CALLBACK
From NASA's Aviation Safety Reporting System
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CONTROLLED FLIGHT TOWARD TERRAIN (CFTT)

Controlled Flight into Terrain (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."[1] Controlled Flight Toward Terrain (CFTT) is the one precursor to every CFIT event, although not all CFTT events become CFIT. To be identified as a CFTT event, ASRS stipulates that the aircraft is mechanically normal and the pilot unaware of dangerous or unsafe in-flight proximity to terrain or obstacles.

CFTT is a complex issue with many components. It can happen anytime during flight, but occurs most often during approach and landing, and if CFTT progresses to CFIT, the collision usually results in fatalities. Causes are not always clear, but could include factors such as weather, approach design and depiction, fatigue, poor situational awareness, or failure to adhere to aviation standards or personal discipline.

CFIT and CFTT have been subjects of much study and thorough analysis. Aviation safety organizations have documented research, likely causes, lessons learned, and strategies for prevention. The NTSB, NASA ASRS, Flight Safety Foundation (FSF), and SKYbrary Aviation Safety are good sources of information regarding CFIT and CFTT. This month ASRS shares reported incidents that provide some insight into the complexities of CFTT phenomena.

Hacking Heard Round the Globe

An alert Salt Lake Center Controller observed a flight navigation error, purportedly the result of GPS jamming. Quick action was taken that may have averted a disaster.

■ *During this time there was widespread GPS jamming.… Almost every aircraft was reporting…GPS outages. Two… [previous] SUN arrivals had advised of GPS malfunctions but reported their GPSs back online prior to the initial approach fix. They flew the RNAV approach from PRESN without incident. We contacted SUN Tower after the first approach to make sure they were unaffected, and the Tower said the Pilot didn't report any issues. When Aircraft X was approximately 4 miles south of the PRESN intersection, the Pilot reported his GPS capabilities had returned. The Radar Controller cleared the aircraft to cross PRESN at or above 9,000 feet, cleared RNAV approach.*

After transferring communication to SUN Tower, [the Radar Controller] noticed the aircraft had taken a more easterly turn than we normally see on the approach. With the abundance of smoke in the area and the TFR very near the RNAV track, we wondered if the Tower had broken off the approach or if something different was happening. I called the Tower and told them Aircraft X was off course and asked if they knew what was going on. They said he had just reported over PRESN at 11,000 feet. The radar showed that Aircraft X was about 12 nautical miles northwest of the PRESN intersection, nearing (about 3 miles from) a 10,900 foot Terrain Alert Volume (TAV), [which specifies an enroute Minimum IFR Altitude (MIA) providing terrain clearance], with the Mode C indicating 10,700 feet. [The Radar Controller] told me to issue a turn to the south. I issued, to the Tower, a 155 [degree] heading and 10,000 feet altitude. We had traffic south of Aircraft X at 11,000. The lowest altitude we saw Aircraft X was 9,600 feet in either a 9,000 or an 8,000 foot TAV. The turn seemed to be timely enough to keep him out of the 10,900 [TAV]. Had [the Radar Controller] not noticed, that flight crew and the passengers would be dead, I have no doubt.

A Diamond in the Sky

With a 300 foot ceiling and 6,000 RVR, a Super King Air 200 pilot intercepted the "glideslope" without crosschecking and correlating position and altitude. Several important lessons were subsequently learned.

■ *The approach to Runway 17L was a bit rushed as traffic was heavy. I intercepted what I thought was the glideslope, but in the Pro Line 21 [Integrated Avionics] System, it was the VNAV bug. Both are green, but one is a snowflake; the other is a diamond. I thought the snowflake was the ILS glideslope and manually took over and flew down the course. I should have correlated altitude with position, but I was hurried and continued until I got the glideslope and a low altitude alert from Tower. I climbed out and subsequently made a normal ILS to landing. Lessons [were] learned on getting rid of the VNAV bug on ILS approaches,…keeping situational awareness despite other factors, and initiating a go-around at the first sign of something not making sense. I spend more time in another aircraft that is also a Pro Line 21 aircraft, but the VNAV bug is magenta and is less likely*

to be confused. Basic airmanship needs to stay in the picture versus following the FMS to the wrong place.

High to Low, Lookout Below

A communication error went unnoticed by this B737 flight crew. An alert Controller recognized CFTT, communication was clarified, and the immediate threat was eliminated.

From the Controller's report:

■ *Aircraft X was being vectored for the Runway 29 ILS approach in low IFR conditions. The altimeter at the time was approximately 29.20. The aircraft was assigned 2,000 feet, and I observed them descend through approximately 1,800 [feet], which is the MVA in the area they were in. At that point, I queried them about their altitude and restated their assigned altitude. The Pilot(s) disputed what I indicated their altitude to be. I issued a low altitude alert without stating the MVA/MSA and a climb back to 2,000 [feet]. In my judgment the Pilots did not believe they were below their assigned altitude, and I felt stating the relevant MVA/MSA would not hasten a climb back to a safe altitude.*

The aircraft descended to approximately 1,200 [feet] before leveling and climbing ultimately to 3,000 feet as I subsequently assigned. Once established in a climb, the pilot asked for the altimeter and stated they had programmed an altimeter setting of 30.20, rather than 29.20, into the aircraft. The aircraft was given the altimeter [setting] on initial contact, shortly thereafter when I read them the latest METAR, …and…a third time when I announced the new hourly ATIS code while the aircraft was on my frequency. To my recollection, the [crew] did not read back the altimeter setting at any point.

I did not issue a Brasher warning. My perception was that the Pilots were rattled (they asked me to repeat their assigned heading three times), and I felt adding the perceived threat of a pilot deviation would not help them safely navigate an instrument approach in low IFR weather.… There was adequate time to issue a Brasher warning on Local or Ground Control frequencies, and they chose not to or failed to do so.… I did not use exactly correct phraseology in my low altitude alert.

From the Captain's report:

■ *We [had] entered and read back a different altimeter setting from [the first Controller than the setting we received]…from [the second Controller]. [The second Controller] asked for an altitude report [from us], which differed from our actual altitude. They told us to climb to a higher altitude at the same time that I queried as to the local altimeter, suspecting we had an [incorrect] setting. This turned out to be true, resulting in [our being] approximately…400 to 500 feet below our assigned altitude. We reset our altimeters and climbed back to the correct altitude and completed the approach and landing.*

From the First Officer's report:

■ *We entered the altimeter setting that we heard…30.25. [While on] vectors for the approach [to Runway] 29, we were told to descend to 2,000 feet. ATC asked, "What is your altitude?" We replied, "2,500 feet." ATC said, "Showing 1,500 feet. Climb to 3,000 feet." We asked for the altimeter setting again. Actual 29.21. We climbed to 3,000 feet and flew the ILS 29 and landed.*

If It Doesn't Look Right, It Probably Isn't

A terrain warning confirmed a First Officer's suspicion that this wide-body aircraft was descending too low. A successful escape maneuver was subsequently performed.

■ *Planned landing at El Paso in day VMC conditions. FO was Pilot Flying (PF). [We were]…2 hours late and 12.5 hours into our scheduled duty day of 10.5 hours. Checking in with El Paso Approach, we were told to plan the visual Runway 8 approach. The previous ATIS was reporting Runway 26L in use.… Due to safety concerns about not having an approach to Runway 8R, we asked for the visual to Runway 26L so we could use the underlying GPS approach for safety. We were then given a visual to Runway 26L, proceed direct to BUSEY fix, and descend and maintain 6,000 feet. A steep descent was initiated due to the [historically] high number of unstable approaches.… Upon passing through 9,000 feet, the Pilot Monitoring (PM) realized that we were being vectored below the FAF altitude of 6,900 feet, and also realized visually and on the terrain display that terrain was very close to our right. The PM asked the Controller to confirm our descent altitude of 6,000 feet. Initially there was no response from the Controller, and the FO initiated a level off.… Shortly after the level off at around 7,400 feet, the Controller…informed us he had a low level alert warning and for us to climb and maintain 8,000 feet. We…simultaneously received a "TERRAIN AHEAD" warning.… The FO initiated a CFIT recovery maneuver, and we leveled off at 8,000 feet as instructed.*

We would like to think that we were given the descent altitude of 6,000 feet in error,…but…we may have either misunderstood the clearance or input the wrong altitude in the altitude select window.

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1. https://www.faa.gov/documentLibrary/media/Advisory_Circular/ac61-134.pdf

ASRS Alerts Issued in April 2019	
Subject of Alert	**No. of Alerts**
Aircraft or Aircraft Equipment	1
Airport Facility or Procedure	1
ATC Equipment or Procedure	1
TOTAL	**3**

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https://asrs.arc.nasa.gov

April 2019 Report Intake	
Air Carrier/Air Taxi Pilots	6,287
General Aviation Pilots	1,420
Flight Attendants	869
Controllers	553
Military/Other	338
Mechanics	307
Dispatchers	135
TOTAL	**9,909**