



BRS: SAVING LIVES ONE PULL AT A TIME

THE DATA IS IN: WHOLE AIRPLANE
RECOVERY SYSTEMS ARE
HELPING PILOTS STAY ALIVE,
DESPITE THE NAYSAYERS.

BY GRANT OPPERMAN

Some things you just can't understand unless you were there. So, it's fitting that a pair of crash survivors are most responsible for one of the most notable and controversial recent aviation safety innovations. They were there.

The first, Boris Popov, had his day of motorboat-towed hang gliding over Lake Owasso, Minnesota, go topsy-turvy after the boat driver misread his hand signal to slow down as "go faster." In the blur that followed — sudden acceleration, wild pitching, wing collapsing and a tumbling fall of several hundred feet, unable to disengage, unable to even move due to the G-forces — Popov could only think how stupid it was that no one had invented a parachute for this kind of situation. A fast-deploying, ballistic chute might be able to pull the sky back right side up and slow his fall to a survivable speed.

These thoughts rushed through his mind in the 15 seconds or so before he crashed and died. Except that he didn't die that day, entering the water in a sideways fetal position so that a few lost fillings were the worst of his injuries.

Necessity, meet the father of invention: Boris Popov, founder of BRS Aerospace and developer of the whole-airplane recovery parachute system (WARPS).

Eight years later and about 300 miles to the southeast, a young Alan Klapmeier was making a climbing, departure turn to the southeast from Runway 36 at an airport in Prairie du Sac, Wisconsin, when he heard the crunch of an unseen Piper Vagabond smashing into his plane, tearing away 3 feet of the left wing and much of the retractable Cessna 182's right aileron. Klapmeier had been wearing an instrument hood, and his instructor didn't see the other plane in the late afternoon sun. Again, time blurred: Fight the forces, full left controls and pull off an improbably successful emergency landing. The Piper pilot was killed as his plane lost control and crashed.

Not long after, Klapmeier decided

he had to adapt Popov's new ultralight parachute for the certified aircraft that he and his brother hoped to develop from their fledgling kitplane company.

"I made a promise that when we manufactured aircraft, we'd have a parachute recovery system," Klapmeier told a reporter in 2004. "People don't have to die."

You can argue whether the WARP systems that emerged from these two nightmares (Cirrus calls its CAPS, for the Cirrus Airframe Parachute System) represent a triumph of safety or marketing. "Real pilots don't need chutes" goes the reasoning of the anti-chutists, arguing that an airplane parachute system appeals to pilots with more disposable income than skill.

Then again, the naysayers weren't in the cockpit when events began to spiral out of control and the plane was going down. Would they have pulled that red lever and chosen to descend under canopy? Would they have saved the situation with their superior skills? Or might they have been another fatality in the National Transportation Safety Board's database?

Whether you believe chutes are hype or last hope, one thing you can't argue is their success. The system that emerged from Popov's and Klapmeier's nightmares has transformed general aviation. A chute has become standard equipment on the world's best-selling certified aircraft, made by Cirrus, as well as on the best-selling light-sport plane, Flight Design's CTLS. Aftermarket systems have been installed on Cessnas, Van's RVs and countless experimental aircraft. And more are coming on aircraft that are in the works, such as the Icon A5 amphibious sport aircraft, the Kestrel turboprop and Cirrus' Vision jet.

If you equate every deployment with saved lives, BRS claims 312 pilots and passengers survived by using their system; the Cirrus Owners and Pilots Association (COPA) counts 95 chute survivors in 46 Cirrus pulls. Some of those, no doubt, were aviation knuckleheads; others found themselves in an improbable, impossible

←
RANS AEROBATIC PILOT DINO MOLINE IN ARGENTINA WAS SAVED BY
HIS BRS SYSTEM IN 2010 AFTER LOSING PART OF HIS WING IN FLIGHT.

situation. But they all lived.

In fact, there has never been a pull within demonstrated parameters — below maneuvering speed and above a minimum height above ground level — that resulted in a fatality. That's a great success rate that compares favorably with outcomes for skilled, real pilots in loss of control, disorientation and systems failure emergencies. So, why does each new report of a parachute pull result in such controversy? Could the pilot have made a forced landing or regained control of the aircraft? Would a real pilot have saved the situation?

It turns out humans are notoriously bad at assessing risk and skill. Psychologists have documented a basic — and necessary — human bias toward overconfidence. In a notable 1981 study, professor Ola Svenson at Stockholm University found that 80 percent of all drivers rated themselves in the top 30 percent of driving ability. Even more troubling, the worse the driver was, the more likely that person was to overestimate his or her skill.

Later studies have confirmed Svenson's insight with similar findings for high school students reporting

their popularity and educators assessing their effectiveness. Another researcher, John Cannell, uncovered the statistical impossibility that every U.S. state had reported its educational test results as above average. Psychologists call this the Lake Wobegon Effect, after the fictional town where "all the children are above average."

Add to that a tendency to think better things will happen to you than another person in a similar situation, and you've got the ingredients for some cocksure and dangerous pilot attitudes.

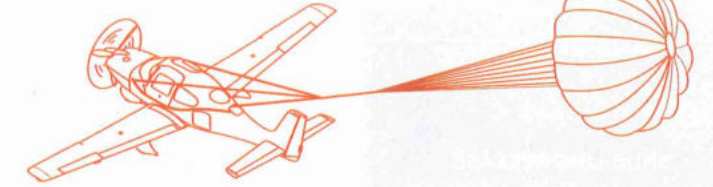
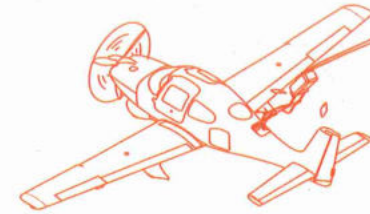
So, no doubt you're a real pilot with really superior skills. But how much better would you have performed than the person who pulled the chute? What if, in the moment, your inner Sullenberger failed you as links in the failure chain clanked together? If it turned out that your self-image was formed in Lake Wobegon, how much would you have given for the extra out of that big red handle on the ceiling?

Increasingly, the answer is "a lot." Earlier this year, a poll of Beechcraft owners on the popular BeechTalk online forum found nearly 60 percent who said they would buy a WARPS if it were offered on their aircraft. BRS'

1
ROCKET EXTRACTION
PARACHUTE EXTRACTION
2
LINE EXTENSION
INITIAL CANOPY INFLATION
REEFED PARACHUTE

Popov says his firm has commissioned research that shows owners would pay up to 15 percent of their plane's value to equip it with a parachute. Even in the light-sport segment, rates of acceptance are changing. Says Tom Peghiny, president of Flight Design USA: "There was initial push-back from our audience: Don't you believe in your airplane?" Now, he says, it turns out "our owners value their rear ends just the same as certified plane owners."

That emerging consensus reflects an awareness of the variety of situations that can lead to a deployment. The NTSB aviation accident database records the last moments of many Lake Wobegon pilots who at one time displayed satisfactory skill, judgment and knowledge to an FAA examiner. Over a



five-year period, eight spatial disorientation accidents resulted in fatalities; 55 engine failures resulted in a death. Also, there were 40 fuel management fatal accidents, 28 midair collisions, one vacuum failure, 89 VFR into instrument meteorological conditions, 78 approach accidents, five induction icings and 36 medical events. Even discounting low-to-the-ground accidents where a chute might not save, such as takeoff and landing accidents, that's 340 fatal accidents over five years.

A scan of these fatal accidents shows plenty of events in which a skilled pilot could have made a decision to solve the problem. A little carb heat might have been just the thing for that induction icing. Still, for these 340, the sad fact is the person in the left seat didn't do the right thing, or became overwhelmed or confused, or the bad luck just piled up.

Some pulls would be hard to argue against. For instance, on June 8, 2009, a Cirrus pilot was in cruise flight at 6,000 feet over Mount Airy, North Carolina, when he heard a loud bang from the engine, followed by violent vibrations and streaming oil across the windshield that eliminated all forward visibility. He pulled the chute on his SR22 and descended under canopy to a farmer's field, where he was able to exit the plane and phone emergency responders.

Might he have successfully dead-sticked to the field that day? Well, yes. But no honest pilot would take the odds of that blind, forced landing over a sure-thing ride down under the parachute.

Or take Dick McLaughlin, an Alabama physician who flies his Cirrus to Haiti monthly for volunteer medical missions. A commercial pilot

certificate holder and certified flight instructor with seaplane ratings and about 1,200 hours over open water, McLaughlin felt very confident flying the familiar route with his 25-year-old daughter, Elaine, aboard for the first time in January 2012.

Then, off the coast of Florida, beyond gliding distance from Andros Island, Bahamas, McLaughlin noticed his oil pressure falling and radioed his situation. "They asked me, 'Do you want to declare an emergency?' It was almost as if I was reminding myself as I said it," he remembers. "Yes, I do have

back and looked at the crash history for water landings. "Ninety percent of pilots live through the hit, and 10 percent [of those pilots] drown. The rates under a chute are 100 percent. I could have flown the plane all the way into the crash, and you would have felt better. But would I be here?"

Further, McLaughlin says it surprised him how much his skill deteriorated in an actual emergency. Controllers asked him for his latitude and longitude coordinates, which were displayed on the default page of his Avidyne R9 multifunction display.

HOW MUCH BETTER WOULD YOU HAVE PERFORMED THAN THE PERSON WHO PULLED THE CHUTE?

a parachute.' That wasn't at the top of my mind until I said it. Then, it was the only thing in my mind."

From there, the story played out more or less according to script: Complete loss of oil pressure, engine stoppage, chute pull, hard splash-down, evacuation to a life raft and Coast Guard rescue. "The plane got saltwater soaked, and we lived. What could have been a better outcome?" he says. But that's when the naysayers attacked, arguing that a real pilot could have performed a ditching and that somehow that would have been better. "It really crushed me, made me feel awful," McLaughlin says. So, he went

"That was a pretty simple request, and I really knew the answer. But I just got stuck. If I had more complex tasks than best rate of glide and heading, I don't think I could have done it."

Other pulls take place in more ambiguous circumstances. Pilots have pulled the red handle after misconfiguring avionics and subsequently becoming confused. They've proceeded VFR into IMC, flown through icing conditions, botched approaches and the whole list of "not a real pilot" activities that can so easily be applied in the aftermath of a tragedy. The difference between the parachute-equipped poor pilots and the general flying population is that they suffer mere grave embarrassment instead of the very real possibility of a grave.

Accidents have also demonstrated some limits: Go fast enough, and the chute will separate from the airframe. Pull too close to the ground, and it may not have time to deploy. But Popov advocates using the system



CIRRUS FLIER DICK MCLAUGHLIN HAS NO REGRETS ABOUT PULLING HIS CHUTE AFTER SUFFERING AN ENGINE LOSS WHILE FLYING OVER BAHAMIAN WATERS WITH HIS DAUGHTER IN 2012.

3
PARACHUTE DISREEF

4
SNUB LINE RELEASE

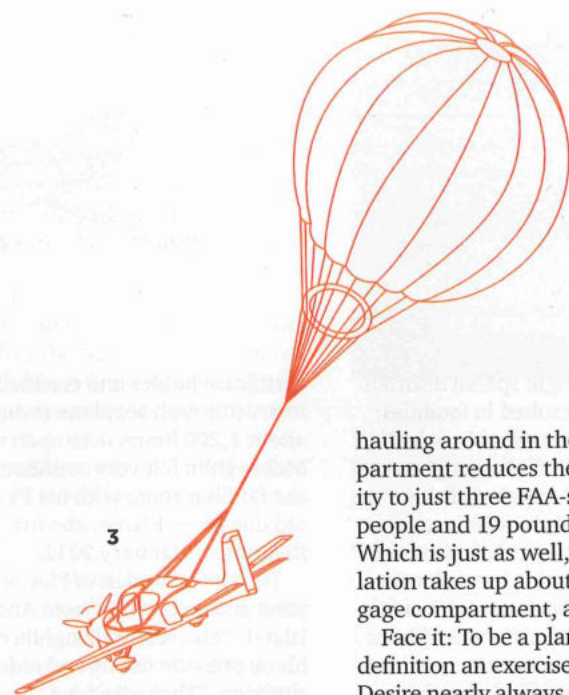
even outside of parameters as a last-gasp attempt. "The fact is, if you're headed toward some hangars or trees, what have you got to lose?" he says. "Here's our mantra: You deploy the parachute when you've lost control of the airplane and you don't feel you're capable of regaining it in time. There is no discussion about altitudes, speeds, minimums, reasons."

In considering the value of a chute, perhaps it's good to look to the actuaries. They value mathematical truth more than heroics. On this subject, their judgment seems unambiguous. In 2009, London Aviation Underwriters began waiving the deductible for claims in which a chute was deployed. They wanted to encourage pulls: It's cheaper to deal with a ruined fuselage than an estate. Since then, many of the other major aviation insurers have followed suit.

Likewise, the Cirrus community has begun to promote a philosophy of "pull early, pull often," a phrase that Cirrus Owners and Pilots Association safety Chairman Rick Beach coined after reviewing several cases in which indecision or a reluctance to deploy the parachute ended up costing the pilot his or her life.

By training pilots to think about — and drill — their parachute system the same way they would any other piece of equipment on the plane, Cirrus and COPA have created a dramatic change in that plane's accident rates. Since 2011, when Cirrus fatalities peaked at 33 deaths (at one point with three fatal crashes in a 24-hour period), chute pulls have steadily climbed, and fatalities have plummeted. Through mid-November 2014, in a fleet of nearly 6,000 planes flying about 1 million hours per year, there's been three fatal accidents. With training and awareness, pilots are pulling more and dying less.

Following the insurers' and Cirrus' logic, what's the harm in a pre-emptive pull, even if the situation might be salvageable? Pilots who have chosen to dead-stick a landing instead



of pulling the chute argue they were concerned about landing on an innocent bystander or descending into a building, since the path of the plane is all but random once it's under canopy.

After 15 years of data, there's never been a case of a chute descent injuring folks on the ground. The initial deployment draws a lot of attention, with the percussive bang of the rocket firing through the fuselage and the unfurling of a more-than-50-foot diameter, orange and white parachute. Then, the plane floats down at less than 20 knots — slow enough for those on the ground to move away.

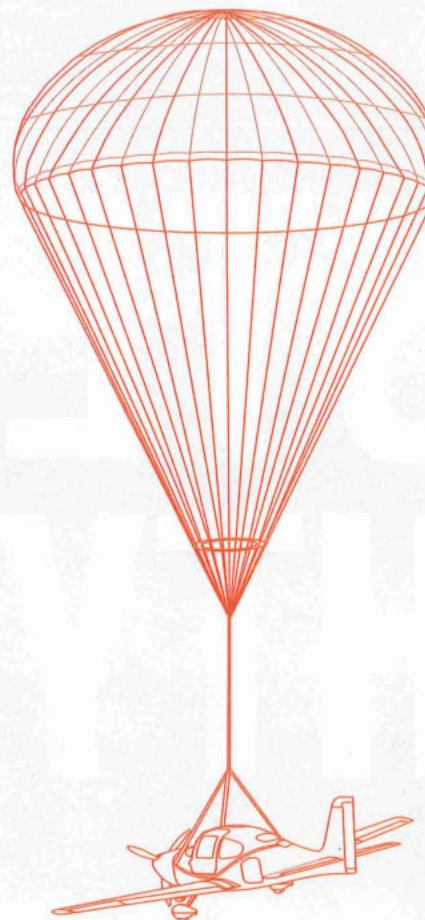
Given the success of Cirrus' CAPS system, why hasn't WARPS equipment

hauling around in the baggage compartment reduces the carrying capacity to just three FAA-standard-weight people and 19 pounds of extra stuff. Which is just as well, since the installation takes up about half of the baggage compartment, anyway.

Face it: To be a plane owner is by definition an exercise in compromise. Desire nearly always outpaces the pocketbook. In a world of flat-panel displays, noise-canceling headsets, and downlinked satellite radio and weather, that parachute system that most likely you'll never use is a pretty unsexy allocation of flying dollars.

In the Skyhawk, a BRS system costs \$13,499 plus cost of installation. Then, every 10 years there's a required inspection and repack of the chute at \$4,500. That's equivalent to a whole lot of avgas.

That said, the owner of N759ZS, one of the handful of Cessna owners to have a BRS parachute system installed, was pleased to have made that trade-off when his engine quit shortly after takeoff from Holly Springs, Missouri, and he successfully pulled



to maintain directional control during takeoffs and landings. Those accidents wouldn't be appropriate for a BRS pull, and they've typically resulted in little more than bent airframes and bruised egos. A chute likely wouldn't have changed the outcome in the sole Flight Design fatality, a 2013 landing accident in New Mexico.

Still, it's interesting to note that 11 Flight Design pilots have successfully made forced landings in Flight Design aircraft, opting for a farmer's field over a parachute descent; there have been no fatalities resulting from unsuccessful dead-stick landing attempts. It's a tough comparison: At about 40 percent of an SR22's weight and a stall speed just over half that of the Cirrus, there's a lot less energy feeding into a Flight Design forced landing.

It will be interesting to see how that comparison works the other way around. If the Cirrus Vision jet ships to customers in 2015 as currently intended, it will provide an opportunity to show how a chute system adds value to larger, faster aircraft. Prior to the 2008 recession and aviation retrenchment, BRS had planned products not just for the Cirrus jet but also for


then-proposed turbine planes.

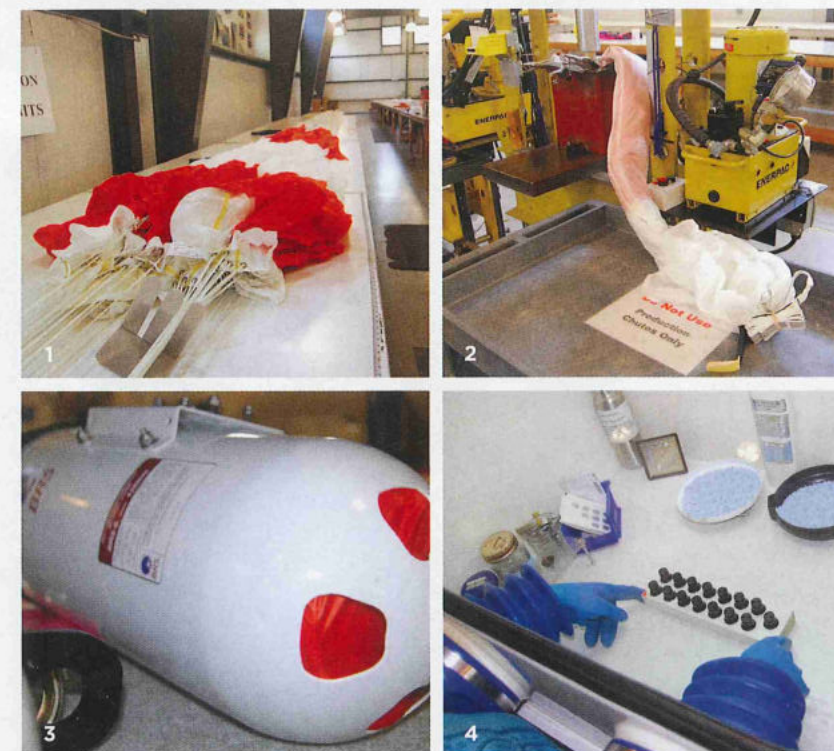
In these applications, BRS tested a two-stage chute that would be applicable to planes in the 5,000 to 8,000 pounds mean takeoff weight range and at cruise speeds up to 350 knots. An initial drogue chute would slow aircraft in this category to 175 knots or less. Then, a second chute would bring airspeed to zero and manage the actual descent.

How the idea of whole-airframe parachutes scales to larger planes and applies to the existing designs remains to be seen. One thing is clear, though: The debate over the effectiveness of airframe parachutes is over. When *Flying* first wrote about the controversy in 2004, there had been only four pulls in certified aircraft. With such a small data sample, the Cirro-scenti, the Lake Wobegon pilots and the anti-chutists

were all entitled to their opinion.

Ten years and 42 more successful pulls later, it's awfully hard to argue against 100 percent success and 92 lives saved in Cirrus aircraft alone. In all, one in every 110 BRS chutes has been pulled over 34 years, from 29,000 systems sold. Popov says the ratio holds for all applications, from hang gliders to LSAs and the top-of-the-line SR22T. "We have a statistical solid fact, undisputable," he says. "That's a pretty startling number if you think about it. You put 110 pilots in a room and tell them, 'One of you is going to deploy a parachute.'"

In other words, think what you will of those pilots who choose to pull their chute in an emergency. But those people were there, in that situation, and you weren't. Then again, maybe someday you will be. 



1. THE PARACHUTE PACKING PROCESS IS A VERY PRECISE SCIENCE.
2. CHUTES ARE COMPRESSED DOWN TO A SMALL BRICK THROUGH THE APPLICATION OF EXTREME PRESSURE.
3. THERE ARE SEVERAL DIFFERENT BRS SYSTEMS; SOME COME IN NYLON PACKS WHILE OTHERS ARE CANISTERS, LIKE THIS ONE.
4. A TECHNICIAN INSERTS THE ROCKET FUEL INTO THE IGNITION MODULE.

WITH TRAINING AND AWARENESS, PILOTS ARE PULLING MORE AND DYING LESS.

caught on more in general aviation? As with so many flying decisions, the key factors seem to be size, weight and cost.

Consider the weight of an airframe chute system. Popov says a rough formula for the required chute is 1 square foot of material per pound of weight. As a result, his BRS WARPS installation on a Cessna 172 adds 79 pounds. On a brand-new Skyhawk with a 599-pound full-fuel payload, that last-chance safety feature you're

the chute and descended to a thicket of trees. He was injured in the landing after deploying the chute at only 300 to 400 feet above ground level.

In the United States, a Flight Design pilot has never deployed a parachute (there have been four overseas deployments, with three saves and five survivors), though examination of the accident history shows that, by far, the most common mishaps in that plane are hard landings and failure