INCIDENT REPORT: NEAR MIDAIR COLLISION IN TURN TO BASE

Date of Incident: September 23, 2020
Time: 16:48 hours
Surface Wind: calm
Active Runway: 18

The Minnesota Soaring Club (MSC) fosters a culture of safety by encouraging pilots to report their aviation mistakes. To foster this attitude the MSC replicates NASA's Aviation Safety Reporting System by 1. Concealing, in incident reports, the identify of pilots who report errors, and 2. Not disciplining pilots who report errors unless the error was deliberate or criminal. This non-discipline stand does not preclude actions to improve pilot skills and knowledge by recommending additional flight instruction.

NOTE: This is a review of the glider pilot and Field Operations Officer (FOO), and not a review of the airplane pilot. Therefore, analysis and comments focus on what glider pilots and FOOs can do to maximize safety.

CONTACTS & INTERVIEWS

09/29/2020 Zoom meeting with the glider pilot (hereafter referred to as Pilot) and the, Field Operation Officer (hereafter referred to as the FOO)

10/01/2020 Flight with Mason Lindenfelser, Chief Flight Instructor, Stanton Airfield, in Stanton Airfield's Cessna 150 (C-150) to review training protocols in the pattern and gather photographs and information about line of sight from the C-150

10/01/2020 Meeting with Mr. Lindenfelser and John Quilling, Airport Manager, Stanton Airfield

10/04/2020 Conversation with Marilyn Meline about her observations of September 23

The airplane pilot who flew the C-150 was offered an opportunity to be interviewed. The airplane pilot did not respond.

INFORMATION REVIEWED

Minnesota Soaring Club Flight Log of September 23

The Pilot's IGC File, Google Earth log file, and written report of the incident

The FOO's written report of the incident viewed from the ground

THE INCIDENT

The Pilot reports returning to the southeast area of the airport with ample altitude after a 150-minute glider flight and using the extra altitude, and the time that it provided, to monitor Stanton Airfield's airspace and radio transmissions. Radio calls and scanning showed an active pattern and accordingly the Pilot entered the pattern on a high and long 45 dog leg, making a radio call on the common traffic advisory frequency 123.3, and losing altitude with airbrakes. The Pilot turned to downwind at 1,700' MSL and announced position on the radio on. The Pilot was number three in the traffic pattern. The first aircraft in the pattern was a glider and the second a Piper Cub. Each aircraft was spaced a half-mile from the other as shown in Illustration 1.

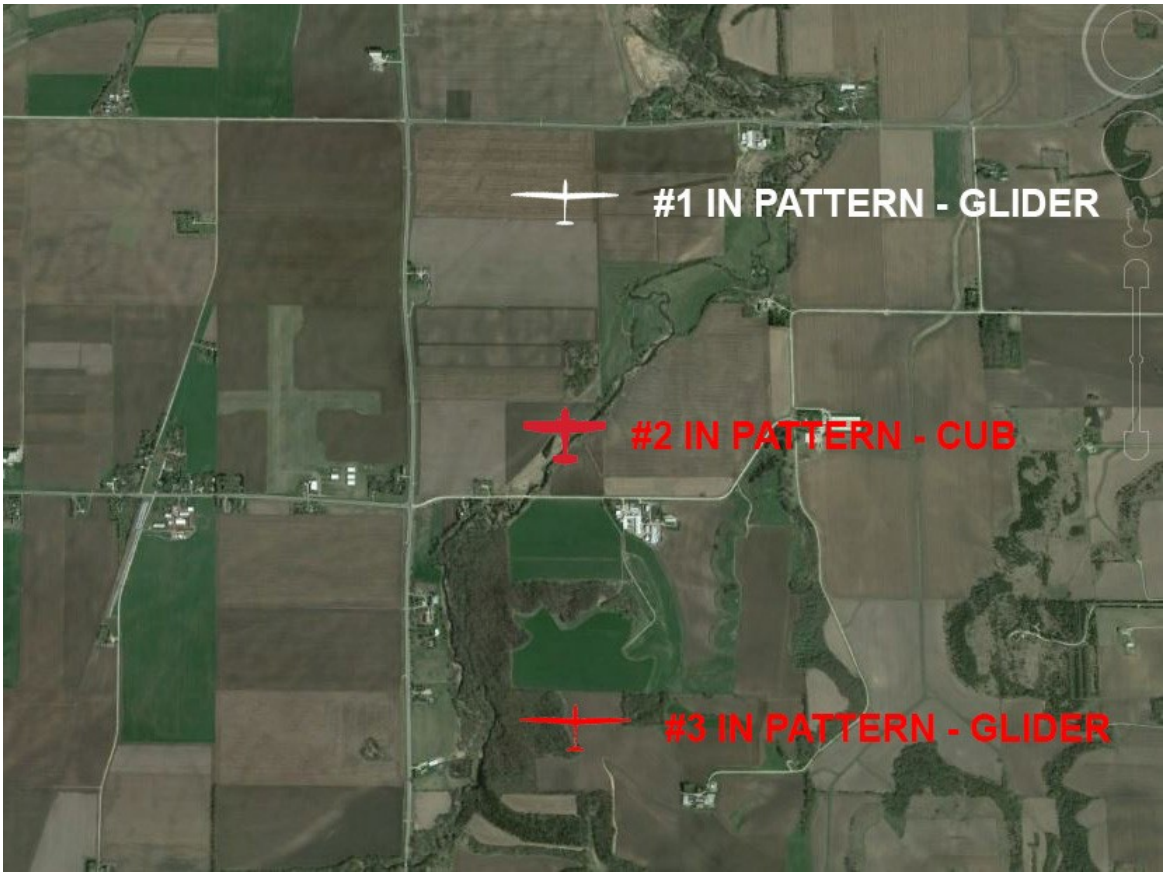

Illustration 1

The Pilot monitored radio transmissions, and as a result believed there were three aircraft in the pattern.

After watching the #1 glider and the #2 Cub land, the Pilot announced a turn to base on the radio and turned. The Pilot's IGC trace indicates the pilot was approximately 1,600' MSL at that time. The Pilot wrote:

> Following the other two landing craft (that I was aware of) and with which I had visual contact, I made my base turn to the west, rolled out of the turn, and seconds later a green C150 appeared at my same altitude, running northbound.

The FOO viewed the incident from the ground. The FOO stated that concern that the C-150 was unaware that the Pilot's glider was on downwind with the C-150 and therefore there was a risk of collision, accordingly the FOO monitored radio transmission on the CTAF. The FOO reported hearing no radio transmission from the C-150 pilot.

Illustration 2 The position of the four aircraft as the Pilot turned to base.

The Pilot wrote that after seeing the C-150:

> I had about 2 seconds to consider the situation and about five more seconds to possible impact, so elected to immediately descend below the C150 and pushed my nose down. I also retracted my flaps because they have an 86 kt maximum extension limit, and went under the C150 by 50'-75'.
>
> After passing the C150 safely I was doing 85 kts or so and needed to slow down, so I pulled up, extended my flaps, turned final, and landed normally on 18.

The FOO reported that the C-150 flew a long downwind before turning to base, and then aborted the landing on final.

The Pilot admitted failing to look to the left before turning to base because there were no radio transmissions indicating other aircraft in the pattern, and due to a belief that an airplane would fly further from the runway than the glider in the downwind leg.

TRAINING IN AND VIEW FROM THE CESSNA 150

Mr. Quilling stated that it was likely that a soloed student pilot was practicing pattern landings in the C-150 when the incident occurred.

Mr. Lindenfelser stated that he trains students to fly the downwind wider and longer than gliders typically fly, but never so long or wide that the C-150 could not reach the airport for a safe landing should the engine fail. This results in the downwind leg positioned about a half-mile from the runway's centerline as show in Illustration 3.

Illustration 3 Half mile from the centerline on Runway 18.

Airplane pilots are trained to enter the pattern at 1,920' MSL and maintain that altitude until abeam the cross runway the pull power back to feathered. Pattern airspeed on downwind is generally 80 to 85 MPH (70 to 74 knots); base 70 MPH (61 knots), and final 60 MPH (52 knots). At 80 MPH a pilot's view ahead and below from the C-150 is limited ahead and below.

Illustration 4 View from pilot's seat of a C-150 at 80 MPH

The pilot's view ahead and below remains limited in a turn as shown in Illustration 4.

Illustration 5 View from pilot's seat in a 75 MPH turn in the C-150.

The pilot's view below and ahead improves on final approach.

Illustration 6 View from pilot's seat at 60 MPH on final approach.

Mr. Quilling reports that a glider pilot will not hear the engine of an aircraft behind the glider.

LANDING PATTERN AT STANTON AIRFIELD

The *Airport/Facility Directory* gives three pattern-entry altitudes for Stanton Airfield: 1,000' AGL for airplanes; 800' AGL for gliders; and 400' AGL for ultralights (Illustration 7).

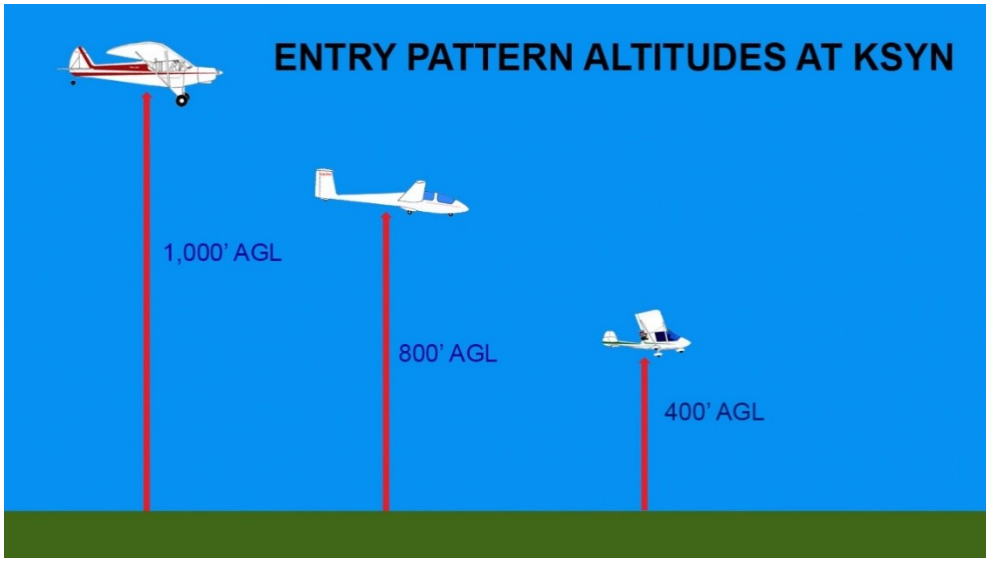

Illustration 7 Altitudes to enter the pattern at Stanton Airfield.

RIGHT-OF-WAY RULES

The Code of Federal Regulations 14 § 91.113 – Right-of-way rules: except water operations, states:

1. "Vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft.

2. That a glider has right-of-way over an airplane.

3. That an aircraft being overtaken has the right-of-way and the overtaking aircraft "shall alter their course to the right to pass well clear."

4. When two aircraft are approaching an airport to land, the lower aircraft has the right-of-way.

5. That in the pattern a lower aircraft shall not overtake another aircraft.

ANALYSIS OF THE GLIDER PILOT'S FLIGHT CHOICES

The Pilot did everything by the book and well, and still was an incident. Pilot's learn based on teaching (whether from a flight instructor, books, or articles) and flight experience. Research demonstrates that accumulating flight experience makes for safer pilots after the first 100 hours of pilot-in-command flight. (The most accident-prone time for pilots is the 20 hours of flight immediately after solo and the second most accident-prone time is around 100 hours of pilot in command flight.) However, flight experience, can lead to an assumption that it-never-happened-before-so-I-don't-have-to-worry-about-it-now.

The Pilot's first assumption, immediately before turning to base, was that because there were no radio calls from the C-150 pilot (or any other pilot other than those from the pilots in the #1 glider and #2 Cub), that the Pilot was alone on downwind.

The second assumption was that airplanes fly downwind legs further from the airport than do gliders, and therefore clearing was unnecessary before turning to base.

The third assumption was that airplanes behind a glider can see the glider.

The fourth assumption was that airplanes behind the glider will maintain spacing.

Arguably these are the firsts four links in the incident chain.

The Pilot's quick thinking, upon seeing the C-150, prevented a potential midair with possible lethal consequences to both pilots. It was the action that broke the accident chain.

Unpacking The Assumptions

Radio

Radios significantly increase the safety of flight, and arguably the greatest need for their use is in the traffic pattern. Pilots rely on radios both to determine when other aircraft are in proximity, and to let other pilots know their position and intent.

However, radio transmissions may not occur or be clear for the following reasons:

1. Batteries discharge (on both the transmitting and sending radios).
2. Radio's fail (on both the transmitting and sending radios).
3. A transmission is stepped on.
4. A pilot speaks unclearly or erroneously.
5. The receiving pilot is busy or distracted and does not fully attend to a transmission.
6. The sending pilot is busy or forgetful and fails to transmit.

If even five-percent of radio transmissions do not reach their target audience, and I suspect the number is higher, it would be prudent to assume that the lack of transmission received does not equate to the lack of an aircraft in proximity.

Position of Airplanes On the Downwind Leg

There is significant variability in how flight instructors teach airplane pilots to fly the pattern. This variability from the airport's centerline, from instructor to instructor, may be a half-mile, or more. Further, there is inconsistency on how any given pilot flies the pattern on any given day, which may be attributable to unknown events, such as engine problems, being unfamiliar with a new aircraft, students flying (as opposed to experienced pilots) and, a passenger being airsick, to name a few possibilities. There is no rule about where a pilot must be on the downwind leg, and a prudent pilot will check to assure there are no aircraft above, below, or to either side.

Therefore, a pilot on downwind, in addition to making radio announcements, should:

1. Check the downwind airspace when entering on the 45° dog leg to determine what aircraft are already on downwind.

2. Clear the airspace directly above the glider.

3. Repeatedly check the airspace to the right (on a left-hand pattern) for aircraft flying downwind or who are on base and will cross the downwind aircraft's flight path.

4. Periodically check the airspace to the left.

5. Execute a clearing look before turning on base.

What Airplanes See in the Pattern

Airplanes usually enter the pattern 200 feet higher than gliders, positioning gliders beneath the airplane. As Illustrations 4, 5 and 6, illuminate, much of the airspace ahead and below a C-150 pilot is obstructed. These photographs show the line of sight of a shorter pilot, and view increases with taller pilots. Given that a glider pilot will typically lose altitude throughout all phases of the pattern, and an airplane pilot will maintain their altitude until reaching the cross runways, this obstructed view is likely to increase in the first part of the downwind. Therefore, it is wise to assume, in all aspects of flight but especially in the pattern, that a glider is invisible to airplane pilots (and not infrequently to other glider pilots).

Aircraft Spacing in the Pattern

Gliders determine their pattern airspeed from the formula:

Stall Speed + Half of Stall Speed + Half of Wind Speed

Given that high-performance gliders with higher stalls speeds use flaps during landing, which lowers their stall speed, there is significant similarity in the landing speeds of gliders, but generally are speeds around 50 to 65 knots. Slower on calm days, and higher on windy days.

However, airplanes generally have higher landing speeds (which are set in the Pilot Operating Handbook). Even the low-performance C150 flies downwind at around 72 knots. Therefore, on most days, but especially calm days airplanes are likely to gain on a glider in the pattern at about 15 to 20 knots—a significant rate of closure.

Assuming that spacing in the pattern will remain constant between a glider and airplane could lead to an incident or accident.

As an aside, ultralights frequently have a pattern airspeed of around 35 knots, and because their pattern entry altitude is 400 feet lower than the glider's pattern entry altitude, they are potentially in the glider's obstructed view region. Further, a glider is likely to be gaining on them at 20 knots while dropping down upon them.

Right-of-Way

The belief that right-of-way rules will be honored is a reasonable expectation until another aircraft fails to follow them due to negligence, failure to see another aircraft, a false sense of distance between aircraft, an assumption that a glider will do what other aircraft do—fly straight and level for long periods, or other reason.

I do not believe that the Pilot consciously made these assumptions, but rather they became part of flight habits that were reinforced by positive flight experiences.

ANALYSIS OF THE FIELD OPERATION OFFICER'S ACTIONS

The FOO prudently and judiciously monitored the landing pattern. However, when the FOO saw the airplane approaching the Pilot's glider, indecision set in, resulting in a wait-and-see choice. While it is unknown what either pilot would have done had the FOO announced the proximity of two aircraft in the pattern, such an announcement had the potential to increase safety.

There is little risk to providing additional information in a potential incident or accident and significant risk should an accident occur. I believe it is prudent to err on the side of safety.

The FOO's willingness to share the actions taken and the doubts thereafter are representative of competence, commitment, and confidence. This FOO is a credit and asset to the MSC.

CONCLUSION

The Pilot trusted that any trailing aircraft would announce their position and intent on the radio, see him, maintain an airspeed and distance in the pattern to secure separation, and yield right-of-way and in that pass on the right. None of these expectations, which are reasonable and which are understood to be standard operating procedure at Stanton Airfield, were flown by the C150 pilot.

The question of this analysis is how to prevent an accident when a pilot flies well and by the rules.

Proper radio use, both in transmissions and listening, is a vital but insufficient first step for safe pattern flight. Visual vigilance must be a corollary, and perhaps prime, method of preventing collision.

The Federal Aviation Administration's caveat of "see and avoid" is, by far the most important of the right-of-way rules, and arguably the rule that saved the Pilot from a midair collision. The

other right of way rules became irrelevant in this instance served to provide a false sense of security. Based on line of sight in the C-150, and the C-150 pilot's actions, it is reasonable to assume that the airplane pilot never saw the glider.

The Pilot did several things spot-on-right after seeing the C-150: 1. Acted promptly as every second counted, 2. Continued to fly the glider within its operating limitations (demonstrating remarkable pilotage by retracting the flaps while diving so as to not overstress the wings), and 3. Recovered from the dive promptly and maintained sufficient presence of mind to safely land. Further, the pilot exhibited the safe and humble attitude of sharing the incident so that others could learn from the incident. We are lucky to have this Pilot flying at Stanton Airfield.

Laurence Gonzales wrote, *Deep Survival: Who Lives, Who Dies, and Why*, in which he lays out an argument, based on science, that people who survive catastrophes have a series of universal traits, and among them is practicing for disaster by imagining catastrophe's and mentally rehearsing responses. By inviting oneself to challenge assumptions about why everything will go well on this flight, steps can be taken ahead of time to short-circuit a calamity. This incident brokers the truth of Mr. Gonzales' argument. That those that imagine disaster and envision the safest response are better prepared to prevent tragedy and to quickly react. Because unforeseen things happen, and certainly more so in the sky than on the ground, the FAA requires flight instructors to conduct scenario-based training.

On behalf of the Minnesota Soaring Club, thanks is extended to Mr. Quilling and Mr. Lindenfelser for their unreserved help in providing a flight in the C-150, and answering questions.

RECOMMENDATIONS

1. That pilots make a point of expecting the unexpected, especially in the pattern by maintain vigilance and defensive flying.

2. That FOOs, when viewing a potential incident, err on the side of safety, and make a radio announcement.

3. That pilots clear behind and to the left before turning on base leg (and similarly before turning onto final).

4. That pilots use the 45° dogleg into the pattern to clear airspace at 1. 135° angle to the left for aircraft on downwind, 2. 45° to the left for aircraft entering on a crosswind leg, and 3. 45° to the right for aircraft ahead on the downwind as shown in Illustration 8 below:

Illustration 8

5. That MSC put increased emphasis on scenario-based ground school training.

Respectfully submitted,

Stephen Nesser, CFI-G
Chief Flight Instructor
Minnesota Soaring Club

October 31, 2020