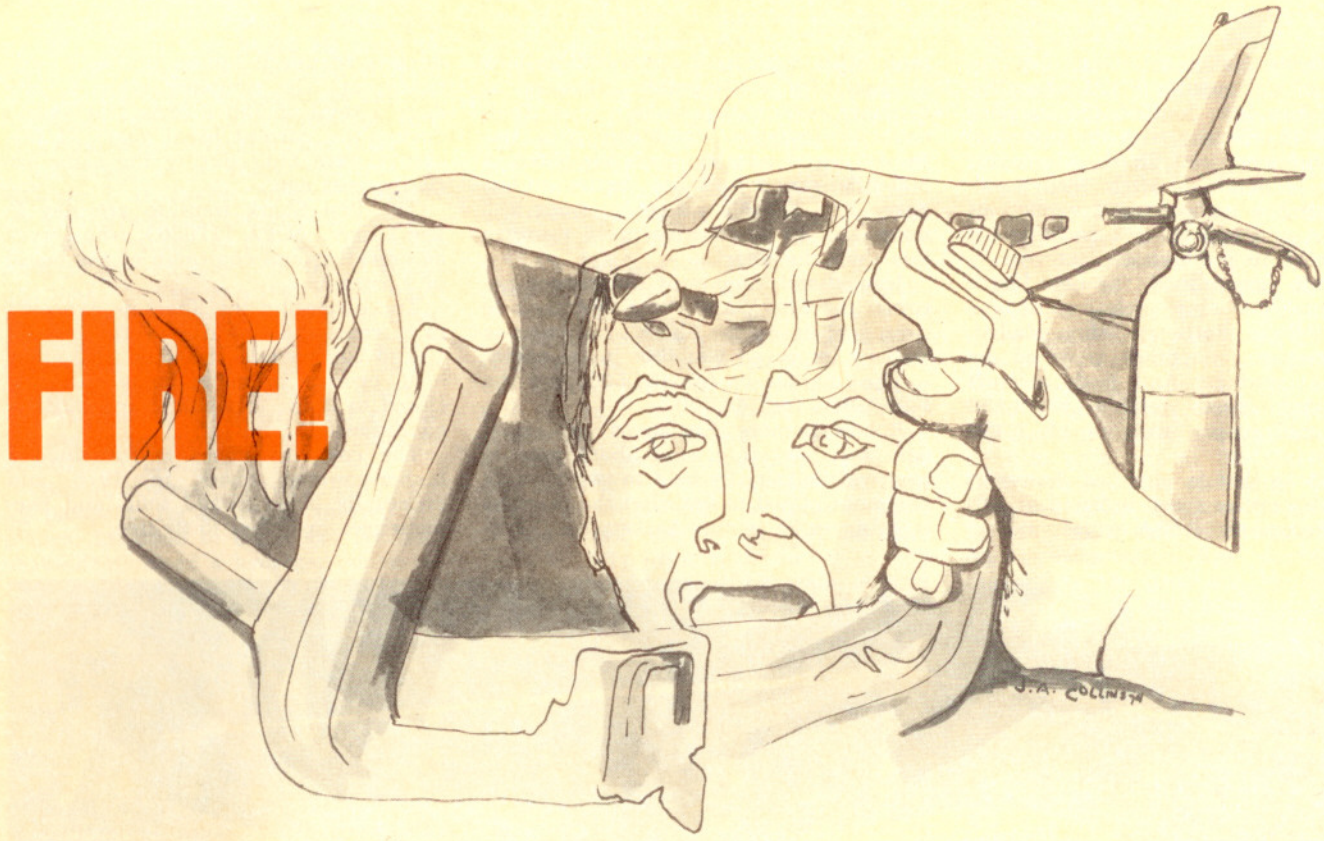
FIRE!



Though it's a very rare occurrence, it's every pilot's nightmare. Herewith, some guidelines on coping, should it ever happen to you

by ALAN BRAMSON

■■ Of all the emergencies that could face a pilot, fire—particularly fire in the air—is generally regarded as the most fearsome. Fortunately it's very rare; however, it could happen.

If you had a fire in your aircraft, could you cope? Would you be able to recognize the source and, if so, would you be sure of the correct emergency procedures to use?

What one should do in the event of fire will in some cases depend upon whether the aircraft involved is a single- or a multi-engine type. In addition, particular planes may require special treatment that will be listed in their owners' manuals. With that caveat, here are some general guidelines for coping with the several types of fire a pilot could conceivably encounter.

Fuel Fires

The plane in your life has an engine mounted on rubber vibration dampers. To allow for a small amount of movement between motor and airframe, it is common practice to introduce a length of flexible hose somewhere between the carburetor and where the rigid fuel line enters the engine bay. The joints between the flexible hose and the carburetor are made with what can best be described as good-quality plumber's unions. Since fuel will seep through a joint that is watertight, these unions must be a perfect fit. Badly fitted, incorrectly locked, or damaged unions will leak, and obviously so will fractured fuel lines.

Other leaks could occur from a faulty mechanical pump or carburetor body, but it must be stressed that fuel leaks on a properly maintained aircraft are very rare. Such leaks present an obvious fire risk, however, and only require a high enough temperature, a vapor flashover from the exhaust, or a spark from the electric fuel pump to put you in the fire business.

A spark plug that is not sparking, or a sticking valve, could cause a fire in the exhaust system—probably the least

serious fire emergency. Alternatively, a sticking float valve could allow the carburetor to flood, presenting a risk of fire in the induction system— and fire there is a different matter, since it could spread through the engine bay.

Dealing with a fuel fire on the ground: Fuel fires on the ground are usually the result of overpriming with the throttle pump. This forces fuel into the induction system, whereas the hand primer injects fuel directly into the cylinders.

There is nothing wrong with throttle priming, always provided that it is not done to excess. Indeed, on some aircraft there is no other method of priming. But too much pumping of the throttle(s) before starting can flood the induction system, and under certain conditions an induction fire can occur. The procedures that follow will usually stop it:

- Turn off the fuel.
- Switch off the fuel pump.
- Leave the engine running at 1,200 rpm or so. (Note that the ignition is left on to burn the fuel remaining forward of the fuel cock.)
- When the fire stops—and not before—switch off the ignition and pull back the idle cutoff.
- If the engine stops but the fire continues because of residual fuel in the induction system, try holding a folded engine cover, map, or other suitable article against the air intake, thus starving the fire of air.
- As a last resort, operate the fire extinguisher. (Have you ever seen an engine after it has been sprayed with an extinguisher? If so, you will understand why this should be used only when all else fails to bring the fire under control.)

Dealing with a fuel fire in the air: The airworthiness authorities of most countries require an aircraft manufacturer to provide a fireproof bulkhead, or "firewall," between the engine bay and the remainder of the airframe. The firewall is usually made of stainless steel or a lower-grade metal backed with asbestos.

Most training authorities, airworthiness bodies, and aircraft manufacturers these days are agreed that when a fire occurs in the engine bay it must be contained in front of the firewall. The old-fashioned practice of sideslipping is not recommended unless it proves necessary to prevent spread of fire to the cabin or a wing tank.

When a fuel fire occurs in the air:

- Close the throttle to slow the aircraft, thus reducing the airflow through the fire.
- Turn off the fuel.
- Check that the electric fuel pump is off.
- Turn off the cabin air intake and the heater to exclude smoke from the fuselage.
- When the fire stops, switch off the ignition and operate the idle cutoff. (Ignition is left on until the engine stops in order to let the remaining fuel in the engine bay be burned off as safely as possible.)
- If flames enter the cabin, use the fire extinguisher.
- Notify ATC (if there's time) and, in a single-engine plane, carry out a forced landing without power.
- In a multi-engine aircraft, check that the flames are being contained within the engine bay and, if necessary, sideslip to divert the fire from a fuel tank. When the engine stops running, feather the propeller, switch off the ignition, operate the idle cutoff, and land at the nearest airfield.

Oil and Hydraulic-Fluid Fires

Modern engine oils have a low flash point, so a self-induced oil fire is very unlikely. A serious fuel fire could lead to an oil fire, however, and the latter may persist after all the fuel has been burned—in fact, for as long as the engine continues to turn and pump oil. How can you tell what is stoking the fire? If it's an oil fire, it will be accompanied by a profusion of thick, black smoke.

Many light singles and twins have electric flap and gear-extension systems, but some use a hydraulic circuit, usually powered by an engine-driven pump. When for any reason hydraulic fluid leaks into the engine bay, there is a fire risk. Again, such a fire would probably result from a fuel fire that might burn through a hose feeding the pump or through the pressure line from the pump to the circuit. And like the oil fire, a hydraulic-fluid fire will continue burning as long as a rotating engine pump feeds the flames.

Dealing with an oil or a hydraulic-fluid fire: Whatever the prime cause of the fire, the main object is to prevent the continued pumping of oil or hydraulic fluid by stopping rotation of the engine.

In cases where fire has started as a result of fuel leaks, the original cause must first be brought under control, as previously explained. When the engine stops running, the oil or hydraulic-fluid fire should be dealt with by stopping rotation of the engine thus:

- Multi-engine aircraft: Feather the affected propeller.
- Single-engine aircraft: Select maximum coarse propeller pitch or, with fixed-pitch propellers, reduce gliding speed until the prop stops turning (altitude permitting).

Once the flames have been put out, *never attempt to restart an engine that has been on fire.*

Electrical Fires

The widespread use of "pop-out" overload circuit breakers and/or fuses, together with modern cables and components, has greatly reduced the risk of fires due to electrical causes. Fortunately, an electrical fire usually gives prior warning: the smell of burning insulation is quite unmistakable.

Since prevention is better than cure, these actions are recommended as soon as a smell of cooking wires becomes apparent:

- Examine the circuit breakers. If one has popped, this will point to the likely cause. If all are in place, then—
- Turn off the master switch.
- Turn off all electrical switches (other than the ignition).
- Select master switch "on," then turn on each circuit required for the flight (e.g., radio com, radio nav, anti-collision beacon, etc.), allowing sufficient time for overheating to occur before adding another load. In this way the faulty circuit will be identified and isolated.

Cabin Fires

Other than fires that have spread from the engine bay, or those of electrical origin, cabin fires in light aircraft are almost invariably the result of careless smoking.

There are always those who cannot pass a moment of the day without a cigarette, and to this type of person No Smoking signs in aircraft are there to be ignored. But when such signs exist, you can take it for certain they have been put there for a very good reason. Even when the plane is cleared for smoking, this is not an open invitation to pilot or passengers to flick ash everywhere or balance a lighted cigarette stub on the edge of an ashtray.

In the event of cabin fire, it takes very little smoke to fill the cabin of even the larger light multi-engine aircraft, and pilots should resist the temptation to open the windows on the flight deck until the cabin fire has been brought under control. Often such action will induce a reverse flow of air within the fuselage, bringing with it smoke for the benefit of the crew. They will have enough on their hands without going IFR on the flight deck.

Fire Extinguishers

Some light aircraft carry a hand-operated fire extinguisher held in a

quick-release mounting. Most modern extinguishers are nontoxic, but they can be relied upon to foul the atmosphere in the cabin when used. To clear the air, vents and windows can be opened as soon as the fire is under control.

Extinguishers should never be used on electrical fires. When wires or other components continue to smoulder, they are best dealt with by smothering them with a rag—or, if need be, your best handkerchief.

If your plane has a fire extinguisher (and carrying one is a good idea), never take it for granted. Always include it in your preflight check, not only to ensure that it is safely stowed, but also to confirm its pressure. (It will have either a small pressure gauge or a pressure pin.)

It is perhaps a measure of the unlikelihood of fire in modern lightplanes that an engine bay extinguisher system is rarely fitted to a single- or twin-engine aircraft. Such systems, where they exist, usually incorporate a red fire warning light and fire extinguisher buttons that activate a methyl bromide spray directed to vulnerable parts of the engine. There is often an inertia switch to set off the system should the pilot be prevented by injury from operating the extinguisher buttons.

Summary

It is fair to say that because of attention to detail and good design, the modern lightplane is very unlikely to catch fire. But when fire does occur and fuel is the cause, the first action must be to stop further fuel supply to the engine bay, then allow the fire to burn itself out before you switch off the ignition.

Oil or hydraulic-fluid fires, which may result from a fuel fire, can be recognized by the smoke, and in these cases rotation of the engine must be stopped as soon as possible.

All engine fires must be contained in front of the firewall by flying or gliding ahead, but—whatever the circumstances—never restart an engine that has been on fire.

Electrical fires give prior warning via a smell of overheating insulation. The load must be shed and reintroduced in stages, allowing the faulty circuit to reheat and identify itself, when a clue to the problem cannot be found among the fuses.

Cabin fires are usually the result of careless smokers—some of them pilots.

If your aircraft has a fire extinguisher, you should know how to use it and check it before flight. When flames enter the cabin is no time to read the instructions—or to discover that there's no pressure anyway.

Finally, always be on the alert for the abnormal. That strong smell of fuel in an aircraft that is usually fresh as a daisy could mean a leak in the system. And fuel leaks were never a pilot's best friend. □