

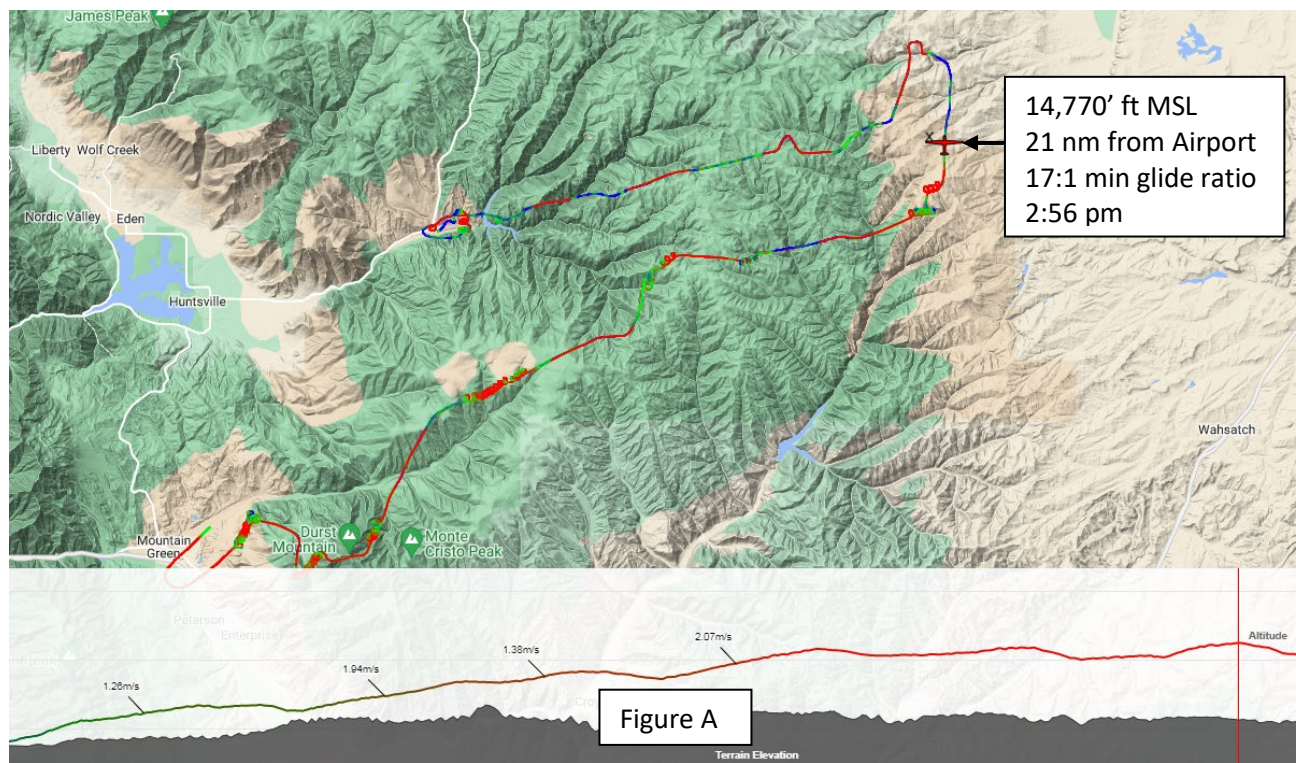
7/29/24 – 85W Narrative

At approximately 2pm Monday, 29 July, a solo flight rapidly deteriorated from excellent soaring conditions into a forced off field landing in a field causing damage to the glider. Causal factors include spatial disorientation and unexpected heavy sink with contributing factors of atmospheric haze (looking westbound) and task saturation. The result was an outfield landing and ground loop east of Huntsville at 3:30pm.

Pilot was 16 years old with @50 hours total time, half gliders and half powered, and this was the second flight after taking the glider private pilot check ride. Preflight planning was more extensive than normal including a detailed study of the weather, thermals, and focused effort on improving thermaling technique and speed control to maximize altitude gained for a given time as a self-directed learning objective. Weather forecasts showed thermals of 5+ knots until 4:30-5:00pm. A few small cumulus clouds were lined up in the distance to the east at the start the flight consistent with the weather forecast of clear skies and very good thermals. The flight was planned as an out and back to the east of approximately 20 miles.

Preflight ops were normal with one exception. 85W was handed off at the departure ramp of runway 21 from the previous pilot that had just landed. Reposition to the approach end of runway 21 was uneventful. However, since the battery was partially used, the aircraft and flight computer were not powered on until accomplishing preflight checklists prior to takeoff. The decision to conserve battery power between flights prevented discovery that the flight computer default program had been extensively modified without warning.

Takeoff was normal. Exceptionally good thermals (4+ knots) allowed a release at 7300' MSL (1717 AGL) at 2:04. Thermals on the mountain ridge, Big Mahogany, and Durst Peak were strong resulting in a climb to 11,000' by 2:21. Thermals and connecting clouds above continued to be exceptionally good headed east, resulting in a max altitude of 14,770 at 2:56, a distance of 21 NM from Morgan County Airport, and a minimum required glide ratio of 17:1 at the point depicted by the Glider in Figure A (next page).



Coincident to this point, the thermalling technique objective and flight plan objective of 20nm eastbound were both successfully completed and a decision was made to glide back to Morgan County Airport.

Approximately 2 miles north of the position in Figure A, was a good looking cumulus cloud, with more clouds strategically lined up eastbound overhead. The decision was made to fly this route home to take advantage of the thermals (presumed nearby under the cumulus) consistent with the preflight weather brief of good thermals until 4:30-5:00 pm and consistent with the excellent thermalling conditions encountered up to this point in the flight with similar clouds.

A planned minimum glide ratio of 18:1 (1000 feet per 3 nm) was used and the flight computer was programmed assuming an arrival altitude of 1000' ft AGL over Morgan County Airport. This provided more than a factor of 2 safety margin for this glider's 36:1 glide ratio. This minimum glide ratio was maintained until maneuvering near the clouds north of Figure A unexpectedly encountered massive sink of up to 9 knots for extended periods. The farthest northeast point was approximately 23nm, 14,000' ft MSL with a minimum glide ratio of 20:1. The turn southbound, west, southwest, west and the minor jink northbound, were all maneuvering under the small cumulus clouds headed southwest in search of thermals. Minimal lift was encountered interspersed with several more stretches of 4-9 knots of sink. The 45 degree jink northwest, followed by the 90 degree jink back southwest occurred at approximately 20nm/12,200' feet MSL and still at a minimum glide ratio of 20:1. It was still possible to make it home at this point with plenty of margin.

Unfortunately, when looking westbound the atmosphere was hazy with the sun coming lower in the return direction of flight. The canyon north of Cottonwood canyon leading home looked exactly like the correct silhouette. The return path was approximately 2-3 miles north of the outbound leg. There were no visual landmarks indicating that it was the wrong canyon until unfamiliar civilization and terrain

became clearly visible near Causey Reservoir. Prior to this point, everything looked and felt right, and the possibility of heading in a direction other than home never occurred. The heretofore unidentified geographic spatial disorientation became suddenly identified and very disconcerting when unknown buildings, fields, and a reservoir appeared around a corner beyond the crest of the intervening ridge.

The sudden realization of spatial disorientation, preponderance of sink (4-9 knots) with only occasional weak thermals, and an unexpected continued deterioration in glide computer computations led to a decision to land out. What appeared to be the only real suitable field was chosen. The power lines were noted, the wind direction was ascertained using the flight computer, and the length of the crops and the smoothness of the fields were assessed; however the slope of the field was not apparent while overhead. The planned course of action was to land into the 10 knot headwind, with power lines at the far end of the field, utilizing the angle of approach that maximized field length of the longest usable surface, approximately 900ft. Despite clearing the approach end fence by approximately 5 feet for a successful landing between 60-56mph, braking action appeared insufficient to stop the glider prior to the fence/gully/obstacles at the end of the field, and therefore a ground loop was initiated in order to prevent exiting the field at high speed. The ground track was well clear of the telephone poles until the start of the ground loop caused the glider to pull much harder than expected to the right. This resulted in the right wing striking the pole approximately 5 feet from the wingtip at approximately 16 mph. The glider spun around to a stop approximately 50 feet past the impact point in the field.

Discussion: Spatial Disorientation. Aviation-associated spatial disorientation, as described by Benson, occurs when “the pilot fails to sense correctly the **position**, motion, or attitude of his aircraft or of himself within the fixed coordinate system provided by the surface of the Earth and the gravitational vertical.” Spatial disorientation, while associated most strongly with vestibular disorientation encountered in instrument flying, can be just as insidious in its other forms. The first step in recovering from Spatial Disorientation is identifying the disorientation. The geographic disorientation in this case was so strong, even after recognizing the disorientation and landing successfully, it was not know that the pilot was north of the intended position. Why wasn’t it recognized this sooner? In approximately 50 hours of training between gliding and powered flight, spatial disorientation had never been experienced first-hand. It is hard to overstate how much of a shock it was. The major factors that contributed were haze, a false sense of security being near home field, and poor human factors of cockpit resources.

I have never encountered haze such as we had on this day before. While the visibility was still more than acceptable for VFR conditions, in retrospect I had a false sense of security that I knew exactly where I was. The mountains and terrain looked to me like cottonwood canyon (the location of Morgan County Airport). Perhaps if the weather had been more clear, I would have noticed much sooner. In retrospect, and talking to instrument pilots, the haze could have been a warning to not rely so strongly on my visual references. However, it did not trigger any red flags as I had never experienced this before.

In the cockpit were two backup resources to assist with the flight: an iPhone mounted on the right-hand side of the cockpit and the built in LXNAV S80. The iPhone was running the app Isoar. The screen was zoomed in on the map so that a full turn occupied much of the screen in order to improve thermaling technique and watch the turns develop. Additionally, due to the iPhone's screen brightness

settings; once the device reaches a specific temperature, it automatically decreases the brightness to a point where it is unusable for navigation. While it is possible to make out the high contrast of the larger green and red lines of the glider track overlaying the background map, navigation on the underlying map picture itself is not feasible in bright sunlight without taking extraordinary measures (taking it out of the mount/shielding it from sun with both hands/taking hands off controls for prolonged periods/etc...).

The second tool was the LXNAV S80. The standard preset I was instructed to use was named John G. This preset was very intuitive and easy to use. The Netto, Vario, Arr Alt, Distance, Speed to fly (STF), and Map were accessible with one button press. This preset had never been modified before, and having flown the glider numerous times recently I expected it to be unchanged; however, the layout of the preset was heavily modified sometime prior to this flight. My standard is to boot the S80 up during the preflight and verify that the preset is good. However, in the previous weeks, the club battery count had reduced from three to one. Upon arrival at the airport, multiple pilots had used this single battery since 0900 that morning. The battery was placed in the charger to gain as much power as possible for the flight, and the master switch was kept off until beginning the launch checklist to conserve power. This did not provide enough time to check the profile's integrity before takeoff, and the changes to the profiles specific pages was only noticed after tow release. Obtaining information previously accessible all in one place now required a combination of multiple unintuitive button presses with information spread out over multiple screens. Having the STF (Speed to Fly) and Nav Map (Navigation) menus six button presses apart from each other greatly increased task loading, leading to an element of task saturation as well as discouraging frequent cross checks of all the elements of information on different screens. Additionally, the distance from the destination (the primary and most important value being used to cross check glide ratio) was located on the STF menu rather than the Nav menu, where it logically should've been located. This resulted in predominant use of the STF menu for this flight as speed to fly in sink/thermals/glide is important and the range to the field was the primary safety value being monitored. While gliding home, the decrease in range on the STF menu was not significantly different than expected. Even though the altitude was slightly lower on the glide home than desired, that was readily attributable to the extraordinary sink encountered such that no other explanation was suspected.

The combination of having my primary visual references insidiously degraded by the haze for the first time, a false sense of security in visual navigation being only 20 miles from my home field, and both secondary navigation resources rendered impractical for casual cross reference all contributed to being spatially disorientated by 2-3 miles without raising any red flags. Unfortunately because I was confident in my visual navigation, I had no reason to go to extraordinary lengths to verify it with my secondary resources and in this case the recognition of geographic spatial disorientation occurred too late to make a correction back to the home field.

Lesson Learned – Emphasize that Spatial Disorientation does not just occur during flight in IMC, but can occur during reduced visibility conditions such as haze. Additionally, it is not just restricted to vestibular disorientation as is classically taught, but can include all spatial orientations.