Flight Advisor Corner by Hobie Tomlinson

May 2012 Annual Safety Issue <u>Controlled Flight into Terrain</u> (Pt. II)

This month we will continue with the second part of our **Annual Safety Issue**. This year's Annual Safety Issue topic looks at a subject that causes a lot of General Aviation accidents, but it doesn't receive much instructional coverage. The issue is **<u>Controlled Flight into Terrain</u>,** better known as **<u>CFIT</u>.**

<u>Controlled Flight into Terrain</u> (CFIT) is a term that was created by Boeing engineers in the late 1970s to describe an accident caused by *<u>an airworthy aircraft still under the pilot's control being unintentionally flown into the ground, a mountain, water, or some other obstacle</u>.*

<u>Oddly Enough</u>, if you look for CFIT as a cause of General Aviation (GA) accidents, you won't find it listed in the Nall Report as a stand-alone category. This is because CFIT is seldom the accident initiator, but it is usually the accident's terminator. Accident initiators, which lead to CFIT events, are those circumstances which cause pilots to fly below the level of the surrounding terrain during conditions which preclude the surrounding terrain from being adequately seen. A secondary CFIT accident initiator is when pilots disregard performance constraints which preclude the aircraft from avoiding the terrain, even though the terrain can be adequately seen.

<u>The Classic CFIT accident</u>, during which the terrain cannot be adequately seen, is either VFR flight into IMC conditions or night VFR flight. The second type of CFIT accident, during which the aircraft has inadequate performance to avoid seen terrain, usually involves a takeoff and departure where climb performance is insufficient to clear the surrounding terrain or getting "trapped" while flying low level in mountainous areas.

<u>We can thus categorize</u> CFIT accidents into the two following categories:

A. Pilot can't see the obstacles in order to avoid them

B. Aircraft has insufficient available performance to avoid the terrain or obstacles, even though they can be seen.

<u>Last Month</u> we listed the following CFIT accident types:

1) **Unwarranted Low Flying**
2) **Mountain Flying**
3) **Confined Space Flying**
4) **Wind Shear**
5) **Scud Running**
6) **VFR into IMC**
7) **Icing**
8) **Night VFR Departures**
9) **Night VFR X-C**
10) **Night VFR Underneath "B" Airspace**

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11) **Night Visual Approaches**
12) **Night Airport Operations**
13) **Loss of Situational Awareness on Approach**
14) **Busting Approach Minimums**

Items 1 thru 4 relate to CFIT accidents occurring because the aircraft had inadequate performance to avoid seen obstructions; **while items 5 thru 14** involve CFIT accidents occurring during conditions in which the terrain could not be seen.

Because CFIT is the terminating event in an accident sequence, it seems like the best way to understand these accidents is to look at sample accidents which typify the initiating events listed above. Last month we covered events 1 through 7 and this month we will pick it up with number 8 and look at the rest of the list.

Night VFR Departures can get us into trouble when we either don't know or don't follow the published obstruction clearance departure procedure for the airport involved. This can involve both straight VFR departures and IFR flights which choose to save time by departing VFR and picking up their IFR clearance airborne.

A Typical Accident involved a Learjet 35A medical flight which elected to make a night VFR departure from Brown Field Municipal Airport (KSDM) near San Diego, CA. This decision was made because the Air Traffic Control Tower had closed for the night and the crew was experiencing difficulty obtaining their IFR clearance on the ground. The aircraft departed VFR to the east while remaining below an overcast and contacting Air Traffic Control (ATC) for their IFR clearance. Shortly after receiving an IFR clearance and commencing climb to their assigned altitude, the aircraft impacted terrain at approximately 4,000 foot MSL (Mean Sea Level). The Captain, Copilot and three medical crewmembers received fatal injuries and the aircraft was destroyed.

Hazards Attitudes Exhibited: Invulnerability, Impulsivity, and Resignation.

Operation Pitfalls: Mind Set (Continuation bias), Get-There-Itis, Fatigue, Lack of Proper Stress Management, Loss of Situational Awareness (SA), and Neglect of Proper Ground Flight Planning.

Mitigation Strategies: The obvious mitigation strategy for this type of accident is being willing to spend whatever time is required in order to get your IFR clearance on the ground before departing. This process is greatly expedited by determining the best way to obtain an IFR clearance on the ground prior to landing at an airport without an operating Control Tower. When a night VFR departure is to be made, it is imperative to follow the airport's Obstruction Clearance Departure Procedure – even when flying VFR.

Night VFR X-C can also get us into serious trouble, especially if we become enslaved to the "magenta line" on our GPS navigators without doing a good route assessment. GPS

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navigators will fly a great circle route direct to any location the pilot has loaded as their "active waypoint" without any intervening terrain considerations.

A Typical Accident involved a Piper PA28-140 in Newcomb, NY, while on a night cross-country flight from Saratoga Springs, NY (K5B2) to Malone, NY (KMAL). The aircraft impacted terrain on the south side of a 4,600 foot mountain about 600 feet below its peak and approximately 47 nautical miles from the destination airport. Data downloaded from a recovered, portable GPS receiver indicated that the aircraft was in a shallow descent on the approximate heading to the destination airport at the time of impact. The accident destroyed the aircraft and was fatal to both the pilot and passenger. Terrain impact occurred 10 minutes after the end of civil twilight on a dark night with no discernible moonlight.

Hazards Attitudes Exhibited: Invulnerability and Macho.

Operation Pitfalls: Mind Set (Continuation Bias), Get-There-Itis, Fatigue, Scud Running, Loss of Situational Awareness (SA), Descent below Minimum Enroute Altitude (MEA), and Neglect of Proper Route Planning.

Mitigation Strategies: VFR night cross-countries require a detailed route analysis to verify that the altitudes to be flown are sufficiently above Minimum Enroute Altitudes for the route. The flight should operate at least 1,000 feet (2,000 feet in mountainous areas) above the highest obstruction within 10 nm either side of the planned flight track to be flown. Needless to say, mixing night, weather, and mountains has a known outcome. The tragedy of this particular accident is that a slightly longer route was available, which could have been safely flown at 2,000 feet MSL.

Night VFR Underneath "Bravo" Airspace has had a couple of iconic, high profile CFIT accidents. When pilots avoid obtaining a clearance to enter Bravo airspace, that airspace has the same effect as a ceiling and caps the altitude choices available. The pilot then is forced to fly below the appropriate MEA for the route. When this occurs in mountainous terrain at night, we are setting the stage for disaster!

A Typical Accident involved a Rockwell Intentional 690A Turbo Commander in Apache Junction, AZ. The aircraft had departed Falcon Field (KFFZ) in Mesa, AZ and was enroute to Sanford Regional Airport (KSAD) in Safford, AZ. The aircraft was cruising at 4,500 MSL to remain under the Bravo Airspace. Approximately 5 minutes after takeoff from KFFZ the aircraft impacted the steep, rocky terrain of the Superstition Mountains at 4,650 feet, which was approximately 150 feet below the top of the local peak. Aircraft wreckage and ground scars were consistent with a wing level impact at cruise power. The aircraft was totally destroyed with the pilot and five passengers receiving fatal injuries. Local weather was reported as winds from 350 degrees at 5 knots, 40 miles visibility, few clouds at 20,000 feet and a waning crescent moon with 3 percent illumination.

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Hazards Attitudes Exhibited: Invulnerability and Macho.

Operation Pitfalls: Mind Set (Continuation Bias), Get-There-Itis, Fatigue, Loss of Situational Awareness (SA), Operation below Minimum Enroute Altitude (MEA), and Neglect of Proper Route Adherence.

Mitigation Strategies: VFR night cross-countries require a detailed route analysis to verify that the altitudes to be flown are sufficiently above Minimum Enroute Altitudes for the route. The flight should operate at least 1,000 feet (2,000 feet in mountainous areas) above the highest obstruction within 10 nm either side of the planned flight track to be flown. Needless to say, mixing night, weather, and mountains has a known outcome. The tragedy of this particular accident is that there were no weather issues and a safe enroute altitude could have been used by simply obtaining a clearance to enter the Bravo airspace. The aircraft needed to climb upon exiting the Bravo airspace overhang anyway, so a Bravo clearance would have allowed it to keep climbing after takeoff. Because the aircraft departed KFFZ to the northeast and was instructed to fly Runway Heading for approximately 90 seconds after departure, it had strayed northeast of a safe route for that altitude. Instead of immediately returning to the safe route over the city of Apache Junction, the aircraft turned directly toward KSAD and impacted the southernmost peak of the Superstition Mountain wilderness area immediately upon exiting the Bravo airspace overhang. Again, proper route analysis and route adherence discipline is imperative during night operations in mountainous terrain.

Night Visual Approaches are another area where we can get into big trouble quickly. Whether arriving in the airport area on a VFR flight plan or by flying a visual approach on an IFR flight plan, it is imperative to fly a ground track into the airport that has been analyzed for minimum safe altitudes and then have the cockpit discipline to remain at or above those altitudes. The easiest way to do this is to simply follow the IFR arrival route and adhere to the charted minimum altitudes. This is always an industry "best practice" and ignoring it in mountainous areas can lead to disaster.

A Typical Accident involved a Beechcraft B200 in Rangeley, ME. The aircraft arrived in the airport vicinity on an IFR flight plan and commenced an instrument approach into Rangeley Airport (K8B0). At 9 miles out, the pilot reported the airport in sight and cancelled his IFR clearance. The aircraft then left the protected airspace of the instrument approach and entered a modified left base, which was outside both the protected instrument approach area and the protected circling minimums area. During descent toward a left base for landing, the aircraft descended into the top of a mountain peak, cutting a level path through the trees before coming to rest 100 feet below the peak's crest. The aircraft was destroyed and both the pilot and passenger received fatal injuries. Local weather conditions were dark night, a solid overcast, and snow showers in the vicinity.

Hazards Attitudes Exhibited: Invulnerability, Impulsivity, and Macho.

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Operation Pitfalls: Mind Set (Continuation Bias), Get-There-Itis, Fatigue, Loss of Situational Awareness (SA), Operation below Minimum Approach Altitudes (MAA), and Neglect of Proper Route Adherence.

Mitigation Strategies: It is very important to firmly grasp the mindset that Visual Meteorological Conditions (VMC) during "dark night" conditions are the equal of Instrument Meteorological Conditions (IMC). Do not equate them to day VMC operations! While this is always true, it is of utmost importance when flying in sparsely lighted or mountainous areas. The wisdom of the old timers to "Never fly into any area where you can't see lights ahead of the airplane" works reasonably well in level flight, but it is useless when the airplane is descending. The reason for this is that it is possible to descend into the top of a mountain and see lights ahead of the airplane all the way to the crash site. In this instance, the lights will disappear almost simultaneously with terrain impact. I have a strong suspicion that that was the case in this accident, as this was the pilot's home base. The mitigation strategy for this type accident is to always remain within the instrument approach's protected airspace and only circle to land within the protected circling area. It also goes without saying that it is still necessary to adhere to the published minimum altitudes, even on a night visual approach.

Night Airport Operations is still another area where we can get into big trouble if we haven't done out preflight planning homework properly. Flying at night in mountainous areas (i.e. away from the coast and east of Pittsburg or west of Denver) requires a thorough analysis of the planned operations for acceptable routes and altitudes. Details matter and this includes destination airport pattern altitudes and directions.

A Typical Accident occurred to a Cessna 172P at Bennington, VT (KDDH) airport. The pilot arrived in the vicinity of the airport after a night cross country and entered a right-hand traffic pattern for runway 13. Runway 31 at KDDH uses a right-hand traffic pattern, while runway 13 uses a standard left-hand traffic pattern. This is because the airport is located against the south wall of a U-shaped mountain valley which opens to the west. The Airport Facility Directory (AFD) for KDDH specifies a left traffic pattern for Runway 13 as well stating that the VASIs are set to a 4 degree approach angle. The AFD also warns that no pattern operations are authorized south of the airport. The pilot was having trouble flying the 4 degree approach slope and executed two go-arounds before descending into the trees during base leg on the third approach. Had the pilot been using the correct traffic pattern, he would have cleared the trees by 300 feet opposite the same point where he impacted the terrain. The aircraft was destroyed and the pilot received fatal injuries.

Hazards Attitudes Exhibited: Invulnerability, Impulsivity, and Macho.

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Operation Pitfalls: Mind Set (Continuation Bias), Get-There-Itis, Fatigue, Loss of Situational Awareness (SA), Operation in an Incorrect Traffic Pattern, and Neglect of Proper Route Adherence.

Mitigation Strategies: Details matter! When planning an operation into an unfamiliar airport at night, take the time to become intimately familiar with the sectional chart altitudes in the vicinity of the airport and the airport information contained in the AFD. With these tools now linked to all the popular flight planning web sites, there is just no excuse for not having the necessary information. The other option is to adhere to the instrument approach procedure (even when VFR) for that airport during night operations.

Loss of Situational Awareness on Approach is a proven killer that seems to take a steady toll of GA airplanes. It is extremely important that we stay engaged during the approach process and mentally arrive at all points before the airplane does. This includes properly programming all the approach avionics and then verifying that they are receiving valid navigations signals and displaying them correctly. It also includes being aware of the altitude we are supposed to be maintaining and how much space currently exists between us and the underlying terrain.

A Typical Accident occurred to an Embraer 110P1 while on approach to Bennington, VT (KDDH) Airport. The airport has a VOR approach without a GPS overlay and a non-collocated GPS Approach. The accident airplane was not equipped with a DME, but relied on the GPS navigator for distance information. The pilot flew the VOR approach to the missed approach point which is located six miles past the VOR and executed a missed approach. On the second VOR approach attempt, the pilot apparently did not catch the fact that the GPS navigator had sequenced from the VOR to the missed approach point. Upon crossing the VOR, the aircraft did not begin descent but instead flew level until reaching the missed approach point and then started a descent with a 6 mile offset. The aircraft impacted rising terrain 6.5 miles past the missed approach point. The aircraft was destroyed and the pilot fatally injured. The fact was missed that the VOR indicator switched from "To" to "From" 6 miles prior to the GPS waypoint.

Hazards Attitudes Exhibited: Invulnerability and Macho.

Operation Pitfalls: Mind Set (Continuation Bias), Get-There-Itis, Loss of Situational Awareness (SA), Operation below Minimum Sector Altitudes (MSA), and Neglect of Proper Approach Procedure Adherence.

Mitigation Strategies: Mitigation strategy for this accident is that there is simply no reason to fly a second approach when the first approach was good and the airport not visible due to weather. If the weather is right at minimums, and the approach was not as precise as it should have been, or the weather is starting to improve, there is possibly justification for attempting a second approach. When this is the case, it is important to reprogram the approach in the GPS navigators

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and re-verify that all the navigation radios are set up correctly and functioning properly. When flying single pilot IFR, it is doubly important to check, check and double-check. Never get overly dependent on single sources of information and never fly more than two approaches before diverting. This is because the way human nature works is that pilots typically fly a second approach lower than the first one and the third approach is typically flown into the ground!

Busting Approach Minimums is our last topic, and this one seems to be another one of those consistent accident types. Conceptually, it is important to recognize the fact that the TERPS approach design criteria does not leave large obstruction clearance margins and that it gets you as low as it is safe to go. When these minimums are intentionally (or unintentionally) violated, we are putting our aircraft into very dangerous situations with a high probability of a catastrophic outcome!

A Typical Accident involved a Cirrus Design Corp. SR20 which was attempting a FAR Part 91 "Night-Look-See" ILS approach in "below minimums" weather at Stewart International Airport (KSWF). After the first approach resulted in a missed approach, the pilot flew a second approach into the terrain approximately 2 miles short of the runaway. The aircraft was totally destroyed with the pilot receiving fatal injuries and the two rear seat passengers receiving serious injuries.

Hazards Attitudes Exhibited: Invulnerability, Anti-authority, and Macho.

Operation Pitfalls: Mind Set (Continuation Bias), Get-There-Itis, Fatigue, Loss of Situational Awareness (SA), Operation below Minimum Approach Altitudes (MAA), and Duck-Under Syndrome.

Mitigation Strategies: The mitigation strategy for this type accident is don't fly "Look-See" approaches, even though they are authorized for FAR Part 91 Operations. They are prohibited for commercial operations because of the realization that the pressure/temptation to "bust minimums" or "duck-under" will oftentimes be too strong to resist. *There is a valid message here*! You should never even fly a first approach when the weather is reported below approach minimums; much less consider attempting a second, for the very reasons listed in the previous accident type. The other obvious mitigation strategy for the above accident is do not under-fly the glide slope with the false hope of seeing the runway. This is a double trap because once you 'Duck-Under" the glide slope you have no reliable approach progress reference and all terrain separation guarantees are lost. The glide slope will position you for the optimum chance of seeing the runway environment at minimums while also providing adequate terrain protection.

In Conclusion we should discuss the three prominent hazards which all pilots will face as they proceeded to gain flight experience. These hazardous conditions are as follows:

1. The primary hazard faced by pilots with less than 500 Hours total time is **Ignorance** or just plain lack of knowledge and experience.

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2. The Primary hazard faced by pilots with <u>more than 500 Hours, but less than 3,000 Hours total time is</u> **Cockiness**. Their flying skills have peaked without the requisite experience levels to temper those skills with an adequate dose of reality!

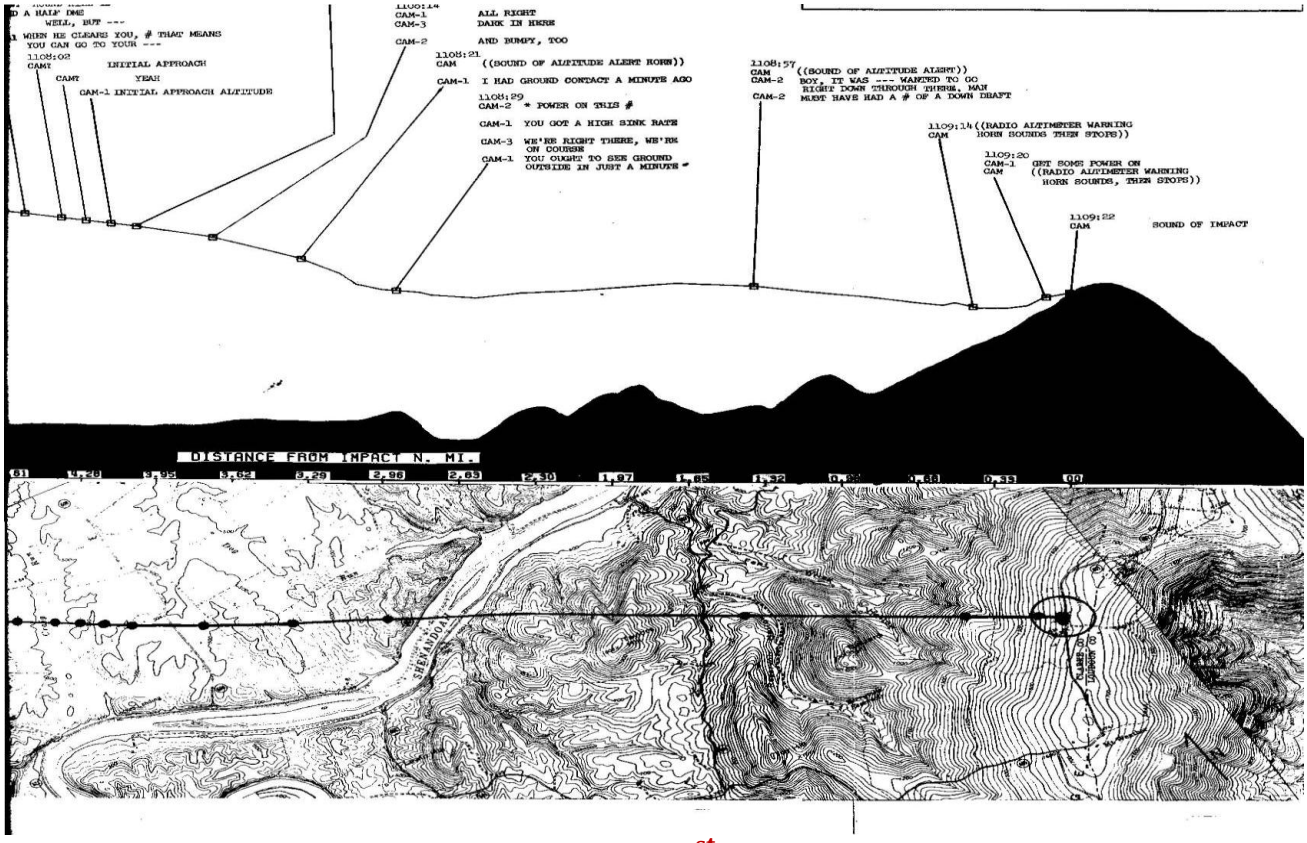
   Note: Many times pilots will go through a period of **Apprehensiveness** as they exit the 3,000 Hour plus total time gate. This usually occurs somewhere between 3000 Hours and 5,000 Hours total time.)

3. Lastly, the primary hazard faced by pilots with <u>over 3,000 Hours and especially those with over 5,000 Hours total time is</u> **Complacency.** ***Complacency is the real face of Invulnerability and is the demon which will hunt experienced aviation professionals for the rest of their careers!***

The Thought for this month is **"Nothing strengthens the judgment and quickens the conscience like individual responsibility." ~** ***Elizabeth Cady Stanton, American Suffragette Leader.***

That completes our two part ***Annual Safety Issue,*** so until next month be sure to **Think Right to FliRite!**

TWA Flt 514 Profile – Mt. Weather, VA – Accident that Started it All



B727-231 – N54328 – December 1st, 1974 – 92 fatalities

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