Description of SZD-50-3 Canopy Opening and Shattering in Flight

On Saturday, August 15, 2015, student Nicholas Remmes prepared for his first flight in the Owl. I briefed Nicholas on speeds to fly, weight and balance, effectiveness and size of control services (and therefore risk of stalls and spins), and cockpit layout.

Nicholas completed the written pre-flight checklist with me observing. This included closing and latching the canopy.

Surface winds were 4 to 8 knots out of 180 to 200.

Nicholas flew all portions of the tow, including boxing the wake staring at 1,920' MSL (1,000' AGL). At approximately 1,700' AGL I took control and induced a mild slack line with bow to the right. Nicholas recovered. I induced a second mild slack line with bow to the left and Nicholas recovered. I then advised Nicholas I would induce a larger bow and induced a slack with the bow to the left. Nicholas took control and pressed right rudder pedal to recover from the slack line. The canopy swung up and open smashed against the right side of the fuselage. The sound of the shattering was as loud as an explosion. The canopy pounded against the fuselage in a loud rapid staccato.

At that moment we flew on a heading of 140° at 3,100' MSL (2,200' AGL) approximately 3 miles ESE of Stanton Airport.

Within the first two to four seconds: Nicholas pulled the tow release control. We both pulled the canopy closed. The nose rose 20 degrees above the horizon. I shouted (over the roar of the wind), "I have control! I have control!" while simultaneously moving the stick forward.

After visually confirming tow release, using the equal push of the wind on both sides of my face as a yaw string of sorts, I made a 30° angle-of bank turn toward the runway.

I stabilized the airspeed at 50 knots, determined the distance from the airport and my altitude, and calculated that the glider could safely return to the airport. A large chunk of Plexiglas sat in my lap and impaired the full range-of-motion of the controls. After unsuccessfully trying to stow it (it was too large and jagged), and rejecting throwing it from the glider, I asked Nicholas to reach over his shoulder and take it. Before handing it to him I considered the possibility of the wind sailing it back at me at 50 knots. I grasped it firmly and keeping it as low as possible, slid it forward and then up, and handed it to Nicholas.

I considered declaring an emergency or an urgency condition, but realized a normal and uneventful landing would occur if no other aircraft prevented our immediate pattern entry. Other than the tow plane there were no other aircraft in view, and the runway was empty.

I radioed (again shouting over the wind):

> *"Stanton air, this is glider nine-two-Mike-November. Our canopy shattered and we are returning to the airport. Please clear all aircraft out of the way. This is not an emergency. I repeat, this is not an emergency."*

I checked the sink rate (400 feet per minute), airspeed, and re-calculated that there was sufficient altitude to reach the runway. All control surfaces remained responsive and stable, and airspeed was easily maintained. I kept the airspeed at 50 knots to minimize the speed of the wind on my face. Fortunately, my glasses remained on. Having recently read a Tom Knauff article about canopies opening in flight, I was mindful of how driving wind causes tearing and reduces vision. To determine if it was safe to use the airbrakes in the pattern, I slowly opened them one-quarter way. There was no adverse impact from their use. I closed and locked them.

I entered the dogleg and turned to downwind midfield at about 1,000' AGL. I chose midfield to shorten the downwind leg and to keep available the option of a cross-wind landing. Balancing the optimum landing speed of 60 knots with the need to keep airspeed down to prevent my glasses from flying off, I increased airspeed to 58 knots. I went through the landing checklist and announced my position in the pattern on the common traffic advisory frequency.

I turned to base just past the runway threshold. The abbreviated pattern was without incident.

I incurred about twelve very minor cuts on my right hand and arm, which I assume came from flying Plexiglas. Nicholas had very minor cuts on his arm.

The tow ring and about six foot of tow rope remained on the tow hook, indicating that the rope broke when the canopy flew open.

Analysis:

A lot happened in the one to two seconds after the canopy flew open. Nicholas acted promptly and appropriately by releasing from tow.

The choice to close the cockpit happened so quickly, that it was instinctual (rather than thought out). In hindsight the closing of the canopy should have occurred after lowering the nose.

The raising of the nose was the only dangerous moment in the flight.

This was a frightening flight, and I experienced some "tunneling" of my thinking. Fortunately, the "tunnel" was fairly wide, my training and experience took over, and by lowering the nose the chain of potentially deadly errors was broken. With the nose 20° above the horizon with a 400 fpm sink rate it is likely the Owl would spin quickly and aggressively and recovery might be tricky.

My experience did not make me immune from fear. Some of the success of flying safely to having practiced, in my mind thousands of times, what would happen if . . .

We had some good fortune: We were upwind and relatively close to the airport. None of the flying shards of Plexiglas hit us in the face, and neither of our glasses were blown off, so our vision was clear. The canopy frame remained attached, and therefore there was no damage to the tail that diminished control of the glider.

Tow pilot, Jackson Maddux, did a great job by staying clear and allowing us to land first.

Nicholas is also responsible for the successful outcome of the flight. He is a CFI, and acted well by pulling the tow release, promptly ceding control of the glider on command, taking and holding the canopy shard, and then remaining silent for the remainder of the flight (no distraction by a talkative and frightened passenger).

I followed the adage of what to do in an emergency:

1. Aviate (clearing the tow plane, lowering the nose, and establishing airspeed)
2. Navigate (turning towards the runway, and determining if we could make it back with available altitude)
3. Communicate (announcing on the radio)

This simple idea served us well. Though, at no point did I say to myself, "Well, the first thing I have to do is aviate!" The repetition of studying, teaching, and thinking about these ideas made my response immediate.

I have been told by club members that other Owls had their canopies flip open in flight, and that Puchacz is aware of the problem and is investigating a fix. This suggests that the cause of the canopy opening is a design flaw. That the canopy did not fly open the first time Nicholas pressed on the right rudder pedal confirms the canopy was down and locked immediately prior to the incident.

Some random thoughts:

A 60 knot wind in the face is deafening. The FOO said he did not hear my radio transmission because of the loud background noise. A second identical radio transmission would have been prudent.

I was so focused on flying, I didn't notice my hand was bleeding until I was halfway back to the airport. Not that the bleeding made any difference, but minor issues like a little pain and bleeding were not even in my consciousness.

It would have been wise to use my left hand to hold onto my glasses except when pulling the airbrakes. That I didn't think to do this reflects the tunneled thinking. As recommended by Tom Knauff, I now fly with a strap on my glasses.

Half-way back to airport, out of habit, I checked the yaw string. It was, of course, gone with the canopy on which it had been taped. I chuckled to myself for my silliness in not knowing this. My self-mocking humor, was a comfort at the time, and a good sign that I was in control.

The Owl flies stably with the canopy shattered. It was easy to maintain airspeed plus-or-minus one knot.

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