



Household water heater wrapping
used as insulation. A picture is worth
a thousand words.

IN-FLIGHT FIRES

Aircraft interiors expert **DENNIS WOLTER** describes the most common causes of in-flight cabin fires, and the best strategies and materials to use in your interior renovation to reduce the chance of encountering this dangerous situation.

At this point in our journey through renovating your Cessna interior, I think we are at a good place for a discussion on the important safety issue of in-flight cabin fires. Fabricating and installing a new interior presents a great opportunity to make your aircraft's interior part of the fire suppression system, rather than the fire support system.

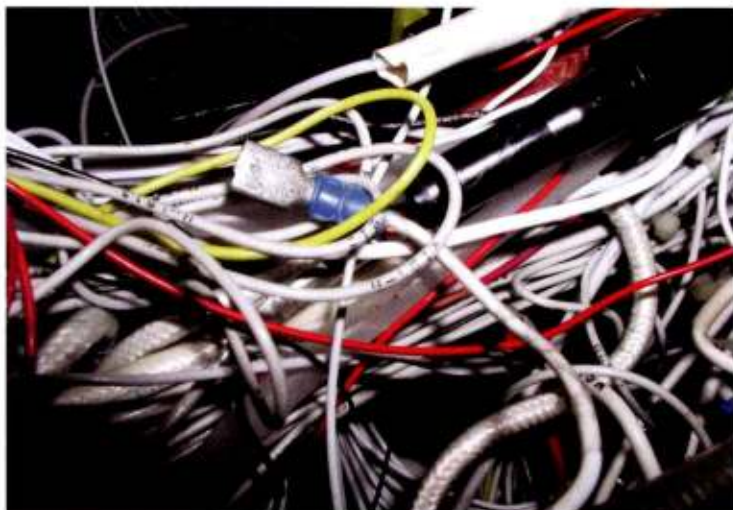
This month, we will discuss ways to identify and correct some possible contributing causes of a cabin fire; and methods to increase the ability of the pilot to manage the threat of fire so that the event will have a good outcome. The specific examples included in this article are conditions that we frequently discover while going through the process of renovating and modifying Cessna interiors and instrument panels.

Threat reduction

Let's get started with reducing the threat of fire. Since most Cessnas are 40-plus years old, it's quite possible to have an accumulation of dirt mixed with combustible oil or hydraulic fluid on the belly skins below the floors.



The flammable tar and liquid petroleum slurry often found below the floors of 40-plus-year-old Cessnas.



Messy wiring, along with abandoned wiring, unprotected connectors, and unidentified inline fuses.

In early production Cessnas, the factory sprayed vibration-damping tar on the belly and cabin skins. Add in the installation of some aftermarket insulation, combined with a little brake fluid, old fuel leak residue, and hydraulic fluid, and a very combustible mixture of material is just waiting for an ignition source.

This hazardous stuff is below the floors where a fire extinguisher will have little effect. Cessnas equipped with hydraulic retractable landing gear will often have flammable 5606 hydraulic fluid pooling in their bellies. It's important to clean the bellies of these not-so-young airplanes and check the condition and age of the actuator seals, fittings, and old hoses.

Years of avionics installations can result in old, abandoned wiring being left in the airplane. Add excessively long

harnesses and old circuit breakers, and you have a wiring mess that can be a troubleshooting nightmare, as well as a potential electrical fire starter. It's not uncommon to find an unprotected connector that is still connected to an avionics buss.

The fix is to dive into this mess of abandoned wiring. The photo below shows what is often removed during this cleanup process. It's also not uncommon to find live wires tie-wrapped to oil or fuel lines. This condition clearly led to one of our customers having an in-flight fire.

An A+ live-feed wire was tie-wrapped to the aluminum fuel-flow-gauge line. Years of vibration finally wore through the insulation on the wire, and the resulting arcing burned through the aluminum tubing that was supplying fuel

under pressure to a fuel flow gauge. The event ended when the pilot landed on a road, where he and his wife exited the airplane.

Should you ever face a similar situation, at the first indication of smoke in the cabin, shut off the master switch immediately and initiate a plan to get the airplane safely on the ground ASAP, even if an airport is not a realistic option. I have read many reports where the time from when a pilot calls ATC to report smoke in the cabin to when communication with the airplane ends is only a matter of a few minutes.

Call me crazy, but whether I fly IFR or VFR, I keep a paper sectional with my route highlighted. Whether it's oil on the windshield, a rough engine, non-running engine, or smoke in the cabin, flat ground is your best friend; and a sectional is the



The four most common circuit protection devices used in light aircraft.



Abandoned wiring we discovered and removed when going through the process of disassembling, painting, and placarding a 40-year-old instrument panel.



You have to wonder how or why these screws would go inside a voltage control unit!



Pay attention to the service life of hoses. I replaced every timed-out hose in my personal Cessna 172 with an orange, fire-sleeved, extended-life hose shown in this photo. "Extra life, extra safety."

best low-tech and immediately available source of that vital information.

Circuit protection

Now, let's talk about electrical circuit protection. Years of equipment changes, and the fact that Cessna installed non-pullable circuit breakers in all their singles, means that the pilot has fewer options when dealing with an electrical fire or smoke in the cabin.

At the top of my bad-circuit-protection-methods list is the use of inline fuses hidden under the panel. We often find unlabeled fuse holders hidden behind a panel, which will make it difficult or impossible to correct an in-flight component failure. We once found a fuse holder stuffed full of aluminum foil. Go figure!

It's also rather common to find a circuit breaker that is protecting more than the original component it was placarded to protect. When additional equipment is installed over the years, the installing technician doesn't want to add another circuit breaker, for whatever reason. They simply connect the A+ wire for the new device to an existing breaker.

This can potentially create electrical load issues, as well as confusion for a pilot when a device fails and the breaker that opens is labeled for something different.

I am a big believer in pullable circuit breakers. Pullable breakers allow the

pilot to better manage electrical and avionics equipment. The best way to illustrate the advantages of pullable circuit breakers is to tell a story.

Years ago, I installed pullable circuit breakers for every circuit in my Cessna 172. Leaving Oshkosh on an instrument flight plan, I was in the clouds when we suddenly had electrical-smelling smoke in the cabin. I immediately shut off the master switch, then pulled every circuit breaker in the airplane.

I next turned the battery switch on; no smoke came back, and no unusual load appeared on the amp meter. This indicated to me that all was well from the alternator through the battery to the main buss.

I then turned on the radio master switch and reset the breaker for my navcom radio and my transponder;

leaving all other breakers pulled off. I called ATC, told them of my problem, and asked to be vectored to the nearest VFR airport.

Once on the ground, I pulled every radio out of its dust cover and found that the No.2 com radio had severe scorch marks on the bottom of the dust cover. With the issue identified, we flew home VFR with a functioning No.1 navcom and a transponder. Having pullable breakers allowed me to shut off all electrical circuits, confirm that power was getting to the main and avionics busses, and reset the two breakers to communicate and safely land the airplane.

I sent out the offending radio to Narco for repair, and all was good. The next time your airplane is in the avionics shop, ask them to evaluate the integrity of your circuit breakers and the wiring

behind your instrument and circuit breaker panels. You might be surprised at what they find. I definitely like my pullable breakers.

Speaking of surprises, finding loose screws inside a Cessna 310's voltage regulator once explained an issue of intermittent voltage control. I wonder how three screws became loose inside a voltage control unit!



Keep critical systems clean. Dirt can hide a serious problem.

Pressure hoses

One often-overlooked fire safety issue is old, long-outdated pressure hoses. Every flex hose that carries fuel, hydraulic fluid, and oil has an in-service life

limit. Being in the business of renovating airplanes, I've had the opportunity to fly many different makes and models of customers' airplanes. Cool deal...well, sort of. Flying an airplane that you know little about can have its downside. That leads me to my next story.

About 10 years ago, I was bringing a customer's freshly painted airplane to Air Mod from the paint shop in Cadiz, Ohio. While on letdown into Clermont County Airport (I69), my home field, I began to smell fuel. I quickly noticed fuel dripping from under the right side of the instrument panel and right on to, you guessed it, the circuit breakers.

I instantly shut off the battery switch, put the fire bottle on the co-pilot seat, and manually extended the landing gear before I got into the pattern at Clermont County.

When the airplane was safely in our hangar, I removed the glareshield and easily found the problem. A rubber fuel pressure hose that ran from the firewall to the fuel flow gauge on the panel looked to be quite old. I turned on the fuel boost pump with the mixture in the full rich position, and the hose began to swell slightly. Fuel was passing right through the old rubber.

I looked at the date on the manufacturer's certification tag on the hose. It said 1956; the hose was 50-plus years old at the time. I said a little prayer of thanks and installed a new hose. As soon as you think you've seen it all, something comes along that makes you realize that you're just getting started!

Now, when we get behind an instrument panel, I always check the condition and age of hoses, including pitot-static system components. Lots of potentially critical stuff behind old instrument panels falls victim to the old out-of-sight, out-of-mind syndrome. 1956...really?

Sometimes a serious in-flight fire can be due to dirt that hides the deterioration of an important component. A clean airplane is a safer airplane.

Self-extinguishing interior materials

Let's move on to interior safety enhancements, with respect to self-extinguishing modern aircraft interior materials. Foam, insulation, leather, fabric, and even vinyl are manufactured to pass FAR Part 25.853a, Appendix F,

ATTENTION C182 LEGACY OWNERS!

THE BEST PERFORMANCE MODIFICATION VALUE
FOR C182 LEGACY MODELS ON THE MARKET TODAY!

- Increased horsepower from 230 hp to 252 hp
- Increased climb up to 400 fpm
- Increased cruise up to 5-8 KTAS
- No additional fuel burn
- No engine or prop change required for Q-R Models

1 866 J JEWELL (866-553-9355)
662-252-6377
www.johnjewellaircraft.com
sales.info@johnjewellaircraft.com

Holly Springs-Marshall County Airport (M41)
Holly Springs, Mississippi USA

Serving the Aviation Industry Since 1966

John
Jewell
AIRCRAFT, INC



Together, we can land like the pros.

Only nature's experts can match the performance of Cleveland Wheels & Brakes.

Parker's Cleveland Wheels & Brakes set the industry standard for general and business aviation. Cleveland products offer pilots the highest level of control and performance. No other equipment offers the same quality and value as Cleveland, landing after landing, except perhaps that made by Mother Nature.

And Cleveland Wheels & Brakes come backed by a broad range of services not found with smaller wheel and brake product lines, including:

- Technical and educational seminars
- Worldwide distributor network
- Spares when and where you need them.
- Extensive in-depth customer service and technical support



So take off with Cleveland Wheels & Brakes.
And experience landings like the true professionals.
One landing at a time.

Cleveland
Wheels & Brakes

Parker Aerospace

www.clevelandwheelsandbrakes.com
1-800-BRAKING (1-800-272-5464)



A corrosion-induced hole found in an aluminum fuel line located deep in the filthy complexity of fuel lines seen in the previous photo.



Early Cessna interiors were required to meet a less flame-resistant regulation that allowed a burn rate of 4 inches a minute, very close to what is used for automobile interiors. Seeing the aftermath of a car fire in a TV news report can be a real eye-opener.

Part 1(a),(1),(i). What conformity to that long Federal Aviation Regulation means is that a material has been tested and passes the standards of this FAR; it can be relied on to self-extinguish if exposed to a flame source as specified in the regulation.

Interiors properly fabricated using approved materials will be a major part of fire suppression, instead of

fire support. These Part 25-approved materials will not burn and will greatly inhibit the spread of a cabin fire. This is of particular benefit when a fire is located behind a side panel or below a floorboard where a fire extinguisher will have little or no effect.

Over the years, I've known two of our customers who experienced an in-flight cabin fire. Both customers called me

afterward and stated that they believe that the approved materials we used were a major reason that their frightening experience had a safe outcome.

Double-check logbook entries describing any interior installation in

*Hard-to-find parts
aren't hard to find here!*



WENTWORTH AIRCRAFT, INC.

CESSNA | PIPER | HOMEBUILTS

As the LARGEST Single-Engine Cessna
Used Parts Dealer IN THE WORLD,
we'll help you find everything you need
...with only ONE call!

Huge Volume | Fresh Stock | 80,000 Sq. Ft. of
Indoor Storage | 30-Day Satisfaction Guarantee

RFQs Online, Fax or Phone

Wentworth Aircraft Inc. • 6000 Douglas Drive N. • Crystal, MN 55429

ENGINES

LYCOMING O-235 to IO-540
CONTINENTAL O-200 to IO-520
*Complete engines with accessories
and complete logs!*
Also Cylinders, Mags, Accessories

AIRFRAME

Wings, Cowlings, Interiors,
Control Surfaces, Landing
Gear, Tail Surfaces, Engine
and Flight Instruments

AVIONICS

King, Narco, ARC, Collins,
Nav/Com, Transponder,
AME, DME, Autopilot
Trays and complete harness included!
All units
100% satisfaction guaranteed

Phone **763-231-8484**

Fax **763-231-8482**

Email **wentacpart@aol.com**



FAA-approved flame-retardant upholstery materials and insulation will not support the ignition or spread of a cabin fire.

your Cessna. If you are purchasing an airplane, give serious consideration to verifying that the interior components comply with FAR 25.853a. You can't write the check on the way down.

Fire extinguishers and smoke hoods

No in-flight cabin fire discussion

in an airplane cabin, the dry chemical creates a cloud of vision-limiting, hard-to-breathe stuff. Second, the dry chemical material will cause corrosion on electrical parts, electronic components, and instruments. Buying a Halon bottle is one of the most cost-effective safety enhancements

would be complete without talking about fire extinguishers. Here's a low-cost, effective preventive item that we still find either missing or outdated in too many of the airplanes we work on. If yours is an old dry-chemical fire bottle, consider replacing it with a modern Halon bottle.

Those old dry-chemical extinguishers present two problems. First, when discharged

you can invest in.

One final note, for those who operate a pressurized airplane. Because you are flying at high altitudes and it will take more time to get the airplane on the ground, consider the purchase of a smoke hood, sold under the trade name of iEvac. When minutes count, this hood can make all the difference.

Until next time, fly safe!

Industrial designer and aviation enthusiast **DENNIS WOLTER** is well-known for giving countless seminars and contributing his expertise about all phases of aircraft renovation in various publications. Wolter founded AirMod in 1973 to offer private aircraft owners the same professional, high-quality work then only offered to corporate jet operators. Send questions or comments to editor@cessnaflyer.org.

RESOURCES

Smoke Hoods

ELMRIDGE PROTECTION PRODUCTS LLC

elmridgeprotection.com



Plane Plastics[®].com

THE WORLD'S LEADER IN GENERAL AVIATION PLASTICS



Exterior Parts



Interior Parts



Carpets



Accessories



Decal Kits

1-866-307-5263

www.planeplastics.com