Next WingNuts Chapter Meeting: ***April Meeting Canceled** Due to number of Members attending Sun N Fun*

Next VMC Club Meeting: ***Tues. Apr 26, 2022 6:00 PM - Hunter International Air-Field***

WINGNUTS PLANETALK

Chapter 1321 / South Middle Tennessee

Our Chapter Home Page: https://chapters.eaa.org/eaa1321

INSIDE THIS ISSUE

PRESIDENTS CORNER:

I'm writing from Sun 'n Fun, we've been here a few days now and things are filling up fast in the campground. The leaders believe it will be attended by more folks this year than last, which was record breaking, by the early online ticket sales so far. The weather looks to be favorable and that's always great news. Thunderbird 7 arrived yesterday and did some fly byes which is always cool. Spent quite a bit of time by the runway watching arrivals. Sometimes the pre-show show is just as fun as the show itself. I know we'll have plenty to talk about when we get back.

Since there is so many of the leadership that is either here or busy with other things that I'm sorry to say for the first time that I can remember I am cancelling this month's meeting. We will be having the April VMC meeting and the chapter meeting will be back in May. Remember the May meeting will be held at the Lewisburg Airport. It will be a fly the members day and a cookout at Bob's hanger. The planed times are 10:00 AM to 2:00 PM. I'll be sure to remind everyone before then and follow up with further information.

Sorry about the cancellation,

Glen Smith

Paraphrased from an AOPA Newsletter

Do the right thing

Make good choices so the magazines don't write about you

LATEST APRIL NEWS FROM

AERO-NEWS NETWORK

Modern jet fighters to race at 2022 Reno Air Races

What is already described as the 'world's fastest motorsport' is about to get a lot faster —

So, if you haven't had a chance to attend the Air Races, this may be the year to check them out!!!

As you may know -- "Racing alone wasn't paying the bills, and four years ago we were as close to shutting down as is possible," says Michael Houghton, president of the Reno Air Racing Association. In debt and faced with declining attendance, the races had to make a decision: It was adapt or die, says Houghton, "and we made a commitment to turn it around. We're in show business, and we have to put on an entertaining event for the broadest number of people. We talked to our crowd and they told us they wanted to see some new things take place."

It has been announced that some of the world's most advanced fighter aircraft will be entering the fray in 2022. The aircraft, which will include the European Typhoon, French Rafale, Russian MiG-29 (from Slovakia) and the US' F-22 Raptor will be racing at speeds more than double the fastest existing racer, the L-29 of the current 'Jet' category.

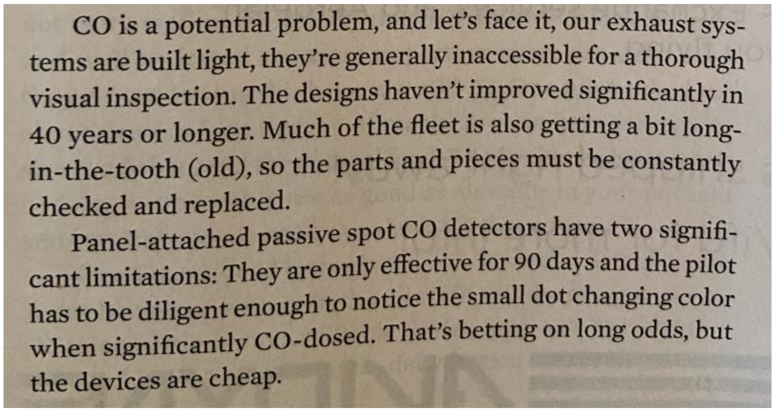
Have You Heard??

NTSB Asks FAA To Require CO Detectors For GA Aircraft

The National Transportation Safety Board (NTSB) released a safety recommendation report on Thursday calling for the FAA to require carbon monoxide (CO) detectors in general aviation aircraft. In addition, the report specifies that the agency should require CO detectors that comply **"with an aviation-specific minimum performance standard with active aural or visual alerting."** The recommendation applies to all enclosed-cabin aircraft with reciprocating engines.

Exhaust system leaks are the most common cause of CO poisoning in GA aircraft, and the spot detectors (printed cards treated with a chemical that changes color in the presence of high CO concentrations) long used to monitor for dangerous cabin conditions do not produce aural alerts, and the visual cue is easy to overlook.

Accumulation of CO in the bloodstream leads to symptoms also associated with hypoxia, including cognitive impairment that escalates quickly to loss of consciousness in the presence of high concentrations of the poisonous gas.


CO is a potential problem, and let's face it, our exhaust systems are built light, they're generally inaccessible for a thorough visual inspection. The designs haven't improved significantly in 40 years or longer. Much of the fleet is also getting a bit long-in-the-tooth (old), so the parts and pieces must be constantly checked and replaced.

Panel-attached passive spot CO detectors have two significant limitations: They are only effective for 90 days and the pilot has to be diligent enough to notice the small dot changing color when significantly CO-dosed. That's betting on long odds, but the devices are cheap.

There are a variety of compact, battery-powered CO detectors that command attention with alarms and blinking lights are available for use in GA aircraft in a range of prices starting at less than $100 for the Geiger CO Carbon Monoxide Monitor carried by vendors including Aircraft Spruce. The keychain-sized TOCSIN 3 Cockpit Monitor was listed for $169.95 by Sporty's Pilot Shop, along with the $99 Forensics Carbon Monoxide Detector. Pilot Mall offers the AV8 Inspector portable CO monitor for $139.

Following are excerpts from "Smart Investment" Article in AOPA's April Magazine

Having seen all this from the inside, when I purchased my 34-year-old aircraft, I visited the aviation aisle at the local home improvement store for an active CO detector for about $30. These devices typically alert at about 50 parts per million (ppm) depending on where they are placed in the cabin. Over a long flight, even below that alert level, let's just say the ol' brain will be somewhat fogged, but you may not be aware. That's an excuse for a flubbed landing but it's not a good long-term strategy, especially when the outcome could be a lot worse.

After learning much more about carbon monoxide, I purchased another, better, commercially available unit (about $200) that is one-third the size of the home model and begins to alert at 10 ppm. Not only that, but it gives a readout of the ppm level. Nice! It then goes silent and advises you on every 10 ppm increase until it gets to about 50 ppm where it really begins to fuss. I placed it near the front seat heater duct and attached it with "aviation-approved" Velcro, easily moved if needed.

Based on a dozen flights to date, a 10- to 15-ppm alert typically occurs while taxiing and occasionally during runup. In climb, it sometimes goes to about 20 ppm and in cruise drops to zero. Using the heater does not cause any changes, which means the shroud around the muffler is still solid. But if anything changes for the worse, I'll know it long before my in-flight decision making or my landings, if you pardon the term, are impacted.

Regardless of whether FAA gets around to requiring a reasonably priced CO monitor, which we hope it will, this is a smart investment for any piston aircraft operator or a renter who is flying the high-mileage fleet. It isn't as much fun as a barrel of monkeys, but it will take a significant headache or much worse out of your flight operations. ■

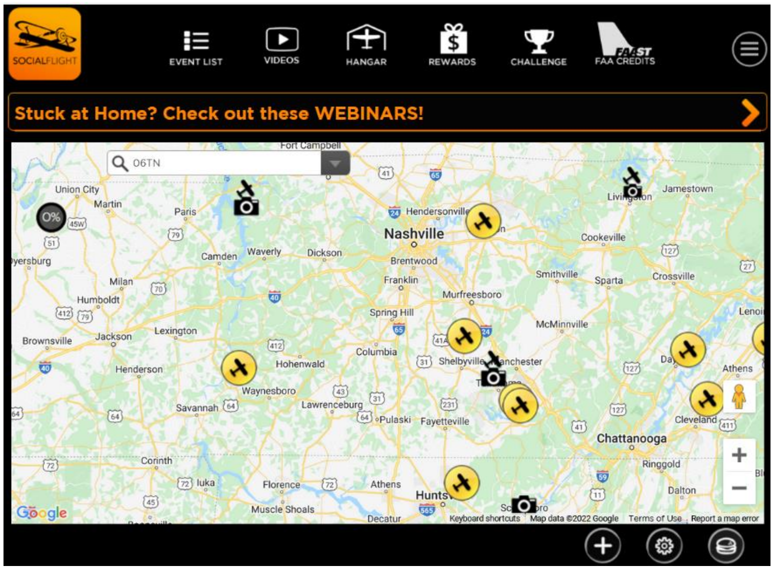
BRUCE LANDSBERG is vice chairman of the NTSB and former executive director of the AOPA Air Safety Institute.

New On-Demand Video Series Serves Pilots and AMTs With FAA Credits

Mark Phelps   March 15, 2022

SocialFlight's free web and mobile app flags aviation events, restaurants and "interesting places to fly" for pilots and enthusiasts.

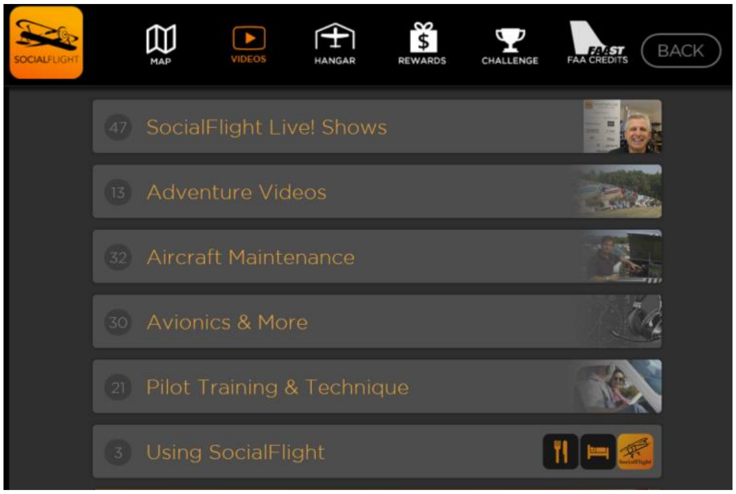
https://www.socialflight.com/search.php



Can search for events near a selected airport

The Marlborough, Massachusetts-based company recently announced a new product, the FAA Learning System, created in cooperation with the agency's FAA Safety Team (FAASTeam).

The video series includes free on-demand, accredited video education for pilots, A&P/IAs and other FAA-certificated Aviation Maintenance Technicians (AMTs).

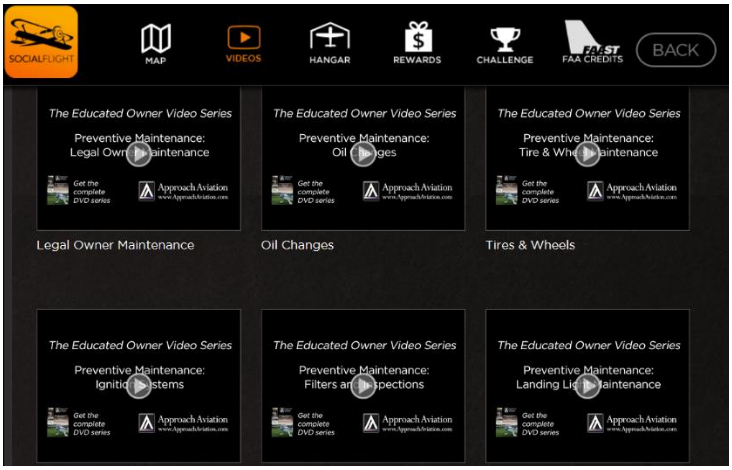


The new video series was created in cooperation with the FAASTeam's WINGS Pilot Proficiency Program, a voluntary pilot safety initiative designed to encourage general aviation flying proficiency with online learning, in-person seminars and tailored flight training.

Pilot Training

Safety

On the aviation maintenance side, the FAA's AMT Awards program prompts AMTs and their employers to participate in recurrent training by offering awards based on documented annual training.



Aircraft Maintenance

Annual Inspections

Buying an Aircraft

Endorsing the new program, pilot, author and aviation educator Barry Schiff said, “Embracing new technology is the key to reaching more pilots and educating them about aviation safety. By making the program free, on-demand, and offering FAA credit, SocialFlight’s FAA Learning System makes it easier than ever for pilots and mechanics to continue learning and refining their skills.”

Along with the FAA, SocialFlight’s partners on the new initiative include Aspen Avionics, Avidyne, Bose, Continental Aerospace Technologies, Hartzell Propellers, Lightspeed, Masimo Health, Tempest, Wipaire, Barry & Brian Schiff, Savvy Aviation’s Mike Busch and many others.

Off-Field Landings

Some might call them crashes, but if you do it right, you can use the airplane again. As with so many things aviation, planning and practice help.

Ryan Motte   March 2, 2022

A good landing is any landing you walk away from. A great landing is when you can use the airplane again.

When your aircraft is in tip-top shape and everything is working properly, you should be able to reuse the plane after each landing.

Unfortunately, every now and then our beloved flying machines let us down. This can be caused by something internal, like an engine or propeller issue, or driven by external factors. Most often, it's because the pilot did something incompatible with continued flight, like trying to run the engine on an empty fuel tank.

Once the need to perform an emergency landing presents itself you must consider that now the airplane belongs to the insurance company. So, your goal as the pilot should no longer be on reusing the airplane. The goal is to use the fabulous technology and engineering to prevent injury to the lives aboard as much as humanly possible.

So You Decided To Crash…

First and foremost, a decision must be made. "Analysis paralysis"—which can be defined as overanalyzing or overthinking a situation to the point no action is taken—is very real. It isn't such a big deal when trying to pick out a restaurant on Friday night, but it can be critical when facing an emergency landing. When an aircraft is not capable of level flight, time is altitude and altitude means options. An imperfect decision made immediately can be more effective than a perfect decision made too late.

The FAA's *Airplane Flying Handbook* presents three major psychological factors that hinder making the correct decision when confronted with the problem.

> One is a reluctance to accept the emergency; put another way, an unconscious desire to delay the dreaded moment may lead to errors.
>
> Second, there's the desire to save the airplane; you want to take it back in the same condition as when you left. But the airplane is already letting you down, and you owe it nothing.

> There's also self-preservation, but the record favors pilots who maintain their composure and apply proper concepts and procedures developed over the years. The *Airplane Flying Handbook* says it well: "The success of an emergency landing is as much a matter of the mind as of skills."

Fortunately, the numbers are on your side. I tried digging up some statistics on the survivability of controlled crashes, but it is a challenging thing to define. What I was able to find was still promising. Of 1275 accidents in 2018, 224 were fatal. Right off the bat, only 18 percent of accidents were fatal in 2018. If you dig a little deeper, you find that there are three types of accidents that have fatality rates even approaching 50 percent. Loss of control in-flight, controlled flight into terrain and unintended flight into IMC are the top three. On the other side of the coin, system malfunction (powerplant) has a fatality rate below 10 percent. And since there's no requirement to report off-airport landings that don't result in severe/fatal injuries and/or substantial aircraft damage, it's safe to say more of these events occur than the NTSB's numbers reflect.

Choices, Choices

This is one of the hypotheticals for the FBO's pilot lounge: Would you head for the semi-busy highway, or the woods? The golf course or the river? Before we talk technical, we need to resolve a philosophical quandary: Whatever choice you make must consider risk to persons on the ground.

When you choose to fly, you accept a certain degree of risk. Our goal should be to reduce that risk to the minimum acceptable for any given flight. Sadly, despite our best efforts, it is never reduced to zero. Folks on the ground did not accept that same risk. It is every pilot's responsibility to avoid risking the lives of others at all costs.

Avoiding crash injuries boils down to two goals: keeping the cabin as intact as possible and avoiding body contact with said cabin. How do we accomplish this? Reduce airspeed and maximize deceleration potential. Airspeed reduction mostly involves hitting the crash surface at the slowest possible airspeed. The *Airplane Flying Handbook* provides a powerful example of how critical each knot is.

Modern light airplanes are typically designed to provide protection for crash landings up to at least a 9G deceleration. The older the airplane, the less likely it meets this standard. In a perfect world, at 50 mph, a uniform 9G deceleration requires 9.4 feet. A 100 mph, 9G deceleration requires 37.6 feet. Perfect, uniform deceleration will be rare. That being said, it is worth noting that doubling the speed quadruples the distance needed to decelerate at a given rate.

Additionally, you can use your aircraft and the terrain around you to reduce your speed safely. Using the wings, landing gear and fuselage bottom to slow down will do no favors on getting the airplane flying again, but it will keep your seat and the metal around it as intact as possible. Fields with dense crops, vegetation and even trees can act in a similar manner as EMAS. This is where reducing airspeed meets maximizing deceleration potential. You can be flying a perfect emergency approach, slow as possible and into the wind, but if you come to a stop too quickly or cannot keep the airplane straight, the chance of injury increases. Just like in a car, you have the most protection in a head-on collision. For example, if you were to drive into a tree head-on at 20 mph in your car, you have the crumple zones and material in front of you to help dissipate energy. If you were to hit that same tree sideways, say with the driver’s door, the potential for injury rises.

This point comes up most frequently when dealing with landing in a forest or wooded area. There are several guidelines for landing in trees, and I recommend reading whatever you can about the subject because there is too much to include here. The challenge with landing in trees is there’s little opportunity to practice or train this, and it all happens quickly. The long and short of it involves the same theory. Use the aircraft and terrain to attempt to dissipate the energy as evenly as possible and avoid hard contact with the cabin.

Ditching is another suitable option, and the result is often a smoother deceleration. Check your aircraft’s AFM for a specific procedure, but there are some general techniques that apply to all aircraft. The AIM provides guidance on planning a descent into different swells and wind strengths, and is worth reviewing in conjunction with your AFM to come up with a solid plan should this misfortune ever befall you. Once you have planned your approach and configured, the next battle is the touchdown. Especially in fixed-gear aircraft, reducing airspeed and maintaining the lowest rate of descent will minimize the chances of flipping.

Securing And Evacuating

When I conduct training, I often give out engine failures or simulated fires to a landing. Usually, folks have a plan for this, either following a flow or the appropriate checklist. If fortune permits, sometimes we actually get to land! Here is where things can go a bit sideways if you don’t have a plan. After we clear the runway, I will usually ask what their plan is for securing and evacuating the aircraft. Clearly this aspect of training is overlooked. Frequently, a crashed aircraft is a fire hazard, and sometimes damage to the frame prevents the doors from being opened normally. There would be nothing worse than flying a successful emergency landing and then being injured or killed in a post-crash fire.

Out of everything we have talked about, this is the safest (and cheapest!) to practice. If I am new to an airplane or reviewing one that I haven't flown in a while, I will sit in the cockpit and review the securing aircraft checklist if there is one. Remember that fire needs oxygen, heat and fuel. Cutting the mixture, mags and electrical power will help minimize sources of fuel and heat. Sometimes you will be able to secure the airplane before the crash takes place, which just speeds up the process.

Lastly, you need to get out. Even if there is no evidence currently of a fire, it is not worth the risk of dawdling. Odds are, you are proficient at exiting the aircraft, but what about your passengers? What if your door is jammed shut? A mentor of mine plays a game with his family where, after they fly, they practice exiting the aircraft as quickly as possible. They have a plan to manipulate the seats so they can assist the kids in the back, and everyone knows to avoid the prop area. Hopefully, you never need to put this drill to the test, but it is best to be as prepared as possible.

The lesson here is that crash landings are extremely survivable. Fly the airplane through the crash, and plan your evacuation accordingly. Use that flying machine to make sure you get the opportunity to fly again.

Types Of Off-Field Landings

While I obviously fully recommend a precautionary landing if there is the opportunity, sometimes we are not so lucky. While a forced landing or ditching is not ideal, the situation is far from helpless. Staying proficient in emergency procedures and keeping a cool head may not save your airplane, but it will give you the best chance to walk away. And always keep in mind the wisdom of the late, great Bob Hoover: "If you're faced with a forced landing, fly the thing as far into the crash as possible."

Precautionary

Precautionary landings are premeditated landings, on or off an airport, when further flight is possible but inadvisable. This can be caused by weather, fuel shortage or decaying aircraft health. This is the most favorable solution because you still have power available to plan your approach.

Forced

Forced landings are immediate, on or off airport landings necessitated by the inability to continue further flight. Due to some psychological factors, pilots tend to pass by precautionary landings, despite it being the safer option.

Ditching

The last type of emergency landing is ditching, which is either a precautionary or forced landing in water. Depending on the terrain, it might be the best option

Flows, Flows, Flows

I am a big fan of normal and abnormal procedures being conducted using the do-verify method. Using a flow that fits the ergonomics of the aircraft and subsequently verifying the completion of the checklist adds a layer of redundancy to your procedures and allows you to defer checklists to non-critical phases of flight.

Practicing flows for emergency procedures can ensure completion of required items when there might not be time to pull out the checklist. The nice thing about flows is that you can design them specifically for the aircraft you fly.

Creating flows for your emergency and abnormal procedures can be easier than just memorizing the steps, because it is further cemented with tactical feedback and the cockpit can trigger reminders. Bring out your POH/AFM and look over the emergency procedures section. Pick a few that could create too high a workload or would not allow time to pull out the checklist. Map out all the items required on the checklist, and then organize them into the most logical order. Most checklists are designed this way anyway, so it should be easy. Run the pattern 10 times or so, until you don't need to reference the checklist. Now if you have an engine failure at 400 feet, you will have a procedure in place.

Editor's Note: I have included the following article as a reminder of the importance of contacting the authorities after an off-airport landing, in order to prevent unnecessary searches like the one that occurred in Alaska

Off-Airport Alaska Landing Leads to Unnecessary Search for Pilot

The pilot of a 1946 Taylorcraft experienced a nose-over during a landing near Hatcher Pass, Alaska.

The good news is the pilot, the sole occupant of the aircraft, was not injured. The aircraft went over on its back in the snow, rendering it unairworthy. Another pilot was able to rescue him, and the damaged aircraft was left behind

That might have been the end of the story **had the accident pilot notified authorities that he was safe.**

Instead, a pilot reported picking up the aircraft's emergency locator transmitter to the state patrol. Although there were no reports of distress calls or overdue aircraft, a multiday search was began for both the aircraft and the pilot.

Members of the Civil Air Patrol searched for a total of five hours over multiple days, often being hampered by high winds and low visibility due to severe weather in the area, and also conducted a 13-hour ground search in an attempt to identify and locate the beacon,"

Alaska Wildlife Troopers and the National Guard also joined in the search by helicopter but failed to locate the aircraft.

CAP volunteers located the overturned accident aircraft. A rescue team from the Alaska Air National Guard immediately flew to the site and found the airplane empty with no signs that anyone had been injured.

There were human footprints leading away from the aircraft. The servicemembers followed the tracks up the mountain where they stopped. Finding no sign of the pilot, the authorities began the efforts to determine if he had already been rescued. They eventually were able to reach him by telephone.

Alaska’s Department of Public Safety public information officer stated, that the **search effort cost thousands of dollars,** but “at this time there are no plans by the Alaska State Troopers to fine or attempt to recoup the cost of the search from the pilot, as Alaska law does not have any avenue to accomplish that.”

We ask that pilots help us by notifying federal officials and search and rescue authorities of abandoned aircraft in the backcountry or minor crashes where the pilot self-rescues so that we will be available to respond to other calls for help that may come in.”

Today's Meme: Life Choices

AOPA ePILOT

Industry rallies to make GA lead-free by 2030

General aviation leaders, petroleum industry stakeholders, and the U.S. government announced an ambitious commitment on February 23 to transition to lead-free aviation fuels for all piston-engine aircraft by the end of 2030.

Online resource
Follow the progress of unleaded fuel

We've compiled the latest news, answers to common questions, updates on AOPA advocacy, and actions you can take to help GA transition to lead-free fuel for every aircraft by the end of this decade. https://www.aopa.org/advocacy/100-unleaded-avgas?utm_source=special&utm_medium=email

Frequently asked question
Why is this issue so important?
Answer: This is the most pressing issue facing general aviation today because leaded fuels threaten our freedom to fly, and threaten to quell the economic impact of GA and the great humanitarian services it provides. Transitioning to an unleaded high-octane fuel that meets the need of the entire fleet is complex, but progress is being made. All of GA supports the smart and safe transition to unleaded fuel for all aircraft.

Frequently asked question
What changes will I have to make to my engine to use 100UL avgas?
Answer: Those with 100UL formulations in development report that no modifications need to be made to engines. The focus is on a transition to 100UL that works for all aircraft in the current GA fleet without the need for engine modification.

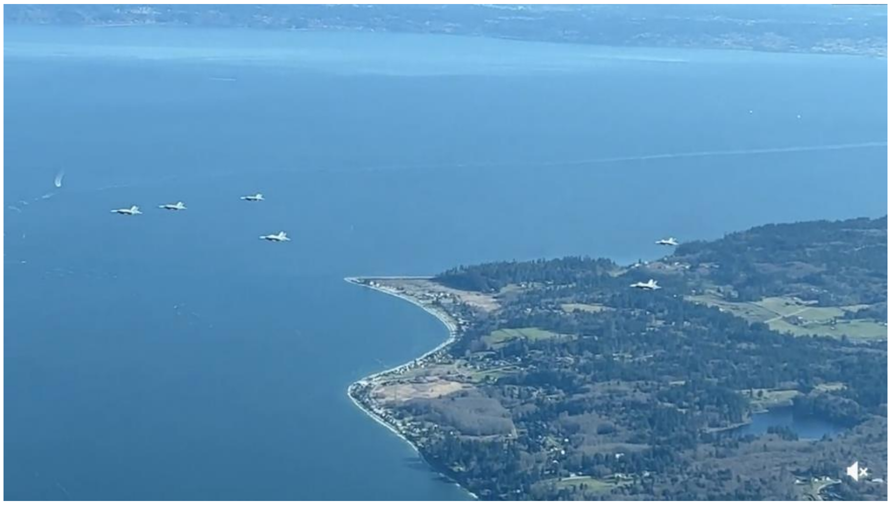
Frequently asked question
How long will leaded fuel be available?
Answer: Total disappearance of 100LL without an available 100UL is a real threat to safety. Some airports have banned the sale of all leaded fuel since January 1, leaving many pilots and aircraft owners without an option that will safely work for their aircraft. The industry supports a smart transition toward a 100UL solution that will work for the entire GA fleet.

Frequently asked question
How do I know if my aircraft can take Swift Fuels UL94?
Answer: Pilots are encouraged to check their flight manual or pilot's operating handbook to see which fuels are approved for their aircraft's engine and fuel system. In addition, Swift Fuels has a web tool that lists which aircraft makes and models have been approved for its UL94.

Frequently asked question
My engine was originally approved to run on 80 octane. Do I need an STC to use UL94?
Answer: Yes. The FAA requires a supplemental type certificate to be issued when an aircraft owner has "received FAA approval to modify an aeronautical product from its original design." This far-reaching definition of modification includes the approval to use a fuel not specified for the original design or in the original aircraft flight manual or pilot's operating handbook.

Video: Why Flight Following Never Hurts

The pilot who posted the video taken from his piston single states, “Was given an altitude restriction on flight following passing through [the] MOA, and then 6 Growlers passed under.”



“I had [flight following] from long before and we were just over the top of [the MOA] anyway. Definitely serves as a demonstration why it’d be unwise to casually fly through a MOA without asking approach about it first.”

https://www.reddit.com/r/aviation/comments/su2k69/was_given_an_altitude_restriction_on_flight/

boldmethod

Understanding Pitot-Static Failures

By Nicolas Shelton 03/01/2022

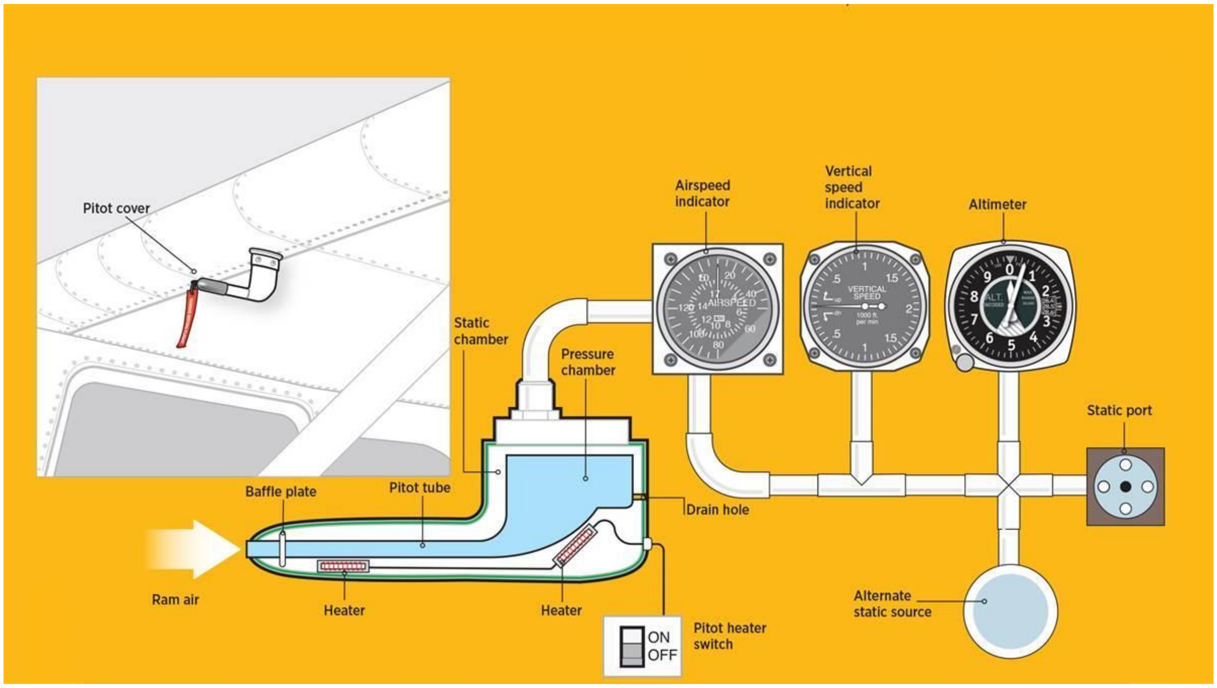
The first step to being prepared in an abnormal or emergency scenario is to know your aircraft's systems. Knowing your systems allows you to think through erroneous indications and diagnose the root cause, getting you on the ground safely.

With that in mind, let's review the Pitot Static System. The system measures and compares air pressures, **Ram Air** from the Pitot Tube and **ambient air** from the Static Ports.

The pitot tube is usually mounted on the wing of the airplane so that it faces into the relative wind. A small hole in the tube allows impact air pressure—also known as ram air pressure—to enter.

The static ports are attached to the airplane's fuselage

These two "Pressures" are supplied to the Pitot-Static Instruments.

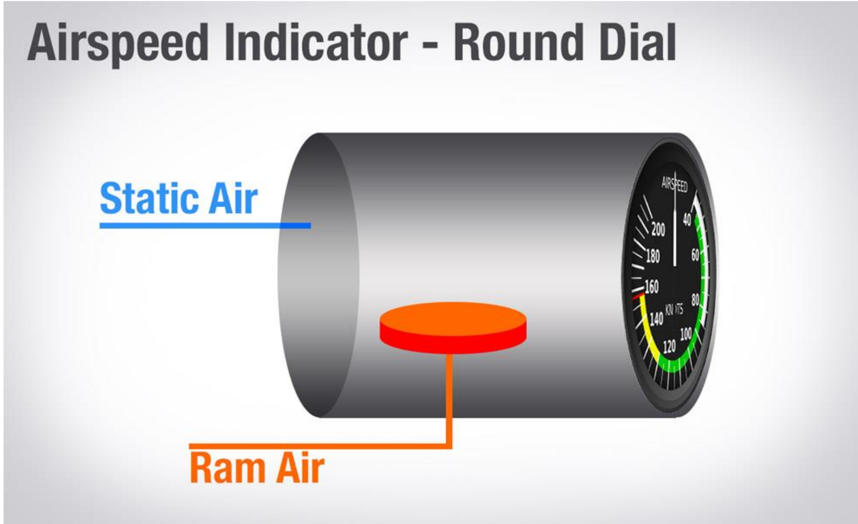


The airspeed indicator is the only instrument in the pitot-static system that uses both types of air pressure.

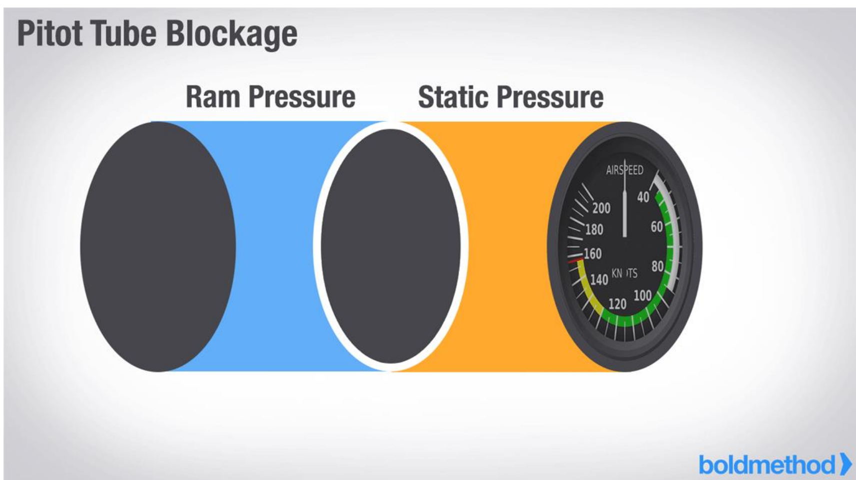
The altimeter, which displays altitude in feet, uses static pressure to sense pressure changes.

The vertical speed indicator, measures static pressure differential for displaing rate of climb or descent in feet per minute.

Pitot Tube Blockage



The only instrument connected to the pitot system is the airspeed indicator. For this explanation think of the airspeed indicator in simple terms. There is a diaphragm that has ram air pressure (from the pitot tube) on one side, and static pressure (from the static port) on the other side.

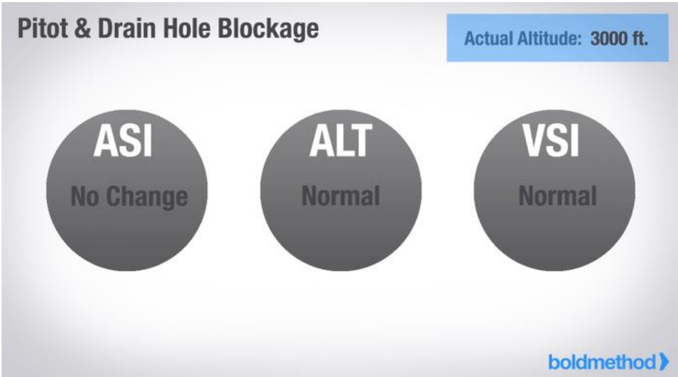


If your pitot tube becomes blocked, there is no more ram pressure entering the tube. Any excess pressure leaks out of the drain hole, and you'll be comparing the drain hole's pressure and the static pressure. This means your airspeed indicator will be at zero, just like when you're sitting on the ramp.

Pitot And Drain Hole Blockage

Now, what happens if your drain hole is blocked in addition to the pitot tube? Think of this as trapping the air inside your pitot system. If you don't climb, descend, speed up, or slow down, your airspeed indicator will freeze on the last airspeed before the tube/drain became blocked.

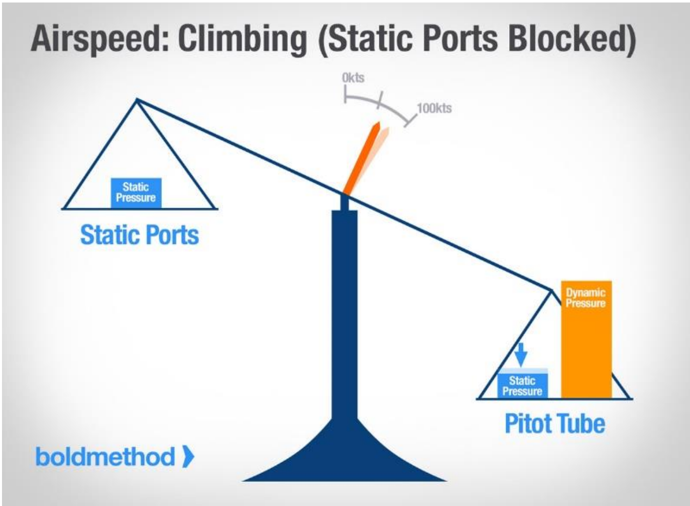
Now imagine your tube/drain blocked and 3,000 feet, and you start a climb to 5,000 feet. The side of the diaphragm that is connected to the pitot system will remain pressurized to 3,000 feet, while the static source side drops pressure as you climb.



This will cause your airspeed indicator to show a faster-than-normal airspeed as you climb. It will also cause it to indicate a slower-than-normal airspeed as you descend. This can be a very disorienting sensation, especially in instrument conditions.

Static Blockage

Since the static port is connected to your airspeed indicator, altimeter, and VSI, they will all be affected by a static blockage.



A static blockage will cause your airspeed indicator to show inaccurate indications. If you climb at a constant airspeed, your ram pressure's static component decreases. Since your static ports are clogged, they have too much static pressure. Essentially, they're stuck at a lower altitude. The difference between ram and static pressure is smaller, and your indicated airspeed decreases. You're now flying faster than your indicated airspeed. The opposite is true if you descend.

Now let's look at your altimeter and VSI. Since your altimeter uses aneroid wafers to compare static pressure to standard pressure (29.92 inHg) if the static port is blocked, the static pressure at the time of blockage gets trapped in the altimeter. With no more changes in static pressure, your altimeter freezes at the altitude the blockage happened.

Your VSI uses a calibrated leak and diaphragm to compare changes in static pressure to determine your climb or descent rate. Without a changing static pressure, your VSI's calibrated leak will allow pressure to slowly equalize in the unit. Your VSI will move to 0 FPM and no longer change, regardless if you're climbing or descending.

What To Do

So you've recognized that something has gone wrong with your pitot-static system.

If you're in visual flight conditions, use your outside references and make a plan to land.

If you don't have airspeed indications, or you suspect they're inaccurate, **rely on your standard pitch and power settings to descend at a safe speed.** Use the sound of the air rushing over your cabin as another tool to determine that you're flying at a safe speed. If you have a static blockage and your altimeter is frozen, use your iPad EFB to display your GPS altitude.

If you're in the clouds the situation is a bit more complex. After you identify the issue and transition to a partial panel scan with the aircraft under control, you'll want to notify ATC that you've had an instrument failure (FAR 91.183 & AIM 5-3-3).

Make sure your pitot heat is on, and check your circuit breakers to make sure none of them have popped. You'll also want to make sure your alternate static source is selected.

From the Archives of

Editor Note: This is a very indepth, lengthy discussion so I will present the highlights and break it into installments. Here is the link to the full article

https://www.avweb.com/features_old/pelicans-perch-18mixture-magic/

Pelican's Perch #18: Mixture Magic

This is the 6th Installment of an article discussing Engine Fuel/Air Mixture

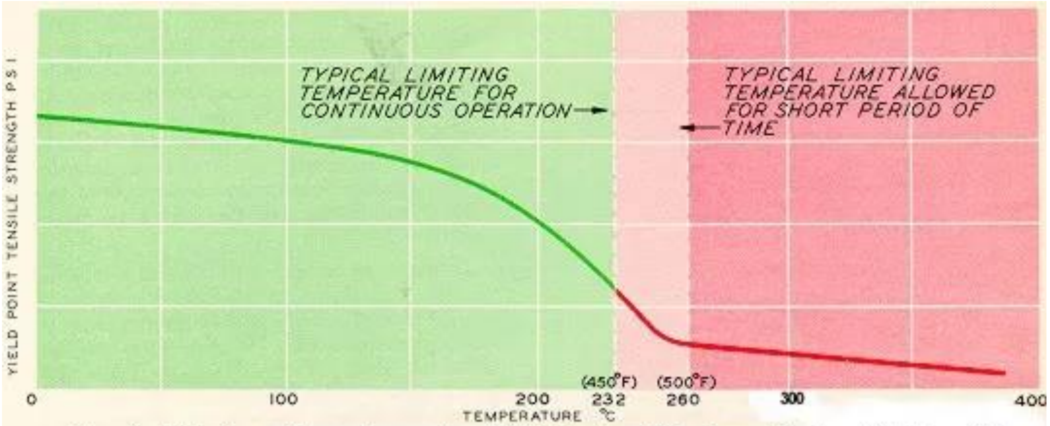
This month we will continue this series, discussing Cylinder Head Temperature (CHT). Where and how it is measured, what affects it, and its' importance to the engine's operation.

How about CHT, Anyway?

CHT is measured by a thermocouple washer under a spark plug, or by a probe screwed into a threaded boss in the cylinder head casting. The latter is probably more accurate.

Since the cylinder heads and pistons are made from aluminum alloy they can lose a substantial amount of strength if the Cylinder Temperature is allowed to become too hot.

This chart from the Pratt & Whitney "The Aircraft Engine" shows the Cylinder Head Temperature Limits for safe operation of an engine. This Chart indicates the Temperature Value that would result in damage to the engine.



Strength of Aluminum Alloy vs Temperature (P&W "The Aircraft Engine and Its Operation" Page 19)

This is a scary chart, because it's obvious that even at normal operating temperatures, we've already given up some tensile strength.

For example, The redline CHT on my IO-550 is 460°F (239 C), is well out in the "short period of time" area. Naturally I would prefer to stay out of that region entirely

Looking at the sharp gain in strength achieved by reducing the temperature from 450°F to 392°F (232°C to 200°C), I think **the conservative pilot ought to limit CHT to that 200°C value, as much as possible**.

There is some support for this. The P&W book goes on to say:

"The higher limiting temperature (500°F) is for a restricted period of time, and is confined to take-off, to maximum performance in climb and level flight, and emergencies. The temperature limit for restricted operations should, therefore, be used for the shortest possible time only, and must never be exceeded.

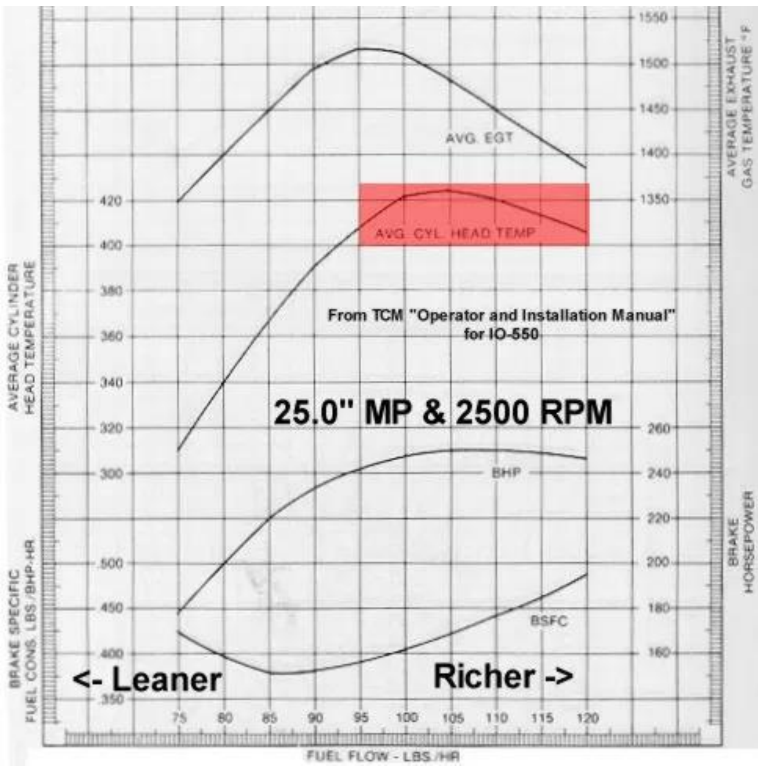
"The lower limiting temperature (450°F) is the maximum for continuous operation. It should never be exceeded except under the restricted operating conditions mentioned in the previous paragraph. It is sound practice to hold the cylinder head temperature 50°F (30°C) below this limit to keep the cylinder head materials at high operating strength." [emphasis mine.]

That puts us squarely at 400°F, a nice, easy-to-remember number.

Let's re-visit that TCM chart of basic engine curves, this time with a red area shown between 400 to 425 degrees.

Remember that this is the chart that shows engine operating parameters **at 25″ and 2,500 RPM**. Does that setting sound somehow familiar?

> **Yes, it's the setting many have used for years right after takeoff, for climb power!**

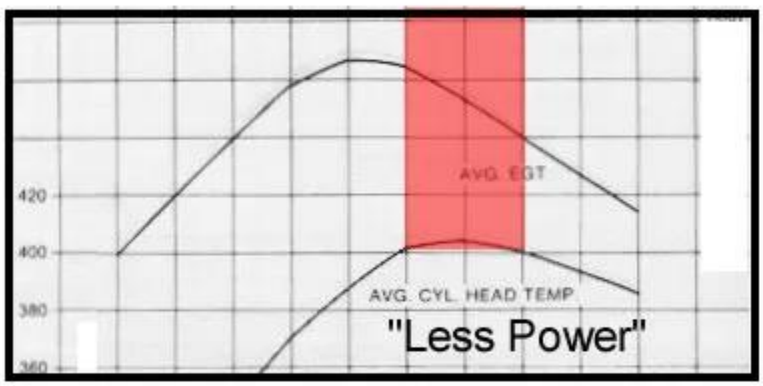


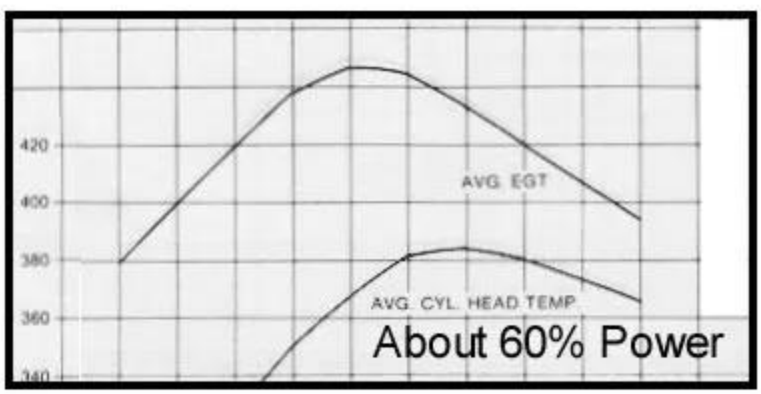
The high temperatures are the direct result of pulling the MP back to 25″, which cuts out the power enrichment feature of the fuel controller, leaning the engine dramatically!

Therefore, this practice (pulling the throttle back after takeoff) may be the single most damaging thing many people do – with the best of intentions, to "make it easier on the engine!"

Forget it, folks. Leave that throttle fully in, unless you need to make a substantial reduction in MP, maybe to 22″, or so. (Also Remember, we're talking about normally-aspirated engines here.)

Now take a little different look at those TCM curves:

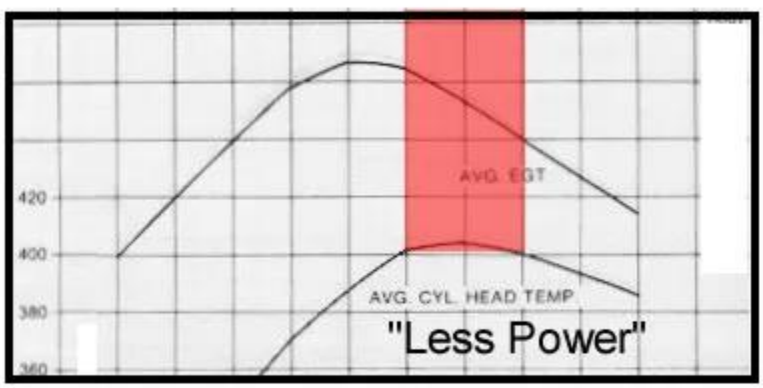


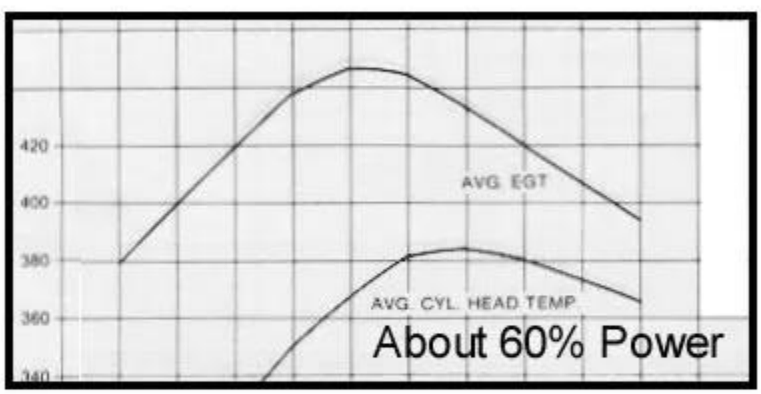


The top picture is the same one we just looked at. I've cut out a lot of extraneous detail to illustrate my point.

> **If we consider that area of CHT "off limits" because it's over 400°F, then the same area of EGT is also "off limits" because they go together.**

In this illustration, note there is no possible combination that will give us a lower CHT/EGT, except **changing the Mixture to very lean of peak condition,** which would cost us a lot of power.





In the **second picture**, I've fiddled the CHT numbers, and erased the EGT numbers, to give **a simple picture of the engine operating at setting which is producing "Less Power."**

It's probably up in the 70% range, but that's not what I'm trying to show.

Look at the much-narrower red band covering the peak CHT (be very careful to read "CHT" and "EGT" correctly, here in this text, and keep them straight while looking at the picture.)

Next follow the red band up to the equivalent range on the EGT, and note where it lies on the curve.

Notice that at this still-high power setting, **peak EGT produces a satisfactory CHT!**

From this we should realize that the "The Danger Zone" for an engines operation occurs mostly when the EGT is on the rich side of peak – precisely where many factory documents would have us run.

At higher power settings, we need to avoid peak CHT, which means avoiding some areas on the rich of peak side of EGT.

That Loose Formation, Again

Remember I talked about six (or four) cylinders, flying along in loose formation, all at different power settings? Now you may be getting the idea why I think that's important.

No matter where you set your mixture, most of the cylinders are **not** running where you think you set them! You have set **one** cylinder, and one only.

Now suppose you lean by the classic advice "lean 'till roughness occurs, then enrich just enough to restore smoothness."

Question? What's causing that vibration? Aha, I see that hand in back there in the audience. What's that you say? "Lean misfire?"

Sorry Charlie, no tuna. **There's essentially no such thing as "lean misfire."** It's probably a term some tech rep made up because he didn't know the right answer.

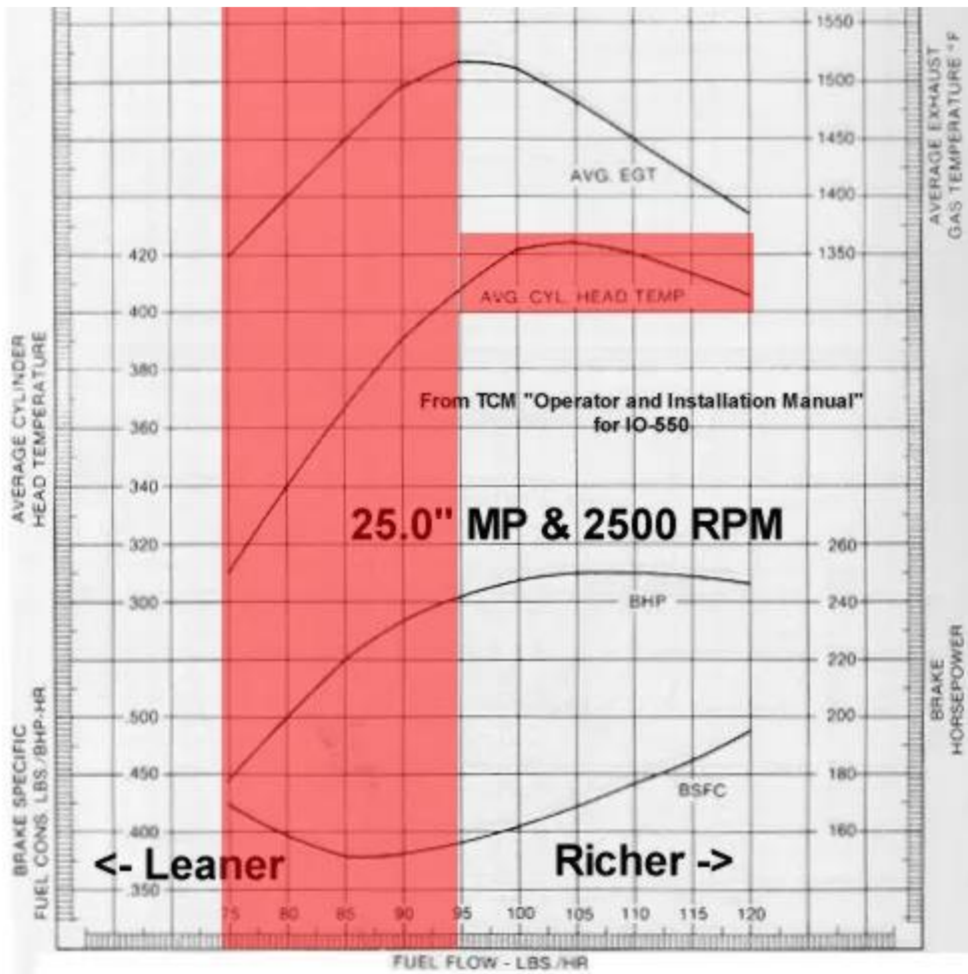
Truth is A properly set up engine will tolerate leaning and remain smooth right down to that 30% power range (see combustion chart), at which point it just quits cold. Since the real world is not perfect, even well-set-up engines may show a just a tiny bit of roughness when leaned to the extreme.

The roughness, when we lean, is really caused when one of the cylinder's reach peak temperature and starts down on the lean side, causing it to produce **less power** than the others. **The unequal power from one cylinder (or more) will cause enough vibration to be obvious.**

So, you enrich until the vibration goes away, restoring that one cylinder (or more) to approximately the same actual power as the others.

That gets them all up on the "sort of flat" part of the power curve (see chart).

There's no way of telling just where all that occurred, or what cylinder it was, but the resulting chart might look something like this, with a new red area added.



This second and much more serious red area holds true through the entire spectrum of power settings, so it is much more serious.

Virtually all factory big bore engines suffer from this uneven power distribution, which sets an artificial limit on just how lean we can run. **Uneven mixture distribution causes the entire lean-of-peak-EGT region to become a red zone, not available for use!**

There is more. During tests, GAMI cemented thermocouples down in between the fins of a cylinder, tight against the barrel at the bottom of the grooves. While operating the engine at various temperatures, it was obvious that there is a variation around the circumference of a cylinder. They found that some cylinders may show up to 150°F difference between the hottest and coolest points, even on a properly baffled and cowled engine.

By the way, the standard factory CHT instrument didn't show anything abnormal at all!

Furthermore, they found that as the temperature gets up around 420°F (at the probe), the **CHT tends to become unstable, and tries to increase all out of proportion to whatever the actual temperature is in the cylinder**. The cause seems to be that at higher temperatures, the cylinder barrel goes significantly out-of-round, and since the piston can't change shape to fit, **the piston starts scuffing the narrow part of the resulting oval, leading to the rapid rise in CHT**

Next month will be the last installment in this extensive discussion concerning the leaning of an engine and its effects on engine operation. We will look at "Some Old Wives Tales" and finally "What we can do to safely operate our engines at a power setting that gives us the greatest fuel economy"

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Interesting and useful websites on the Internet:

NOTE: You may have to copy and paste the address into your browser if the link doesn't work

I have added a few that I use.

If anyone knows of other interesting websites let me know and I will add them to the list

Our Chapter Home Page:
https://chapters.eaa.org/eaa1321

Why We Fly
www.whywefly.org

EAA: Home Page
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FAA Safety Team FAAST
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