



U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: General Aviation Controlled Flight
Into Terrain Awareness

Date: 4/1/03

AC No: 61-134

Initiated by: AFS-800

Change:

1. PURPOSE OF THIS ADVISORY CIRCULAR (AC). This AC highlights the inherent risk that controlled flight into terrain (CFIT) poses for general aviation (GA) pilots. This AC includes the Federal Aviation Administration's (FAA) common definition of the term CFIT; identifies some, but not all, of the risks associated with GA CFIT accidents; and provides some recommendations and strategies to combat CFIT within the GA community. This AC is not an all-inclusive document on CFIT; rather, this AC is designed to help flight instructors, FAA Aviation Safety Program Managers, and other trainers develop CFIT training materials by identifying some of the factors involved in GA CFIT accidents. Some common references are included to aid instructors in preparing CFIT presentations. Pilots can benefit from reading this AC to check their own knowledge of CFIT and factors involved to avoid having a GA CFIT accident. This AC will break the study of GA CFIT into three broad categories. One will focus on visual flight rules (VFR) pilots without an instrument rating operating in marginal VFR weather conditions (visual meteorological conditions (VMC)) or instrument flight rules (IFR) weather conditions (instrument meteorological conditions (IMC)) commonly known as scud running. The second category will focus on GA IFR operations in IMC conditions on an IFR flight. The third category will focus on low-flying aircraft operating in VFR conditions. This AC does not address CFIT in Title 14 of the Code of Federal Regulations (14 CFR) part 121 or part 135 operations. The contents of this document do not have the force and effect of law and are not meant to bind the public in any way. This document is intended only to provide clarity to the public regarding existing requirements under the law or agency policies.

2. BACKGROUND.

a. According to FAA information, GA CFIT accidents account for 17 percent of all GA fatalities. More than half of these CFIT accidents occurred during IMC. The FAA is working in partnership with industry to develop an action plan and revise guidance material to reduce the incidence of CFIT within the GA segment of aviation. However, one of the problems in reviewing GA CFIT accidents is the lack of data, particularly human factors data. Since many of the pilots involved in GA CFIT accidents are fatalities and most GA aircraft are not equipped with data recording systems, the lack of GA CFIT accident data will continue to remain a problem for investigators.

b. Although many CFIT accidents have some common factors that are applicable for all types of aircraft, we want to stress the difference between a crewed aircraft with two pilots in the cockpit and a single-pilot aircraft. In crewed cockpits, the second pilot may make the difference between a safe flight and a CFIT accident. Conversely, a second pilot can also be a distraction in certain circumstances unless the crew has been trained to work well together and is following

c. Checklists.

(1) Personal Minimums Checklist,

https://www.faa.gov/training_testing/training/fits/guidance/media/personal%20minimums%20checklist.pdf.

(2) Flight Safety Foundation, CFIT Checklist, Appendix 1, and

https://flightsafety.org/wp-content/uploads/2016/09/cfit_check.pdf. To order a laminated copy, send a written request to The Director of Programs, Flight Safety Foundation, 701 N. Fairfax Street, Suite 250, Alexandria, VA 22314-2058. A fillable Microsoft Excel spreadsheet version of this checklist is available at <https://flightsafety.org/wp-content/uploads/2016/09/FSF-CFIT-Checklist-Worksheet.xls>.

d. Airman Certification Standards and Practical Test Standards. The current versions of these documents are available online at https://www.faa.gov/training_testing/testing/.

e. Controlled Flight Into Terrain Education and Training Aid. Historically, most of the research related to CFIT accidents and the development of recommended safety practices have been done for air carrier type operations. The Controlled Flight Into Terrain Education and Training Aid is a good example of such research done by industry and government. Produced by the Flight Safety Foundation, the International Civil Aviation Organization (ICAO), and the FAA, the aid provides a good history, lists common dangers, and provides some recommended means of combating CFIT accidents for air carrier operations. In addition, the document is a valuable resource for anyone developing a CFIT training course. The document is available online at <https://skybrary.aero/sites/default/files/bookshelf/2507.pdf>.

5. DEFINITIONS.

a. Controlled Flight Into Terrain (CFIT). CFIT occurs when an airworthy aircraft is flown, under the control of a qualified pilot, into terrain (water or obstacles) with inadequate awareness on the part of the pilot of the impending collision.

b. Loss of Control. Loss of control refers to emergency situations from which a pilot may have been able to recover but did not, such as problems with situation awareness, recovery from wind shear, mishandling of an approach, and recovery from a stall.

c. Situational Awareness. As used in this AC, situational awareness means the pilot is aware of what is happening around the pilot's aircraft at all times in both the vertical and horizontal plane. This includes the ability to project the near term status and position of the aircraft in relation to other aircraft, terrain, and other potential hazards.

d. Crewed Aircraft. In this AC, crewed aircraft refers to an aircraft or flight operation in which more than one pilot is required by aircraft certification or type of operation.

e. Single-Pilot Aircraft. In this AC, "single-pilot" means only one pilot is required by the aircraft certification. Normally, only one pilot flies such an aircraft.

- (6) Enhance the flight review and/or instrument competency check.
- (7) Develop and distribute mountain-flying technique advisory material.
- (8) Standardize and expand use of markings for towers and wires.
- (9) Use high visibility paint and other visibility enhancing features on obstructions.
- (10) Eliminate the pressure to complete the flight where continuing may compromise safety.

8. VFR-ONLY PILOTS OPERATING IN MARGINAL VFR/IMC CONDITIONS.

a. Operating in marginal VFR/IMC conditions is more commonly known as scud running. According to National Transportation Safety Board (NTSB) and FAA data, one of the leading causes of GA accidents is continued VFR flight into IMC. As defined in 14 CFR part 91, ceiling, cloud, or visibility conditions less than that specified for VFR or Special VFR is IMC and IFR apply. However, some pilots, including some with instrument ratings, continue to fly VFR in conditions less than that specified for VFR. The result is often a CFIT accident when the pilot tries to continue flying or maneuvering beneath a lowering ceiling and hits an obstacle or terrain or impacts water. The accident may or may not be a result of a loss of control before the aircraft impacts the obstacle or surface. The importance of complete weather information, understanding the significance of the weather information, and being able to correlate the pilot's skills and training, aircraft capabilities, and operating environment with an accurate forecast cannot be emphasized enough.

b. Continued flight in reduced visual conditions compounded by night operations and/or overwater flight poses some risks. VFR pilots in reduced visual conditions may develop spatial disorientation and lose control, possibly going into a graveyard spiral or descend to an unsafe altitude while trying to maintain visual contact with the surface. The pilot then impacts terrain, the surface, or an obstacle while trying to maneuver. The following are some of the CFIT risks associated with such flight.

- (1) Loss of aircraft control.
- (2) Loss of situational awareness.
- (3) Reduced reaction time to see and avoid rising terrain or obstacles.
- (4) Inability of the pilot to operate the aircraft at its minimum controllable airspeed.
- (5) Getting lost or being off the preplanned flightpath and impacting terrain or obstacle.
- (6) Reduced pilot reaction time in the event of an aircraft maintenance problem because of a low or lowering altitude.
- (7) Failure to adequately understand the weather conditions that resulted in the reduced conditions.

(8) Breakdown in good aeronautical decision making.

(9) Failure to comply with appropriate regulations.

(10) Failure to comply with minimum safe altitudes.

(11) Increased risk of hitting one of many new low altitude towers installed for cellular telephones and other types of transmissions. This risk is especially great along major highways if VFR pilots try to follow a highway when lost or trying to stay under a lowering ceiling.

(12) Failure to turn around and avoid deteriorating conditions when first able.

9. GA IFR OPERATIONS IN IMC CONDITIONS ON AN IFR FLIGHT. These operations also pose special risks. Whether it is failure to follow safe takeoff and departure techniques, recommended en route procedures — which includes loss of situational awareness — or failure to maneuver safely to a landing, IFR operations can be dangerous for those not prepared to operate or not current and proficient in the IMC and IFR environments. Many of these accidents result in fatalities. Techniques or suggestions for avoiding some of these IFR risk factors include:

- a. Importance of the PIC being qualified, current, and proficient for the intended flight.
- b. Importance of the aircraft being properly equipped for the intended flight.
- c. Having the proper charts and approach plates for the intended flight. VFR charts, although not required, should be on board because they can provide important obstacle and terrain data for an IFR flight.
- d. Knowing the planned procedure well enough to know if air traffic is issuing an unsafe clearance or if the pilot flying, when a crewed aircraft, is not following the published procedure.
- e. If in a crewed aircraft, both pilots have adequately briefed the flight and operation of the aircraft, including shared responsibilities.
- f. Having complete weather data for the flight, including knowing where VMC exist or a safe alternative is since many GA aircraft flown IFR have limited range or speed to fly out of unforecasted weather conditions.
- g. Importance of maintaining situational awareness, both horizontal and vertical, throughout the flight to avoid flying into hazardous terrain or known obstacles.
- h. Complete knowledge on how to operate all equipment on board the aircraft. This includes the limitations and operations of new types of navigation equipment.
- i. If a crewed aircraft, the crew is aware of and follows FAA and industry recommended CRM principles. If a single-piloted flight, the pilot knows to use all available resources including ATC to help ensure a safe flight as well as any onboard resource such as passenger or onboard charts or manuals.

during the climb portion. Only about 4.5 percent occur during cruise. About 19.5 percent occur during descent and initial approach. But 41.4 percent of the accidents occur during final approach and landing. Takeoff, initial climb, final approach, and landing represent only about 6.0 percent of the total flight time of a given flight. But as these numbers point out, that 6.0 percent of a flight's total time can be deadly. GPWSs and the newer TAWS using GPS have the potential to reduce CFIT accidents on takeoffs and landings. These systems provide one more tool for pilots to use to increase their safety margin when operating close to terrain and obstacles. However, every pilot must know the limitations of their database and what objects are included in the database.

b. The solution to combating CFIT accidents starts on the ground. Pilots need to properly prepare to safely execute the maneuvers required during takeoff, initial climb, final approach, and landing phases of flight. Whether VFR or IFR, each flight has critical flight segments. How the flight segments are planned for and handled determines, to a great extent, the safety of the flight. Appendix 1, Flight Safety Foundation's CFIT Checklist, provides one example of how to calculate CFIT risk. It states, "Use the checklist to evaluate specific flight operations and to enhance pilot awareness of the CFIT risk." Page 4 of the checklist tells how pilots can obtain copies of the checklist or reproduce it.

c. Recommendations.

- (1) Noninstrument rated VFR pilots should not attempt to fly in IMC.
- (2) Know and fly above minimum published safe altitudes. VFR: Fly a minimum of 1,000 feet above the highest terrain in your immediate operating area in nonmountainous areas. Fly a minimum of 2,000 feet in mountainous areas.
- (3) If IFR, fly published procedures. Fly the full published procedure at night, during minimum weather conditions, or operating at an unfamiliar airport.
- (4) Verify proper altitude, especially at night or over water, through use of a correctly set altimeter.
- (5) Verify all ATC clearances. Question an ATC clearance that assigns a heading and/or altitude that, based upon your situational awareness, places the aircraft in a CFIT environment.
- (6) Maintain situational awareness both vertically and horizontally.
- (7) Comply with appropriate regulations for your specific operation.
- (8) Don't operate below minimum safe altitudes if uncertain of position or ATC clearance.
- (9) Be extra careful when operating outside the United States or in an area which you are not familiar.
- (10) Use current charts and all available information.