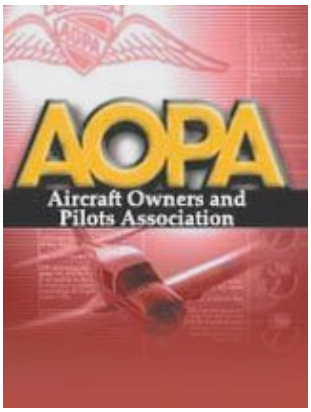


AOPA Forums (*http://forums.aopa.org/index.php*)
- **I was Wondering** (*http://forums.aopa.org/forumdisplay.php?f=4*)
- - **Cirrus SR2X fatal accident and parachute activation history**
(*http://forums.aopa.org/showthread.php?t=15102*)

sdbeach

09-05-2006 05:32

Cirrus SR2X fatal accident and parachute activation history

As a long-time Cirrus owner and AOPA volunteer, let me contribute some analysis of the accident history o the Cirrus SR2X fleet. The recent parachute deployment in the fatal accident off Eagle Creek airport near Indianapolis fueled lots of interest and discussion.

Cirrus Fatal Accident Rate

For the record, since 2001 there have been 19 fatal accidents in production Cirrus aircraft and 39 people ha perished. Way too many for lots of reasons worth examining, but the trend is changing (see below).

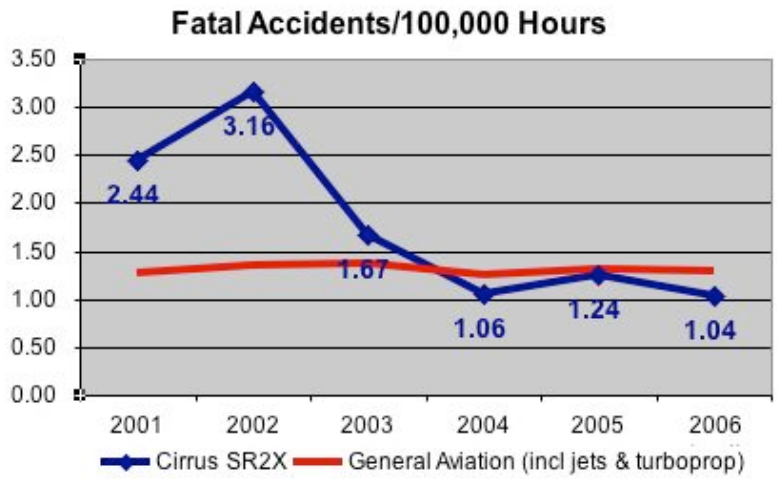
In the same time, there have been 9 CAPS parachute activations, in which 17 people have been saved and fatalities (included above).

After two fatal accidents within 5 days in January 2003, the Cirrus Owners and Pilots Association, Cirrus Design and our insurers focused on a concerted effort to improve pilot safety, training and decision making The COPA Critical Decision Making seminar, the Single Pilot Resource Management module at CPPP (Cirrus Pilot Proficiency Program), and the Cirrus Design CSIP (Cirrus Standardized Instructor Program) instructor designation all focus on risk management and decision making.

By that time in early 2003, there had been 6 fatal accidents in a fleet of less than 1,000 planes that had flown for less than 200,000 hours. That's 3 fatal accidents per 100,000 flying hours, almost triple the Gene Aviation rate around 1.3! :eek:

Since 2003, there have been 13 more fatal accidents while the fleet has grown to over 2,500 planes and th flying time expanded to approximately 1,400,000 flying hours. Now the overall accident rate is about 1.36 fatal accidents per 100,000 hours and the most recent annual rates are 1.06, 1.24 and 1.04 for 2004, 2005 and 2006 YTD respectively. Those rates are below the overall GA fatal accident rate that has hovered arou 1.3. (Curious, the Nall report claims a rate in 2004 of 1.2 but the Bureau of Transportation Statistics has higher rates.)

Here Is a chart that plots these rates. Note the initial bad news followed by a significant improvement tren following 2003.

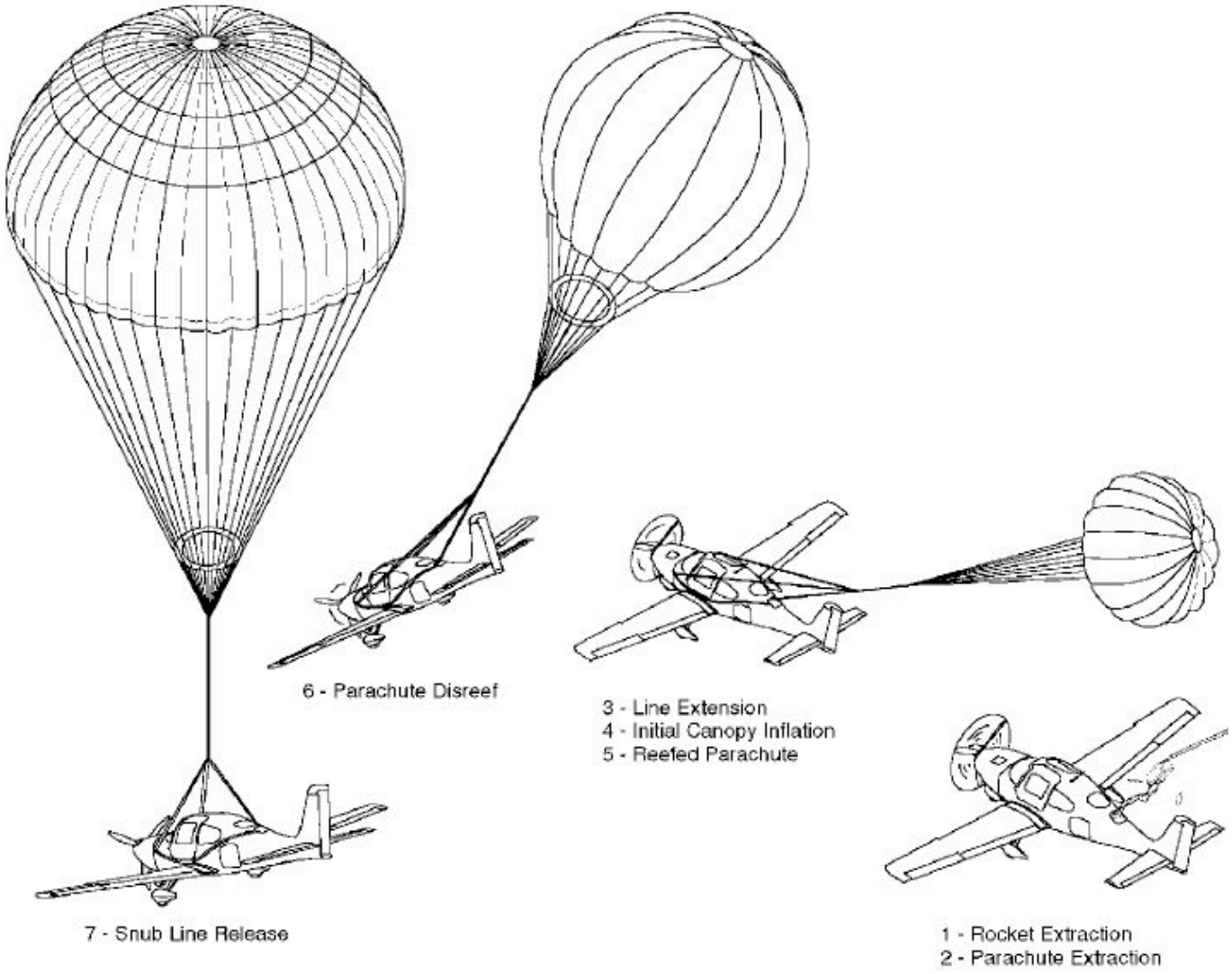


The trend encourages me that we have the right focus on risk management and decision-making to take better advantage of the safety features engineered into the airplane. However, as Cirrus Design grows by encouraging new people into aviation, seen by many as a "real good thing" but accompanied by significant challenges, we are not going to run out of new pilots with whom to address these issues. But, IMHO, the health of General Aviation needs the new blood and responses to the challenges.

CAPS Parachute Activation History

Following the Indianapolis parachute activation, many posts debated the merits and issues surrounding this unique emergency option.

CAPS stands for the Cirrus Airframe Parachute System and consists of a ballistic rocket-fired parachute tha extracts a large round parachute attached to the airframe. The rocket ensures that the parachute will deplo successfully despite the attitude of the airframe in flight, such as a spin or while inverted. The parachute inflates slowly and the risers are reefed to ensure a rapid transition to stable attitude under canopy. Tests demonstrate that within 8 seconds, all forward velocity is reduced to zero (relative to wind) and descent occurs at about 1700 fpm or 17 knots. The parachute deployment airspeed was demonstrated at Vpd of 13 knots. One CAPS deployment occurred successfully at higher speed, perhaps 190 knots, and one deploymer failed at speeds estimated at over 240 knots.



Here is a synopsis of all of the known 9 CAPS parachute activations. I summarize each deployment by yea location and injuries, then describe the factors that lead to the activation, the activation scenario, and the landing scenario.

CAPS pull #1, Oct 2002, Lewisville, TX, 1 uninjured
Factors: VFR departure after maintenance, aileron unhinged due maintenance error
Activation: low altitude, 1,500 feet VFR after maneuvering, first parachute deployment by pilot in a certifie production airplane
Landing: bushes near golf course

CAPS pull #2, April 2004, Lethbridge, AB, Canada, 4 uninjured
Factors: VFR night cruise, loss of control, possible autopilot-induced stall, night VFR over mountains, SR20 performance
Activation: high altitude, deployment upon loss of control
Landing: landed in scree in mountaneous terrain, skidded backwards 1/4-mile, helicopter extraction via parachute risers

CAPS pull #3, April 2004, Fort Lauderdale, FL, 1 uninjured
Factors: confusing instrument behavior, low IMC, departure climb, water in static system
Activation: low altitude, 700 feet IMC, prior to disorientation
Landing: landed in trees

CAPS pull #4, Sept 2004, Peters, CA, 2 uninjured

Factors: VFR climb, autopilot-induced stall, rolled inverted, attempted recovery
Activation: high altitude, activated CAPS in VMC before entering IMC above 10,000 feet
Landing: landed in walnut grove

CAPS pull #5, Feb 2005, Norden, CA, 1 fatality
Factors: IMC, pilot reported icing at 16,000 over Sierras, high speed descent well above Vne of 204 knots
Activation: uncertain if intentional activation or due to airframe stress in high speed descent, CAPS failed a
parachute found separated from airframe, located along track to crash site
Landing: high speed impact in mountainous area

CAPS pull #6, June 2005, Haverstraw, NY, 1 serious injury (compression fracture of vertabrae)
Factors: IFR on approach to KHPN, pilot incapacitated from brain seizure, loss of conciousness, awoke and recovered from Vne dive, determined numbness and loss of function in legs
Activation: low altitude, last radar report at 1,600 feet and 190 knots (well above Vpd of 133 knots)
Landing: water, bay of Hudson River

CAPS pull #7, Jan 2006, Childersburg, AL, 3 uninjured
Factors: IMC, severe icing, loss of control
Activation: high altitude, icing report at 9,000 feet IMC
Landing: flat terrain

CAPS pull #8, Feb 2006, Wagner, SD, 2 uninjured
Factors: IMC, shortly after takeoff, pilot disorientation
Activation: low altitude
Landing: flat terrain

CAPS pull #9, Aug 2006, Indianapolis, IN, 1 fatality, 3 serious injuries (spinal surgery)
Factors: IMC, pilot incapacitation, 2.5 miles from departure airport
Activation: low altitude, possibly first activation of CAPS by non-pilot, possibly not fully deployed
Landing: water, pond among residential housing

Don't just take my word for it. Review the NTSB database documents. Read the Nall report on aviation safety.

But just as we have made some advances in aviation safety through technology and training, so too do we need to make advances in our discussions about the circumstances and accident chains that lead to fatal accidents. Thanks for reading this far!

Cheers
Rick

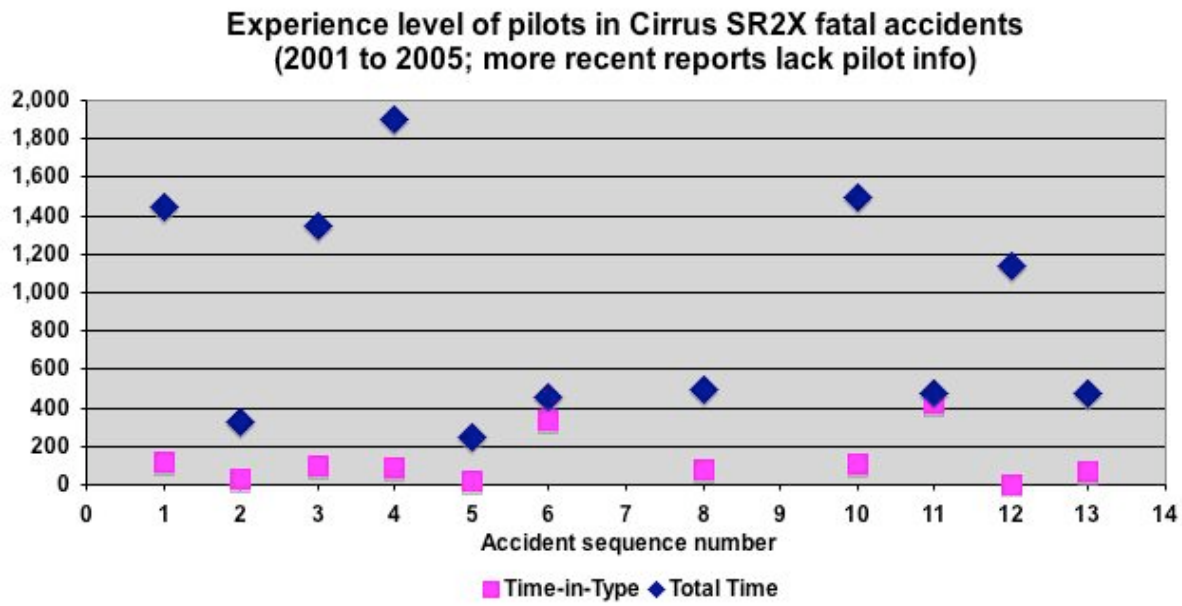
sdbeach 09-05-2006 11:40 PM

Re: Cirrus SR2X fatal accident and parachute activation history

Quote:

> *I would also be somewhat curious as to the experience level of the pilots involved.*

Me too! I had read the reports and transcribed the pilot experience but never really looked at your question -- until now.



These are the first 13 accidents that have NTSB factual reports that report pilot experience. Accident 7 occured in Spain and information was not presented. Accident 9 was a training accident, which we suspect was low total time and certainly less than 20 hours time-in-type.

No, it's not mainly rich folks buying a plane with 60 hours. Five of the fatal accident pilots have more 1,000 hours. Nine of them have more than 400 hours, well beyond the killing zone.

But look at the time-in-type -- is that the definition of the "killing zone" or what?! Only two of these accidents had more than 200 hours in a Cirrus! :eek:

As for who buys them, ask Cirrus Design. On COPA, there is such a wide variety of experience levels that it feels like everyone buys one! Certainly there are some owners who have bought a Cirrus and completed their primary flight training in it. I did my instrument training in mine. And just as certainly, there are retired airline captains and military flyers who share their wisdom frequently -- as we often demonstrate the need for it!

One wag on COPA noted that several of the accident pilots were successful in the building and construction trades. But clearly, the accident pilots are all over the map in terms of experience.

Just as clearly, pilot risk management and decision-making is the most critical accident factor.

Cheers
Rick

sdbeach

09-06-2006 12:10 AM

Re: Cirrus SR2X fatal accident and parachute activation history

Quote:

> Notice that during the first three years, 2001 to 2003, the Cirrus fatality rate did exceed the GA rate, and 2004 was the first year that the Cirrus rate was below the GA average. 2005 shoes only a slightly higher rate of 1.24 that is just 0.06 below the GA rate. One might argue that this trend is typical for other aircraft.

Actually, digging into the Nall report and the accident trend presented there, I learned a few things about NTSB, FAA and Bureau of Transporation Statistics (BTS). They all do things slightly differently, but they base their calculations on an annual survey of General Aviation flight hours.

So, the definition of "GA aircraft" becomes important. The total fatal accidents per 100,000 hours, the national average you mention and published by BTS, is quoted for all fixed wing general aviation aircraft. They use the FAA annual survey of flight hours for fixed wing aircraft. And that includes planes of all ages as well as single-engine piston, twin piston, turboprop and turbojet aircraft.

That means, the Cirrus accident rate is being compared to the overall general aviation fleet, including jets. Of the 24 million hours in fixed wing estimated in 2004, 15 million were single engine piston, 3 million in twin piston, 2 million in turboprop and 4 million in turbojets. Given the Nall report confirms that accident rates are substantially lower for twin, turboprop and turbojet categories, any single engine fleet that gets to the "national average" is dealing with a tough comparison.

Having said that, comparing Cirrus to similar fleets of new single-engine designs, like Columbia or Diamond, would be much more interesting. And I can guess much less favorable. However, I suspect that those fleets are substantially smaller, attract a different demographic of pilot, and may be used in different mission profiles.

Quote:

> *With four months remaining in 2006 and the winter months coming, the accident rates could increase again.*

Agreed. Extrapolation is foolish. And the winter months have more than half of the fatal accidents.

Quote:

> *Because Cirrus is such a young fleet, it's premature compare with existing aging aircraft that have millions of hours and years against the Cirrus fleet.*

That cuts both ways. The Cirrus fleet has reached the million-hour level and is flying about 500,000 hours per year. So the annual comparisions are getting to be more and more statistically reliable. On the other hand, the Nall report incidates that only 10% of fatal accidents have much to do with mechanical issues, whereas 78% of fatal accidents involved pilot action or inaction. Doesn't seem to matter much what pilots fly, they find ways to kill the airplane.

Cheers
Rick

sdbeach

09-06-2006 12:16 AM

Re: Cirrus SR2X fatal accident and parachute activation history

Quote:

> *Here's a final thought. So let's say in the case of all of the BRS deployments, BRS had not been an option. Well, I suggest we would have had a bunch more fatal accidents where the "aircraft crashed under unknown circumstances." The difference in some of these cases with BRS is that we can now learn more precisely what happened and develop training, skill development and*

> *decision making programs to address root causes.*

A thought credited to Mike Busch, the safety investigator at Cirrus Design (and not the Avweb guy), who observed very early in the design of the Cirrus parachute system that the parachute system would provide them with new problems to solve.

That is, with a living accident pilot to interview and explore the flight scenario they would learn a whole bunch more about those accidents. Two examples are the autopilot-induced stall scenario and the water-in-static line scenario. As Tom described, these insights have helped other pilots avoid troublesome situations.

Cheers
Rick

sdbeach

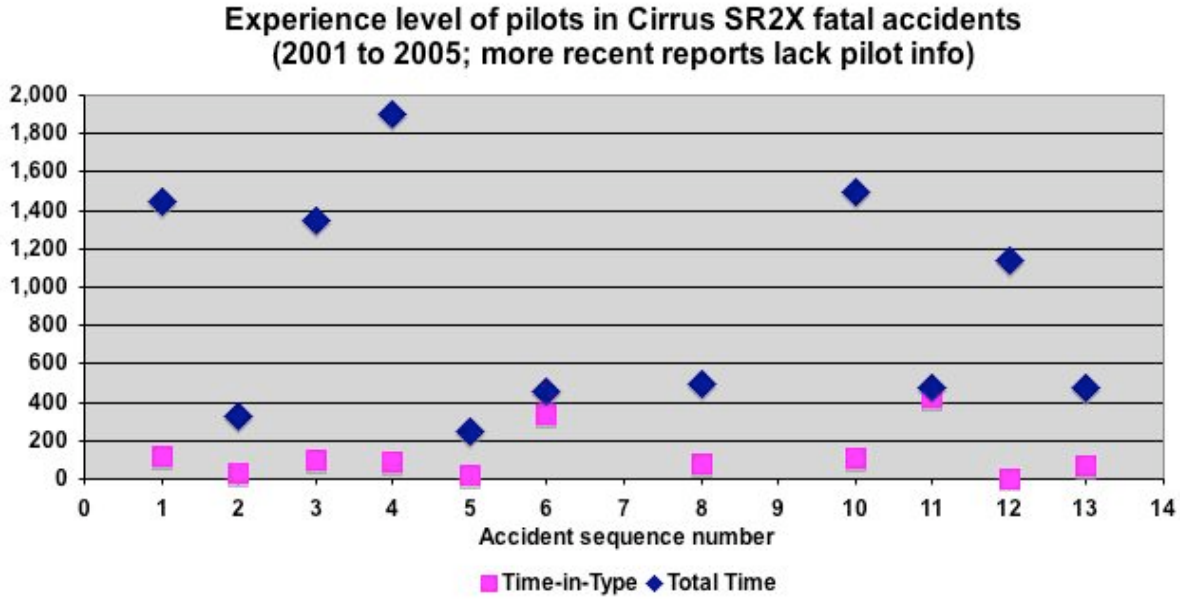
09-06-2006 12:25 AM

Re: Cirrus SR2X fatal accident and parachute activation history

Quote:

> *The statistics and the accident reports, particularly early on in the model history suggest a pattern of poor decision making by pilots at a much higher than industry rate. Part of that is due to marketing the plane to non-pilots, a channel Cirrus has been able to effectively sell into.*

Your claim was part of the reason that I went back and charted the experience level of Cirrus fatal accident pilots.



While Cirrus Design has been successful marketing to non-pilots, most of the accidents happen with more experienced pilots. Not all, but most. Without looking at it, I might have agreed with your speculation, but the data is compelling. Most of these pilots had several hundred hours in other planes.

Pilots are killing airplanes.

Quote:

> The other thing is all the electronics and "advanced" systems on the plane have lulled some into the false belief that the plane is more capable than it is. The SR22 for example, is fast and comfortable. But it won't carry more, and it can't fly anywhere or any weather that my 40 year-old Cherokee can't also fly, even though it takes me longer to get there. It has the same limitations really.

Really! :eek:

However, it gets worse. Several of the accident pilots behaved as if they were flying that 40-year old Cherokee -- scud running, not talking to ATC, not planning for crossing several weather systems, etc. So, the extra capability of a long-distance traveller exposed these pilots to risks that they were ill-prepared to handle. That's why our focus was on risk management and decision-making.

Cheers
Rick

sdbeach

09-07-2006 08:16 AM

Re: Cirrus SR2X fatal accident and parachute activation history

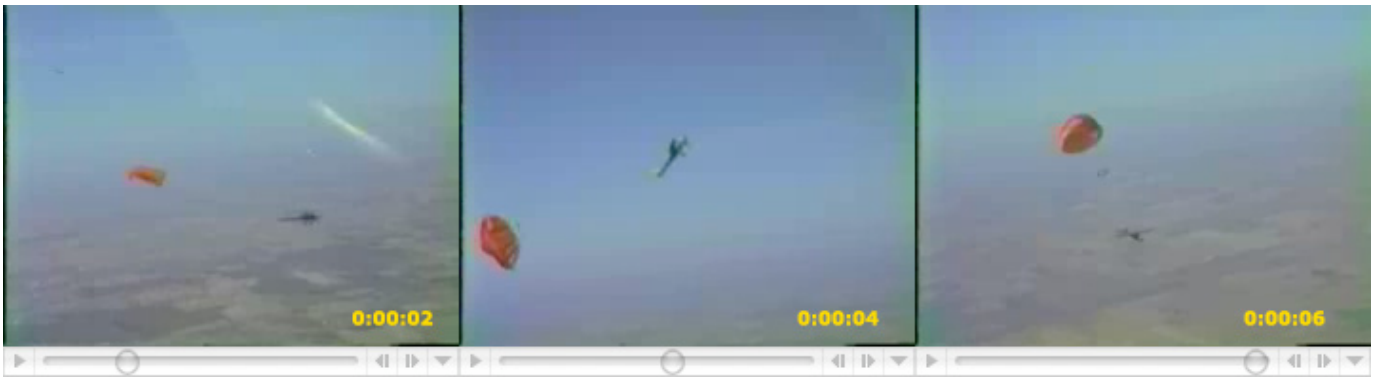
Quote:

> *What did you think of using the chute for last minute use in the horizontile plane as energy absoption?*

Last minute use of the Cirrus parachute is problematic for a bunch of reasons. Again, it's the physics of the thing. But I could talk myself into it (see below). First, the problems.

1) Altitude gain may slam you down

If you are going fast and activate the parachute, then you may encounter a pendulum effect. Because the rocket takes the parachute both up and behind the airplane, the deceleration may cause the plane to rotate upward. I did a set of frame grabs from a high-speed test done by BRS Parachutes in a Cessna 150 (but how high-speed could that be, eh?), that illustrate the effect:



Note that 4 seconds after activation the plane has gained altitude and that in the next 2 seconds dropped down with some significant negative vertical velocity. Over the tree tops, this might not be a bad thing, but closer to the ground or water, this might ruin your day.

Instead, note that the test videos show that by 8 seconds after activation, you have lost all forward

momentum and are stable in a vertical descent. I'd prefer a vertical descent into a forest, so would not wait to deploy. I'd take my chances with lower energy.

2) Forward velocity may be too high

If you wait to deploy in a descent, has your airspeed built up to exceed Vpd? In the high-speed parachute failure, the plane went from stall speed to over 240 knots, possibly higher, and apparently the parachute was found damaged consistent with high-speed forces. Did the pilot wait too long? If you are gaining speed, then don't wait.

3) Dragster effect not demonstrated

I like the concept of deceleration to zero within 8 seconds. One Cirrus runway accident involved sliding towards a building or wall at Compton airport. In that case, I would use the chute like a drag racer to slow my forward velocity before I hit something hard. But this has never been demonstrated before, so you are a test pilot! :cool:

To your question about over tree tops, would I pull the handle?

If I was low and slow over the trees when something bad happens, I'd pull.

If I was high and over trees, then I would deploy early and not wait.

If I was out of control, I would pull immediately.

Turns out that I routinely fly into an airport that is surrounded by forest. So my final approach is descending into the tree tops, just that they cut some of them to make a runway!

Ocean Ridge Airport (E55) on final approach with the low stratus rolling in

Cheers
Rick