CFIT(Controlled Flight Into Terrain)

NCAA- FLIGHT OPERATIONS PRESENTATION

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Description

Controlled Flight into Terrain (CFIT) occurs when an airworthy aircraft under the complete control of the pilot is inadvertently flown into terrain, water, or an obstacle. The pilots are generally unaware of the danger until it is too late, and a few instances where it was intentional (psychological).

Most CFIT accidents occur in the approach and landing phase of flight and are often associated with non-precision approaches.

Effects(Results)

- Collision with the ground normally resulting in hull loss and fatalities/injuries.

Contributory Factors

- **Weather**: (Rain, turbulence, and icing) may increase the workload of the pilot and cause interference reducing the accuracy of radio navigation beacons.

- **Poor Visibility:** particularly at night or due to smoke caused by fires especially in the dry season In Africa can contribute to disorientation and loss of situational awareness.

- **Approach Design and Documentation**: The depiction of an approach, and particularly step-down fixes, on Terminal Approach Procedure (TAP) plates may not be clear. Approaches may take aircraft close to high terrain in order to comply with noise abatement constraints, or to deconflict with departure routes.

- **Failure to use Standard Phraseology** leading to confusion and misunderstanding.

- **Pilot fatigue** and **Disorientation**. Approach and landing is a demanding phase of flight for pilots.

CFIT Precursors/Forerunners

- **PROCEDURAL & FLIGHT PATH DEVIATIONS:**
- Low pitch attitude/shallow flight path/altitude loss after lift-off
- Flight below desired profile path during climb
- Lateral deviation during climb VFR(NIGHT) OR IF (SID)
- Descent/flight below segment or sector safe altitude (MSA)
- Altimeter setting error QNH /QNE(1013)
- Failure to check navigation accuracy before approach (RNAV/GNSS)
- Lateral deviation during approach VFR(NIGHT) OR IF (STAR)

CFIT Precursors/Forerunners

- Distractions caused by unapproved usage of electronic devices/EFB.
- Failure to revert to nav aids raw data in case of doubts on automation
- Incorrect or inappropriate radar vectoring by ATC (i.e., below minimum vectoring altitude (MVA) or (MSA) and/or toward high terrain)
- Premature descent to the next step-down altitude during a multiple-steps-down non-precision approach
- DME confusion (non-collocated DME versus ILS-DME), in identifying the final descent point
- Premature descent to DA(H) before G/S intercept or premature descent to MDA(H) before final descent-point/FAF
- Premature descent below MDA(H) before reaching the visual descent-point (VDP)

CFIT Precursors/Forerunners

- Flight below desired flight path during initial and/or final approach
- Continued approach, when below DA(H) or MDA(H), after loss of visual references
- Late or inadequate response to GPWS/TAWS alert/warning
- Late or inadequate response to MSAW warning
- Late or inadequate response to windshear warning
- Un-stabilized approach (steep or shallow approach)
- Failure to go-around
- Lack of effective flight path control during go-around VFR OR IF
- Failure to follow published missed-approach procedure
- Inadequate fuel management (pre-flight planning)

Examples of Accident and Serious Incident Reports

Typical Scenarios 1

Pilot-induced situation: The pilot encountered weather conditions that were worse than forecast and, in an attempt to maintain or regain visual contact with the ground in an area of very low cloud, descended below Minimum Safe Altitude (MSA) and the aircraft struck the ground. Contributing to this accident was the pilot's over-reliance on GPS while attempting to maintain Visual Meteorological Conditions (VMC) and a resultant lack of adequate situational awareness of terrain.

Especially at our coastal airports e.g. FYLZ ,FYWB,FYSM and even our central airports during the rainy season .FYWH ,FYWE ,FYWD etc.

Examples of Accident and Serious Incident Reports

Typical Scenarios 2

ATC-induced situation: The controller gave an aircraft which was still at 210 KIAS an intermediate heading towards the ILS centerline during a radar vectored initial approach but was subsequently distracted and failed to issue the intercept heading for the ILS LLZ. When the flight crew, who were unfamiliar with the approach, failed to notice the situation in time to query it, the aircraft flew beyond the centerline and into high terrain on the other side before resolution was possible.

Brief the Approach

: Gulfstream III N303GA.

Figure: Airborne view of Aspen Runway 15, from NTSB Accident Brief, Figure 2.

Examples of Accident and Serious Incident Reports

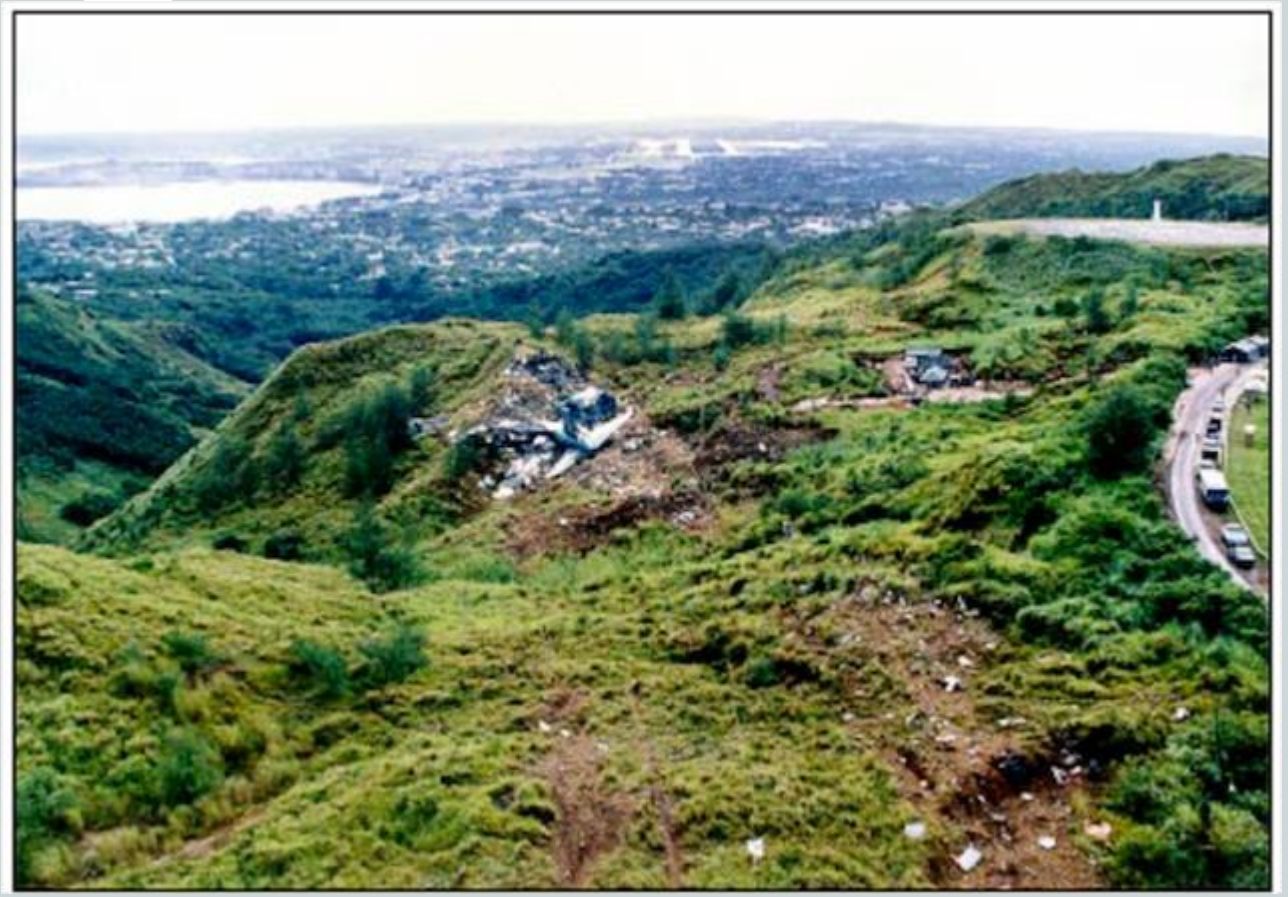
The approach briefing sets the tone for the approach to come and should include terrain considerations. Many of us fail to give complete approach briefings when we expect visual conditions, "this will be a visual approach backed up by the ILS." In the case of the GIII that killed all on board on approach into Aspen in March of 2001, the captain never gave an approach briefing because he expected visual conditions. His poorly flown approach ended with the crew losing sight of the runway and killing all on board.

At the very least your cockpit should have detailed charts to give you an idea where the terrain is. If your cockpit gives you a visual display of terrain on the instruments, you should know how to interpret and use that information.

Examples of Accident and Serious Incident Reports

Pay Attention to ATC clearance:

There is a long history of pilots relying on an ILS glide slope and crashing their airplanes when the glide slope was missing. That was certainly the case of Korean Air 801. But a contributing factor was the pilots not understanding that when the controller said "glide slope unusable" they were being given a key piece of information.



Examples of Accident and Serious Incident Reports

- The controller instructed: "Tiger 66, descend two four zero zero. Cleared for NDB approach runway three three."
- The pilot heard "descend to four zero zero" and read back: "Okay, four zero zero."
- The correct phraseology would have been: "descend and maintain two thousand four hundred feet" from the controller and the pilot.
- The clearance was to 2,400 feet and the crew descended TO 400 feet. Everyone on board was killed and the aircraft was destroyed.

Examples of Accident and Serious Incident Reports

Headline: V5-KAI Accident

Narrative: V5 KAI on flight from Swakopmund to Roidina DCT FL075

Top of decent over Omaruru switched to freq. 124.8 , and descended to overhead Roidina airfield 2000ft. Passed runway on eastern side flying 040. Observed windsock hanging vertically. Pilot decided to descend to 1000ft and continue with circuit for runway 04 following crosswind, LH downwind, LH base making radio calls.

Final approach was steep, too deep into runway, and to the left of center, full flaps extended.

Shortly before touchdown pilot decided to go around. Applied full throttle and flew straight and level. The aircraft yawed to the left. The pilot waited for the speed to increase and attempted to retract flaps but observed tree(s) directly ahead. The aircraft continued in the direction of trees. Pilot attempted to gain altitude by lifting nose. Initially the nose of the airplane cleared trees but trees hit underside of plane. Crash ensued. Pilot turned off electrics but could not reach fuel selector, then made emergency call on cell phone for help. The pilot exited airplane through left window where the perspex was broken. Help arrived and pilot left the scene.

Examples of Accident and Serious Incident Reports

On 15 August 2015 at 2351Z a Cessna 441 aeroplane, with two crew and a paramedic on board took off

from Eros Airport (FYWE) on a medical evacuation flight with their intended final destination Cape Town

International Airport (FACT).

The aircraft landed at Oranjemund (FYOG) to pick up a male patient and his daughter. At 0206Z the aircraft

departed from FYOG on a mercy flight to FACT.

At 0343Z the aircraft made the first contact with FACT area and the aircraft was put under radar control.

At 0355Z, area control advised the crew that there was a complete radar failure. The aircraft was on a descent to 6500 ft when approach advised them to prepare for a VOR approach for runway 19.

Examples of Accident and Serious Incident Reports

At 0429Z, while on approach for landing at FACT, all contact was lost with the aircraft. At approximately 0556z the aircraft's wreckage was located approximately 8 nm to the north of FACT.

All five occupants on board were fatally injured and the aircraft was destroyed by impact and post impact fire.

The investigation revealed the aircraft collided with terrain, following descent below the minimum safe altitude (MSA) on the step down fix, during instrument meteorological condition (IMC)conditions, while on the VOR approach for runway 19 at FACT. At the time the ILS was working, however the approach controller offered a VOR approach for separation with an outbound aircraft as the radar was unserviceable.

Examples of Accident and Serious Incident Reports

On Thursday 26th June 2003, a Cessna 208 aircraft, commenced take-off from runway 28 of the Rooisand Guest Farm Airstrip, Namibia. The flight destination was Eros Airport in Namibia. There were 04 persons on board.

The medical evacuation flight departed Runway 28 at the Rooisand Guest Farm approximately 180 kilometers southwest of Windhoek, Namibia, at 1827 UTC with a car accident victim, two paramedics and one pilot on board. Approximately 50 seconds after take-off the aircraft impacted hilly ground approximately 4,500'southwest of the runway, at an elevation of approximately 3,873 ft (57° below the top of a hill) on a heading of approximately 120°. Ground scars suggest the wings were level at the time of impact.

All occupants were fatally injured in the mishap. A post-impact fire destroyed the fuselage. It could not be determined it the occupants were using their safety restraints. Post-impact fire damage prevented the evaluation of the seats and the seat rails. Both wings and the engine separated from the fuselage during the impact sequence and all three propeller blades separated from the engine.

The aircraft arrived at Rooisand 15 minutes before sunset and took 1 hour to load the accident victim. Witnesses stated it was a moonless night and very dark when the aircraft took off. The hills surrounding the runway could not be seen. Cars were parked at both ends of the gravel runway with their lights to assist the pilot. Weather was reported to be clear, a temperature of 19° and with a 10 to 12 knots taking off with a 10 to 12 knot tailwind. The aircraft was seen to lift off at midfield. The witness with the car at the departure end of the runway stated the aircraft passed 150ft to 300 ft over his head. It turned to the right and then banked steeply to the left and began to lose altitude. It continued in the descending left turn until it disappeared from witnesses view. A ball of flame was seen to rise above a hill to the southwest of the runway. Two other witnesses collaborated his statement and all agreed the take off seemed normal and the engine sounded normal during the entire event.

After almost five months of carrying out investigations and having heard several witnesses and made visits and inspected various facilities and read and considered a number of memoranda, the Investigation has now come to rest and made its findings.

Examples of Accident and Serious Incident Reports

The Investigation finds that the accident occurred as a result of controlled flight into terrain. Contributing to this was the poor ground/sky illumination and the pilots difficulty in seeing the control panel without his glasses.

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1.3 Damage to aircraft

1.3.1 The aircraft was completely destroyed by the impact and fire.

Figure 6 View of Wreckage

Figure 7 View of Wreckage

CFIT Defences and Controls

Identification of accident precursors is only half the battle; it is also necessary to define and implement defences and control strategies to address the threats involved.

CFIT Defences and Controls

Namibia's Aviation Industry's activities are mostly single crew operations, hence the defenses and controls we will be discussing today will be for both single and multi crew operations.

The first three points are single crew's most important defense

- Self Brief- Take off ,Approach, and Route
- Use the highest form of assistance from ATC (radar vectors) and airport facilities
- Knowledge of area you are flying (speak to other pilots) (aeronautical maps to have a good understanding of the location of terrain) this will help to keep situational awareness.

CFIT Defences and Controls

- Industry prevention strategies and best practices
- Adherence to SOPs (task sharing, briefings, use of checklists, standard calls and excessive-deviation callouts, mutual crosscheck and backup)
- Cross-check of takeoff data: mass and balance, fuel distribution, wind component, runway conditions, flaps setting, V_1/V_r speeds, etc.
- Adherence to sterile-cockpit rule
- Adopting the constant-angle non-precision approach (CANPA)/constant descent final-approach (CDFA) concept

CFIT Defences and Controls

- Use of an aircraft/airport-specific Engine Out Standard Instrument Departure (EOSID) in case of engine failure
- Adequate use and supervision of automation (If applicable)
- Vertical and horizontal flight paths monitoring (situational and energy awareness)
- Altimeter setting cross-check
- Cross-checking cleared altitude versus minimum safe altitude
- Timely and adequate response to GPWS/TAWS alert or warning
- Timely and adequate response to MSAW warning

CFIT Defences and Controls

- Timely and adequate response to windshear alert or warning
- Awareness of minimum vectoring altitudes
- Awareness of approach design criteria (PANS-OPS(ICAO) versus TERPS (USA))
- Awareness of relationship between track distance to runway threshold and height (300 ft/nm rule-of-thumb)
- Awareness of minimum safe radio-altimeter readings for each approach segment (IAF-IF, IF-FAF)
- Awareness of "black-hole" or other visual illusions for prevailing approach
- Timely go-around
- Adherence to published missed-approach procedure

Reference

Annex 6 part 1-Appendix 2.1.21/2.1.30

Doc 8168 (Aircraft Operations) Volume I/II

ICAO Doc 9365 (Manual of All-Weather Operations)

ICAO Doc 10004 (Global Aviation Safety Plan)

Flight Safety Foundation (CFIT Checklist)

Ministry of works and Transport (DAAII)

In Conclusion …

We as the Aviation Industry can reduce the number of CFIT incidents and/or accidents by remaining vigilant, with regards to

- ✓ Training for pilots (initial and yearly training should include CFIT training and SOP training)
- ✓ Training for ATC and sticking to the standard phraseology and procedures.
- ✓ Sticking to SOP even on the most routine of flights (especially the BRIEFINGS: Take-off, Approach, Go Around)
- ✓ Situational awareness at all time (charts ,preflight planning, weather, notam)
- ✓ Not all our aircraft have GPWS, TAWS etc. but we all have aeronautical maps and airport charts(AIP, Jeppesen, Lido etc.)
- ✓ Most Importantly be Go-Around Orientated (It will save your life)
- ✓ If it's a VFR flight (day or night) keep it a VFR flight
- ✓ Implementation of fatigue management and psychological/wellness monitoring programmes.

Q&A

discussion