THE INS AND OUTS OF CANOPIES

Giving Emergencies a Little Thought

By BUDD DAVISSON

Interesting thoughts enter your mind when boring a hole through the sky.

This time it was on the backside of an east coast cold front in the middle of January. The visibility had to be 100 miles and check points were lined up out front like fence posts. A real no-brainer cross country. The snowmobile suit and ski gloves were keeping all the important stuff warm, so, after sucking in all the visual delights to be had, the inside of the airplane began to get a little attention. In this case it was the "snugger than a bug" cockpit of a Pitts S-2A.

The single place canopy fit nice and tight and it was a marvel the way it kept the cold air out and the almost-as-cold air in. OAT was -10° F! Then a thought flashed across the brain cells and a glove fist came up and bumped against the inside of the canopy at the top. It was solid. It was so solid, in fact, that it was obvious if it ever became necessary to break it with a bare fist, it couldn't be done. No way!

Then a bunch of scenarios formulated themselves: The engine quits and a near perfect forced landing puts the airplane in the trees, right side up, no damage to the sole occupant. But the canopy rails are jammed. Said occupant is fresh-frozen by the time the search party zeros in on the ELT.

Second scenario: The engine quits on takeoff, the little bird streaks off the end of the runway, skidding to a halt as it flattens a bunch of street signs on Airport Road. One of the signs stabs the fuel tank. The rails are jammed again and the occupant is toasted by the time the people watching the accident run the length of the runway.

Same scenario, but this time the pilot is knocked unconscious and the rails are not jammed. The canopy would easily slide open. Two little old ladies and a kid come running up to the side of the airplane while it is sitting on Airport Rd. but they can't figure out how to open the canopy.

More likely scenario: The engine quits while on cross country over Pennsylvania/Arizona/Florida or any place else in the world where there are open areas bigger than a city block on a side. No one sees you crash land, even though there are lots of houses and civilization within sight. The land where the airplane lands is rural enough, no one is around. There you sit; trapped in your own airplane. This could happen practically anywhere. Within sight of New York City, for instance, there are miles of territory where an airplane could go down and not be found for weeks. If ever.

> "A totally different problem exists if the canopy is jammed or the airplane is upside down."

Grisly thoughts? Absolutely. Realistic? Absolutely! Bad things can happen and any pilot flying an airplane with a canopy should give some thought as to how that canopy is going to affect him/her in an emergency. The two basic concerns are: how fast can the pilot get out and is it possible for other folks to get in if he needs help.

Canopies aren't supposed to be traps, but to keep them from having all the ingredients of one, it is important they be easy to open from the inside in all situations. It is just as important that a spectator or rescue crew member be able to easily get in from the outside. It is with the latter in mind that the military plasters rescue instructions all over the outside of their airplanes.

When thinking about canopies and emergency situations there are several possible variations:

- Canopy works fine but pilot is knocked out so someone else has to know how to open canopy from the outside;
- Canopy is jammed, but pilot is okay and needs method of getting out;
- Canopy is jammed, but pilot is knocked out so outsiders need a method of getting in to save him.

First, let's talk about canopies in general. Forget about what kind of canopy it is since it doesn't make any difference whether it is sliding, side-opening, clam-shell or what. The only thing that counts is how it locks and how simple that locking method operates.

Obviously, the simpler the locks, the better. The ideal situation is one where the locking is done with a single mechanical action that can be operated from either inside or outside the cockpit. For instance, if it is a center mounted, over center lock, there should be an external lever that both locks and unlocks it. If it is a cable operated side lock, the lock should extend through the side, so the locked canopy can be opened from the outside.

Almost every canopy is locked in several different places in an effort to make it secure and weather proof. Unfortunately, it isn't unusual to see a canopy in which each one of those locks is operated separately, i.e., there

may be a latch on each side of a sliding canopy and the pilot has to unlock each separately. The extra motions required would not only slow the pilot in getting out, but would make it practically impossible for someone standing on the outside to figure out how to get into the airplane in a hurry. And in an emergency, seconds count.

Right now someone out there is saying something about security . . . they don't want someone to be able to get into their airplane. There are lots of airplanes with clever little locking systems that are specifically designed to make it difficult for avionics thieves to ply their trade. That's understandable. It's an unfortunate fact of life that we sometimes feel as if we're living behind enemy lines and can't trust anyone. But, we have to ask ourselves whether we're so afraid of losing our avionics that we are inadvertently making our canopy into a clever trap designed specifically to snare us at the worst possible moment.

If security is a problem, make the security system something entirely separate from the primary locking mechanism. Nothing will keep a determined avionics thief out of your airplane. If he wants in badly enough, a $3 crowbar is the pefect airplane opener. Hopefully, however, by using some sort of key lock, or even a garden variety pad lock, they will be slowed down enough they will leave rather than be discovered.

The canopy should be designed as if the pilot assumes he will eventually be totally dependent on the aforementioned two ladies in wrinkled socks to save his skin. The pilot has to assume whomever comes to his rescue will know nothing about aviation and will have absolutely no tools. The way into the canopy has to be easy to understand and easy to operate. Even if the fire department or rescue team shows up, some effort should be made to lead them by their noses so they know the best way to help the pilot.

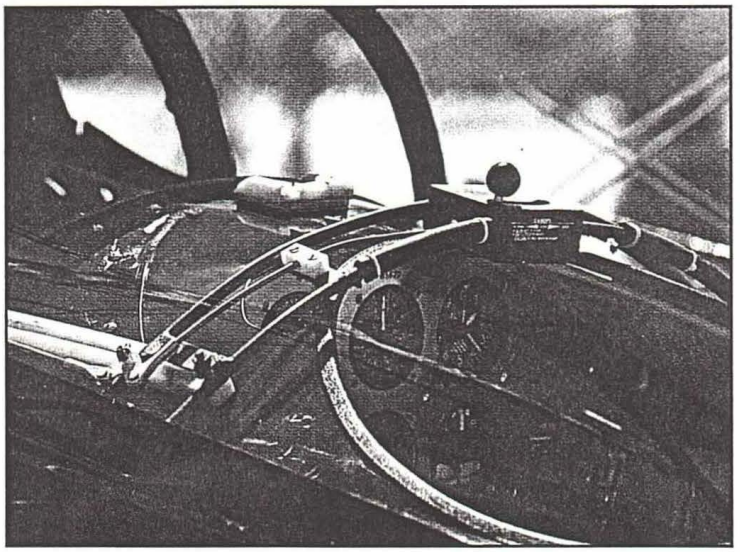
Although pilots would probably balk at painting rescue arrows and placards on their airplanes, maybe they should ask themselves whether they aren't a good idea after all. A well placed red arrow with a short placard may be a visual distraction, but like we used to say about roll bars on street rods . . . they look ugly until you're upside down. Then they are positively beautiful. A simple "Push Here to Open" or a dashed panel proclaiming "Cut Here for Canopy Release" could spell the critical difference.

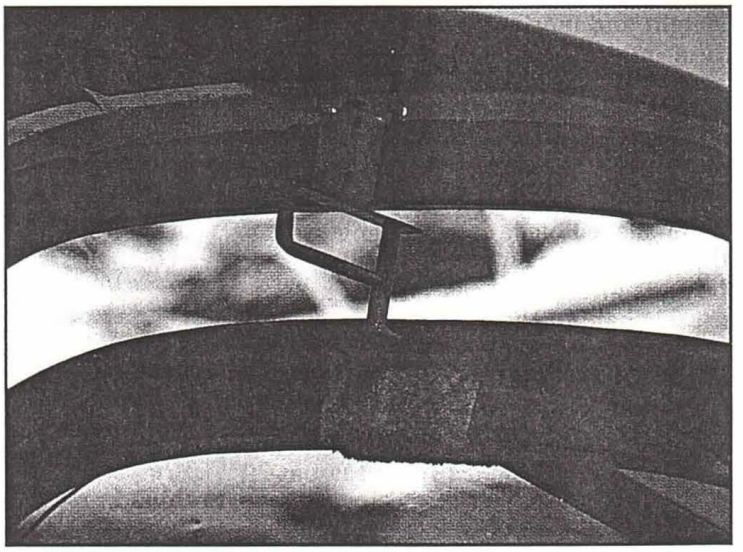
And this doesn't just apply to canopies. There was an accident a few years ago where the rescue team took the time to cut the belts and harness off the pilot because they had never before seen the type of belt buckle being used and didn't want to take the time to figure it out . . . it was the normal over-center military buckle. A short "pull to open" flag attached to the handle would have gotten the pilot out a few seconds earlier.

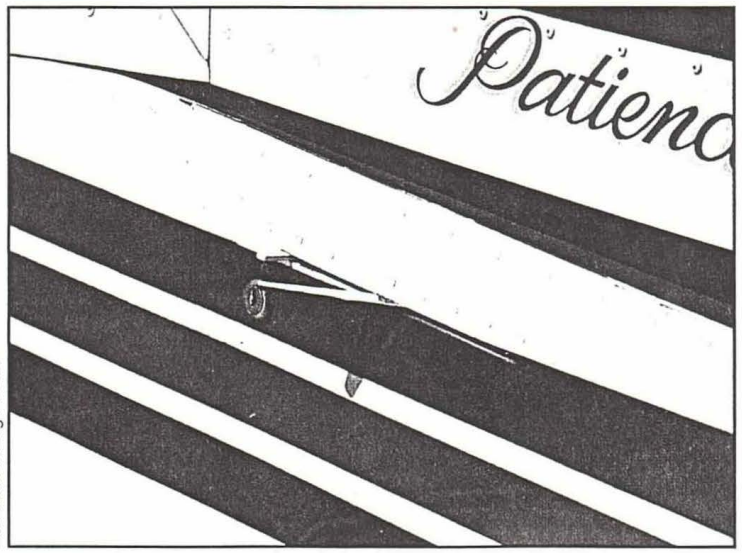
A totally different problem exists if the canopy is jammed or the airplane is upside down. In that situation the pilot is, obviously, in a much more serious situation.

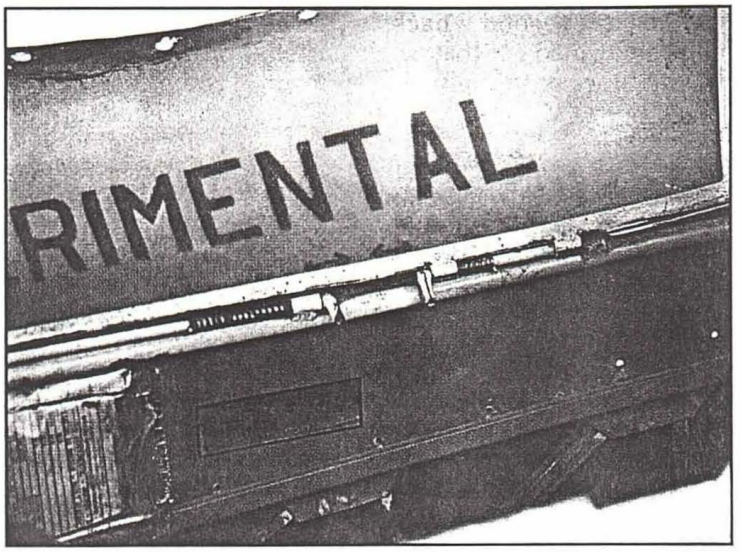
Think about being inside a Plexiglas™ bubble. No matter how thin it is, the pilot is on the tension side and, short of laying down on his back and using his feet, there is no way he can summon enough strength to break it. Even using his feet, the best he can

Various latching mechanisms seen on homebuilts at some EAA fly-ins.









Ken Lichtenberg Photos

hope for is to break the entire panel out of the frame. No easy task. Think about a Pitts canopy, or RV-6, Venture, etc. Every one of their canopies would just laugh, if the pilot made an effort to break it with his fist.

If there is even the slightest crack in the canopy, however, a pilot has it made in the shade. As we've all found out in one kind of expensive experience or another, once a canopy starts to crack, stopping it is the problem, not starting it. But, in an accident, we can't count on a canopy cracking and letting us finish the process. In fact, many canopies are thin and flexible, so they may not crack in any but the most serious accidents.

The goal is to find a way to create a crack. Once it is started, the pilot can work it like a chick breaking out of an egg.

Plexiglas™ doesn't like point impacts. Hit it with a pointed object hard enough and that crack we so desperately need will magically appear. Even in that case, however, the going won't be easy. A canopy as thick as that on a Venture, for instance, would probably ignore a pilot who was banging on it with something like a screwdriver. Whatever is used has to have enough weight and inertia that the momentum makes up for the lack of swinging space within the cockpit.

The military used to have canopy breakers secured to the side of the cockpit. They were nothing more than small, cast iron dumbbells with knife-shaped blades terminating in a dull point. They weighed about two pounds and once they got enough muscle behind them they were supposed to crack a thick military canopy. There are lots of reports about them not being able to cut the mustard. Of course, those canopies were nearly 1/4" thick or more.

The canopies we're used to all run in the .100" to .187" range and, while they wouldn't necessarily split like melons, a few good whacks with the right tool would get that crack started. What are we carrying in our cockpits right now that would qualify as "the right tool"? Nothing!

Nothing we normally carry will do the job. A screwdriver won't cut it. It is too light for penetration, although a big one might work as a pry bar to get the canopy slid back. There isn't a flashlight in the world that, when used in battering ram mode, could make a canopy do anything other than laugh. Something is needed that has a point and weighs at least one pound.

Rather than going out and turning over rocks looking for the exact tool, remember your homebuilders roots. If you can build an airplane, you should be able to build a sharp, pointy thing of some kind. How about cutting the bottom eight inches off a crow bar? Grind the edges sharp and tape the shaft for good grip. It's heavy enough. And, with the edges sharpened, it should be able to concentrate the blows on a tiny area to promote cracking. With the blade being wide and thin it could even work as a crow bar (what a unique thought) to wedge the canopy open. It's also cheap enough.

Same thing could be done with a piece of 1" cold roll steel and an hour on the bench grinder. Grind one end to a short, flat, pointed blade shape. Or maybe modify a tire iron. Or grind up a piece of half inch plate steel and tape the handle end. Or wedge a short piece of 4130 plate into a piece of tubing and pour it full of lead. Use your imagination.

"The hardest part of getting set up for getting out of an airplane in an emergency is changing the pilot's mind set."

Beauty isn't important. Weight, strength and the ability to conveniently stow it on board is.

It's probably not such a good idea to think in terms of a small hatchet although a sheet rock hammer or a geologist's pick sure looks inviting. All of those need swinging room and, in the best of situations, that kind of room is usually not available in the small cockpits most of us live in. A knife or chisel-like instrument moves in a linear fashion, so it is easier to get an arm behind it in cramped quarters and build up speed. Its weight and inertia will take care of the rest.

Up to this point, we've been talking about getting out through the canopy. If the airplane is on its back, the canopy may or may not offer a way out, even if it is broken. Then it's time to look elsewhere in the airplane for a way out.

A composite airplane is obviously the easiest one to get out of. The same tool we fashioned to split a canopy would whack its way through a glass fuselage fairly easily. Another possibility is to make something similar to a key-hole saw out of an old cross cut saw blade. Another idea might be to grind a saw tooth pattern in the edge of a short, heavy butcher knife. The canopy tool would open a hole and the saw would start in the hole. A minute of frantic sawing could remove a sizable piece of airplane.

Aluminum airplanes need some hacking and bashing ability. The canopy tool would certainly do that, although some upholstery panels would have to be ripped out of the way first. Just think of the canopy tool as a handheld battering ram and flail away.

Rag and tube airplanes have several possibilities. The canopy tool would make hash out of the fabric and stringers, but often the open areas of the tubing trusses are too small to wiggle through. Also, there is always the possibility in something like a Pitts or similar small sized airplane, that the pilot may be pinned in position and can't do much wiggling. The ideal thing there may be a hack saw.

As dumb as it sounds, a 32 tooth hacksaw blade with fuel line jammed over one end as a handle, could easily cut a tubing airplane completely in half with only four to six cuts. Removing a diagonal or vertical to make a bigger hole would take only two cuts and a couple of minutes because a piece of 3/4" x .035" can be eaten by a hacksaw in less than 60 seconds. That's why a lot of Pitts pilots, for instance, keep a hacksaw blade taped to the back of one of the verticals where it can always be reached.

It is important that emergency tools be stowed correctly. Among other things, they have to be mounted up where they can be reached by a pilot pinned in his seat. That means within an arm's reach. An escape tool stowed in the baggage compartment might as well be left home. They also have to be secured tightly so they won't fly around the cockpit during the accident. At the same time, however, the mounting system has to be of the quick release variety so the tool would be ready for use with a minimum of motion. Pip pins would work well in that situation.

The hardest part of getting set up for getting out of an airplane in an emergency is changing the pilot's mind set. That "... it won't happen to me" syndrome is hard to overcome. But, it can happen. Getting prepared is a matter of a few hours work and, when balanced against a life, that seems like a good investment. ◆