Stan/Eval Newsletter
CIVIL AIR PATROL
UNITED STATES AIR FORCE AUXILIARY
105 S. Hansell Street
Maxwell AFB, AL 36112

June 2023

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Overshooting Final (CEN21FA215)

In May 2021 at Centennial Airport (KAPA) in Colorado, a Cirrus SR22 and a Metroliner collided on final approach when the Cirrus overshot the centerline for 17R and crossed into the path of the Metroliner on final for 17L. The Cirrus pilot pulled the chute while the Metroliner, badly damaged, managed to make an uneventful landing. Miraculously, no one was hurt. This accident demonstrates in a spectacular way how important it is to line up on final without overshooting the final. Although there were many factors involved, the immediate cause was the Cirrus overshooting final and blundering into the final for the parallel runway.

SR22 Crash after Midair

Centennial Airport, like many other airports we operate out of, has two parallel runways spaced close together. Being off centerline either on final or departing introduces the risk of mid-air collisions. Most pilots, once on centerline, do a pretty good job of staying on centerline all the way to touchdown. But it can be a challenge in a strong cross wind. However, it's not holding centerline that tends to be problematic. It's getting on centerline. In the Cirrus/Metroliner incident, the Metroliner was established on the centerline for 17L (tracking the ILS) while the Cirrus was in a right traffic pattern for 17R. There is no electronic guidance for 17R. The Cirrus was going 50 knots over its recommended approach speed. When it turned from base to final to intercept the centerline it overshot the 17R centerline and hit the Metroliner.

Metroliner landed safely after midair

Of course, you and I would never make this mistake except that I don't believe any pilot reading this article (including myself) has ever overshot the final. As an instructor, I also see students doing this occasionally especially if the wind is behind them as they turn base. It might seem benign to overshoot final at a single runway airport. Afterall, there is no parallel runway. But that would be a bad assumption. Imagine one plane on a right-downwind extending to let the airplane on left downwind turn base. If the plane turning base overshoots, they could hit the airplane on the opposite downwind. Enough said. Overshooting final is not a good thing in any operation.

Be sure to emphasize to students the factors contributing to a runway overshot, especially a tailwind on base. One characteristic of a good pilot is one who is always aware of the wind and its effects. Students need to understand that overshooting final can be a deadly mistake. To minimize the probability of overshooting final the following may be helpful.

- If there is electronic guidance to the runway, use it. Even if you are in the pattern, you can just select vectors to final to get lateral guidance. (This was not available for 17R at KAPA).
- Many EFBs like Foreflight will draw the extended centerlines on your electronic map which you can use to intercept and stay on the centerline. (It’s hard to believe that the Cirrus didn’t have Foreflight and could have used this feature).
- Get your speed down to the published approach speed before the base to final turn. Remember your turning radius increases with speed (speed squared – so a small increase in speed means a large increase in turning radius).
- Flying too tight a pattern may increase the probability of overshooting final.
- You may be doing everything right (like the Metroliner) but the other pilot is overshooting. ADS-B may alert you to incoming traffic and you must take evasive action. Be aware of where all the nearby traffic is and what they are doing if possible.
- As always, keep your head on a swivel when other aircraft are nearby in the pattern. See and avoid. Easier said than done but still worth doing.
- Don’t overcorrect. If you are going to blunder into the other final, don’t pull back hard and get into an accelerated stall. It is better to pull power and slow down to decrease turning radius.
- In a non-towered environment, do the expected. When you use a “watch this” maneuver you may surprise your fellow aviators in the pattern causing a conflict.
- In a towered environment, follow tower directions exactly and expeditiously. If the tower gives you direction that creates a traffic conflict, let them know immediately.

Fly safe!

NTSB Releases Alert on Circling Approach Risks (AINsights)
The National Transportation Safety Board (NTSB) has released a safety alert advising on the risks and preparation necessary to perform circling instrument approach procedures and maneuvering. The alert, “Circling Approaches: Know the Risks,” was released as the NTSB has been preparing a report on its investigation of the July 2021 Bombardier Challenger 605 accident in Truckee, California, that involved an unstabilized circle-to-land approach. In addition, the Safety Board released the alert to coincide with the Air Charter Safety Foundation’s (ACSF) Safety Symposium last week.

Board member Michael Graham was among the slate of speakers at the ACSF event, providing an overview of the publicly available facts in the Truckee accident. He cited that accident—as well as ones that involved the May 2017 Learjet 35A crash in Teterboro, New Jersey, and the

December 2021 Learjet 35A accident at Gillespie Field in El Cajon, California—in the development of the safety alert.

In the alert, the NTSB noted that since 2008, 10 accidents involving Part 91 and 135 operators have occurred during a circling approach and have resulted in 17 fatalities. These approaches can be riskier because they require maneuvering at low altitude and low airspeed, increasing the opportunity for loss of control or collision with terrain, according to the Safety Board.

Further, circle-to-land maneuvering often results in an unstabilized approach, the agency added. While sometimes necessary, pilots don't always evaluate the risks before accepting them, it further noted.

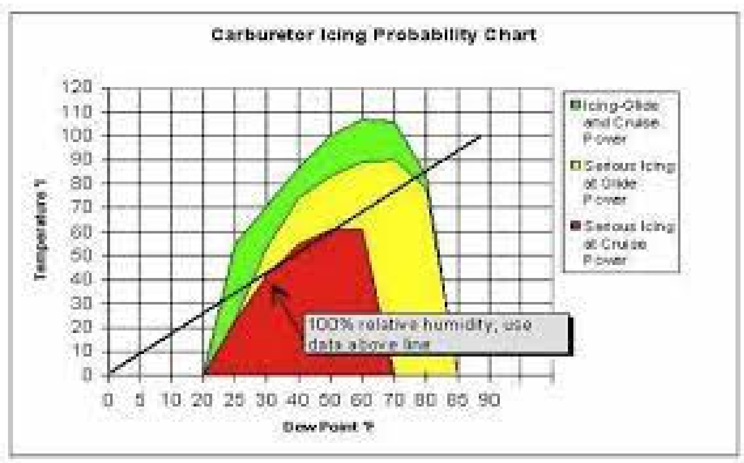
Weather Cameras Now in Maine (FAAST Blast)
The FAA's Weather Camera Program (weathercams.faa.gov) has expanded to the northeast coast, hosting 18 new camera sites in Maine, with plans to add more sites through 2023. The cameras provide pilots with better weather information, especially in terrain where radar coverage is scarce. Read more about the Maine addition: https://medium.com/faa/weather-cameras-go-live-in-maine-d41c967a8ef4

The FAA's Weather Camera Program began in Alaska more than 20 years ago and has expanded to sites in Hawaii and the contiguous United States. The program is also researching technological improvements to introduce 360-degree camera capabilities. Another enhancement available later this year is the new Visibility Estimation through Image Analytics (VEIA) tool that uses existing FAA weather camera infrastructure to provide visibility estimates based on an automated comparison of current conditions to clear day images. Read more about VEIA: https://medium.com/faa/new-visibility-estimation-tool-coming-soon-4519d575eb32

Carb Heat (Flying Lessons)

You probably learned it by rote—pull the carb heat knob and note an RPM loss as part of your Before Takeoff check, and when reducing power below the tachometer green arc for landing. If anybody asks (not likely since your last checkride or flight review), you mutter something about “venturi effect” and “carburetor ice.” But do you really understand why we need carb heat and how to properly use it?

The venturi-shaped internal design of most carburetors cools air as much as 40° Fahrenheit as it passes through. This means moist air as warm as 70°F (~21°C) can freeze in the carburetor, strangling combustion. The FAA’s Carburetor Icing Potential Chart provides much more information than I recall seeing 40 years ago when I began learning to fly (I’m still learning now). The chart quantifies the carb-ice hazard especially prevalent this time of year as weather moves from winter to summer (or summer to winter for my Southern Hemisphere readers), dragging moist air along with it.



When to use carb heat:

1. At the first sign of power loss -- if too much ice forms, or engine exhaust cools too much from power loss, carb heat might not melt out all the ice.
2. When humidity exceeds about 80% and/or there’s a five degree or smaller temperature/dew point spread.
3. When operating at low power settings, especially during extended glides.
4. Any time recommended by the aircraft or engine manufacturer.

If carburetor icing exists when you apply carb heat, the engine will likely get worse before it gets better. The drop you see in a normal Before Takeoff test—50 rpm or more prop speed reduction caused by ducting hotter, less dense air (i.e., less oxygen to combine with fuel for power) into the intake—still exists, along with the effect of carb ice blocking air flow through the induction manifold. Consequently, engine power drops even more, and the engine may run irregularly or roughly, until the ice is melted away and the engine is running on clear (but still heat-reduced) intake air.

The sequence, then, is this:

No carb ice: If no carburetor ice is present when carb heat is applied, engine (propeller) RPM will decrease within tolerances presented in the Pilot's Operating Handbook (POH) or other manufacturer's information. Left a while, RPM remains steady at this lower rate. The engine should still run smoothly, although perhaps not as smoothly as before carb heat was applied. When carb heat is turned off power (RPM) returns to where it was before carb heat was applied.

Carb ice: If carburetor ice exists when carb heat is applied, engine (propeller) RPM will decrease, perhaps more than the tolerances presented in manufacturer's information. The engine may run very roughly until the ice is melted out, at which time power (RPM) will increase and smooth out even while the carb heat is still on. When carb heat is turned off power (RPM) should increase to read higher than before carb heat was applied because the airflow is now unobstructed by ice.

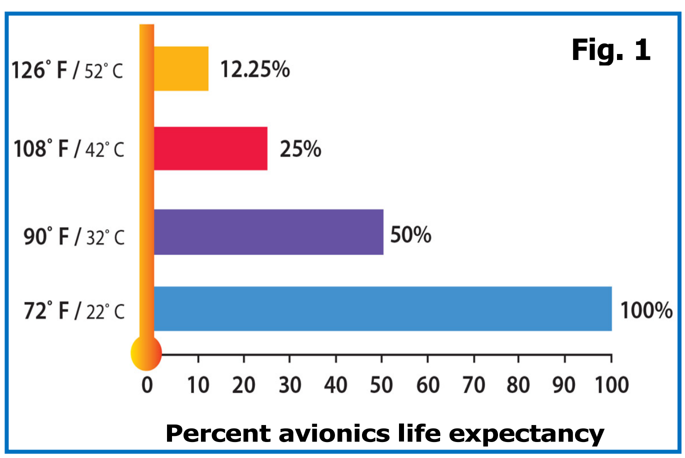
To safely operate a carbureted engine, you must take your planning and testing up a notch. Check to see whether you're in conditions conducive to carb ice or even "serious" carb ice potential. When you check carburetor heat on the Before Takeoff checklist, don't just pull the control, look for an RPM drop and push the control back in. Instead:

1. Activate carb heat;
2. Quantify the RPM drop; and
3. Evaluate the quality (smoothness) or power. Then, wait 30 seconds or so and
4. Determine if there's been any change in RPM or smoothness while carburetor heat is applied.
5. Turn off carb heat; and
6. Quantify the RPM rise to see that it returns to the same speed as before the test

If power increases during the time carb heat is applied, and/or RPM is higher after the test than before, you probably have carburetor icing on the ground.

Staying cool – avionics cooling fans required (Maj M. Banner, FLWG)

Heat is a nemesis of aircraft avionics equipment. Avionics equipment life expectancy varies inversely with temperature (Fig. 1). The mean time between failures of avionics equipment can be extended by decreasing the equipment's operating temperature. Two sources of heat associated with avionics equipment are the heat generated by the operating equipment itself and the sun on the glare shield, especially during the summer, referred to as solar heat radiation or solar heat gain. The hottest temperature the avionics will endure is



when an aircraft is on the ground on a hot summer day, engine running and not moving and with all the electrical equipment on. Consider the following as stated in FAA Advisory Circular 23.1311-1C, Installation of Electronic Display in Part 23 Airplanes, Section 27.0, Environmental Conditions, 27.2, Temperature: "Electronic systems reliability is strongly related to the temperature of the solid-state components in the system. Component temperatures are dependent on internal thermal design and external cooling. In evaluating the temperature environment, consider the additional heat generated by the equipment, especially in a location where airflow is restricted."

Air scoops – inadequate avionics cooling

In previous decades many aircraft were built with outside air scoops for the purpose of directing outside ram airflow while in-flight to cool one or two simple older style radios. While this passive method of avionics cooling may have been partially satisfactory, it is now regarded as inadequate for maintaining the cooling needs of modern digital avionics for the following reasons. First, avionics cooling is most needed when moving slowly or not moving on the ground, as on a hot summer day with minimal ram airflow from an air scoop. It this situation, avionics equipment may reach operational temperatures greater than 125° Fahrenheit (F), "killing / cooking" integrated electrical circuits (Fig 1). Second, contributing to the heat in a vertical stack of avionics equipment mounted in many aircraft is the so-called "chimney effect", i.e., the rising heat from avionics equipment is "cooking" the electronic circuity mounted above. This effect exacerbates the heating of the avionics equipment. Finally, outside ram airflow can blow dirt and moisture onto avionics equipment, leading to damage and failure. A more effective method for cooling avionics equipment is desirable.

Avionics cooling fan

Cooling fans are employed to mitigate avionics equipment heat in modern aircraft. These small high-RPM fans are capable of directing mass airflow, calibrated in cubic feet per minute (CFM), to cool electrical equipment. Cooling fans are an inexpensive and practical method for maintaining appropriate operating temperatures of avionics components. Some fans are capable of generating up to 21 CFM airflow, suitable for cooling several avionics components simultaneously. As a result, avionics operating life expectancy can be prolonged. The Garmin G1000 system, as used in Cessna 172 S NAV III and 182 T NAV III airplanes, incorporates Forward and Aft avionics cooling fans (Fig 2). The Forward fan is positioned under the glare shield and behind the multifunction display (MFD). The Aft avionics fan, located in the tailcone behind the aft cargo bay, is mounted on the rear wall of the cargo bay (Fig. 2). Some line replacement units (LRU) in the G1000 system are provided with built-in internal cooling fans, for example, the primary flight display (PFD) and MFD.

The Forward avionics fan provides cooling for the engine airframe interface, as well as supplemental cooling for the PFD and MFD. The engine airframe interface (Fig. 2) is an LRU used for displaying the Engine Indicating System (EIS) shown on left side of the MFD during normal operations. The EIS displays engine RPM, manifold pressure (C182), fuel flow, oil pressure and temperature, exhaust gas temperature, cylinder head temperature, vacuum pressure, fuel quantity and an electrical section indicating volts and amperes of electrical buses and the ampere charging / discharging of the system's two batteries.

Cooled by the Aft avionics fan are the following G1000 LRU components: Attitude Heading and Reference System (AHRS) – displays attitude indicator, heading indicator (combined with information from the magnetometer in left wing [GMU 44]), rate of turn and slip-skid indicators; Air Data Computer (ADC) – displays outside air temperature (OAT), airspeed indicator, altimeter and vertical speed indicator; transponder (GTX 33); and two integrated avionics units (GIA 63 one and GIA 63 two) with each containing a communication radio, navigation radio and GPS receiver (Figs 2).

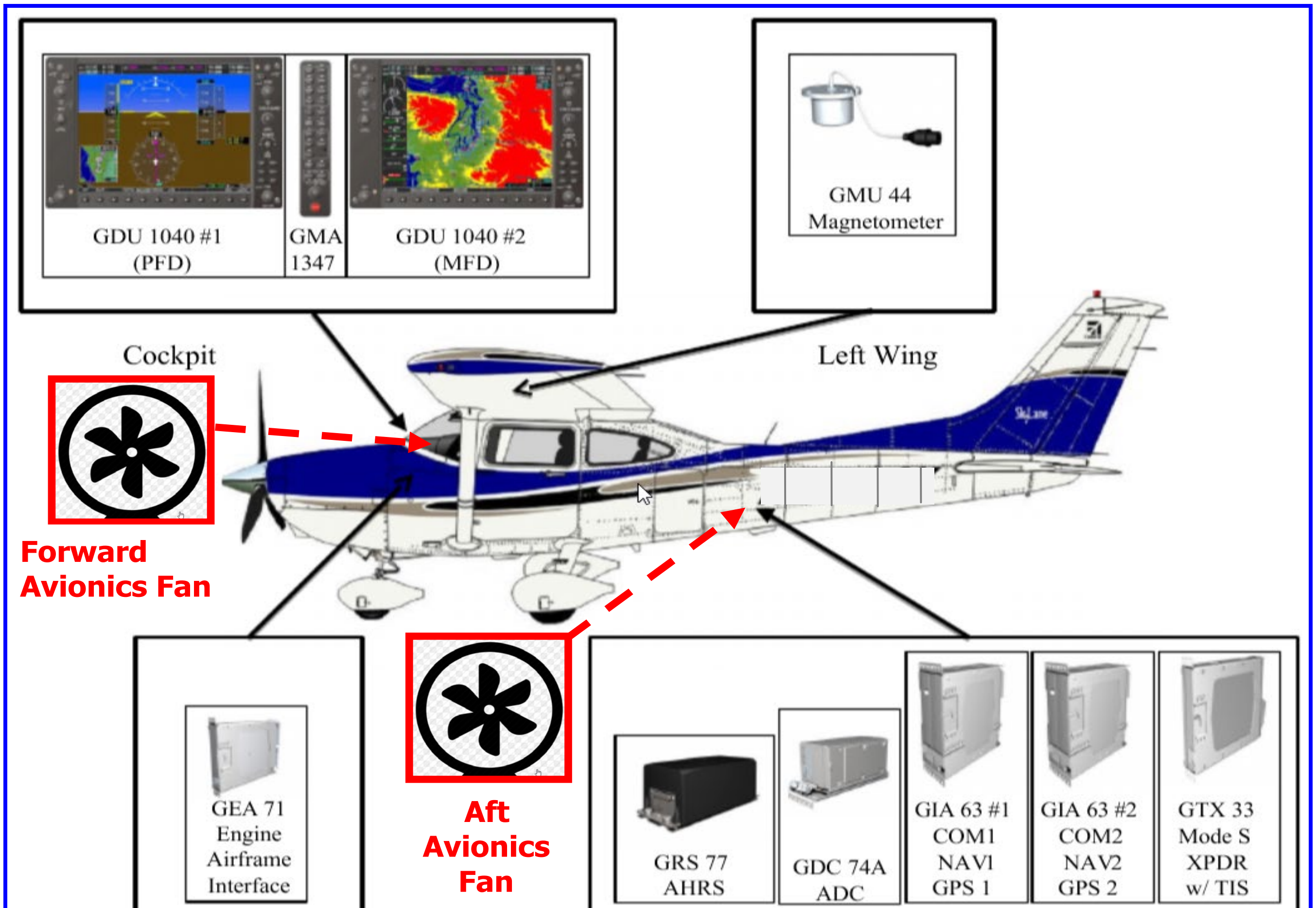


Fig 2 Locations of Forward and Aft avionics cooling fans and G1000 avionics components as cooled by the fans are shown. (C172 S NAV III and C182 T NAV III airplanes)

During pre-flight inspection it is important to verify the Forward and Aft avionics cooling fans are operating properly. This is done by turning on Avionics Bus switch number 1 and listening for the Forward avionics fan and then turning on Avionics Bus switch number 2 and listening for the Aft avionics fan. The pilot may need to open the aft cargo bay door and place his/her head near the open door to hear this fan. Also, it is important to verify that the air inlets to the avionics fans are not obstructed by any objects (airplane covers, plastic bag,).

The consequences of an inoperative avionics fan and/or a fan with an obstructed air inlet are significantly decreased cooling air flow, predisposing to overheating of G1000 components resulting in popped circuit breakers, loss of G1000 functionality and electrical fire. It is important to note that with an inoperative avionics fan, the airplane is unairworthy and must be grounded; it cannot be flown (see KOEL in section 2 of the POH "Limitations")

Summary

Sufficient cooling provided by avionics fans prolongs the equipment's life expectancy and helps to minimize the probability of in-flight loss of control due to failure of the airplane's avionics. "Staying cool" at all times not only applies to a pilot's demeanor in the cockpit, it also applies maintaining appropriate operating temperatures of modern digital avionics equipment by ensuring that avionics cooling fans are functioning properly – keep it cool.

Articles for the National Stan Eval Newsletter:

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