EAA
SAFETY WIRE
FLIGHT ADVISOR AND TECHNICAL COUNSELOR NEWS

Volume 4 Issue 2 April 2010

Your EAA Staff Resources:

Jennifer Bork
Safety Programs Administrator
safetyprograms@eaa.org
888-322-4636 ext. 6864
920-426-6864

Joe Norris
Homebuilders Community Manager
jnorris@eaa.org
888-322-4636 ext. 6806
920-426-6806

Charlie Becker
Director –Member Programs
cbecker@eaa.org
888-322-4636 ext. 6530
920-426-6530

Member Line
888-322-4636
info@eaa.org

Inside this issue:

Message From Headquarters

Joe Norris, EAA Homebuilders Community Manager

As I sat down to write my column for this issue of "Safety Wire" it dawned on me that we are entering the fourth year of publication. Much has happened since the first issue was published in April 2007;

- EAA created the position of Homebuilders Community Manager to better develop and coordinate the many efforts EAA puts forth on behalf of the homebuilder/craftsman member
- A new monthly electronic newsletter – The Experimenter – was launched to provide a focused publication exclusively for the homebuilder/craftsman community
- EAA's flagship publication – EAA Sport Aviation – was completely "reborn" to better serve the entire EAA membership, including the homebuilder/craftsman community

Reflecting on these events I have come to the conclusion that it's time to take a step back and reevaluate how EAA communicates with Technical Counselors and Flight Advisors. That's where you come in. We need to hear from you! Please take a moment to go to the following web link and fill out the survey:

http://www.zipsurvey.com/LaunchSurvey.aspx?suid=44816&key=0A3BF837

Those of you who have given us your email address will be receiving an email notice that includes this link. I encourage everyone to take time to complete the survey. Your input is very important and will help us move forward in the most efficient and effective manner.

In this issue of Safety Wire you'll find two accident reports that were submitted by the NTSB. Both point out the potential pitfalls of not following manufacturers' instructions when installing systems in homebuilt aircraft. Keep these issues in mind as you visit projects in your area.

For those of you attending Sun N Fun, I invite you to stop by the EAA Membership Center. I'll be at the event all week and would enjoy the opportunity to talk with you "live and in person"!

Homemade Phosgene Gas

The following article appeared in EAA Chapter 88's newsletter. This is good safety info to pass along to builders in your area….

Phosgene gas is an organic chemical compound first produced in 1812 by the English chemist John Davy. While it was and is still used as an industrial chemical, it is also a Schedule 3 CHEMICAL WARFARE AGENT. According to Wikipedia:

"Phosgene is an insidious poison as the odor may not be noticed and symptoms may be slow to appear. Phosgene can be detected at 0.4 ppm, which is four times the Threshold Limit Value. Its high toxicity arises, not from hydrogen chloride released by hydrolysis, but by the action of the phosgene on the proteins in the pulmonary alveoli. The alveoli are the site of gas exchange, and their damage disrupts the blood-air barrier, causing suffocation."

Okay, you're asking, what does this have to do with me, Joe Airplane Builder? (cont. on pg 4)

Equipment Installation Problems

In-Flight Fire!

The following excerpts from NTSB homebuilt accident factual reports highlight the importance of following manufacturer recommendations when installing equipment, or making sure you understand the possible pitfalls if you choose to deviate from those recommendations…

On August 11, 2008, an experimental amateur built Lancair IV-P, was substantially damaged by an in-flight fire shortly after takeoff. The airplane was equipped with a dual battery system. According to the pilot, after takeoff he turned on the "rear battery switch" to charge the battery. Upon reaching 3,000 feet above mean sea level he engaged the autopilot. After turning the airplane to the right and left utilizing the heading select knob he suddenly smelled smoke. All engine indications and circuit breakers were "normal." While turning towards the airport, the pilot then turned off both battery, and both alternator switches.

As the pilot flew the airplane on final approach the smoke was "very heavy and thick." The electric pitch trim was unavailable, but the landing and rollout were "normal." When the airplane was slowed to a safe taxi speed, the pilot opened the door and the smoke was "immediately" evacuated. The pilot observed that everything was "normal up front" and taxied the airplane to its hangar and shut down the engine. Upon exiting the airplane and looking toward the rear of the airplane, he was shocked to see "billowing clouds of black and gray acrid smoke." He then shouted to his passenger "the planes on fire get out."

The pilot then opened the baggage compartment door, and smoke and heat "hit him full in the face." He retrieved a cordless electric drill and Phillips head screwdriver bit from the hangar and removed the screws which held the floor in place. He then reached in and removed the baggage compartment floor and false bulkhead from the rear of the baggage compartment. It was still very hot though, and the pilot could not see the battery or hydraulic pump due to the smoke.

The passenger had retrieved a fire extinguisher and the pilot took it and discharged the fire extinguisher into the battery area. He then could see the battery. The battery had a visible flame for a "few seconds" and he discharged the fire extinguisher once again. When the "dust" from the fire extinguisher had settled, he observed a red glow in the center of the battery box.

Examination of the airplane by NTSB Investigators revealed the fire had damaged approximately three feet of the aft fuselage in the area of the standby (rear) battery box and baggage compartment. The damaged section of the aft fuselage exhibited areas of peeling and blistered paint, softness, delamination, and sooting. Internal examination of the aft fuselage also revealed evidence of fire damage to the wiring harness, standby battery contactor, standby battery box, and standby battery.

Further examination revealed that a charred rubber like substance had adhered to the top of the standby battery and its vent caps, along with the charred remnants of a rectangular shaped wood block. The standby battery's vent caps were partially melted, and holes with charring along their circumference were present along the upper edges on one side of the battery. Examination of the wiring forward of the baggage compartment area revealed no evidence of any damage. Download of the EFIS revealed no anomalies with the main electrical system of the airplane. The standby system was not recorded.

Review of the regulator manufacturer's schematics which were provided by the pilot to the NTSB revealed that they did not include a provision for a standby battery. Hand drawn schematics of the airplane's wiring system provided by the pilot revealed that he had modified the basic design shown on the regulator manufacturer's schematics to include a standby battery. It was discovered that the drawings contained discrepancies which prevented determination of the airplane electrical system's actual configuration.

The regulators were mounted forward and to the right on the firewall, on a sheet of aluminum inside the engine compartment. The main electrical system's regulator was mounted above the standby electrical system's regulator. Examination of the regulator wiring revealed no drip loops or other means to keep condensation (water) from running down the wiring to the regulators. Further examination of the mounting area revealed staining adjacent to the lower right corner of the standby electrical system's regulator on a copper terminal strip, which was mounted below the standby electrical system's regulator.

Testing of both regulators revealed that when power was applied to the main electrical system's regulator it was functional. However, attempting to connect a power source to the standby electrical system's regulator caused visible sparking between the case and the terminal strip. Internal examination of the standby electrical system's regulator revealed that it was not potted and that the internal components were mounted on a circuit board which was not conformally coated. No weather seal existed between the plastic terminal strip and the metal case. Evidence of staining and arcing was present on the inside of the case, and portions of the plastic terminal strip exhibited evidence of melting.

According to the regulator manufacturer, both the main and standby electrical systems were designed to be operated at the same time so that when the system sensed a drop in voltage it would turn the standby system on. The regulator manufacturer was also aware of an occurrence a few years earlier of water running down the wiring and entering a regulator. According to the installation instructions supplied for the regulator, the manufacturer recommended when mounting the regulator, to "try and choose a location that will protect it from heat, vibration, and water. We recommend on the pilot side of the firewall, or inside the cabin somewhere close to the panel."

According to the pilot, he was aware of the recommendation to mount the regulators in the cockpit, but thought that the heat in the airplane would be worse in the cockpit than in the engine compartment. Additionally, he believed that the regulators were "sealed in Bakelite," and it would provide "ease of access" to mount them on the firewall.

Equipment Installation Problems (Cont.)

Fuel Flow Transducer Installation

The Pitts Mode 12 homebuilt airplane was substantially damaged during a forced landing following a loss of engine power after takeoff. The pilot stated he was flying the 23rd flight in the airplane since it was certified. He was planning a local flight to practice flight characteristics. Prior to flight he "topped off" the fuel tanks. He said preflight and run-up were normal and the fuel sump samples were clean.

During climb out from initial takeoff and about 500 feet above the ground (AGL), the master caution light illuminated and the pilot received a "Fuel Pressure" warning. The pilot immediately turned to a downwind leg. Soon afterward the engine started sputtering. The pilot turned on the electric fuel boost pump and the engine did not respond. The engine quit when the pilot was approximately abeam midfield, so he turned immediately towards the runway and elected to land in the grass beside the paved runway. During landing the airplane bounced three times before coming to a rest beside the runway.

Examination of the airplane showed the engine firewall and both lower wing spars bent. The wing fuel tanks were ruptured and did not contain any fuel. Fuel captured from a fuel line contained small particles of an unidentified substance. The Floscan 201B-6 fuel flow sensor, which was located upstream of the fuel filter, was obstructed with an unidentified substance. The source of the unidentified substance was not located.

The airplane was a homebuilt, experimental airplane, manufactured by the pilot. During manufacture the fuel flow sensor was installed upstream of the fuel filter. The pilot told investigators he installed the fuel flow sensor upstream of the fuel filter as depicted on the Pitts Model 12 fuel schematic provided for reference by the airplane airframe kit manufacturer. A representative of the kit manufacturer stated the fuel schematic was provided for reference only. He also stated the builder was responsible for determining the location of components per their desires and the installation instructions of each particular component. The notes section of the installation instructions for the Floscan 201B-6 state “The transducer should be mounted downstream of a fuel filter.”

Magneto Internal Timing

Dick Koehler, Technical Counselor #3023, EAA Member #161427

An EAA member recently contacted me with magneto timing questions, including a question about setting the “E-gap”. Setting the E-gap is part of setting the "internal" timing of the magneto. Setting the mag-to-engine timing is "external" timing. Let’s take a look at the internal timing.

The first step in setting the internal timing is to rotate the magneto to the firing point for the #1 cylinder. On a Bendix magneto this is done by rotating the mag in the direction of normal rotation until the painted chamfered tooth on the distributor gear is approximately centered in the inspection window. On a Slick magneto, the mag is rotated the same way, until a pin inserted in the back of the mag drops in place and locks the distributor gear.

After finding this "firing point", the rotor is turned backwards until it locates in the "neutral position". The neutral position is located by "feel" of the rotor. As the rotor is turned a few degrees backward from the #1 firing position, the magnet will have a natural tendency to "pull in" and locate in the neutral position. It will take extra effort to rotate the magnet shaft either direction out of this neutral point.

The "E-gap" for a Bendix mag is defined as 10 +/- 4 degrees of shaft rotation from the neutral point. After finding the neutral point, the shaft should be rotated 10 degrees in the direction of normal rotation and the points set to open at exactly that location. This will cause the points to break the primary coil circuit at the optimum time for a maximum electromagnetic pulse to the secondary coil for the hottest possible spark. On a Bendix mag, you also need to check the maximum point opening at .018 +/- .006". If outside this limit, then the E-gap can be adjusted to its + or - limit to get the point opening correct. If the limits cannot be met, then a new set of points is required, and the set procedure is repeated. If you haven't figured it out yet, let me say that there is a little bit of art in all this, but it is easier to do than explain.

If you suspect that your mag is not operating up to snuff, I suggest you get the maintenance manual and replace all the mandatory parts. Bendix mags require disassembly and repair, including resetting the internal timing, at 500 hours and overhaul at 1000 hours. Unfortunately most owners don't touch the mags until engine overhaul, or mag failure, and then blame the "old technology" mag for their problems. Mags are actually a very reliable ignition source, if maintained properly.

Of course, timing the mag to the engine is also critical. I have found many that were incorrect, particularly with new homebuilders. Get someone that really knows the procedure to show you how it is done. Again, there is a bit of art in the science, so it is much easier to learn from an experienced person than to self-teach.

EAA
Safety Programs
PO Box 3086
Oshkosh, WI 54903-3086

Phone: 888-322-4636 ext. 6864
Fax: 920-426-6579
Email: Safetyprograms@eaa.org

Mailing Address Line 1
Mailing Address Line 2
Mailing Address Line 3
Mailing Address Line 4
Mailing Address Line 5

Join us for the World's Greatest Aviation Celebration!
AirVenture 2010
July 26-August 1

Homemade Phosgene Gas (Cont.)

Well, it turns out you can make Phosgene at home, right in your own shop, without even knowing you are doing it. All it takes is a little brake cleaner and some heat.

Here's an actual real world account of one welder's experience with Phosgene:

"I had a rush job welding four diesel tanks. I had to patch where they were pitted by road salt corrosion. Normally, I spray a little carb cleaner on the spot I'm going to weld, wipe it off, and then preheat the area with an acetylene torch to get rid of any solvents. To be on the safe side, I even had the shop door open and turned the exhaust fan on."

"I started TIG welding on Thursday afternoon and no problem at first. But when I started welding across a really pitted area, I found a couple of drops of cleaner that were lurking in a deep dimple. As I came closer, a small puff of white smoke popped up, and I almost passed out. I made it outside and sat for awhile in the fresh air."

"After about ten minutes, I went to the office to check the warnings on the brake cleaner can I used. That's when my whole left side started shaking for about ten to fifteen minutes. I found out later that I was having a seizure."

"My breathing was still hard a few hours later, but I felt a little better so I didn't go to the hospital. The chlorine taste and smell was still strong. About midnight, I started coughing and my chest started hurting. The next day the symptoms got worse and my kidneys started hurting."

"By next Monday, nine days after the poisoning, I lost all balance. I was confused and could hardly talk. I finally went to the emergency room. My symptoms were low blood oxygen level, sugar level out of control, vertigo and I was hurting badly in my entire chest. I was admitted into the ICU. My kidneys had probably shut down for those first four days. My lungs were damaged, I had to be on oxygen, I needed insulin to keep my blood sugar in check. **There is no antidote for Phosgene**, all I could do was rest and hope I got better."

"After CT, MRI, EKG, EEG and several blood tests it looks like, at least for now, there is no permanent damage, however, the MRI showed fluid in my sinuses and a buildup of fluid near my brain. The Phosgene scarred my sinuses, which became infected. The three doctors I saw said I was lucky to make it."

"After four weeks, it appears I may have emphysema and chronic bronchitis. I'm on nasal medicine and an inhaler. My sinuses are severely scarred, and my smell nerves are damaged. I still have that awful chlorine taste and smell, and I may also have pancreas damage. The insulin I was taking had little effect on my sugar levels, so now I'm on stronger medicines."

Here we have a recounting of a near fatal incident caused by a few seconds misuse of four dollars of over the counter chemicals that resulted in tens of thousands of dollars in health care bills and most likely a lifelong affliction of disease. It's not an urban legend, it's not the bogey-man, it's real and it could happen to any one of us.

For the complete article use this link: http://www.brewracingframes.com/id75.htm
You can learn more about Phosgene here: http://en.wikipedia.org/wiki/phosgene

So the next time you pick up a can of chemical product for some phases of your project, take just a few minutes and research its constituents. Read the health warnings in the Material Safety Data Sheet (MSDS). The web has made this an easy task and might save you or a loved one a lifetime of suffering