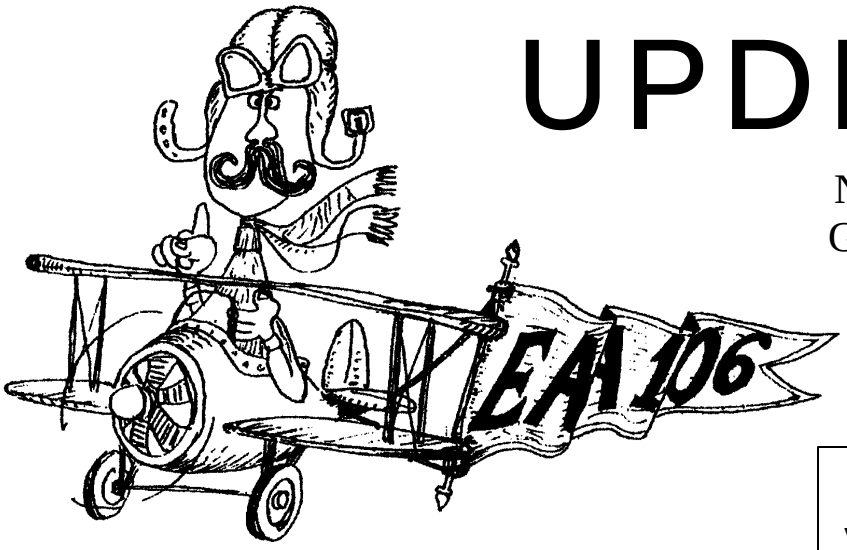

UPDRAFT

Newsletter of EAA106
Greater Boston Chapter

We Build
Airplanes

March 2003
Volume 31 Issue 3

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MARCH MEETING

Friday 7 Mar '03

The USUAL Time 7:00 PM

at

Bedford VA Hospital

This meeting will be a **'Show and Tell'.**

Talk about your PROJECTS and bring the interesting bits and pieces you're working on.

Joel will bring a brief BBC video of parabolic flight in NASA's KC-135 aka 'The Vomit Comet'.

He will also bring some video of experiments run on his last flights on the airplane the first week of February.

Dawn Patrol Arise !

We hope you'll fly if weather permits !

The location of the Breakfast meet will be decided at the meeting and selected for either Saturday 8 March or Sunday 9 March.

This issue has some very important Safety Features that should be read and adhered to particularly the <u>Hanger Fire Extinguisher operations.</u>

Secretary's notes of 8 Feb '03 EAA Chapter 106 meeting

Aviation Tomorrow, - Worcester Airport.

This was a Dawn Patrol activity with many partaking.

- Jim Dunn, President of Advanced Technology Products Corp, Worcester MA, gave a thorough and invigorating explanation of how his group plans to provide electric propulsion to a MCR Lafayette composite low-wing two seater airplane.
  - Because of the composite construction (over tubular frame) and light weight (330 pounds), both low stall and high cruise speed are anticipated.
  - NASA has done a review of the planes performance specs, and electric propulsion plans and concurred that ATP has selected the most appropriate airframe and electric motor.
  - NASA has agreed to Phase II funding amounting to $400,000 over the next two years.
  - To help promote flying, NASA has proposed that the electric airplane be flyable and displayed at the upcoming Festival of Flight at Dayton in August and also at Kitty Hawk for the celebration of the 100th anniversary of flight in December. The Wright Flyer replica will represent the history of flight, and the E-Plane will represent flying's future.
  - Many are volunteering their talents including Paul McCready's inputs about how to convert fuel cell moisture into hydrogen, and Hoot Gibson and Bruce Bohanon's test pilot skills.
  - Contact Jim Dunn at JDunn@ctc.org to find out more details and to volunteer your skills.

Secretary's notes from Executive Board Meeting held on 12Feb03:

- Website:
  - Need to add content. Roman will study the materials provided by Rebecca and give tutorials to members who are interested in contributing to creating and maintaining portion(s) of our website.
  - Need to add B-17 schedule and information
  - Insurance:
  - Our insurance lapsed in January and needs to be renewed, but all members must provide their EAA membership number to Joel Ventura so that he can comply with the EAA Insurance formalities.
- March Meeting:
  - Roman will check into professional painting company and about Blue Mountain Avionics Displays providing a talk
  - Alan Cate will check other EAA chapters to find out what good ideas they may have for show-and-tell projects.
  - One proposal is to have Superior Air Parts provide a lesson on their O-360 series of kit engines.
  - Another proposal is to have a provider of CD engine ignitions give us a demonstration talk. Perhaps Klaus Sevier.
  - B-17 Ladies and Gentlemen, start your engines !! The B-17 Tour is happening and will be our at the Lawrence Municipal Airport in mid August.
  - Ed Dokus will contact FBO's for fuel and ramp space.

- LWM requires EAA-106 to provide security.
- Roman will check for a source of oil.
- Need to scribe a letter with details (dates, and space requirements for vendors, parking, and planes).
- Roman will send EAA file info.
- Alan will draft a letter and forward it to board members for revisions/additions. Emphasis will be put on promoting our non-profit effort to :
- Support this B-17 living museum
- Encourage aviation
- Include local towns
- Exclusive use of LWM (to exclude Collins etc).
- Any ideas from members will be greatly appreciated. Please email your ideas to Alan for inclusion into the draft-letter.
- Need a straw-man budget for promotion costs
- Create an estimate of promotion costs for various promotion opportunities.
- Alan to find out costs for Promoting in Atlantic Flyer, AOPA, and EAA. Roman will check into the Hansconian Magazine. Rebecca has said she will check into Veterans Groups. Also local EAA chapters may be an avenue for promotions.
- Need to find out about the flight plan and put this into the promo materials.
- TV coverage on the first day may help to sell seats on subsequent days. Roman will check into this.
- Tewksbury Science Fair was discussed and it was decided that this activity is not associated with what EAA-106 can provide.

Alan Cate, Secretary

Items for Sale by members

Franklin Engine

YPQ-14 powerplant; O-300-11 Franklin Aircraft engine, 6 cylinder, dual ignition, horizontally opposed, baffled, non-certified engine B.R.O. Fully assembled, on a test stand incorporating a Stinson engine mount. Also included are extra case, extra crank & prop flange, 5 extra cylinders. No prop, no cowling.
Contact >> Robert Nelson; Phone 1-207-864-7399 (Maine between 5 and 7 PM

Wag-Aero Wag-A-Bond *Traveler*

Plans for sale
Full, New and Unused set of plans for a Wag-A-Bond *Traveler*
The *Traveler* is a Piper Vagabond 'Look-A-Like'
Check out the www.wagaero.com website.
Asking Price: $40.00
Contact > Bill Smith; (978) 667-8970
(Joel will have the plans at the March Meeting)

Important Safety Information !
Read it and Heed
Static Initiated Aircraft Fires.

Researched by Joel

Part 1: Handling Portable Fuel Containers

I will not actually get to aircraft fires until next month. This time I want to talk about some of the processes involved, and about portable fuel containers and their properties. There are hazards in filling them, and their properties will come up again when we talk about their use to transfer fuel into an aircraft. Some of the information I am presenting here is from the following web site, which is worth looking at:

http://www.chevron.com/prodserv/fuels/bulletin/product_safety.shtml

First a review of the basics. Substances are made up of atoms, and atoms are made up of protons and neutrons in the nucleus with electrons circling the nucleus. (We know this simple model is a gross over simplification, but it is good enough for our purposes.) The neutrons have no charge, so we will just be concerned with the positive protons and the negative electrons. Materials differ in how tightly bound to the nucleus are the outer most electrons. The gross measure of this binding strength is called volume resistivity (VR). It is usually obtained by measuring the resistance of a 1-cm cube of the material. The unit of VR is the ohm-cm.

Substances are usually divided up into three groups based on their VR. These groups are conductors, semi-conductors, and insulators. This is an artificial classification, because the VRs of substances form more of a continuum than divide up into three groups, but it is a common and useful classification. Conductors, which are usually metals, have very weakly bound outer electrons and have VRs in the 10 to the minus 6 range. If a conductor is placed in an electric field, its outer electrons will move through that conductor to cancel the field. Insulators however, have very tightly bound outer electrons. The VRs of most plastics for example are around 10 to the 16^{th}. If you place an insulator in an electric field, most of its electrons will not move. Of course there is a limit to this resistance. If you raise the voltage high enough, you can rip the outer electrons off any substance.

Most materials have an equal number of protons and electrons, the charges balance, and the object is electrically neutral. However, you can move electrons from one material to another through friction by rubbing them together. If the materials are dissimilar, the transfer of electrons will be mainly in one direction, and you will end up with one material with a net negative charge and the other with a net positive charge. If you then bring those objects close to one another, the opposite charges will strongly attract one another and form a strong electric field. The air between these two objects is normally an insulator, but if the electric field gets high enough, the outer electrons of the atoms that make up the air molecules will begin to get ripped off the atoms, forming positive ions and free electrons (negative ions). These ions will begin to carry charges between the two objects, and increase the electric field in other parts of the air gap, forming more ions. This process can rapidly escalate until, in a local area, a relatively large flow of ions can heat the gas to a temperature that is so high the electrons are easily striped off the atoms. This plasma is a conductor, and now the charges have a relatively easy path from one object to the other. This spark or discharge will keep the plasma hot until most of the electrons have returned to the object they started from, and the voltage difference between the objects can no longer maintain a current flow large enough to maintain the plasma. If there happened to be an explosive mixture in that gap when the plasma formed, it could be ignited. Note that before the plasma

and spark were formed, there is an ionization period where charges are transferred from one object to another without hot plasma. This will turn out to be important when considering what material to use for portable fuel containers.

This process where charges are moved and electric fields are formed via friction is called static electricity, as opposed to the more familiar formation of fields and current flows from chemical reactions (batteries) or via electromagnetic generators.

Metal Fuel Containers:

When any fuel container is filled, static charges are transferred to the fuel due to the friction between the fuel and the fuel line and nozzle. The fuel nozzle collects the opposite charge but since it is grounded, those charges flow off the nozzle, and it remains at ground potential. The fuel, however can pick up a significant charge, and that charge can not readily flow off the fuel because fuel is an excellent insulator. As the fuel falls through the air in the container, air friction can add to the charge on the fuel. These charges are not very social and want to get as far from each other as possible, so they build up on the surface of the fuel. However, if the tank is on the ground (or a grounded object), these charges will have a path to flow to ground, and the charge on the surface of the fuel can be kept at a safe level. Even though fuel is a good insulator, it has a large contact area with the grounded container, and there is a surface effect that will also tend to remove charge from the fuel surface.

However, the situation is far more hazardous if the fuel container is not on the ground and is filled while supported on an insulating surface. By far the most common cause of fires involving portable containers is when ungrounded metal containers are filled at the gas pump, for example when a can is filled while placed on the plastic lined bed of a pickup truck. As long as the nozzle is held in contact with the can there is no problem. But as soon as the nozzle is moved away from the edge of the can opening, a voltage difference rapidly develops because the grounded nozzle is no longer removing the charges that were on the fuel. Then when the grounded nozzle again approaches the can edge, a strong spark can jump and ignite the mixture which is lean enough to burn at the fuel can opening.

Plastic Fuel Containers:

Filling plastic containers with a grounded fuel nozzle is usually more dangerous than filling a metal container. A large charge will be delivered to the fuel through friction, but now since it is in an insulating container, it can not as easily bleed off. Again these charges will build up on the surface of the fuel and can reach 10's of thousands of volts. As the tank fills, the voltage increases, and at the same time the distance between the surface of the fuel and the grounded nozzle is decreasing. Eventually the gases between the nozzle and gasoline surface ionize, and a spark can form. Usually the mixture inside the container will be too rich, and nothing will happen, but if the end of the nozzle is close to the tank opening, the mixture may be lean enough to be ignited.

It is clear that metal containers should be on the ground when they are filled. What about plastic containers? Since plastic is an insulator, how would putting them on the ground help reduce the static charge on the fuel? There are at least three relevant properties of the container here. The first is its dielectric strength –how high does the electric field have to get before the material breaks down and a current will flow. For most plastics this is about 20,000 Volts/mm. So if you get 30,000 Volts on the fuel in a 1.5 mm thick plastic container, it will be rapidly shorted to ground. My guess is this rarely happens.

The second property of interest is the V**olume Resistivity** (VR). As mentioned above, the VR of most metals is around 10 to the minus 6. The VR of most plastics is around 10 to the 16^{th}. That is a huge difference between metals and plastics—about 22 log units. But VR is a function of many factors, notably temperature and voltage. The VR of plastics can drop significantly at high voltages. The VR of gasoline (though measured differently) is also about 10 to the 16^{th}, and we know the charges move

through the fuel to the surface. Since the container has a VR close to that of the fuel, the charges can move about as easily through the plastic container to ground if the container is on the ground.

A third important property of the plastic container is its surface resistivity (SR). This is a measure of how easily charges can flow along the surface of a material. For most plastics the SR will be thousands of times lower than the VR. That means if the container is on the ground, the entire outside of the container will essentially be at ground potential, encouraging all those charges piled up on the fuel inside the container to move on through the plastic wall (via its VR) to ground. It also means that charges can travel up along the interior wall of the container, out along the wall of the opening, and down along the sides of the container to ground. I have seen recommendations to encourage the surface effect by wiping down the exterior of the plastic container with a saline solution. This would not have to be done every time the container was used. Once a year would probably be enough unless it was left out in the rain. Enough salt would remain on the surface to attract water vapor and keep the surface resistance very low. That seems a little excessive to me, but at least don't wash off or keep the outside of your plastic containers clean. That is probably where the saying "Cleanliness is next to Godliness" came from. The cleaner the outside of your fuel containers, the closer you are to meeting God in the near future.

Conclusions:

Ok, it is time for the bottom line recommendations:

1. The number one recommendation for metal or non-metal, the fuel container should be filled on the ground (or on a grounded surface). With metal containers a dangerous charge is probably removed in less than a second. With a plastic container it probably takes minutes. And this is supported by the statistics from the Petroleum Equipment Institute. They report 25 fires involving the filling of portable gasoline containers between 1990 and 1995. For metal containers filled while on an insulating surface there were 14 fires. For the metal containers filled while on the ground there were zero fires. For approved plastic containers filled while on an insulating surface, there were 5 fires. For plastic containers filled while on the ground there were zero fires.
2. When filling a metal or plastic container, keep the nozzle in contact with the filler neck.
3. To reduce the chance of a dangerous spark, fill the container slowly. This reduces the total charge delivered to the fuel, the rate at which the charge is delivered, and gives the fuel more time to bleed off the charge that was delivered to keep the voltages down.
4. Several fire safety organizations recommend only filling portable containers ¾'s full. This allows for fuel expansion. But the real advantage to me is that it keeps you from pulling the nozzle up near the top of the container where a spark can occur in a mixture that is lean enough to be ignited. Since I know you are going to top off those containers, at least leave the nozzle end submerged in the fuel as you fill up so there is less change of a spark near the container opening.
5. Keep in mind that at these voltages, your body is a very good conductor. If you are wearing inch thick rubber soles in the winter, and slide across the seat of your car, you could easily have charged your body to 20,000 volts. Touch a grounded object before opening a fuel container. And once your body is grounded, remember that the fuel in a plastic container is not, so keep your fingers away from the opening, or any funnel to the opening.
6. Note that in recommendation 1, it says from 1990 to 1995 there were only 25 fires reported. I am sure there were more, but the point is that even if you follow none of these recommendations, filling a portable container is not a very dangerous task. However, most of the precautions mentioned are easily done, so it takes very little effort to make a safe task safer.

Hangar Fire Extinguishers

We now have **five** fire extinguishers in the hangar; **three CO_2** and **two dry chemical**. The CO_2 extinguishers are 15 lb. units, primarily suitable for Class B (flammable liquids and gases) and Class C (electrical) fires. The dry chemical extinguishers are 10 lb units for A, B, or C fires. (Class A is for wood, paper, or trash.) One CO_2 extinguisher will be mounted on the wall on each side of the main hangar folding door. The third CO_2 extinguisher will be mounted on the wall near the outside door to the workshop area. That way the extinguishers should be readily available for fires inside the hangar or on the ramp. One of the dry chemical extinguishers will be mounted in the shop next to the CO_2 extinguisher. The other dry chemical extinguisher will be mounted next to the CO_2 extinguisher on the opposite far wall of the hangar.

The first line of defense for ALL fires inside the hangar should be the CO_2 extinguishers. These extinguishers will only last 10 to 13 seconds each, but will do minimal damage to any aircraft. Only if these fail to control the fire should you resort to the chemical extinguishers. These have about 20 times the extinguishing power of the CO_2 devices, but will damage aircraft and produce a corrosive fog which will settle on objects in the hangar. The clean up after the use of a dry chemical extinguisher is also far more difficult, especially if used on an aircraft. Once a fire inside the hangar is extinguished, the people should leave the area, and ventilate the hangar, especially in the confined space of the workshop.

The **tenants especially** should know **which extinguishers are** the **CO_2** type (the larger extinguishers with the 4" diameter nozzles), and be **familiar with** their **operation**:

1. **Hold the extinguisher upright, and pull the ring pin;**
2. **Bring the extinguisher to within 8 feet of the fire;**
3. **Point the nozzle at the base of the fire and squeeze the handles together while swinging the nozzle from side to side.**

The operation of the dry chemical extinguishers is the same. If you have any questions about the use of these extinguishers, talk to Ed or Joel.

One of the most common fires around aircraft is a carburetor or intake system fire from over priming, especially in cold weather. These fires are not initially visible to the pilot since the fire is usually in the bottom of the cowling. **If you see such a fire start, do not try to tell the pilot about it**.

Instead:

1. Immediately get a CO_2 extinguisher from the hangar and approach the airplane in the pilot's field of view. (The left side of the airplane is better if the airplane has side by side seating.)

2. STAY CLEAR OF THE PROP.

3. Point up with one of your hands raised over your head. The **pilot, seeing you** with a **fire extinguisher**, and **hand** raised **over your head**, should get the message that he is on fire, and **should throttle up to suck the fire into the engine, and turn off the master switch**. Keep your hand up until all signs of the fire are gone.
4. **If this does not work, and the fire appears to worsen, give the pilot a thumbs down.** This is **his sign to pull the mixture**, **shut off the gas, shut off the master if that was not done, and get out of the airplane**.
5. **WHEN THE PROP STOPS, PULL THE PIN**, put the nozzle into one of the cowl openings and squeeze the handles together.

If you see a fire or see someone running around with a fire extinguisher, do not run out to be a spectator without bringing another fire extinguisher with you. Remember that the short duration of the CO_2 output may well require more than one extinguisher to do the job. Similarly, when the pilot gets out of his airplane, if he does not see five extinguishers out there, he should go to the hangar and get another one, and not supervise the use of the first. Any extra body available should call the fire department.

Note that the fire may burn through a magneto P-lead, so switching off the ignition may not kill the engine. The pilot should do MIXTURE, GAS, and MASTER, but if the pilot does only one thing, he should pull the mixture before he leaves the airplane. Do not attempt to extinguish a fire in an aircraft with a spinning prop.

If my engine backfires through the carburetor while starting, I continue to start the engine, and immediately throttle up as a precaution. Please review these procedures so you can do more than roast marshmallows in the event of a fire. If you have any additions, subtractions, or disagreements with the procedures presented above, let us know.

Some Further Information on the February Meeting
Concerning Fees at SwissPort, the FBO at Worcester Airport

Will and I flew out to the meeting in his Cessna 310. As it was a twin, we seemed to incur some extraordinary costs compared to what one might see as usual for a stay of two hours at the meeting. We were charged $10.00 for a landing fee, $18.00 for a handling fee, and $20.00 for parking. I know SwissPort can't control the landing fee charged by the airport, but the other fees are at the discretion of the FBO. When we were landing, I was struck by the lack of General Aviation planes on the ramps. Now I know why they're missing. I suspect that Worcester will soon become a strip mall and if it takes SwissPort out as well, then good riddance to that blood-sucking FBO.

Surviving Liberators, Some still airworthy

from Aeroplane, December 2002

Consolidated B-24-J-85-CF #44-44052 *The Dragon and his Tail*

The B24 was built in the largest number during World War II; not many are still around and fewer in flyable condition. There appear to be only three that are still flying.

The B-17 has more fans than the B-24, which probably explains the lesser numbers.

From the article in the December 2002 issue of *Aeroplane* only 13 complete aircraft are mentioned. Most of these are on static display, some actually have engine runs and taxi around airports. Three are airworthy still and at least two are on the flying circuit.

The Collings Foundation has both a B-17 and a B24 and keeps both flying. These two will surely be at the Daniel Webster College show this coming September. Bob Collings is a Supporter of Daniel Webster and may even have his Corsair here.

The Collings B-24 is *The Dragon and his Tail*, the most extensively painted with 'Nose Art' of all. It served time with the Indian Air Force before restoration as The All American. It was at the DW College Air Show 2 years ago as *The All American*.

Diamond Lil is with the Commemorative Air Force, nee Confederate Air Force, and is the oldest B-24 existing today. Originally consigned to Britain, it was damaged in delivery, returned to the factory, and was converted to C-87 configuration. It spent 10 years as an executive transport for Mexican National Oil Company.

Consolidated LB-30 #AM927 *Diamond Lil*

Consolidated B-24J-95-CF #44-44272 *Joe*

Joe is currently at Kermit Weeks's Fantasy of Flight Museum in Florida. It was assigned to 215 Sqn RAF in India and was turned over to the Indian Air Force. In 1973 it was purchased by David Tallichet Jr. and initially appeared as *Delectable Doris* of the 389 Bomber Group.

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This **Newsletter** is for **communication** and **enlightenment**, but should **not** be relied upon as absolutely correct in content.

EAA Chapter 106 of Greater Boston
c/o William Miller, Editor
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DUES WERE DUE THIS JANUARY
If you haven't paid,
you've likely been dropped.
Mail your dues to Joel Ventura

$20.00 for the E-Mail NewsLetter
$23.00 for the Snail-Mail version

DIRECTIONS TO THE BEDFORD VA HOSPITAL MEETING ROOM

From Route 128 aka Rte I 95 take Route 4/225 West towards Bedford. Go approximately 2.2 miles on Rte 4/225, passing the Great Pond Shopping Center (on left) and Marshall's (on right). Turn right onto Hillside Road (gift shop just beyond this turn) and stay on Hillside past merge into Springs Road. Go straight at the four-way stop sign, and about 0.6 miles beyond into the VA Hospital grounds.

Turn **LEFT** at the sign for Parking Lot #2. Proceed past the **Receiving & Warehouse,** past the buildings on the left, around the turn past the **large water tower** on the **LEFT** and enter the parking lot on your left. Park as close to the water tower as you can. Proceed on the side walk towards the long low building that ends at the road. Walk towards the connecting hallway between buildings and enter the door. Take two quick right turns and go down the hall to the classroom.