

SOUTH AFRICAN



**CIVIL AVIATION
AUTHORITY**

Controlled Flight into Terrain

*Accidents and Incidents Investigations Division
Research and Data Analysis Section
Ms Bongji Mtlokwa*



The aircraft collided with mountainous terrain during Instrument Meteorological Conditions (IMC).



The aircraft collided with mountainous terrain during Instrument Meteorological Conditions (IMC) on a flight from Nelspruit Aerodrome to Rand Aerodrome.

Both the aircraft represented above collided with terrain during controlled flight. In both these accidents several occupants perished. From these two accidents the investigation teams found that the aircraft were serviceable prior to flight.

Why does it happen?

Poor flight planning by the pilot/crew;

Lack of experience by the pilot/crew;

Disregard for standard safe operating procedures;

Poor decision-making;

Lack of knowledge of the area and associated weather phenomena;

Deliberate VFR into IMC conditions;

Commercial/operational pressures.

These are but a few of the factors that should be considered that might have played a direct or an indirect role in these types of accidents.

What exactly is Controlled Flight into Terrain (CFIT)?

CFIT is described as an accident in which an airworthy aircraft, under pilot control, is unintentionally flown into the ground, a mountain, water, or an obstacle. The pilots are generally unaware of the danger until it is too late. According to worldwide statistics, CFIT is the major cause of loss of life in aviation accidents. According to available SACAA data applicable for the period January 2006 to December 2010, twenty-four (24) CFIT accidents occurred in which seventy-five (75) occupants perished.

Why do CFIT accidents occur?

Pilots find themselves in this situation due to various reasons, but encountering inclement weather conditions en route to an intended destination without taking evasive action timeously (returning to point of departure, or an alternate aerodrome) remains one of the main causes for these types of accidents. In most cases poor flight planning could be regarded as the primary cause for this type of accident, together with the fact that the pilot was not familiar with the area and associated weather conditions/phenomena. Another very profound cause of these types of accidents is the 'Get-There' syndrome; where the pilot, or in many cases his or her passengers/cargo must be at a certain location at a certain time, irrespective of whether safety is compromised and regulatory requirements and procedures are not met.

Contrary to more advanced transport aircraft, aircraft in the general aviation sector in most cases do not have terrain awareness warning systems (TAWS) on board, which in many cases could prevent these types of accidents if the pilot(s) adhere to the warning command of such a device. Weather radar is another important piece of equipment, and is found more commonly on general aviation aircraft than TAWS. However, if your aircraft is equipped with all these warning and information systems, it does not mean that a CFIT accident will necessarily be avoided. History has shown us that from some of the most advanced aircraft in the world to some much less advanced, have been involved in CFIT accidents. The pilot/cockpit crew needs to believe and adhere to the warning signals displayed by these warning units to avoid these types of accidents. A very prominent aircraft accident that occurred in South Africa with an aircraft that was equipped with all these warning devices was the Hawker HS748 that collided

with the Outeniqua Mountains to the north of George on 1 June 2002, in which two crew members and well-known cricketer Hansie Cronje perished. The crew of that aircraft received the command to 'Pull Up', 'Pull Up' several times from the GPWS (Ground Proximity Warning System) but failed to adhere to it, resulting in the tragic CFIT accident.

The majority of flights are being flown utilizing GPS as the primary navigational reference. In certain instances pilots will fabricate their own let down plates based on GPS. These you find to be more common amongst pilots who fly into known aerodromes on a regular basis where the weather conditions from time to time do not favour VFR flight (i.e., his/her home aerodrome, or holiday destination, farms or game lodges, which in most cases are unlicensed aerodromes). It is very seldom that faulty equipment plays a role in these types of accidents, but this cannot be ignored, nor ruled out. Human factors remain the primary factor resulting in these types of accidents.

Just how important is flight planning and what is flight planning?

Flight planning can be described as the process of planning your route, includes several safety-critical aspects and is essential to ensure a successful flight.

The pilot/crew must ensure that they obtain an accurate weather forecast for the time and route to be flown, with special emphasis on winds and possible inclement weather conditions that might be encountered en route (i.e., thunderstorms), which might require a possible deviation or turning back.

Accurate fuel calculations are essential to ensure that the aircraft can safely reach its intended destination with adequate reserves for an alternate aerodrome should it be required.

Compliance with air traffic control requirements/routings, which might require extended approaches or going into the hold for some time, can play a role.

Ensure aircraft performance criteria are not compromised (i.e., weight and balance, centre of gravity, density altitude) and are within the Aircraft Flight Manual limitations.

Ensure the pilot and/or crew are fit for the flight and are appropriately licensed and rated in accordance with regulatory requirements to perform such a flight.

Ensure the aircraft is airworthy and properly certified for the intended flight.

CFIT accidents are mostly caused by poor flight planning and decision making on the part of the pilot/flight crew members.

As a pilot, you need to make a decision as to whether to proceed with the flight or abandon it prior to departure or turn back en route and divert to an alternate aerodrome. In recent years during provincial safety seminars that were conducted by the accidents investigations division, pilots had a discussion about the challenges that come with being a freelance commercial pilot. Scenarios where fare paying passengers, cargo, company aircraft or EMS (Emergency Medical Services) flights need to be flown were highlighted under these risks. Commercial operators have to look after the financial interest of the business, while the pilot needs to look after his credibility and ensuring that he does not jeopardize his 'lifeline'/employment opportunities as well as the safety of the operation, which is of paramount importance.

It is a well-known fact that certain pilots end up being placed under severe pressure to perform flights even if they know that conditions are not favourable and that safety might be jeopardised. This gets done in the interest of commercial demands and satisfying the customers' needs, and not in the interest of aviation safety. Pilots end up deviating from procedures and regulations (taking chances) to meet commercial demands. Some pilots make it to the other side, and in doing so develop a habit of non-compliance to procedures and regulations, which one day when he or she least expects it, fails to beat the odds, resulting in an accident. As a pilot, ask yourself, how you would respond if you were faced with such a scenario? Is the decision that you make a safe one or not, and should you proceed?

Procedures and regulations which include adherence to minimum heights where written and documented in the interest of aviation safety and should be adhered to, to ensure that each and every flight is being performed as safely as possible. A disregard of these procedures and regulations could be fatal.

Certain aircraft and certain pilots are not certified nor rated to fly in instrument meteorological conditions (IMC). They can only fly in visual meteorological conditions (VMC). It sometimes happens that a pilot finds himself/herself entering IMC conditions. This is once again a decision that was made by the pilot, a decision which in most cases is dependent on his or her experience and knowledge of the area. This could be very dangerous if you are not instrument rated, or if the aircraft is not equipped to be flown under these conditions. It is therefore of paramount importance to plan your flight properly and avoid any fatal traps, for example entering IMC conditions not knowing if you will be able to remain clear of terrain ahead.

Being an instrument-rated pilot, flying an IFR certified aircraft does not make you immune to CFIT accidents. The SACAA has investigated several CFIT accidents where both these requirements were met, yet the aircraft still collided with terrain. One of the major aspects leading to these types of accidents is failing to adhere to procedures. Example: Pilot/crew initiate their descent prematurely, by deviating from the published letdown procedure for a licensed aerodrome, which might be surrounded by mountainous terrain, resulting in a CFIT

accident. You may find the same type of scenario with pilots that create their own letdown plates and deviate from it.

Additional factors which contribute to CFIT accidents

There are unforeseen situations that do arise during flight where the pilot or crew member might suffer from a medical condition, or have eaten food just prior to or during the flight that caused sudden illness (food poisoning) that could impair his performance to such an degree that he can no longer apply his mind to the complexity of the flight. These types of situations, although rare, do manifest themselves from time to time. It is therefore essential for all flight crew members to ensure that they are in good health prior to every flight and that a proper diet (proper eating routine) is followed, and that situations of glucose intolerance (associated with diabetics/fluctuating blood sugar levels) be avoided at all costs, as an example. From a medical perspective, cardiovascular conditions were found to have been the cause of several CFIT accidents in South Africa, and remain the number one medical condition resulting in accidents.

There have also been a few CFIT accidents associated with the “Black Hole” effect. All these accidents occurred at night, with very little or any celestial illumination or any lights on the ground. The pilots in all of the cases were flying VFR, and he/she lost his/her visual reference (horizon) and as a result started to descend and collided with terrain. One such an accident occurred while the pilot was positioning for landing and had to approach his landing zone while flying over a lake. There was a power failure in the area and he had no visual cues with reference to the shore/landing zone (no lights). The pilot, however, had decided to continue with the approach as he had flown it several times before. He descended too low and flew into the water. He managed to survive the accident and swam to shore.

The CAA also has on record a CFIT accident where the pilot was found to be intoxicated during the flight. This accident also occurred at night, resulting in inadequate terrain clearance. Even though the aircraft was equipped with an auto-pilot, it is believed that the hold function of the auto-pilot ALT (altitude) was not working properly (numerous maintenance entries in the aircraft logbook to rectify the auto pilot ALT hold) and the aircraft was slowly descending without proper monitoring on the part of the pilot, who failed to detect this happening and correct it timeously.

There have been one or two CFIT accidents in South Africa where the pilot experienced technical problems during flight, which required him/her to divert or return to the aerodrome of departure and in doing so, collided with terrain. These types of situations require quick decision-making on the part of the pilot and in most cases he becomes fixated in dealing with the emergency instead of flying the aircraft. During such a deviation the pilot mostly refers to the GPS (there could be more than one unit installed in use) as his primary navigational reference. In some instances the aircraft might be on an official flight plan, under radar control. Being under radar control the aircraft might be vectored to a certain aerodrome with the assistance of the radar controller. It remains the pilot-in-command’s responsibility to ensure that the flight is conducted safely, and terrain clearances en route are adhered to, as terrain

does not get displayed on the controller's screen and he/she can therefore not advise the pilot/crew as such.

Just how many lives have we lost to CFIT?

The SACAA causal factor list for accidents in the flight crew/pilot category (sub-heading 7 of the list) indicates that for the period under review, 75 people have lost their lives under the CFIT category out of the 115 fatalities on record for the entire category (see list on next page). This resulted from 24 CFIT accidents.

CFIT accidents are usually associated with more than one fatality apart from the pilot/crew. The second highest cause on the list of high fatalities is that of stalling/failure to maintain flying speed in an aircraft.

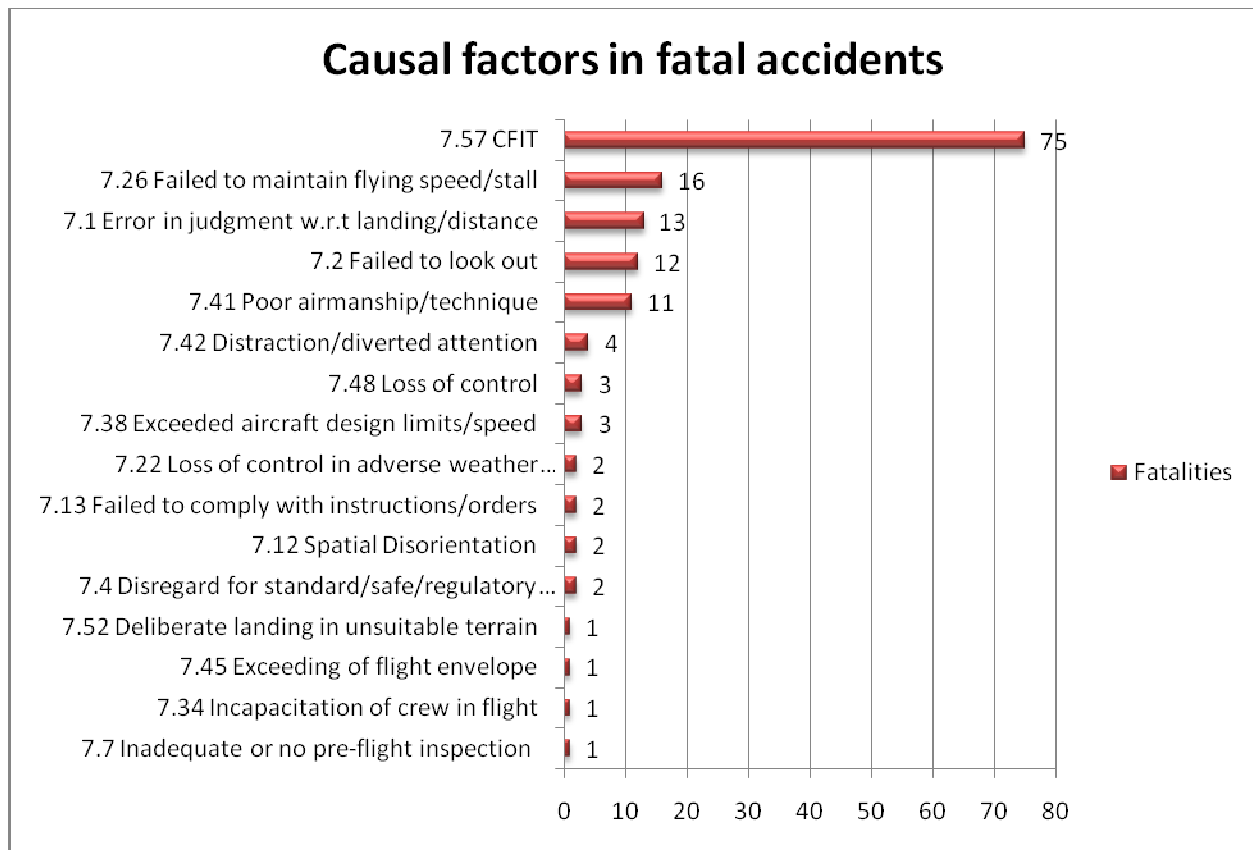
The survival rate associated with these types of accidents is minimal, with only two CFIT accident survivors who lived to share their experiences on record.

Where do CFIT accidents occur?

According to our database, we found that most CFIT accidents occur in the Mpumalanga province followed by KwaZulu-Natal, Limpopo and the Western Cape provinces. These are the areas that topographically contain the most mountainous terrain in the country. Several South African Registered aircraft have also been involved in CFIT accidents in countries outside the borders of South Africa, with most of these accidents occurring in the sub-Saharan African region.

It is interesting to note that very few of the CFIT accidents that have occurred outside the borders of this country, involving South African Registered aircraft, were in the general/private aviation category. Most of these aircraft were either on a wet or dry lease to a relief/humanitarian organisation or a licensed operator (Part 127 or 135) in these countries.

It should be noted that CFIT accidents are not only associated with mountainous terrain or high ground but could also occur during an approach to land in conditions of low visibility, where the aircraft is allowed to descend below minimum heights before a go-around is performed. In some instances the aircraft will collide with level terrain on the approach, and instances have been recorded where the aircraft collided with terrain while executing a go-around due to a deviation from the missed approach procedure for the aerodrome in question. Most of the medical-related CFIT accidents on record occurred on flat open remote land or water (aircraft crashing into the sea/lake/dam).



This graph indicates fatalities per cause of the accident. It is clear that CFIT is the leading cause of death. It must be noted that we are only considering accidents of which the accident reports were approved during the 5-year period (2006 – 2010) only, meaning that the numbers could be significantly higher.

How to avoid CFIT Accidents

1. Conduct proper flight planning, especially with regard to weather conditions en route, fuel endurance and alternate aerodromes, should you need to divert.
2. Avoid VFR into IMC, especially flights being conducted below the TMA.
3. Adhere to procedures and regulatory requirements.
4. Ensure that you (the pilot) are fit for the flight.
5. Ensure that the aircraft is airworthy and properly equipped for the flight.
6. Do not allow commercial pressures to jeopardize aviation safety.

7. Display sound judgment and decision-making skills.

These are but a few of the important factors to keep in mind to ensure a safe flight.

Conclusion

Remember to put safety first. We are appealing to all pilots out there, commercial organisations, training schools and the flying public to put safety first. Rather be late than not arrive at your destination. Let us be a safety-conscious community. The Accidents Investigations Division, together with the SACAA is hoping that this article will bring awareness to the flying community and also to get debate going with regard to safety issues. You are welcome to invite accident investigators to share some of the lessons learned during aircraft investigation activities.

In the next article, we will briefly discuss the remaining causes of accidents and later explore other safety factors uncovered during the research activities.

Until next time!

We would love to hear from you; comments and enquires can be directed to Ms Bongi Mtlokwa at mtlokwab@caa.co.za, Tel: 011 545 1238, Fax: 011 545 1466.