Stan/Eval Newsletter
CIVIL AIR PATROL
UNITED STATES AIR FORCE AUXILIARY
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NASA ASRS – God's gift to Aviators

Pilots and aircrew should be aware of and use the NASA Aviation Safety Reporting System (ASRS). This system allows us to report aviation safety incidents without fear of enforcement. For example, if you bust class B but report it in ASRS, you receive a degree of protection from enforcement. More on that later. First a little background.

"In April 2001, the world's largest confidential voluntary aviation reporting system, the NASA Aviation Safety Reporting System (ASRS), celebrated its 25th anniversary of operation. Just prior to this event, the ASRS reached another milestone – the processing of its 500,000th incident report. Scarcely one year later, report intake has now exceeded 558,000. The longevity and success of this government program is a remarkable example of how interagency cooperation can create a stable, effective agent for system safety improvements against the backdrop of changing political climates and times.

The ASRS was founded in 1976 through a Memorandum of Agreement between the Federal Aviation Administration (FAA) and National Aeronautics and Space Administration (NASA). The program was designed primarily to support the FAA in its mission to eliminate unsafe conditions in the national aviation system and prevent avoidable accidents. The first step was to design a system in which the aviation community, both individually, and collectively, could place a high degree of trust.

The FAA quickly recognized that its regulatory and enforcement roles would discourage the aviation community from trusting and using the new program if the FAA were to operate the system. It therefore asked NASA to act as the highly respected, independent third party that would administer the program and fulfill the role of an honest broker attending to the interests of both sides. NASA, a research organization with no regulatory or enforcement role, saw a unique opportunity to enhance its research capability through access to the human factors data generated by the new system.

NASA accepted the FAA's proposal, and the ASRS began operation on April 15, 1976. This mutually beneficial interagency partnership has endured for a quarter of a century. The data collection and analysis operations of the ASRS are funded by the FAA within in-kind contributions from NASA. NASA administers the program's details, oversees its products and services, guarantees confidentiality, and ensures that de-identified incident data and the results of special studies are communicated to those responsible for aviation safety, and other interested parties.

The idea behind the ASRS is fairly simple and straightforward:

- When organizations and industries want to learn more about safety incidents and why people did what they did, the best approach seems to be to simply ask the participants.
- People are generally willing to share their knowledge if they are assured their identities will remain confidential, and ultimately, anonymous. And the information they provide will be protected from disciplinary and legal consequences.
- A properly structured confidential, voluntary, non-punitive incident reporting system can be used by any person to share this information.
- Such a system has the means to ask, and frequently answer, the question of why. There is no substitute for knowing why a system failed or why a human erred." (ASRS: The case for confidential incident reporting systems – NASA ASRA pub 60)
- A voluntary incident reporting system cannot succeed without the cooperation, oversight, and guidance of the community that will use it. It must be viewed as a safety information resource accessible and responsive to all.

- A voluntary reporting system usually must exclude from its protections some types of incidents, such as criminal acts and intentional unsafe acts. In certain systems, such as the ASRS, this exclusion extends to legally defined accidents.
- The safety data gathered from incident reporting can be used to identify system vulnerabilities and gain a better understanding of the root causes of human error. Incident reporting data is complementary to the data generated by mandatory, statistical, and monitoring systems.
- The ultimate achievement of an incident reporting system is that it can prevent accidents and fatalities." (From the ASRS Pub 60)

The ASRS was in part motivated by a landmark accident. On December 1, 1974, TWA Flight 514, inbound through cloudy and turbulent skies to Dulles Airport in Washington, DC, descended below the minimum safe altitude for the area they were flying through and collided with a Virginia mountain top. All passengers and the flight crew were killed. The accident investigation revealed that the flight crew had misunderstood an ATC clearance and descended prematurely to the final approach altitude, in the process also misinterpreting an approach chart. Another disturbing and provocative finding emerged: six weeks earlier, a United Airlines flight crew had narrowly escaped the same fate during a nighttime approach at the same location but discovered their mistake after landing. The United pilots reported the incident to their company's new internal reporting program, and a cautionary notice was issued to all United pilots. Unfortunately, at the time there existed no method to share this knowledge with other operators. It was determined that such safety information must in the future be shared with the aviation community. Thus, was born the idea of a national aviation incident reporting system.

ASRS is not just limited to United or American Airlines but is a useful resource for all pilots and crewmembers including those of us in CAP. It provides us an anonymous way to report safety incidents that become part of a large database that is used to monitor aviation trends and share information on safety issues. Even though when you submit the information you use your name and other identifying information, that information is hidden to any user of the database. NASA only uses your contact information to be able to get any amplifying information that might be needed. But even that is rare. I've used ASRS for years and never once been contacted by NASA. When the report is filed, you receive a receipt documenting your submittal.

One of the many advantages to filing an ASRS report is that it provides you some protection from enforcement actions. If you file a report documenting that you busted Class B or some other incident, if the FAA should come knocking you can produce that receipt and no enforcement action will be taken. So, it's kind of a get out of jail card. This is to encourage the reporting of incidents even when a FAR was busted or some other untoward event. You have to read the fine print, however. The protection is not unlimited. You can only use this mechanism once every 5 years and if there is any criminal activity there is no protection. Willful acts of misconduct are also not covered. You must file the report within 10 days of the incident. You can read the specifics of the protections provided by the pilot in AC 00-46F also found here. Paragraph 12 is the key paragraph.

It would be a mistake to just use ASRS when you broke the rules. You should file a report whenever any safety incident occurs. For example, if you have a near miss in the pattern at your local non-towered airport, that would be a good reason to file a report. Include the circumstances, the reasons for the near miss, and perhaps even some musings on how the incident could have been avoided.

ASRS is not just a giant database sucking in all known safety data. It also provides lots of useful reports. You can subscribe to the ASRS CALLBACK which comes out monthly with a summary of certain safety highlights. Makes for really interesting reading.

Filing an ASRS report is easy, painless, and can be done online (yes, you can do it with paper as well). Just go to the homepage here and click on the submit a report button. You can also view back issues of the ASRS Call Back and search the database. Note that the ASRS has been expanded to include UAS safety as well.

Leaning the Engine

Many newly minted pilots may be good aviators but practice poor engine management skills because that's how they've been taught. Many flight schools and flight instructors consciously or unconsciously teach pilots to fly full rich and to only pull the mixture when shutting down the engine. There are lots of reasons for this, most of them not good. But the student passes the check-ride, and no one notices that they really have not learned proper leaning techniques.

So, what is that little red knob for and why should we care? Lots of you who fly out of high-altitude airports are very familiar with running lean for the simple reason that if you fly full rich you probably won't even get off the ground assuming the engine doesn't choke on taxi.

One of the ways to characterize what goes on inside a piston engine is that engine combustion is a chemical reaction. In order for the fuel to combust you need three things: air, gas, and spark (and compression). The air and gas must be in the correct proportion. Too much air or too much gas will not support combustion. A flooded engine is an example of this. The combustion is most efficient when the mix of gas and air is just right (see Goldilocks and the Three Bears). Leaning is all about getting it just right. Our single engine Cessna's will not do this for you. You have to do this yourself. If you have FADEC or other more modern powerplant, the computer takes care of all of this just like it does in your car. But we still live in the 1930's despite all of the avionics so we have to do it the old-fashioned way. In general, the higher we fly, the farther you have to pull that little red knob back. As the air gets thin, we need less fuel to keep the air-fuel mixture just right. Incidentally, "just right" is about 15:1. Fifteen pounds of air for every one pound of fuel. That's why all our aircraft have a pound meter for fuel and air – oh, wait, I guess they forgot that.

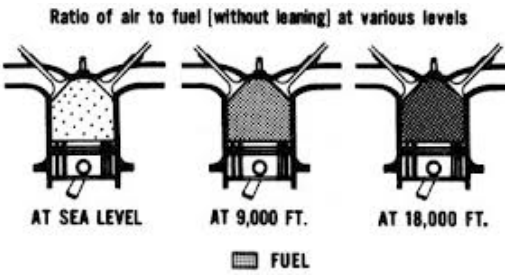
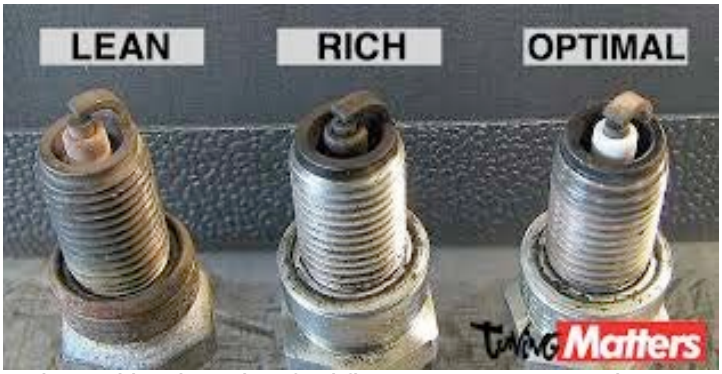


Figure 2-12 Changes in Fuel-Air Mixture with Increased Altitude

One of the barriers to proper leaning is the belief of some pilots that you can harm the engine by leaning. And they are correct – in some cases. Over leaning at other than low power settings can and will destroy an engine if not corrected. When an engine is over leaned it starts running very hot and will exceed the temperature limitations of the power plant. On the other hand, at very low power settings (like on taxi) you will not harm the engine even if you over lean. So, leaning on taxi is always a good thing. If you over lean on taxi the worst that can happen is that the engine quits. You should always lean when taxiing but be sure to enrichen before doing the runup or takeoff. A good practice is to lean aggressively for taxi – so lean that if you try to go to full power the engine will stumble reminding you to enrichen! Taking off too lean will certainly hurt the engine.

But under leaning is bad too. An overly rich mixture can:

- Foul the spark plugs causing a rough running engine.
- Prevents the engine from producing full power causing longer takeoffs and sluggish climbs.
- Prevents the aircraft from achieving book values in the POH. If you aren't coming close to what the POH says you should, you are probably not adjusting the mixture properly. If you read the fine print on the performance table, you'll see that they assume proper leaning.



So how can we achieve the right fuel air balance by leaning? We should start with the POH. The C182 POH has a recommended procedure for leaning on the ground. For our C182 aircraft we are told to go full rich for takeoff below 5,000'. But in cruise climb (23" MP 2400 RPM) we are told to lean to 15 gph. At cruise, we can look at the performance tables and see for a particular power setting what the fuel flow should be and set the red knob to that fuel flow. Or we can use the Lean Assist if we have a G1000 equipped aircraft.

If you are taking off from a high-altitude airport, you should lean the engine before takeoff. For our Cessna aircraft, a simple procedure is the following (there are others). During the runup with the RPM at 1800 RPM, lean slowly to peak RPM. At peak RPM, enrichen slightly and then leave the red knob in this position for takeoff. Don't go full rich! Remember where it is if you have to do a go around. Going full rich on the go around at high altitude airports could cost you your life.

There are in general three ways to lean an engine in cruise.

- Lean using an EGT (or lean assist which is really the same thing). Once in cruise, we slowly pull the red knob back while monitoring the EGT. At some point the EGT will peak. From peak, you slowly enrichen to about 100 degrees rich of peak (ROP).
- Lean to recommended fuel flow. Simply look up your cruise power setting at the appropriate density altitude and pull the red knob back to the recommended fuel flow. Sometimes there will be two fuel flows. One for best power and one for best economy. Best power will be a bit cooler and should be preferred unless fuel endurance is an issue.
- Lean the good old-fashioned way. If you don't have an EGT or fuel flow meter, the best you can do is to pull the mixture until the engine runs slightly rough and enrichen until it runs smoothly. Not great but the best you can do.

These three methods all result in running rich of peak (ROP). That means that the engine is running slightly richer than at peak EGT. There is a way to run lean of peak (LOP) which has many advantages but requires tuned injectors and the engine must be approved for LOP. Our Cessna and Gippsland aircraft are NOT approved for LOP operation. To do so will damage the engine.

Once the mixture is set, it will need to be reset if you change power settings or change altitude. Always monitor the cylinder head temperatures and EGT to ensure they stay within limits. If you come close to the limits immediately enrichen, open the cowl flaps, and reduce power to get the temps under control.

Don't over manage the engine. Although leaning is important, it's not critical to have it exactly right despite what Goldilocks says. If in doubt, err on the rich side.

If all this seems a bit confusing, get a knowledgeable pilot or CFI to give you some real time experience with proper leaning. Here are some useful links as well that give some procedures for leaning.

Engine Operations for Pilots:
https://www.faasafety.gov/gslac/ALC/libview_normal.aspx?id=6849

Leaning Lycoming Engines:
https://www.lycoming.com/content/leaning-lycoming-engines

Cross Wind Limit

For many Cessna drivers, the demonstrated cross wind limit for C172/C182 aircraft has always been 15 knots. However, the new C172's that are now coming online have changed that to 20 knots but **check your POH carefully**. There is a subtlety. Previously the 15-knot limit was with any flap setting. But to take advantage of the 20-knot limit, you can use no more than one notch of flaps. Enjoy the higher limits – carefully.

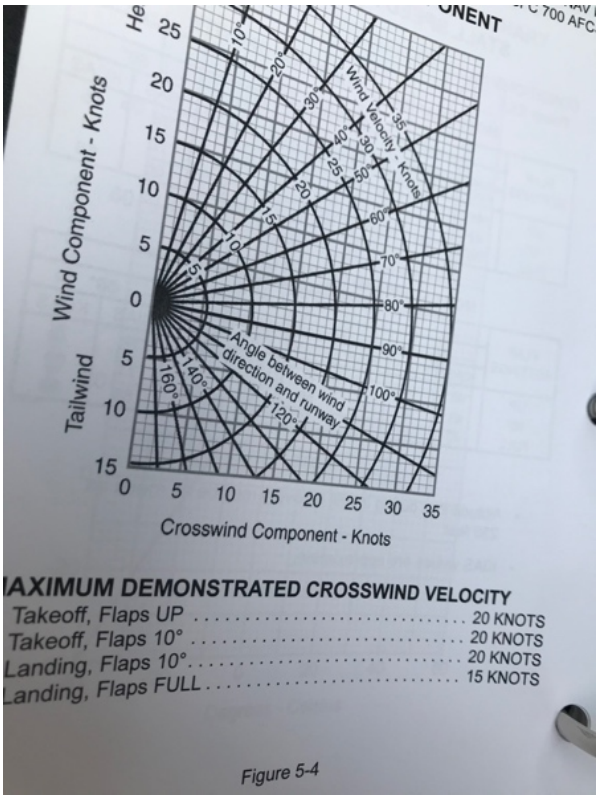


Figure 5-4

Articles for the National Stan Eval Newsletter:

These articles have been written to present ideas, techniques, and concepts of interest to CAP aircrews rather than provide any direction. The articles in this newsletter in no way should be considered CAP policy. We are always looking for brief articles of interest to CAP aircrews to include in this newsletter. CAP has many very experienced pilots and aircrew who have useful techniques, experiences, and tips to share. Please send your contribution to stephen.hertz@vawg.cap.gov. You can view past issues here.