EAA Chapter 83
Terre Haute, IN

A Social Organization operated for the Advancement of
Aviation Education, Homebuilt Aircraft, and Private Aviation
Dedicated in the memory of Garland Wadsworth and John Blouch

Our web address: www.EAA83.net
President: Keith Welsh, 812-230-2355, kw544@juno.com
Vice President: Rick Ramsey, 317-900-2815, crbunt@yahoo.com
Secretary: Alice Ramsey
Treasurer: John Watler, 812-478-4571, jlw@watler.com

January 2022

From your President- Keith Welsh

Hello again everyone.

At our last meeting several items were discussed. Our VMC coordinator Laurence Cross gave a presentation on Class G or E airspace, Flying into Bravo airspace, Crash landings, Maneuvering speeds, and Pilot controlled lighting. It was fun to hear some interesting stories. Recently Laurence and his family were in the Pensacola area and visited the Naval Museum just to fine it closed to the public. The museum, as a result of the COVID restricted period, is still only open to those who have a DOD card. Bummer.

YE Coordinator: Vicki Welsh has volunteered to serve as YE coordinator for 2023 with the help of Jeff Tucker. The immediate goal is to have a YE Rally planned for by Natl. YE Day on June 10th.

EAA AirVenture Chapter Camping: Tom Mulligan has again volunteered to take care of it.

Jim Mayhew has volunteered to host either our March or April meeting. So, what's so special about that … right? Well … he has invited us to visit Rose Hulman's wind tunnel lab. Pretty cool.

Remember the meeting at Williams Aviation where Chad Williams gave a demonstration on polishing? During its annual Jerry Badgers Mooney got the treatment including the ceramic coating. I was in Chad's hangar recently and couldn't help but notice Jerry's super shiny airplane. Very nice!!

Airport meetings: I took a show of hands and it was unanimous to do them. We will try scheduling airport meetings from May – October. A number of airports were discussed however I will probably focus more on local airports to facilitate a broader range of airplanes.

EAA Chapter room at the HUF T-hangars: Recently myself, your VP Rick Ramsey and Secretary Alice Ramsey spent a couple of hours cleaning and doing some rearranging of the room. While not yet done we are hoping to make the room a Welcome Center for the hangar tenants featuring EAA and Chapter 83. There will be quite an assortment of reading materials and photos available. Especially important is we will have materials readily available for qualified pilots to meet with and do YE flights. It'll be nice to have an environment controlled EAA / pilot lounge in which to do flight prep and to just relax.

ATIS: Communications:

EAA B-25 Berlin Express:

I assume y'all have seen by now the event announcement of EAA's B-25 bomber Berlin Express coming to Terre Haute KHUF 15-18 June. The chapter will have many responsibilities during its stay with a number of ways to make money for the chapter treasury. VP Rick will begin covering the particulars at February's meeting as I will be out of town.

USAF Museum Tour:

It's a GO!
We will be visiting the USAF Museum in Dayton, OH on Saturday 12 August 2023 traveling on a 54 passenger Turner motor coach. Reservations are on a first come first serve basis. Right now, we have 10 seats reserved which leaves 44. The cost for the trip will be announced at a later date with the final cost / seat yet to be determined. Payment will be required by July 1st. Your reservation can be made by texting or emailing me at 812-230-2355 or kw544@juno.com.

In May 2018 a very historic airplane was put on display, one which I'm sure you have all heard about. If you get the time, I encourage you to watch the 58-minute presentation of the

“Memphis Belle: Her Final Mission”, a presentation that will prepare you and help you appreciate what you are about to see.

A history of the museum can be found at the link below. https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/195668/history-of-the-national-museum-of-the-us-air-force/

GroupWorks:

A BIG thank you to everyone who responded to the email. Currently with over 100 emails send all but four have responded. One important item is to click on account and set up your preferences one in particular is how often you wish to receive notices. They can come by text, email or both and the frequency that you wish to receive them. Posting is as easy as following the bright red prompts. The dues collection part will follow soon … I hope. That is an item which will need some setup time and we will look into the possibility of using this platform to process payments for the museum trip. A special thanks goes to Foraker for his help and advice getting us to this point. There is much to do getting the platform to where needed but the most important part is done thanks to you all. THANK YOU!

This Month’s Feature:

Throughout one’s aviation experience from time to time an article comes along that makes an impression … enough of an impression to warrant saving. In this case I ran into an article years ago that dealt with carburetor icing. I usually read it about once every 5 years or so but recently I decided to post it to our Quickie Aircraft q-list. The response was more than I expected. From pilots, engineers, builders, owners, and renters it seemed everyone had had an experience with carburetor icing. One of our Q drivers was flying a Cherokee180 over the Mississippi around Northern IL and hadn’t noticed that the engine had begun to run a little slower, he increased the throttle thinking it had moved … nothing. He pulled the carb heat and the engine almost died. Did that get his attention or what!! One in particular was an A&P who was in the process of rebuilding a VariEZE which had gone down due to carb ice and he had even lost friends to carb ice. Funerals are not fun especially knowing the reason they died was so avoidable. He was well spoken and very direct at painting a bleak and sad picture of the dangers and made a point to make certain we understood that, if we hadn’t already, that we needed to seriously consider installing a carburetor temperature probe in our airplanes. I did in my Thorp T-18 which has a JPI EDM350 installed and carb temp is one of the many features it includes. I’m amazed at how much lower the carburetor throat temperature gets in flight. Flying on a 41-degree day recently the carb temp was 28. I’ve also noticed that after applying carb heat on downwind and as the engine is throttled down in the pattern the carb temp tends to increase as it should but by then the damage will have already been done as had happened to me a long time ago when I owned an Aeronca Chief. At touch down the propeller stopped. I had no idea the engine had already quit producing power until then. Reducing throttle before applying carb heat does not melt already formed ice. I’ve learned that checking the throttle during decent is a pretty good idea just to know the engine is still there. One more mention is that I had my Quickie throttle plate, throttle shaft and intake manifold Teflon coated. As you read through the article you will see why.

This is his article:

INDUCTION ICING

BY ARTHUR A. WOLK

An article from the April 1988 issue of the AOPA Pilot magazine.

It was a simple flight in a simple airplane, a charter to fly some magazines and return one night with refueling stops midway. The airplane was a popular single-engine model, carbureted, four place and well maintained. It was a flight from which neither Sara L. Scully, age 49, nor Robert J. Jones, age 24, would return alive. The weather was clear with a temperature of 66 degrees Fahrenheit and a dew point of 66, about the same as it was along the route of the two-and-a-half-hour flight. The flight was routine until the refueling stop on the return trip. The crew, both of them flight instructors, flew over the Clarksburg, West Virginia, airport, and saw it was in the clear but noticed ground fog along the approach to the landing run-way. Prudently they asked for an instrument approach to the airport. Vectors were given to the outer marker, and the flight was cleared for the ILS approach. Center radar showed the commencement of the descent until the aircraft disappeared. The crew never canceled IFR, and after a search was initiated, the wreckage was found along the localizer course, two and a half miles from the runway. It had struck a tree in a fog-shrouded valley at the same elevation as the airport. The propeller showed no signs of engine power at the time of impact. A careful examination of the entire aircraft showed no evidence of pre-impact malfunction, and there was plenty of fuel.

Scully and Jones were the victims of engine failure due to carburetor ice. Investigation and research into this phenomenon revealed that both existing training and information about induction system icing of all types is woefully inadequate, and the manufacturers of aircraft, their engines and carburetors have all but ignored the means to prevent the single most prevalent mechanical cause of aircraft accidents.

Whenever you reduce power, do not forget to first put on the carburetor heat-it will prevent carburetor ice. Clear your engine periodically in the pattern so you are sure it does not load up during prolonged idle. If your engine begins to run rough, apply carburetor heat until the roughness disappears. Carburetor ice will only occur at high humidity and moderate temperatures. Fuel-injected engines do not have carburetors, so do not worry about carburetor icing. Sound familiar? These warnings by flight instructors-parroted from the published flight manuals of aircraft manufacturers, the advisories of the Federal Aviation Administration and the National Transportation Safety Board and the multitude of articles published periodically by pilots' organizations-are well known to student pilots and the owners of general aviation aircraft. We have all either heard or read about them and assume that if we heeded them all, we never need concern ourselves about induction system icing. I say induction system icing, because even fuel-injected engines have induction systems where the air enters the engine. Induction system icing, whether in a carbureted or fuel-injected engine, can lead to engine stoppage, a crash and death or serious injury.

The unfortunate truth is that while well intended, each of the above caveats that we have dutifully learned and relied on is only partially true, and under certain circumstances strict compliance can be fatal. What is induction ice and don't I already know what I need to know about it anyway? Read what follows and make your own judgment.

Carburetor ice was studied as early as 1921 and found to be a principal cause of power plant failure. Attention was sharply focused on the problem in 1939 when an alarming number of transport aircraft losses occurred in the China-Burma-India theater of operations. By 1949, as many as 25 percent of all air craft accidents were attributed to carburetor-ice-induced engine failures, with 99 percent of those in small single-engine aircraft. NTSB has regularly attributed as many as 10 percent of all aircraft accidents annually to this phenomenon, the lesser number recently probably being due to the increased number of fuel injected aircraft engines.

Put into human terms, as many as 300 accidents per year may be caused by carburetor ice. These numbers do not account for, nor does NTSB include, induction icing in fuel-injected aircraft that results in engine stoppage and accidents. These statistics are staggering but not surprising in view of the misinformation upon which pilots rely and the minimal efforts expended by manufacturers to eliminate or lessen the risk of engine stoppage.

Induction system icing has always seemed like so much hocus-pocus to me, but after looking into it in connection with representing the families of Scully and Jones, it is not so difficult to under-stand after all. There are two classes of induction system icing: carburetor ice and something that we will call "other" for now. Carburetor ice occurs at low power and in high humidity conditions, correct? Yes, but it also can occur on takeoff, at high cruise, low cruise, low power and taxi, in temperatures from 40 degrees F to 100 degrees F and in humidity from 40 percent to 100 percent. In short, carburetor ice occurs virtually anywhere, anytime, any altitude, any temperature and any humidity encountered by carburetor-equipped aircraft on or above 90 percent of the earth's surface during the entire year as many engine failures due to carburetor ice occur on takeoff as on landing, and many more occur at cruise power than at idle. Do you really have to know why it happens or just that it does? The why is just as important because with the why comes the knowledge of when and presumably how to cope with it given the limitations on what the pilot can do to prevent this kind of engine failure.

Carburetor ice has been classified into three basic kinds: impact icing, throttling icing and fuel-evaporation icing. Impact icing happens when you are flying in rain or snow and the outside air temperature (OAT) is about 25 degrees F The water is supercooled, and the droplets impact the cooled surfaces of the induction system. The water droplets immediately freeze, blocking the passage of air; the mixture gets rich; the engine gets rough, and if enough ice forms, the engine will quit. Throttling icing occurs when air expands as it makes its way through the restrictions in the induction system, cools down rapidly and water vapor in the air condenses on the cool surfaces in the induction system. Fuel-evaporation icing is the most serious because it occurs when fuel vaporizes into the air mixed with it. The temperature rapidly lowers, and moisture in the air or the fuel condenses and adheres to the inside of the carburetor because of the sub-freezing temperatures normally found there, the effect on the fuel-air mixture is the same, and engine stoppage inevitably results. Fuel-evaporation icing is most serious because it is an absolutely normal occurrence in any carbureted engine and occurs over the complete range of anticipatable temperature and humidity conditions, engine operating parameters and power settings.

The "other" kind of induction icing happens to fuel-injected engines. It is perhaps the most overlooked cause of unexplained engine stoppage, and typically the accident reports conclude "engine failure due to undetermined causes." Like carburetor ice, this cause of engine failure must be concluded from the negative. No other cause being found and conditions conducive to induction icing existing at the time of the crash, icing is therefore presumed to be the reason for the engine failure. It is a more difficult conclusion in fuel-injected engines because the data is so limited and the inclination to reach that conclusion is reluctantly made because everybody knows you need a carburetor to have carburetor ice. Not so. Fuel-injected engines also mix fuel and air, but sometimes by mis adjustment, wear, manufacturing or design defect or material failure, fuel is able to leak through a seal that separates the fuel from the air in the injector servo. The result is fuel-evaporation icing on the air side of the fuel injector servo. This ice serves to block the flow of air, enrich the mixture and, in extreme cases, cause engine failure. Do not bother reaching for the carb heat: you do not have any.

Is the pilot of a carbureted aircraft devoid of the means to deal with carburetor ice? No. Yes. Maybe. In truth, all three answers are true. Carburetor heat is supposed to be able to prevent carburetor ice, eliminate it when it forms, and is to be used only when carburetor ice is suspected or likely. Well, since we now know carburetor ice is likely most of the time, shouldn't we use carburetor heat all the time? No. Use of carburetor heat causes an average 15-percent loss of power, so it is never recommended for use on takeoff. Unfortunately, carburetor ice sufficient to kill the engine on takeoff can also form while taxiing. Use of carburetor heat while taxiing is not usually recommended because it allows unfiltered air to go into the engine and may overheat the cylinders because of higher induction temperatures. Carburetor heat applied in cruise when loss of power is noticed or engine roughness is felt may sufficiently reduce the ice build-up so that engine failure can be avoided when power is reduced, but by the time ice accumulations are large enough to cause a problem you might notice, it may be too late. Careful watch must be maintained after application of carburetor heat to see that normal rpms restored and further deterioration does not occur. Leaning sometimes, but not always, helps because ice enriches the fuel-air mixture and leaning will adjust this imbalance somewhat. Extreme care must be taken, however, to avoid over leaning, especially when and if carburetor heat melts the ice and the normal fuel-air mixture is restored.

The Civil Aeronautics Regulations under which most carbureted engines were certificated required only a 90-degree F rise in induction air temperature when carburetor heat is applied. Such an increase is insufficient to melt all the carburetor ice in cruise or takeoff and is only barely able to cope with it during idle power. It is entirely possible to use the carburetor heat exactly as recommended by the manufacturer and to be the victim of a silent, insidious cancer of ice growing on the carburetor throttle plate, venturi or downstream ready to kill the engine when the mixture is enriched during descent or when power is applied, either to clear the engine or arrest the aircraft's descent.

If by this time you think that all is doom and gloom, it is not, because by stroke of luck, and only because of that, Mother Nature puts the exact weather conditions and engine operating circumstances together in perilous coincidence infrequently, but not infrequently enough to prevent the loss of many, many lives since 1950 in single-engine general aviation accidents due to carburetor ice.

What can be done, if anything, about this deadly problem? What can pilots, airplane owners and manufacturers do to reduce the loss of life and injury?

We can first be aware that induction system icing can occur in almost any weather, power setting and altitude, and is most often wholly unrelated to pilot performance or lack of it. Second, we must redouble our vigil for anything in engine operation that hints of carburetor ice-roughness, loss of rpm in aircraft with fixed-pitch propellers and loss of manifold pressure and later rpm in constant-speed-propeller-equipped aircraft. Carburetor ice should always be suspected. Carburetor heat should be applied, and if it does not work, a little leaning might confirm the existence of substantial blockage. If ice is suspected, idle power should be avoided, prolonged low power or rapid descents should be avoided and sudden power adjustments absolutely forbidden.

The best preparation for all induction system ice is a preflight that includes draining thoroughly all the water from the fuel tanks. The greatest risk about which we have been taught regarding water in the fuel is that engines will not run-on water That is true, but an additional risk is water evaporation into ice in the carburetor or the fuel injector servo that will make the fuel-air mixture so lopsided that the engine will quit. Careful draining of all water from the fuel is, therefore, a must.

Careful preflight attention to the carburetor heat control is also important. Does the cable operate freely? Does the carburetor heat intake door move freely in full travel? Is the exhaust system sound and the carburetor heat muff in good condition?

Offered as optional equipment are various carburetor ice detection aids designed to help the pilot detect the existence or likelihood of carburetor ice. None is perfect, but because awareness is better than surprise, the use of some carburetor ice detection system cannot be more strenuously urged. Some devices, one being the Richter carburetor air temperature device measure temperature inside the carburetor to determine if it is low enough to be conducive to ice formation (Richter Aero Equipment, Incorporated, 2314 Ridge Road, Essex, New York 12936; 518/963-7080). Others, for example the ARP carburetor ice optical probe, actually "see" the ice formation and signal a warning by activating a light in the cockpit (AR? Industries, Incorporated, 36 Bay Drive, East, Huntington, New York 11743; 516/427-1585). The latter is likely to be the most effective means of detecting carburetor ice because unless the temperature probe is at the coldest spot in the carburetor, its readings are only relative and require some interpretation to be effective. A third device, such as the Shivers grounded circuit probe, grounds an electrical circuit when ice forms, which activates a signal in the cockpit (Charles B. Shivers Jr., 8928 Valleybrook Road, Birmingham, Alabama 35206; 205/833-7968). As long as there are carburetors, there will be carburetor ice. As long as that is true, then carburetor ice detectors belong in carburetor-equipped airplanes.

Aircraft engine, airframe and carburetor manufacturers have been derelict in dealing with this problem-a problem more pervasive, more deadly, more likely to cause injury or death than any other single mechanical problem in piston-powered aircraft. When the magnitude of the problem became known to the British, carburetors were designed with an oil jacket. Warm engine oil circulated through the jacket so the carburetor was always warm enough so that no ice could develop and no other carburetor heat was required. Partial systems where the throttle plate was hollow and warm oil flowed through it were also built. Electrically heated throttle plates have also been tested successfully. No U.S. manufacturer of general aviation aircraft, their engines or carburetors uses any of the proven British methods of keeping the carburetor warm enough to prevent ice formation.

****

The Canadians were also troubled by the number of carburetor ice-related accidents and performed a study of their own. The results of that study were hopeful. They determined that by coating the inside of the carburetor with Teflon, ice formation was virtually eliminated. No carburetor manufacturer coats its carburetors with Teflon, even until this day. The cost to coat carburetors during manufacture or overhaul could be brought down to $25 per unit or less, depending on volume. This cost, compared with the cost of the loss of airplanes alone, not to mention the cost in human terms, is a pittance.

The Canadians also learned that if ethylene glycol monomethyl ether (EGME) were added to avgas, in as little as 0.1 percent to as much as 1.15 percent by volume, together with the Teflon coating, carburetor ice could be eliminated altogether. EGME is not additive to avgas by the fuel manufacturers, nor has the aviation industry made the effort to have this additive blended into aviation gasoline. The use of this additive in avgas would also very likely prevent induction icing in fuel injected engines as well, although no tests have ever been conducted in this regard because the manufacturers of such engines and fuel injectors do not admit that such icing can occur, or if it does that it can stop engines. Editor's note: For a discussion of the use of EGME as a fuel additive, see "Pilot Advisory: Fuel System Icing," October 1986 Pilot, p.76. Isopropyl alcohol is also sometimes used to inhibit fuel system icing. For a discussion of the use of alcohol as a fuel additive, see the above-named article and "Pilot Advisory: Autogas; Cautions Abound, and the Jury is Still Out," May 1986 Pilot, p.91.]

****

What do all the years of study, all the years of research and all the deaths and injuries of pilots and their passengers boil down to? Induction icing cannot be blamed on the pilot. Engine failure due to induction system icing is the cause of countless accidents, and the only solution is to use the technology that has long been available to deal with it. **Teflon coatings by manufacturers of carburetors should be mandatory. Ethylene glycol monomethyl as an avgas fuel additive by fuel manufacturers or suppliers or the use of it as a fuel additive by the aircraft owner**

after each fill-up should be standard operating procedure. Every carbureted aircraft should have a carburetor ice detector as standard, not as optional equipment. In this way, perhaps as many as 200 lives per year can be saved and families saved the grief and sorrow of this unspeakable loss.

While this article is meant for us, the pilots and aircraft owners who live and love to fly, it is written with great appreciation and respect for the aviation pioneers who have studied carburetor ice and whose creativity has allowed for solutions that for reasons we might never know have yet to be implemented. To Willard D. Coles, Vern G. Rollin and Donald R. Mulholland of the Lewis flight Propulsion Laboratory of the NACA, who wrote in 1949 of the seriousness and scope of the problem of carburetor ice; to **Leslie Gardner and Gerald Moon of the Fuels and Lubricants Laboratory of Canada who tested the Teflon-coated carburetor and eythlene glycol monomethyl fuel additive and found them completely effective in preventing carburetor ice**; and to Augusto M. Ferrara, William C. Cavage, James E. Newcomb and Keith J. Biehl of the FAA's Technical Center; whose carburetor ice studies and analysis of carburetor ice detection systems revealed the means to identify and cope with this serious menace, my thanks for the research that hopefully one day will mark the end of NTSB's accident probable cause determination "carburetor ice."

Implementation of these recommendations-the results of government-funded studies in three countries years ago-and the consequent reduction of accidents should reduce aviation product liability claims by 10 percent annually and to that extent save the troubled aircraft industry in one stroke a significant percentage of their product liability exposure. Remember, before you have an aviation product liability claim, you must have an aircraft accident. The reduction of accidents is a goal for which we must all strive. Eliminating induction system icing accidents is a good step.

Arthur A. Wolk, AOPA 464840, is an attorney specializing in aviation law. He has an airline transport pilot certificate. He is the owner and pilot of a Beechcraft Duke and a Grumman F9F-2 Panther.

Our Next Meeting:

18 February 2023 at 10:00 est.

We will meet next at the HUF business center beside the Corsair restaurant.

VP Rick will have a few very important items to cover at the meeting ie…the Chapter room at the T's and plans for it, USAF Museum trip and the B-25 Berlin Express tour stop. Jeff Houser, KHUF director, will update us on the goings on at the airport. After our meeting feel free to have lunch at the Corsair Restaurant.

Have a good meeting on the 18th.
Fair Skies and be careful out there.
Keith