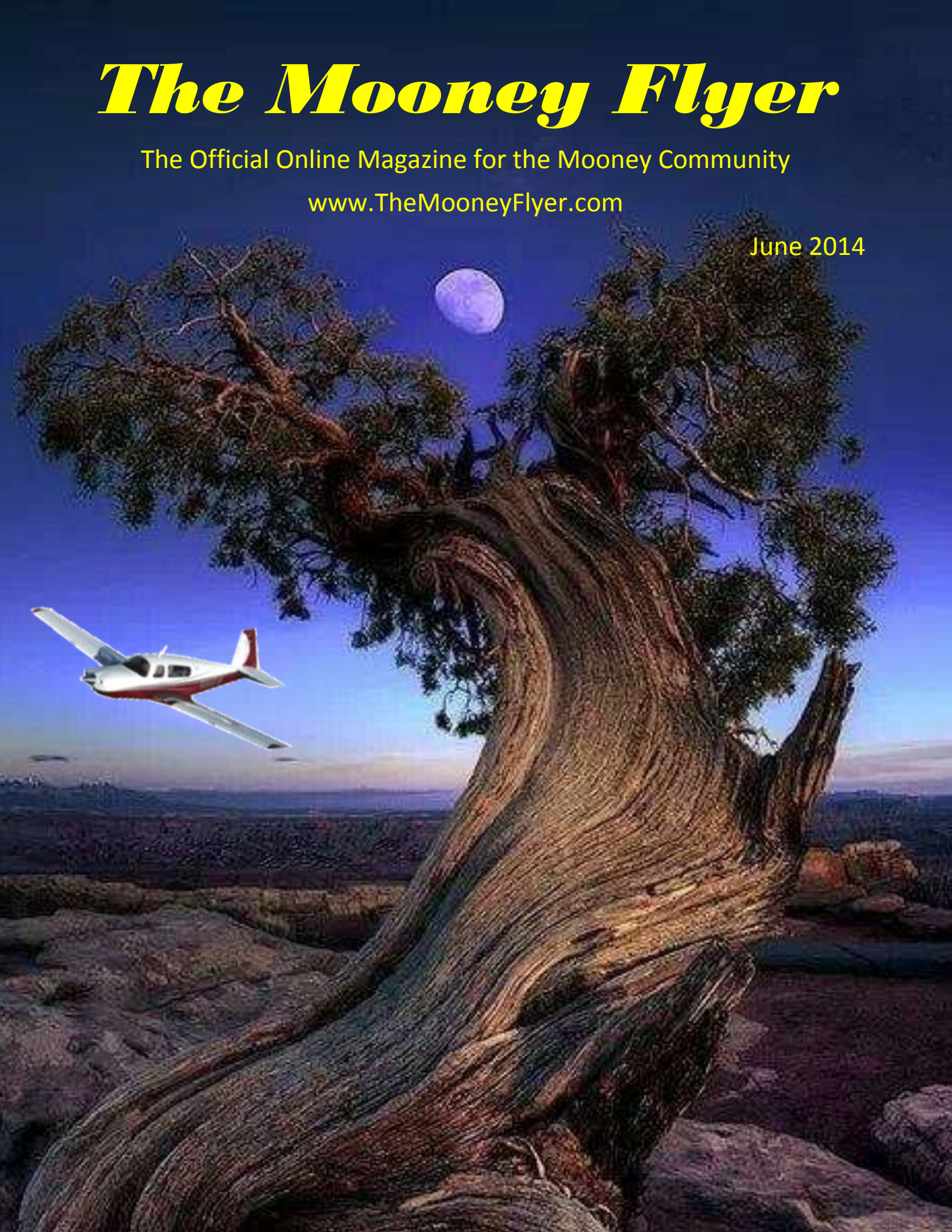
The Mooney Flyer

The Official Online Magazine for the Mooney Community

www.TheMooneyFlyer.com

June 2014



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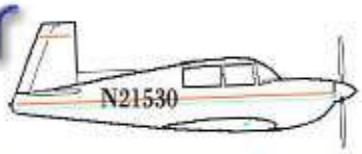
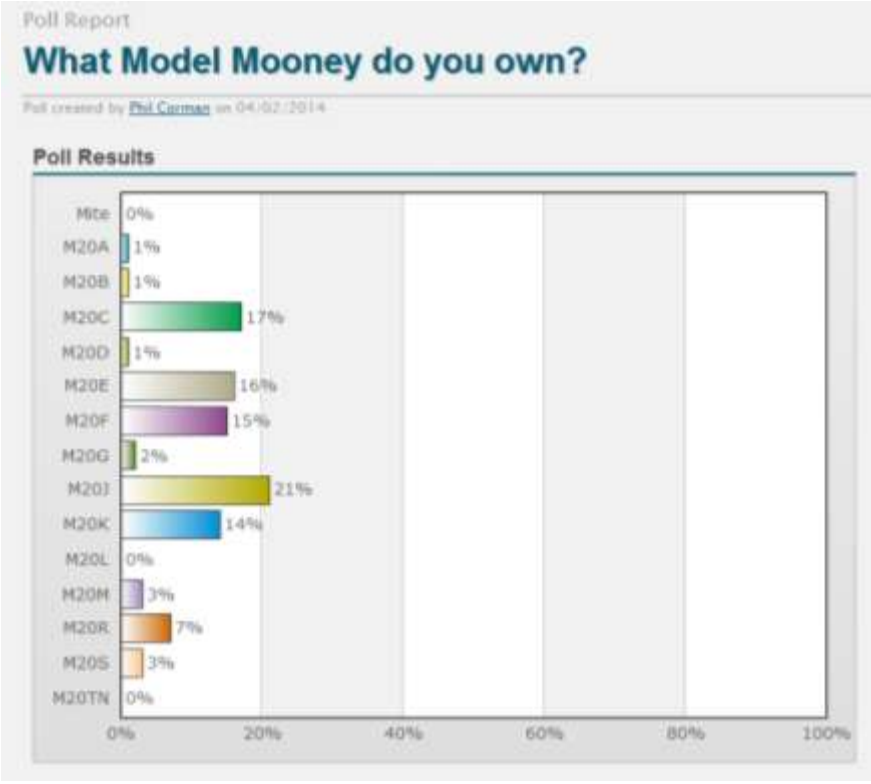
From the Editor

Phil Corman



With this issue, The Mooney Flyer enters its 3rd year of publications. We would like to thank all of our readers and also our writer contributors. What makes our magazine unique is that knowledgeable people contribute amazing articles each month. On the maintenance side, we have 2 of the top MSCs in the USA with LASAR (Paul Loewen, Shery Loewen and Mike Riter) and Top Gun Aviation (Tom & Mark Rouch). These folks contribute valuable information each month. Additionally, we have A&Ps such as Cliff Biggs, who work on Mooneys regularly and pass on direct experiences with Mooneys. On the flying side, our CFI lineup is impressive, including our very own Jim Price, Geoff Lee, and Mike Eliott. We are anchored with Bob Kromer and his long time experiences at Mooney. For our "right seaters", Linda Corman reports on places to take your loved one and your Mooney (sometimes the same thing). And there are many more… Thanks to everyone as this is a true team effort which keeps the magazine fresh, informative, and entertaining.

Here are the results of last month's survey on what models of Mooneys we own. C's & E's – close siblings, account for 1/3 of the fleet. It's no surprise that the venerable J is the most owned model. When you couple J's & K's, also close cousins, they account for a little more than a third as well.

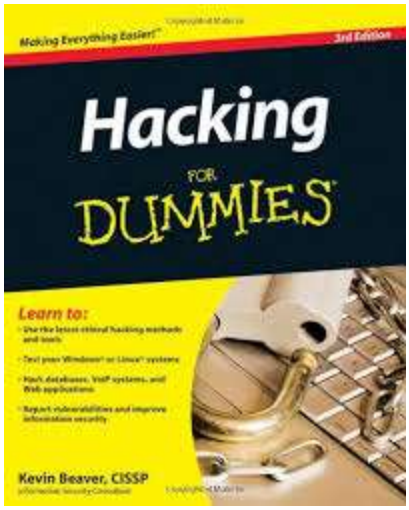


Here is next month's poll:

What are your expectations of the new Mooney International. CLICK HERE to vote.

Mooney Safety Foundation

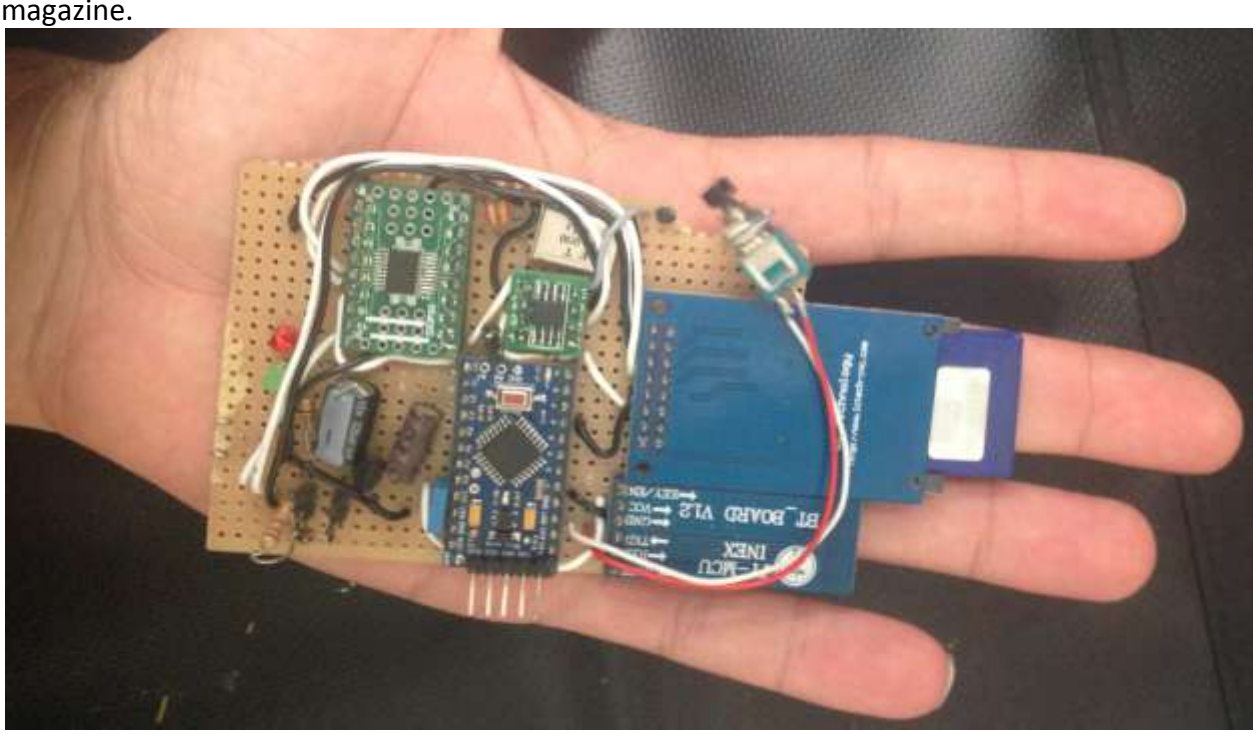
We are particularly proud to announce a relationship with the Mooney Safety Foundation. Effective with this issue, we will be posting all of their events, Pilot Proficiency Programs. The missions of both organizations support the Mooney owners and pilots worldwide and it is a natural relationship.



Op Ed: The Internet of Mooneys

by Phil Corman

For most of the existence of the Internet, PC and Mac users, and now Tablet and Smart Phone users, have suffered hacking and viruses. For the most part, early on anyway, they were simply a nuisance. Over the years, they became malicious, then destructive. Lately, they have focused on financials, targeting such name retailers as Target and major credit cards. All of this is about to change and have more significant real world effects. Why? Because the internet is evolving into the "Internet of Things". Your automobile has many computers and networks. Pictured below is a device that costs approximately $20. It can be connected to a car in minutes and could be activated at any time. It is trivial to use this device to hack windows, alarms, anti-lock braking and more. Essentially anything controlled by a processor with software in your car. You can even plug your PC into the dashboard port on some cars and control them. CLICK HERE for an article by Forbes magazine.



Your Mooney has processors with software also. Where, you ask? Mostly in our glass panels, but also in our portable devices, including handheld GPS and iPads/iPhones. Any device that has a processor and can receive data can be hacked. Malicious software can enter your cockpit in a number of ways. Here's a few:

- A firmware or software download

Do you know your V_{mu} speed? It's called the "unstuck speed" and is the minimum indicated airspeed that your Mooney will lift off the runway. Just sayin'

- Across a WiFi or 3G/4G/LTE connection
- Across Bluetooth
- From your iPad/iPhone or Android device

Because of the FAA's costly process of introducing new technology, our Mooneys have no such processing in our engines. We don't even have electronic ignition, which does have a processor with software and data. So for now, our engines cannot be hacked with software…. Yet.

Here's a big opportunity for trouble that is on its way to theaters near you between now and 2020. It's called ADS-B. This will be one of the first processors with software and a network connection that is mandated by the FAA, and the International community. Unlike a GPS, ADS-B will be used as the backbone of the Air Traffic Control System. ADS-B relies on open communication aircraft-to-aircraft, aircraft-to-ATC, and ATC-to-Aircraft. Pretty interesting scenario to us here at The Mooney Flyer.

At "The Hack in the Box" conference in Amsterdam, there was a talk given on doing just these things. They even named the framework for this, "SIMON", and an Android app called PLANESPLOIT. These tools can be used to hack into an aircraft's Flight Management System (FMS), ADS-B, and even airlines Aircraft Communications and Reporting Systems (ACARS). SIMON is only a platform to demonstrate how insecure these systems are and deliberately developed only for simulation. But it proves that these systems are massively insecure and subject to passive and active attacks.

This is not an alarmist Op Ed. It is simply an eye-opener; not the "future-world", but the today world.

Appraise Your Mooney's Value

Don't forget about our cool new **Appraise your Mooney's Value** using Jimmy Garrision's valuation. Jimmy is from All American Aircraft, the country's largest Mooney reseller. We have implemented the models for M20C, M20E, M20G, M20F & M20J. Click on your model to simply complete the valuation. You no longer need paper and pencil. Just another benefit to our subscribers. These forms are currently Beta test quality. Please send errors to us.

M20C M20E M20G M20F M20J

Aviation Safety Reporting System

http://asrs.arc.nasa.gov/

Purpose

The ASRS collects, analyzes, and responds to voluntarily submitted aviation safety incident reports in order to lessen the likelihood of aviation accidents.

ASRS data is used to:

- Identify deficiencies and discrepancies in the National Aviation System (NAS) so that these can be remedied by appropriate authorities.

- Support policy formulation and planning for, and improvements to, the NAS.

- Strengthen the foundation of aviation human factors and safety research. This is particularly important since it is generally conceded that over two-thirds of all aviation accidents and incidents have their roots in human performance errors.

To use this amazing "safety" process, you must report the incident within 10 days and attest that the action was inadvertent and not deliberate Check Enforcement Restrictions in Section 9c for a complete list.

G'day mates! Another amazing issue – I've just had a quick look and whetted my appetite for tomorrow, when I will go through it at leisure. Linda has a nice style – she really made me want to go to Glacier Park.
Tony R

Great magazine. I look forward to every issue....
Dan D

Great May Issue! One minor nit with the article **"Really, Dude?** 1/4 Tank?". "The M20B, like the M20C and E can hold 52 gallons." Actually the M20B and the pre-1965 M20C can hold 48 gallons. That guy had even less fuel than you thought! Two things every early model C-driver dreams about at night are PC and 4 more gallons of fuel!
Andrew S

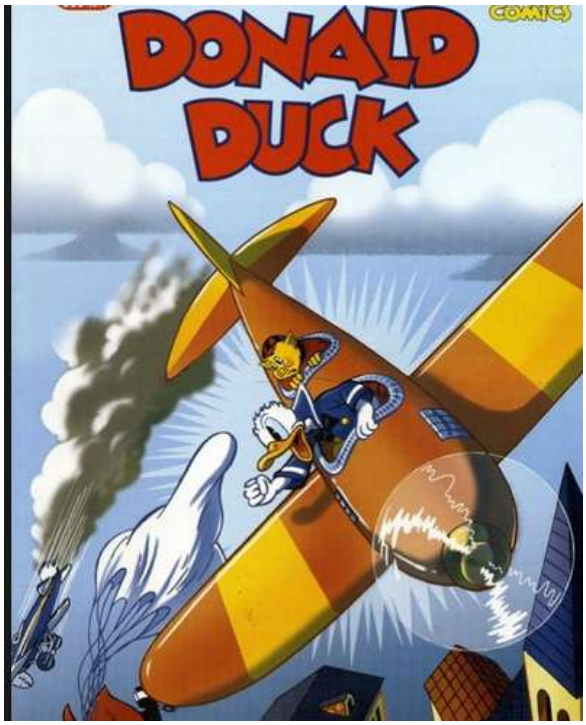
You are doing a great job. If I were MAPA, I would be a little worried.
Sincerely, **Richard B**

Wow, The Mooney Flyer is soooo valuable, as well as informative. I gave a copy of the article "**Pulling a Cylinder.. We don't need to pull no stinkin' Cylinder**" by Cliff Biggs to my mechanic. Six months ago, he pulled a cylinder that might have been saved had he known about Cliff's technique. It's brilliant and saves time and money. Wish it had been written 7 months ago.
Tom D

RE: Really Dude? How can these types of accidents continue to happen! Rod Machado has stated over and over that about 90%+ accidents are caused by the pilot. What was this guy thinking? The Mojave Desert is an inhospitable place to land a Mooney. Judgment is not overrated. This seemed like a simple decision. Let's be careful out there.
Don T

I just wanted to shout out a huge THANK YOU to the Loewens and Mike Riter of LASAR. Their articles each month in The Mooney Flyer are absolutely terrific. I am a pilot, and NOT mechanically adept. But their articles are understandable to me and give me such a better understanding of the workings of my Mooney.
George D

PHIL CORMAN



Judgment vs. Skill

We have written several articles over the past few years, encouraging Mooney pilots to consider the fundamentals. We've emphasized "stick & rudder skills", "slow vs. fast thinking", and "conditioned responses". Conditioned responses, in some ways, are the opposite of judgment. Here's why. Conditioned responses are responses that pilots either innately have or have conditioned themselves to execute "without having to think too much or analyze". The best example is the conditioned response to "lower the nose aggressively if you have an engine out on departure. Your Mooney will stall, and maybe spin, if you don't do this. Not a lot of time to think. Hence, it's a conditioned response.

An excellent pilot uses his excellent judgment to avoid situations requiring his excellent skills

Judgment, on the other hand is considerably different. "Pilot judgment is the process of recognizing and analyzing all available information about oneself, the aircraft and the flying environment, followed by the rational evaluation of alternatives to implement a timely decision which maximizes safety. Pilot judgement thus involves one's attitudes toward risk-taking and one's ability to evaluate risks and make decisions based upon one's knowledge, skills and experience. A "judgment decision" always involves a problem or choice, an unknown element, usually a time constraint, and stress."

Good pilot judgment requires the ability and motivation to:

- Discover and launch the significance of all available information relating to the problems of the flight
- Identify problems
- Specify alternative courses of action
- Assess the risk associated with each alternative
- Choose and effect the appropriate course of action within the available time (Jensen, 1995)

In situations requiring judgment, the PIC's decision will be based on (1) what the pilot had previously learned which may be applicable to the new situation; and (2) what the pilot chooses to consider as relevant information for arriving at a new decision while operating in "unknown territory." Judgment takes into effect the pilot's skills, the airplane status, and the outside environment. Here are some examples of each.

Good judgment comes from experience. Experience comes from bad judgment

***Pilot Skill**: The pilot had four hours of sleep the night before. A friend then asked the pilot to fly him to a meeting* 700 *miles away. Using good judgment about his fatigue, the pilot said no.*

The rest of the world calls it an "apron". In the USA, we call it a ramp.

***Airplane (A) Status**: During the preflight, the pilot noticed the fuel cap did not seem to lock securely. The pilot decided to delay takeoff while a mechanic checked the situation. The pilot's good judgment was confirmed when the mechanic had to install a new cap.*

***Environment (E):** The pilot was landing a small, single-engine plane just after a helicopter had departed. The pilot assumed that turbulence would not be a problem, but the plane slammed into the runway due to vortices from the helicopter.*

***Pilot (P) & Environment (E)**: With a 90-degree, 30-knot left crosswind **(E)**, the pilot attempted to make a landing. The pilot's left leg was in a cast **(P)**, and he had trouble using the rudder. Upon touchdown, the aircraft veered sharply to the right and collided with an embankment.*
***Pilot (P), airplane (A) & Environment (E)**: In cruise, ideal conditions for carburetor icing existed, and ice did develop **(E)**. However the pilot, who was unfamiliar with this type of aircraft, concluded that the engine was running rough due to a mechanical failure, and he did not apply carburetor heat **(A)**. Instead, the pilot rushed into an emergency landing attempt, landed downwind unnecessarily, and ground looped the airplane **(P)**.*

85% of GA accidents, maybe more according to Rod Machado, are pilot-caused. This leads us to deduce that the PIC either executed poor judgment, such as flying into instrument conditions without an IFR rating, or had inadequate skills to salvage the poor judgment call. A great part of good judgment actually comes from the pilot's attitude. You've seen these two extremes of pilots. The first may not do a preflight inspection, check the weather enroute, not worry about density altitude or weight & balance, etc. The other pilot, typically a Mooney pilot, is constantly wanting to learn from other pilots or top notch CFIs. An attitude of "safety" is a typical prerequisite for good judgment. And remember, attitudes can be learned and can be changed. With that statement, so can judgment. So judgment is not something you are simply born with, or never have. It can be acquired, and should be an essential tool in any Mooney pilot's flight bag.

In other articles in **The Mooney Flyer**, we have emphasized that accidents, or incidents, are rarely the result of one bad situation. Rather, they are the result of a chain of errors. Break the chain, and you can significantly reduce the chances of an accident or incident. With judgment, there are similar caveats. First, as Yoda said in Star Wars, "There is no try, only do."

- **Do**: But, the first caveat is the pilot **did something** which should not have been done
- **Not Do**: The pilot **did not do something** which should have been done.
- **Under Do**: pilot **did not do enough** when something more should have been done
- **Over Do:** The pilot **did too much** when less should have been done
- **Early Do:** The pilot **acted too early** when action should have been **delayed**
- **Late Do**: The pilot **acted too late** when action should have been initiated **earlier**

Let's spend a few minutes on Mooney-specific judgment calls. The first and most obvious judgment call is to fly the pattern, final, and flare right on the airspeed numbers. Much deviation from those numbers usually means a float into the next county. So a good judgment decision in a Mooney is to have a stabilized final on the numbers. If not, go-around. The second most obvious judgment call in a Mooney is, if you find yourself in a porpoising moment, just go-around. The third touchdown is most likely going to ding your prop, and engine, and maybe more…. Just go-around. These are good judgment calls, and if you make them, you won't have to execute your excellent skills. Another good one for Mooney pilots is to keep the ball centered when practicing stalls, lest you enter a spin, which is prohibited by POH decree. Lastly, learn your stall speeds in different configurations and weights/balances. The POH is a good starting point, but your stall speeds "will vary". Do this with a good CFI. Learn the onset of a stall in different configurations so as to avoid inadvertent stalls. This is just another good Mooney judgment call, and once again, lets you avoid your excellent skills to get out of a bad situation.

So where does this all end up. Most accidents are caused by the PIC. Most PIC-induced accidents are caused by poor judgment. Judgment is greatly affected by your attitude. Taking that into consideration, you can significantly improve your chances of a safe flight every time your Mooney flies, by exercising excellent judgment. Even with excellent judgment, you will still need to exercise your excellent Mooney skills each time the environmental situations change. The difference between judgment and skill is also exemplified in the realization that most CFIs teach or provide remedial training on skills. Most of the judgement skills that you will learn will be self-directed.
Lastly, the best time to execute excellent judgment is while you are on the ground. Don't fly if you don't feel SAFE. Don't fly if your Mooney isn't tip top. Don't fly if the weather or other external environmental situations may place you in a tough spot, causing you to try to use skills that you don't have.

Most Common Judgment Errors:

Get Home-itus

Flight with too little fuel

Questionable PIC mental or physical status

Pushing on into bad meterological conditions (IFR if VFR, icing, etc.)

Inadequate Flight Planning

"Watch This!"

For the latest Mooney News

Death is just nature's way of telling you to watch your airspeed

When Judgment Takes a Vacation

JIM PRICE ATP, CFII, MEI

One Good Goof Deserves Another

January 1, 2010, two guys set out from Austin, TX on a flight to Crystal City, TX (20R). This would be a **night** cross-country flight in a Maule; a mere 144 nm trip. The pilot experienced problems with his GPS and elected to land and recharge the battery. Airborne again, the pilot lost his GPS, so he then received vectors to Crystal City. While in the vicinity of the Crystal City airport, if you were on the CTAF frequency, you would have heard, "Click, click, click." Nothing happened. The runway lights remained unlit. Where the heck is that airport? All that clicking and it just seemed to turn on some leftover home Christmas lights in town. He couldn't see the beacon, either. Hmmm.

The pilot then selected an alternate airport located 45 miles away.

While en route to the alternate airport, the airplane's fuel supply was exhausted and the airplane experienced a complete loss of engine power. During the ensuing forced landing near Pearsall, TX, the main landing gear collapsed and the airplane came to rest upright in a ditch.

The pilot and passengers were able to exit unassisted, where I'm sure there was a discussion about how much fuel pilots are supposed to carry.

What went wrong?

#1. The rotating beacon was NOTAMed out of service. *PPP*, (Poor Preflight planning).

#2, Crystal City's CTAF is 122.9, but pilots are to activate the lights on 123.4. *PPP*.

#3. When flying at night, pilots need to have enough fuel so they can arrive at the intended destination plus have an additional 45 minutes worth of fuel in the tanks. *PPP*.

Most Mooneys can fly the whole trip, including the leg to the crash site in the Pearsall area, with 10 to 13 gallons, plus, of course 45 minutes of fuel.

What are Friends For?

January 30, 2010, the Piper Dakota, (PA-28) pilot was almost home, near Crystal, NV, just **north of Pahrump**, NV. While descending to land, he spotted his friend's car on the dirt road below. He couldn't honk and wave, so he decided to do the next best neighborly thing – attack! He made a 180^{o} turn and started a descent, dive bomber style, towards his buddy's car. While excitedly engaged in this game of chicken, the pilot realized that he was a bit low, so he started a pull up. It was too late, however, and he struck his friend's car. Worried about his friend and probably feeling like an idiot, he landed on the dirt road to check on him. During the landing, the left wing hit a berm near the road. This could have happened because he had sheared off his left main landing gear while strafing his friend's car. With his Dakota stuck in the dirt, his friend gave him a lift in his slightly dented car.

What went wrong?

#1. Zero judgement comes to mind. Usually these stunts are prefaced by the phrase, "Hey, Bubba, watch this!"

#2. The town, formerly know as "Pah, NV", was so "amazed" by this event, that in honor of the pilot, they added another syllable to their name.

Well, I Stayed at a Holiday Inn Express Last Night

January 17, 2010. Somewhere in Tulsa, OK, a non-instrument rated pilot called for a VFR briefing for a flight to Washington, IA (KAWG). You're familiar with

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those guys, right? The, "It looks like VFR-Not-Recommended all along your route briefers" at Lockheed Martin. AFSS told the pilot that IFR conditions were forecast for the next few hours, after which the ceiling might improve to 2,000 feet. The pilot waited a good 8 ½ hours. That seemed to be the limit if of his patience and his good judgement. He strapped his impatient body into his trusty Cessna 172 and departed VFR without updating his briefing.

Once airborne, he received flight following and told the controller that he planned to land short of his destination for fuel. ATC then told him that the weather at his fuel stop was IFR, so he diverted to Cedar Rapids, IA (KCID), which he was advised was also IMC. So, what did he do? He pressed on, hoping for the best. Finally, he realized that the sky wasn't going to open up at the last moment, like he had seen in the movies. The approach controller offered a VFR airport in Minnesota, but the pilot didn't have enough fuel to get there. He then requested emergency assistance and vectors to an ILS at KCID.

"Are you IFR capable?" Well, not exactly, he told the controller, but he had practiced an ILS during a flight review – and stayed at a Holiday Inn Express. Gee, that's almost like having an instrument ticket, isn't it? So, down he goes, through the ILS rabbit hole.

He soon was "confused" at how that little glide slope indicator actually works. If the needle is high, do I raise the nose, or lower the nose?

Prang! The Cessna 172 almost made it, but landed two miles short. There were only minor injuries, but lots of damage to the fuselage and wings. He was able to call for help using his cell phone.

What went wrong?

#1. Failure to update an eight hour old flight briefing.

#2. Fairy Tale Syndrome. This pilot expected the skies to open up, showing him the way to the airport with a glorious sunlit path strewn with rose pedals.

#3. Self Imposed Box Canyon Syndrome. He had flown almost 400 nm. He was running low on fuel and was trapped with nowhere to turn.

#4. ILS or die! He elected to execute an approach for which he had little or no training.

Pilots find endless ways to amuse the NTSB and The Mooney Flyer!

You have to make up your mind about growing up and becoming a pilot. You can't do both.

Angle of Attack

by Geoff Lee, CFI

Angle of attack (AOA) is defined as the angle between the chord line of an airfoil and the relative wind. AOA is a constant in aerodynamic calculations.

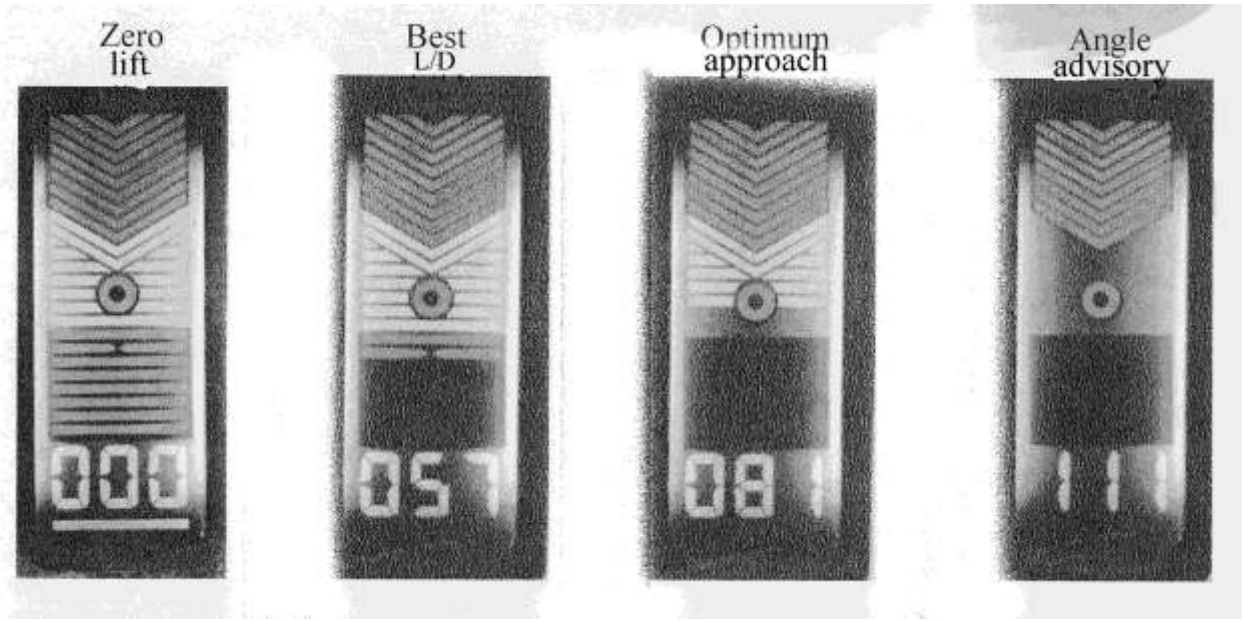
In February of this year the fed announced a new ruling aimed at making Angle of Attack indicators more affordable to GA by allowing the manufacturers of these devices to comply with ASTM Industry standards as opposed to complying with the costly TSO or PMA standards. It would be reasonable to assume that we shall see these devices more frequently installed in production GA aircraft. There are several affordable offerings already on the market. At this time they are mostly installed in experimental aircraft.

The US military, particularly the Navy and Marine aviation branches, has long recognized the accuracy and safety factors associated with the AOA device. The Wright brothers figured it out and simply used a piece of yarn and a reference stick, but sophistication and the expense of modern certification and installation on GA aircraft have deterred the proliferation of the device in this segment of aviation.

Recently, I have been instructing in a Glasair SII that is equipped with a *Proprietary Software Systems* AOA indicator.

It came to my attention that the pilot was consistently using up all of a 3,000 ft runway each time we landed. This seemed a mite excessive to me. Stall speed on this craft is 63kts with flaps and gear deployed, so the approach speed should be around 85-90 kts. That is close to the approach speed for my 231 Rocket, which weighs about 30% more than the Glasair. The Rocket stall speed is 61kts. Wing loading is less on the Mooney, but that 1,100 lb. difference in gross equates to a lot of extra kinetic energy. The Mooney can be stopped comfortably in 1,200 ft. The slick, rivet free Glasair has a good deal less frontal area than the Mooney, so it will certainly accelerate faster in ground effect.

Upon inquiring if he was utilizing the AOA indication and or the ASI, the pilot responded that he had never used the AOA! I commandeered the AOA instrument operation manual for a couple of days and educated myself regarding the markings and their significance. Seems sort of obvious, but there are some things that are prudent to fully understand. This instrument has voice alerts for flap deployment and an impending stall as it relates to positions on the instrument face. The total instrument face is divided into 31 liquid crystal light segments that progressively extinguish as AOA increases. (Lose light, lose lift.) There is a ”doughnut” in the center Yellow area, whose position is related to the optimum AOA for a normal approach. All the light segments below the doughnut would be extinguished when the optimum AOA is achieved so the instrument is read by observing the position of the unlit light segments that move upward as AOA is increased. This is akin to a shadow that moves in relation to the aircraft pitch attitude.



No shadow Shadow at Best L/D Shadow at Optimun app. Shadow @ “angle push”

A small X in the Green area denotes best lift over drag and the AOA for best glide, engine out and V_X for climb and best pitch attitude for endurance. V_Y would be one or two segments below the X. That little X seems understated for the amount of significant information that it conveys. There are three colors which depict your angle of attack: **Normal ops** in the Green. The Yellow area would put the plane on or **close to the backside of the power curve**, while the Red starts out at a point 1.15% of the AOA prior **to stall**. Full stall occurs when only the last Red bar is illuminated. The vocal “flaps” alert will trigger in the yellow area and a loud “angle, angle push” will be heard when the first two Red bars are extinguished at 1.15% AOA. The usual aircraft stall warning horn would normally also occur at this angle of attack (1.15% or 5-10 kts prior to a stall)

The digital numbers at the bottom of the instrument are arbitrary units that are useful to determine if the pitch is increasing or decreasing and by what degree. They can be associated with key airspeeds on the ASI. The AOA instrument is considerably more responsive than the ASI. These digits may be used for very fine pitch adjustments.

Using the AOA instrument in a supplemental role with the ASI is recommended and prudent. After reading the installation and calibration procedure, it became clear that the device must be carefully

There are certain aircraft sounds that can only be heard at night and over the ocean. Most of them are scary.

calibrated. Determining such details as “zero lift” appears in the writing, stating that the correct terminology for angle of attack is the pitch “angle measured from the point of zero lift”. Zero lift is the point where the wing has zero lift and thus no drag. It is determined in cruise flight by having the co-pilot hold a tennis ball in extended hand and watching for the point at which it floats upward as the pilot pushes forward on the stick or yoke. At this point, the AOA instrument is electronically calibrated by pushing certain buttons. This act is accomplished while one is floating off the seat, dodging loose airborne objects and trying to keep a recent meal down.

I have to believe that it would greatly reduce the number of stall spin accidents on base turn to final, if after having AOA indicators installed in all aircraft, we trained pilots to observe that instrument during base/final turns in conjunction with the ASI. The ASI, which **becomes less accurate as airspeed decreases**, does not adequately foretell an impending stall in a steep turn particularly in turbulence with the ball not centered; the AOA indicator predicts it precisely in all circumstances.

It is worth reviewing what makes an angle of attack instrument such a great safety device. We already have a pretty reliable airspeed indicator that tells us that the plane is flying or about to cease doing so, and we all know what the stall speed of our craft is, don’t we? It turns out that the **stall speed of your aircraft is a moving target** that is affected by any change in loaded weight, by any change in position of the C of G and certainly quite dramatically by change in angle of bank and G load. All of these issues are present when we fly blithely along our chosen path. We are burning fuel and the C of G location and the aircraft weight is changing. Load luggage, the wife the dog and kids prior to a trip into the mountains and hopefully, the stall picture moves more into the concern segment of the preflight planning process.

An aircraft will stall at exactly the same angle of attack (AOA) no matter what the load, airspeed, CG, bank angle or G load. This “*it quit flying*” pitch attitude is termed the “critical angle of attack” and it is an aeronautical constant. The critical pitch attitude is accurately measured and predicted by the AOA instrument which, especially at low airspeed, is much more sensitive, accurate and responsive to pitch changes than the airspeed indicator.

My subject pilot has dramatically reduced the length of his landing rollout thanks to that little device.

Fuel Selector Valves

by Michael Riter (LASAR Service Manager)

I would like to talk about Dukes and H&E fuel selector valves. These valves are found on Mooney M20C through the earlier J's. For all aircraft it is important that the fuel screen be inspected every 100 hours or at the annual inspection. People send us their fuel selectors for us to inspect and reseal, so at LASAR, we reseal a lot of fuel selectors. The most common thing we see is damage to the threads for the AN3 bolt that holds the bottom part of the fuel strainer. The next thing we see a lot of is fuel strainers that have not been inspected or cleaned regularly and are full of gunk. We also see a lot of fuel selectors with the top o-ring around the fuel tank selector valve leaking. This is seen as a blue stain around the selector knob.

Cleaning the screen is a simple matter. With the fuel selector off, remove the safety wire and undue the B-Nut attached to the plunger, then remove the AN3 Bolt. Stay out of the way; some fuel will come out. The screen is at the top. Remove and clean the screen, inspect the plunger and all parts including the threads in the bottom of the selector for the AN3 bolt. We've seen a lot of stripped threads. If all is well, clean the screen and reassemble with new seals. When tightening the AN3 bolt, do not over torque. Mooney Service Bulletin SBM20-200 calls for a torque of 15-20 inch-lbs. Remember to safety wire the bolt. Turn on the fuel and do a leak check. It may take more than one try to correctly install the top seal.

If damage is found or the top o-ring leaks, the fuel selector will need repair. Also, if the fuel selector is in the off position and fuel is still coming out, it will need to be repaired. ***LASAR*** repairs and reseals fuel selectors and we are happy to answer any question you may have.

SERVICE BULLETIN

This Service Bulletin is FAA Approved.

SUBJECT: FUEL SELECTOR VALVE

MODELS AFFECTED: M20C, M20D, M20E, M20F, M20G and M20J

TIME OF COMPLIANCE: At next 100 hour or annual inspection.

INTRODUCTION: On aircraft equipped with Dukes or H & E fuel selector valves, (ring pull sump drain inside cabin) routine maintenance calls for removal of the sump to clean the filter screen. Some of the Dukes valves have been marked "Torque 35 to 45 inch-lbs." for the AN 3 bolt holding the sump bowl. This may result in the breakage of some valves when re-installing the sump.

1. On those valves marked "Torque 35 to 45 inch-lbs.", remove this stamp with solvent or by light sanding. When reinstalling sump use the standard torque values for AN 3 bolts (15 to 20 inch-lbs.).

2. Make appropriate log book entry and return completed Compliance Card to Mooney Aircraft Corporation.

Tucson, Arizona

by Linda Corman

We have numerous friends that live in Arizona, so one day we decided to fly to Tucson and join up with a few of them and enjoy the wonders of the area. After we arrived and got settled in, we thought of some aviation related things to do there.

We headed out to the **Titan Missile Museum** which is open daily and for a small fee and under the guidance of a docent, you can wander around the largest missile ever built during the Cold War. This missile is housed in a silo and has been deactivated, but you still get the feeling that it is still protecting the nation. After everyone is assembled in the waiting area, you are taken to either an elevator for people with walking problems or to the stairway that circles around and around to the launch control center far down into the silo. The blast doors and a close up view of the missile are really impressive. This whole experience took a good part of the day, so we decided it was time to find something to eat. We were directed to a unique dining place called Cattletown Steak House and Saloon. You sit at long picnic tables, family style, and order the only things on the menu – steak and chicken. How you want your steak cooked is your only other selection. It was fun, and with all the side dishes and salads you don't leave the place hungry.

The next day, after breakfast, we headed to the **Pima Air and Space Museum**. We knew this would take us most of the day because the place is huge. Inside the hangar museums are aircraft displays with every type of airplane I could imagine. There are also rows and rows of additional airplanes outside.

The biggest and most impressive display was yet to come – **The Boneyard**, also known as the 309th Aerospace and Regeneration Center (AMARG). This is a must see. You purchase a ticket at the Pima Museum and are transported to Davis-Monthan Air Force Base. You need to remember to bring your I.D. with you because you will not be allowed on the bus without it. The day was quite warm; of course it is Arizona. So we drove back to town for Margaritas and some local food.

The next day we had seen our fill of aviation stuff, so we decided to go to the **Desert Museum** and look at some native critters and wildlife. This is a very nicely done outdoor museum. You just follow an easy walking path around the various exhibits. These included desert birds, wild cats, and Javelinas. There are also numerous places to stop and refresh yourself with drinks and Southwestern fare. It was fun to see the numerous plants and animals that live in the desert. I really liked the Javelinas and at first I thought they were small pigs. However, I was corrected by a sign near their enclosure saying "These animals are not pigs". Leaving the Desert Museum, we drove miles through the **Saguaro National Park**. This is only a short drive and well worth it. These huge cacti are hundreds of years old. After spending the night in Tucson, we departed early the next morning, as flying through the desert is always best done in the cool of the day. We are lucky to have Mooney friends that live in such a wonderful place and to be able to visit them in our Mooney.

Getting There

We recommend two airport options when visiting Tucson. The first is Tucson International (KTUS) and the second is Marana (KAVQ).

Marana is much more Mooney friendly, although Tucson Intl's ATC and FBO were very accommodating. Marana is less than 25 miles from downtown Tucson, which is southeast on I-10.

We flew in from the west and never entered any of Phoenix's Class Bravo. Using flight following makes handoffs to KTUS Approach & Tower effortless. At KTUS, there are 2 parallel runways. You can expect the right runway, since it is shorter. When we flew in, there were a bunch of F16s landing. We held between runways and got an amazing show, including some "after burner" go-arounds.

What to Do

Pilot Stuff to Do

Titan Missile Museum

Pima Air and Space Museum.

The Boneyard

Everybody Stuff to Do

Desert Museum

Saguaro National Park

Old Tucson

You can spend ½ day, walking through this old west town… Many TV shows and movies were shot here.

To Err is to be a Pilot

by Mike Elliott, MCFI, CFII, FAASTeam Rep

Last month we talked about the need to get your "mind right" to empower your ability to fly your Mooney safely. This month, let's delve a bit deeper into the human factors of accidents. Most accidents are attributed to human error, so it's a good thing to try to understand it. Let's begin by completing the statement "To Err is….." How many of us agree that to err is human? How many say it's universal? How about inevitable? And how many say its all 3?

Well, whoever said it got it right when they said to err is human. It's also universal, and inevitable, but they went on to say that to err is bad and those who make mistakes must be punished. Well, if it's universally human and inevitable, why does it have to be bad? Hold that thought and we'll get back to it in a bit.

An accident investigation begins with answering the 5'W's. Who was responsible, What happened, When did it happen, Where did it happen, and Why did it happen? There is a sixth W that the FAR's are based on in part - What is to be done about it? What can be done to prevent it from happening again? The first four questions are relatively easy to answer, but the Why and What's' to be done are more difficult. Many things can complicate getting to effective solutions.

Blaming people for their errors is emotionally satisfying, but remedially useless. Our traditional crime and punishment view only works when the perpetrator sets out to do wrong. If we fire the "bad apple", especially without understanding what led to the error, we'll accomplish two things. First, we'll send a message that says if you make a mistake, you'll be punished. This will encourage people to hide their errors. Secondly – if we don't address the real cause of the event, other folks are likely to make the same mistake in similar circumstances.

We're still accountable for our mistakes and part of making things right is to disclose them. That way, others can benefit from our experience and avoid making the same mistake in similar circumstances. So with that said, it's time for a story. It's not an aviation story and that's on purpose. We don't want to bring aviation preconceptions into the discussion just yet. This story has less than an ideal outcome. If we concentrate on who's responsible for what happened and how they should be punished, we may well miss why it happened and that could inhibit our understanding of how we might get caught short in a similar situation. Jane and Bob were a young professional couple who had been trying to have children for over five years. As luck would have it, they finally had a wonderfully healthy boy named Mikey. They both loved the little tike beyond words. Bob was a gynecologist and Jane was a partner in a law firm specializing in patent law. As Mikey approached his first birthday, it was Jane who would drop him off at the day care every day. But this July day would be different. Jane has to catch a flight to Washington, DC for a hearing at 10:00 AM and Bob would have to drop little Mikey off at the day care. Bob, on the other hand, was up until 3:30 with a delivery the night before. That morning, Jane wished Bob and Mikey her love and headed to the Tampa International airport, while Bob packed up little Mikey and strapped him in the car seat in the rear of their BMW. Soon, little Mike was fast asleep in his car seat as young children often do. It was a fairly long drive to the hospital where Bob worked and he was running a bit late for his morning rounds. He was pre-occupied with one particular patient and forgot to make the turn to the day care and proceeded straight to the doctor's parking lot of the hospital. You can imagine what happened. This tragedy actually happened and continues to happen every year. The community was outraged to learn of the infant's death and called for Bob to be charged with child neglect and manslaughter. We know who, what, when and where, but now let's look at why and how do we keep it

from happening again? Have you ever had one of those days when, preoccupied with what you have to do, you take a wrong turn on a familiar route? Set out for work when you intended to go to the store. Lock your keys in the car or the house? Can't find the keys to the car or house? The first three examples, called slips, are familiar to us all and if you're not familiar with the last – well just wait until you're older. Some people my age complain that they spend most of their day looking for things.

People cannot avoid those actions they did not intend to commit.

If we focus our investigation on who and quit when we answer that question, we can fire the perpetrator or - in the case of pilots - revoke their certificates, fine them and maybe put them in jail. That will leave us and the public feeling that justice was done but it does little or nothing to prevent the same thing from happening again with another pilot. Throwing out theses *Bad Apples,* lashing out at them, and telling them you are not happy with their performance, may seem like a quick, nice, rewarding fix. But it is like peeing in your pants…. It gets nice and warm for a little while, and you feel relieved. But then it gets cold, uncomfortable, and embarrassing. Lashing out at Bad Apples, the putative culprits behind all the trouble, is actually a sign of weakness. It shows that you could be at a loss as to what to do in the wake of failure and you actually have no idea how to really make progress on safety. (Sidney Dekker 2006)

By bearing down on Bad Apples, you can actually make things a lot worse:

- You fool yourself and others that you have done something about the problem.
- You actually haven't done anything to remove the problem. It leaves the trap in place, and it leaves you as exposed as you were the first time.
- Fearing punishment, people will hide evidence of mistakes. They will no longer report irregularities. They will remain silent about problems, incidents, occurrences.

So, when you think you are "setting an example" with a robust response to a supposed "Bad Apple", think about what you are setting an example for. You will condition your people to shut up, to conceal difficulties. If you hunt down individual people for system problems, you will quickly drive real practices underground. You will find it even more difficult to know how work really takes place. Do you want to wait for the accident to reveal the true picture? Organizations do this all too often, at their own peril. (Sidney Dekker 2006)

While blaming people for their errors is emotionally satisfying, it is remedially useless. Moral judgments are only appropriate when the actions go as intended and the intention is reprehensible. Blame and punishment make no sense at all when the intention is a good one, but the actions do not go as planned. We should not, however, confuse the issues of blame and accountability. Everyone ought to be accountable for his or her errors. If the error maker does not acknowledge the error and strive to avoid its recurrence, then no lesson has been learned and little or nothing was gained from the experience. (James Reason and Alan Hobbs 2003)

Errors are Consequences rather than Causes

The natural human tendency after a bad event is to track back in time to the first deviant human action and call it the cause. We then go on to say that Person X caused the event and punish him or her accordingly—often in proportion to the extent of the damage or injury. This may be appropriate in societies that operate by the 'eye for an eye' principle, but it is totally out of place in maintenance organizations in which accidents arise from the complex interaction of many different factors and where

the primary aim of any subsequent inquiry should be to strengthen the system's defenses. From this perspective, errors are best regarded as consequences rather than causes. Just like the bad event, errors have a history. Each is the product of a chain of events that involves people, teams, tasks, workplaces and organizational factors. Discovering an error is the beginning of the search for causes, not the end. Only by understanding the circumstances that gave rise to them can we hope to limit the chances of their recurrence. (James Reason and Alan Hobbs 2003)

Mikey's story is not so much about Mikey as it is about his parents – both hard working professionals, both loving parents. Both were exhausted. Both were working full schedules and they were in the process of weaning their 10-month old son and that involved sleep interruptions for feedings each night. Mikey's dad was up late. Mikey's dad left for his office early that morning with an en route stop to drop Mikey off at the day care center.

Walking back to his office after lunch, Mikey's father noticed police and rescue personnel in the parking lot. A baby lay on a gurney next to the father's car. The police had been notified of a baby in a locked car with closed windows. They broke a window to gain access, but Mikey was dead.

I know some of us are struggling with hindsight bias right now. We're asking ourselves – how could a reasonable human being make such a stupid and terrible mistake? That focuses our thinking on Mikey's father and views the event as an individual failing. We're not going to go down that road though, because if we do – we won't learn what factors were at work in Mikey's dad's life making this event more likely. We'll never discover that there's a system error component in place that guarantees this kind of tragedy will be repeated.

Just as a good accident investigator will do, let us start at the beginning of this accident chain, instead of looking back with hindsight bias. Bob was up late and didn't sleep well. Bob's routine was changed. Mikey fell asleep in the back of a quiet car. Bob was pre-occupied with a life decision of one of his patients. Each of these elements were involved in the accident chain, and any one of them, if eliminated, could have changed the outcome. The system error component that is in place is the now mandated rear seat positioning of the child seat. This law was introduced to prevent injuries due to air bags to infants. Guess what? Prior to 1993, Hyperthermia deaths of children in cars numbered less than 10 per year. Children were usually strapped into car seats next to the driver where they couldn't be overlooked, even if they were sleeping. In 1992, side air bags were introduced and in 1995, 63 children were killed by airbag deployment, The obvious solution was to put children in the back seat. Guess what? Airbag deployment deaths declined sharply, and hyperthermia deaths increased sharply, (49 in 2010).

As most know, an accident is a chain of events and if we can break that chain at any point, we can prevent the accident.

(This article is based on an excellent presentation given by Dr. Karen Dunbar, FAASteam Rep)

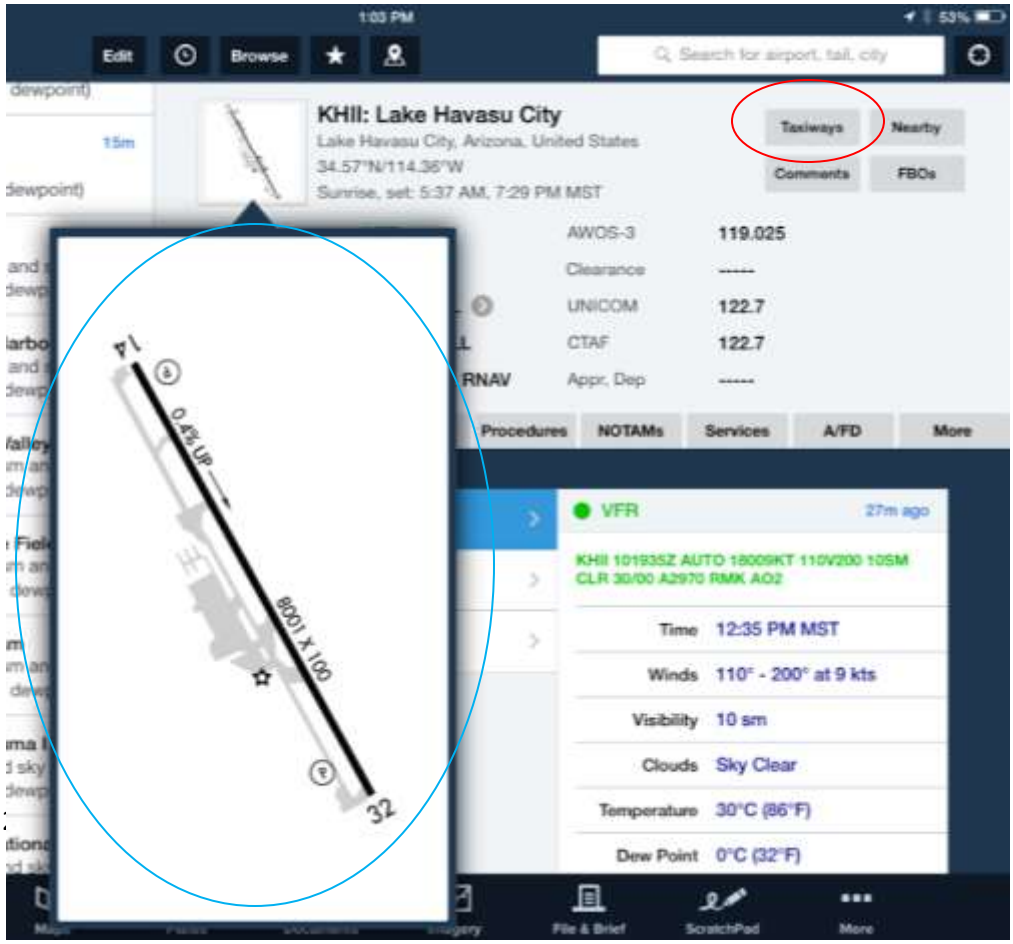
Mooney Tunes

Jim Price

ForeFlight 6 Improvements

Many Mooney Pilots use an iPad app to help them plan and navigate to another airport. My favorite and the favorite of the majority of app users is ForeFlight.

In the past, if you were lucky, you could click on ForeFlight's "Taxiways" button (circled in red) and see the published Government (AeroNav) airport diagram. If the airport has no published taxi diagram, then you can use the small, basic chart, like the one shown below (circled in blue).

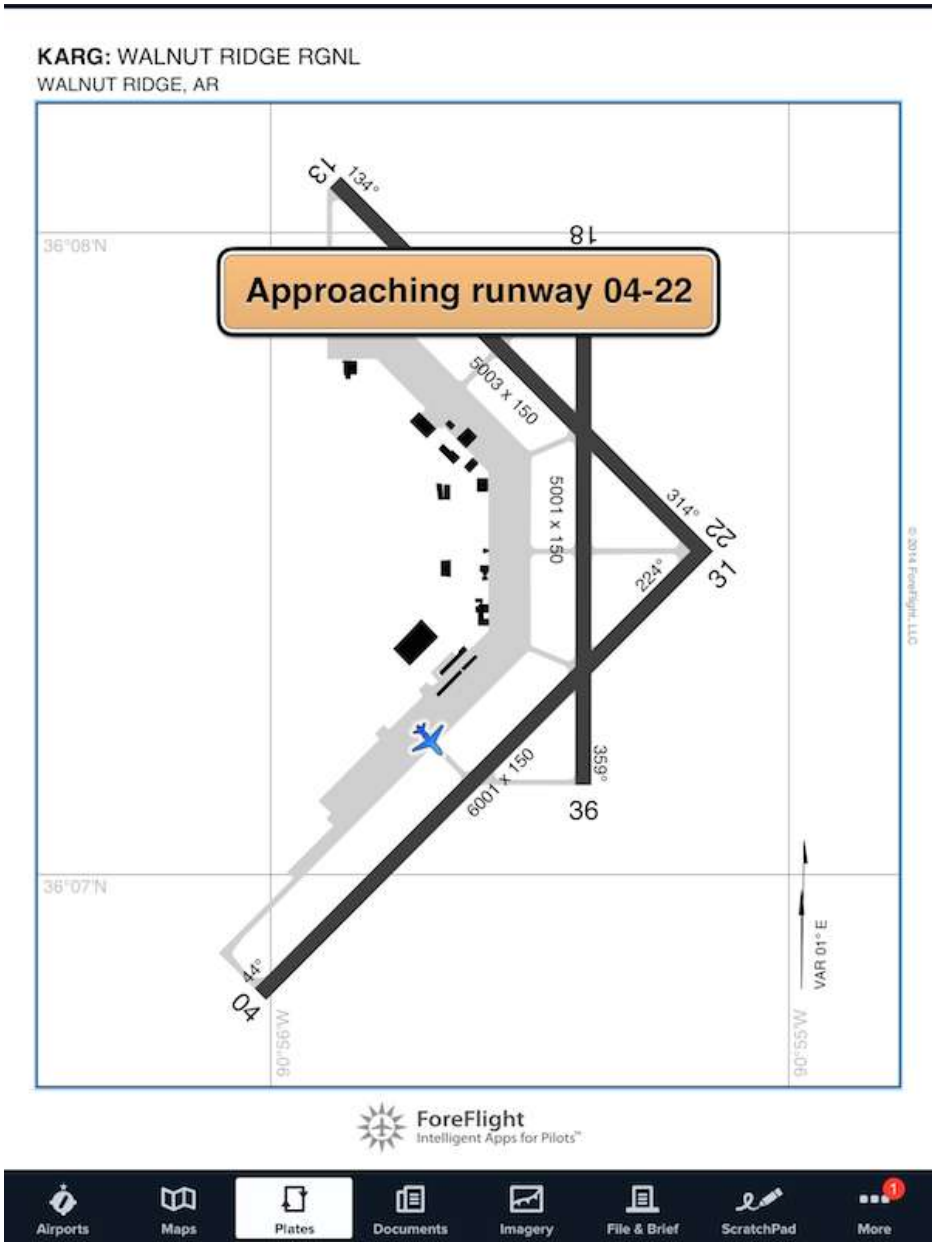


ForeFlight 6.0 changes all that, with new generated diagrams, providing a great tool for situational awareness at airports that would not otherwise have maps available. ForeFlight has built their own airport mapping database, which nearly doubles their airport coverage and enables airport moving map capabilities at destinations large and small, like this one for Lake Havasu City, AZ (KHII). (Pro Subscription required).

Click on the pencil icon.

This will allow you to highlight, with your finger, the way you plan to taxi to the runway, or anything else you want to write on the chart, such as the CTAF and noise abatement procedure.

In addition to the taxi route tracing capability, the charts work with geo-referencing (ForeFlight Pro subscription required), runway proximity advisor alerts, automatic display of the diagram upon landing, and the ability to overlay the diagram on the moving map. Lots of improvements are planned. In the near future, ForeFlight will be sweeping back through each location to add taxi labels, where applicable, and other layers of information.



Runway Proximity Advisor alerts

Denver Mountain High PPP

By Ted Corsones

The Mooney Safety Foundation will present two distinctive pilot proficiency programs at **Denver, Colorado during the weekend of June 27-29, 2014**.

We will be using the Rocky Mountain Metropolitan (KBJC) Airport and our FBO host will be Denver Air Service. Each attending Mooney pilot will select the program of his or her choice.

The first program is our acclaimed recurrent training program. This features eight hours of informative lectures on Friday, which include ATC Procedures, Weight & Balance, Flying a Mooney By the Numbers, Landing a Mooney, High Performance Engine Management, Emergency Procedures and Aviation Physiology. Then, on Saturday and Sunday we have a minimum of four hours of flight recurrent training with Mooney specific instructors, involving Normal Takeoffs, Crosswind Takeoffs, Slow Flight, Spiral Demonstrations, VFR Go-Arounds, Approach to Landing Stalls, Takeoff and Departure Stalls, Steep Turns, Forward Slips, Shortfield Takeoffs and Landings, Softfield Takeoffs and Landings, Emergency Procedures, Partial Panel Navigation, Recovery from Unusual Attitudes, Instrument Approaches (GPS, VOR, ILS, Localizer Back Course), autopilot coupled approaches, Circle To Land, Missed Approaches and Holding Patterns. In between your training flights, you will have an opportunity to attend seminars on Mooney Aircraft Systems, Mooney Aircraft Maintenance and Mooney Owners Inspections.

The second program that will be offered is the Mountain Flying Program – a program that is highly recommended for pilots who fly in the Mountain West. The special Friday ground school for these pilots will include lectures on Mountain Flying Techniques, High Altitude Engine Performance, and Weather in the Mountains. Then on Saturday or Sunday there are confidence building flights with your instructor in your Mooney to fascinating high elevation airports including Leadville, at a pattern altitude of 10,727 feet, and a field elevation of 9,927 feet.

Upon completion of the weekend program, eligible pilots will be endorsed for their flight review, instrument proficiency check, FAA WINGS credits, and will receive an FAA recognized Certificate of Successful Completion of a Mooney specific recurrent training course. This certificate will prove valuable to you when it becomes necessary to renew your airplane insurance policy. Many insurance companies are now requiring confirmation from you that you have completed a recurrent training program prior to determining the amount of your annual premium or offering you a renewal policy. However, on the positive side, a number of them will provide you with a 10% discount on your annual premium upon proof of your successful completion of our program.

Remember, family members are always welcome to attend our programs. There is so much for them to see and do during this event. The nearby Rocky Mountain National Park, Estes Park, National Mining Museum, and the U.S. Air Force Academy are but a few of the attractions that lure thousands of visitors to this area each year.

Now that Mooney Airplane Company has recommenced the manufacture of our favorite airplane, perhaps we can induce them to send a representative to Denver to make a presentation about their aspirations for the future and respond to your questions about factory support of current and older Mooneys.

John Allen of Falcon Insurance Agency has stated in the MAPA Log: “Make it a point to get annual recurrent training, i.e., MAPA Safety Foundation, Inc. flight training, etc. Then, make sure your agent notifies your insurance company.This may hold down, and possibly even reduce the cost of your hull insurance.”

Don’t wait until your insurance agent asks you “when did you last participate in a Mooney specific recurrent training program.” Come join us in Denver and you will be ready with the proper answer.

As we always do on your behalf, we have successfully negotiated favorable hotel rates and FBO prices. So that you will not be disappointed, I encourage you to make your reservations without delay. Click Here for the registration form – fill it out and mail it, together with your check, to MAPA Safety Foundation, Inc., 1885 Airport Loop Road – Suite 100, Kerrville, TX 8028. If you have any questions, you may call MAPA at 830-315-8008.

Safety Is No Accident

June 14, Punta Gorda (PGD)
July 12, Williston (X60)
August 9, St. Augustine (SGJ)
September 13, Lakeland (LAL)
October 14, Flagler
November 8, Vero Beach, (VRB)
December 13, Punta Gorda (PGD)

June 28: Santa Ynez, CA – Join us for a Saturday picnic at Santa Ynez (KIZA) in the grassy and tree filled area overlooking the ramp. There is a winery next door and a fun town down the street with cafes and small shops as well.

August 22-24: Gold Beach, Oregon – Join us for a fun-filled weekend to the coast of Oregon. We're arranging for discounts at The Inn of the Beachcomber and a Jet Boat tour up the Rogue River. **CLICK HERE** to check out the area. More details later.

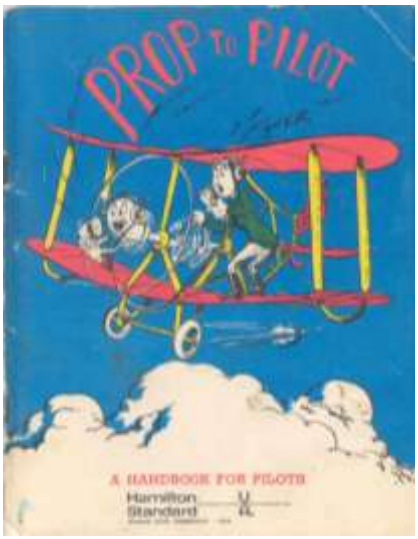
October 3-5: Return to Page, Arizona – Join us for a day or the entire weekend at beautiful Lake Powell. Fly-into Page (KPGA). Hotel, BBQ, and activities to be provided soon.

June 18-22: Join us for a 5-day fly-in. We will be heading for the Baltic Sea area: the islands of Ruegen (Germany) and Gotland (Sweden). CLICK HERE for the official information.

The 2nd Mooney Summit will be hosted by Mike Elliott on **October 24-26**, at Panama City Beach, FL.

The **Mooney Safety Foundation** will present two distinctive pilot proficiency programs at Denver, CO, **June 27 – 29, 2014**.

Internet Clippings



Prop and Pilot Manual

We found this on the Mooney list. It's an old document called **Prop to Pilot** written by Hamilton Standard in 1948 and revised in 1966.

Just as Stick and Rudder is a very worthwhile read, So is Prop to Pilot. There's a lot of good information and detailed diagrams that are as relevant today as when they were written.

Click Here to read this very interesting manual.

Guidance for Borescoping your Valves

We found this illustration of valves and how they look, healthy vs unhealthy. Pretty useful for Mooney Owners.

Send your questions for Tom to TheMooneyFlyer@gmail.com

Q1: I was told to check the free-play in my tail by lifting on it during a pre-flight. There is a very small amount in my Ovation. What am I checking for? How important is the amount of play?

We do a preliminary check by lifting the tail, but it is not accurate since you can also lift the entire aft of the airplane. Through experience, I can tell if further check is needed. We would put the aircraft on jacks, put a piece of tape on the trailing edge of the rudder, and then lift the tail and measure the travel, which, on an Ovation is only allowed .010 travel. This wear is normally found in the tail attach link, bushing, and bolts and these are not too hard to replace. The early model Mooneys are only allowed .008 travel. Always refer to the manual for the serial number and model for correct measurements. Since this is a printed limit in the manual we must adhere to that limit. The other check on the tail is to move the end of the horizontal stabilizer for and aft. The limit of that movement is .025. That wear would be in the upper tail attach bolts, bushings or mount brackets. We usually find this type of wear in high time airframes.

What is a high time airplane? To me, it is one with over 4,000 hours. That equates to 100 per year for forty years, which is close to average. There are many Mooneys with over 10,000 hours. Our friends in Australia have many with over 15,000 hours, which speaks well to their maintenance capabilities.

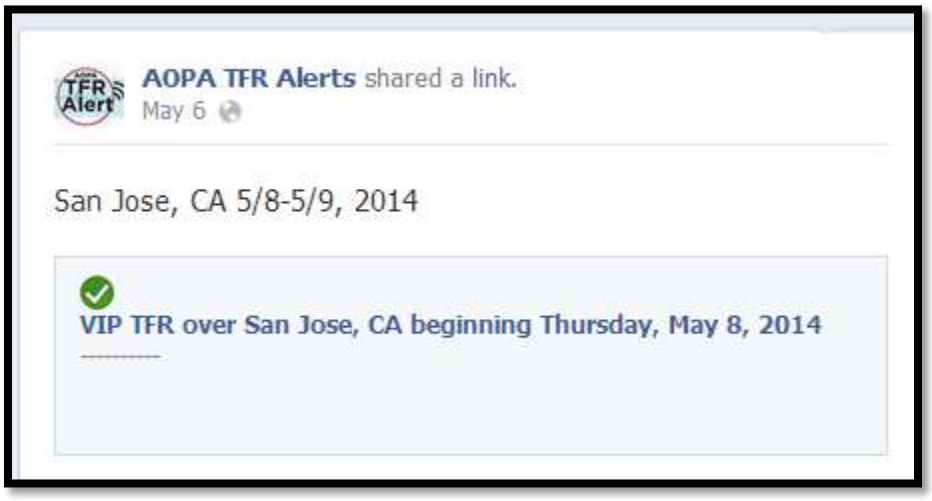
Q2: There is a jackscrew in the empennage of my Mooney? What regular maintenance is required? I've been told failure is catastrophic.

The jackscrew in the tail is what moves the entire empennage up and down, and makes the Mooney so unique. It is a very solid unit and only requires lubing at Annual. Refer to the Service Manual for the type of grease and frequency. That being said, I want to refer to the previous question about up and down movement in the tail. While I said that most of the wear is in the tail attach link, the next area of wear is the tail jackscrew. Especially in high time airframes, there can be considerable wear in the jackscrew bearings. We can disassemble and install shims to make up for wear. We can also replace the roller bearings if needed, but on occasion I have had to replace the jackscrew due to considerable wear.
A total failure of the jackscrew is highly unlikely but possible. I do know of the tail coming off of a K model, but it had flown into a level six thunderstorm. I do consider maintenance of all tail components to be of the utmost importance, since the tail is so unique. The only other plane that I have worked on with a similar tail is the Lockheed Jetstar.
The other areas that I look at are the tail upper attach points where it pivots up and down. We have found a number of worn bolts and bushings plus worn tail mount brackets. Removing the tail for repair is relatively easy, so the man hours required is very reasonable.

June 2014

Another layer of protection

Never be caught in a TFR! AOPA has a Facebook page called AOPA TRF Alerts. “Like” AOPA TFR Alerts, and whenever there is a TFR coming up, you’ll get the alert, plus a link so you can learn all the details such as all the airports affected and the rules you need to follow to stay out of trouble!



Product Review: Blackstone Labs

At The Mooney Flyer, we continually push for preventative maintenance and inexpensive options that Mooney owners can use to ensure their engine's health. Flying regularly is our #1 mantra for engine longevity. Beyond that, you should change your oil AND your oil filter regularly – every three months. Cutting the filter will show you if your engine is making metal.

Another option in your tool bag is "Oil Analysis". *Blackstone Labs* does a thorough job of providing you with detailed oil analysis.

Blackstone provides the oil sample kits at no charge and, as of this writing, runs each sample for $25. You can buy bulk tests at a discount. Check their website for details.

To sample, start draining your oil, and after 30-45 seconds, or more, take the sample.

Oil analysis is NOT about a single sample. It becomes more useful and therefore, more valuable, after you get a few samples. Oil analysis shines when it highlights trends in metal content.

The reports are usually self explanatory with a summary of *Blackstone's* conclusions in a paragraph at the top of the report.

Their website is filled with useful information and Newsletters to keep you informed as a pilot and owner.

BLACKSTONE LABORATORIES

OIL REPORT

LAB NUMBER: A23177 **UNIT ID:** NHUNTER
REPORT DATE: 9/20/2009 **CLIENT ID:**
CODE: 22/16 **PAYMENT:** CC: Visa (Bulk)

UNIT
EQUIP. MAKE/MODEL: Lycoming TIO-540
FUEL TYPE: Gasoline (Leaded)
ADDITIONAL INFO:
OIL TYPE & GRADE: Aeroshell 15W/50
OIL USE INTERVAL: 29 Hours

CLIENT
OSCAR HUFF
125 DOGG CT.
BARK CITY, CA 95168
PHONE: (828) 555-1212
FAX: (828) 555-1213
ALT PHONE:
EMAIL: oscar@huffcontracting.com

COMMENTS
OSCAR: As you expected, iron and aluminum are both still high in this most recent sample from your TIO-540. Nickel is high as well, though not as far out of line as aluminum and iron. Some of the metals you're seeing here are probably residual from past oil fills. And since you've had a new cylinders installed, some of the metals are from break-in. Everything should decrease in the next sample, even if you run 29+ hours again. Glad we could help you identify this problem.

ELEMENTS IN PARTS PER MILLION

		UNIT / LOCATION AVERAGES						UNIVERSAL AVERAGES
MI/HR on Oil	29		57	30	72	43	45	
MI/HR on Unit	1,452		1,423	1,396	1,366	1,294	1,251	
Sample Date	9/20/09		6/12/09	4/22/09	10/21/08	07/6/08	06/17/08	
Make Up Oil Added	2 qts		6 qts	0 qts	3 qts	5 qts	0 qts	
ALUMINUM	**26**	23	**29**	17	**32**	22	**34**	17
CHROMIUM	13	15	18	12	17	15	**19**	11
IRON	**140**	172	**370**	115	**210**	**187**	97	62
COPPER	6	8	7	9	13	9	10	13
LEAD	4958	6099	4816	5630	**8448**	**8520**	7222	4935
TIN	1	2	2	2	2	2	2	0
MOLYBDENUM	0	0	0	0	0	0	0	0
NICKEL	16	15	17	16	15	14	17	10
MANGANESE	0	0	0	0	0	1	0	0
SILVER	0	0	0	0	0	0	0	0
TITANIUM	0	0	0	0	0	0	0	0
POTASSIUM	0	0	0	0	0	0	0	0
BORON	1	1	0	0	1	2	0	0
SILICON	6	8	9	6	7	8	9	8
SODIUM	1	1	0	2	0	0	1	1
CALCIUM	0	2	1	2	0	0	3	5
MAGNESIUM	2	1	0	1	0	3	1	1
PHOSPHORUS	911	746	659	822	626	695	764	726
ZINC	2	3	2	1	4	5	5	7
BARIUM	0	0	0	0	0	1	0	0

PROPERTIES

		Values Should Be*						
SUS Viscosity @ 210°F	91.7	82-99	89.9	84.5	87.2	90.5	93.4	
cSt Viscosity @ 100°C	19.84	12.7-15.5	13.50	13.21	13.44	14.57	14.02	
Flashpoint in °F	515	>440	505	**440**	520	500	510	
Fuel %	<0.5	<2.0	<0.5	TR	<0.5	<0.5	<0.5	
Antifreeze %	-	-	-	-	-	-	-	
Water %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Insolubles %	0.5	<0.6	0.5	0.5	0.5	0.5	0.5	
TBN								
TAN								
ISO Code								

* THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

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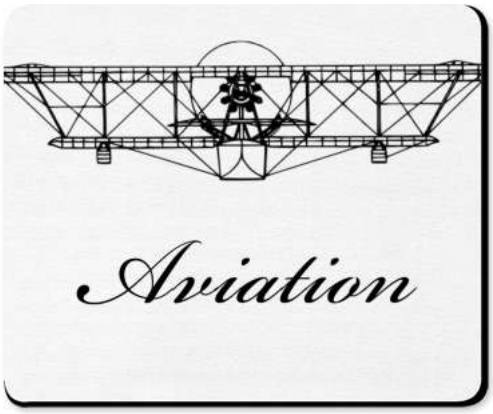

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