

## INCIDENT REPORT: NEAR MIDAIR COLLISION IN DOWNWIND



Date of Incident: August 29, 2020

Time: 10:23 a.m.

Surface Wind: 8 knots at 320°

Wind at 3,000' AGL: Approximately 20 knots at 320°

Active Runway: 36

*Minnesota Soaring Club (MSC) fosters a culture of safety by encouraging pilots to report their aviation mistakes. To foster this attitude 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.*

### CONTACTS & INTERVIEWS

- 8/29/2020 Meeting with John Quilling (Airport Manager, Stanton Airfield), Jay Biggs (Flight Instructor, Stanton Airfield), Ron Houle (MSC President), Paul Boedecker (MSC duty Field Operations Officer FOO), and Stephen Nesser (instructor of the day)
- 8/29/2020 Safety Stand Down Meeting with all MSC pilots and students at the airport at that time (approximately 20), Mr. Quilling, and Mr. Biggs
- 8/29/2020 Interview with the teenage glider pilot who flew the Junior (hereafter called 'Pilot')
- 8/29/2020 Interview with the Pilot's mother
- 8/29/2020 Interviews with MSC pilots who were present when the incident occurred
- 8/29/2020 Phone conversation with Steve Fischer (MSC flight instructor and duty instructor on August 30) about instructing the Pilot the next day
- 8/30/2020 Written summary of the incident by the Pilot
- 9/2/2020 Meeting with the Pilot's parents
- 9/02/2020 Emergency flight instructor meeting of MSC flight instructors and Loren Swanson (MSC Director of Operations)
- 9/03/2020 Email from Bob Wander (MSC flight instructor) about his experience flight instructing teenagers in his gliding operation

9/05/2020 Phone conversation with Loren Swanson about FOO training in view of incident

9/12/2020 Zoom conversation with the Pilot

There were numerous other conversations with club members, and Stanton Airfield staff whose date of contact was not captured.

## **THE INCIDENT**

On the morning of Saturday, August 29, 2020, the Pilot was offered the opportunity to fly with duty flight instructor, Mr. Nesser. The Pilot declined. And because the Pilot had satisfactorily flown with Mr. Nesser the week before, the Pilot was cleared for solo flight. Mr. Nesser observed the Pilot complete his preflight checklist, including radioing for a tow to 3,000' above ground level (AGL) northwest of Stanton Airfield. The Pilot launched in the Junior without incident.

The Pilot reported being released southwest of the airport, however the tow pilot stated that the Pilot released about three miles to the northwest, which was consistent with wind speed and direction. The Pilot reported losing track of position over the ground and ending approximately 1.4 miles southeast of the runway at 1,800' AGL. The Pilot considered entering the pattern on a long final but chose not to given no previous experience flying an entry into pattern on final with a flight instructor. The Pilot then considered entering the pattern on base for a right-hand turn to final, but declined that option due to having only flown one right hand pattern with a flight instructor, and given the belief there was sufficient altitude to do a normal pattern entry.

The Pilot flew with the nose pointed due west (resulting in southerly drift due to the northwest wind) until parallel with the Syngenta Seed Farm, then turned north. The Pilot reports being approximately 1,500' AGL at that position. The Pilot wrote, "I knew I was low so I stayed toward the inside of the pattern box so I would be able to make it back but I thought I was far enough out where I wouldn't interfere with other planes." The Pilot reported seeing the PA-12 (flown by a student pilot under the instruction of Mr. Biggs) three seconds before it flew overhead. The Pilot reported never hearing the PA-12. The Pilot believes that the PA-12 flew overhead when both aircraft were directly over Highway 19. The Pilot promptly turned 45° left, radioed intent to enter the pattern, and did so. (Note: pilots on the ground report this was the sole radio call they heard from the Junior pilot.) The Pilot reports then turning back to a northerly heading and turning to downwind when at the north end of the runway. The Pilot reports being approximately 1,200' to 1,100' AGL at that time. The Pilot stated that the pattern was "normal" except for an early turn onto base. While making the turn to base the Pilot saw the PA-12 on final and then heard Mr. Biggs announce he would exit the pattern to clear the pattern for the Junior.

Mr. Biggs stated that he first saw the Junior when it was 50' to 75' directly beneath the PA-12. Mr. Biggs believes the PA-12 was between 500' and 700' AGL at that moment. The PA-12 has a significantly nose-up attitude in the pattern, obscuring sight ahead and below. Mr. Biggs believe that the PA-12 overflew the Junior slightly south of Highway 19. The Pilot concurs.

However, witnesses on the ground report that the PA-12 overflew the Junior someplace between Highway 19 and the cross runway. Given the southward movement of the Pilot's left turn combined with the drift from a northwest wind, the latter report would be consistent with my observation of the Pilot entering base leg about slightly south of Highway 19.

Simultaneously the Stearman biplane entered the downwind leg from a 45 dogleg over the cell tower, which is 1.04 miles north of Highway 19. The Stearman biplane pilot radioed his intent to exit the pattern to give time for the Junior to land and did so with a right turn.

I observed the pilot made a low energy landing.

The FOO reported not seeing the Junior until it was flying northward close to the runway. The FOO reported taking no actions because there was nothing that could be done.

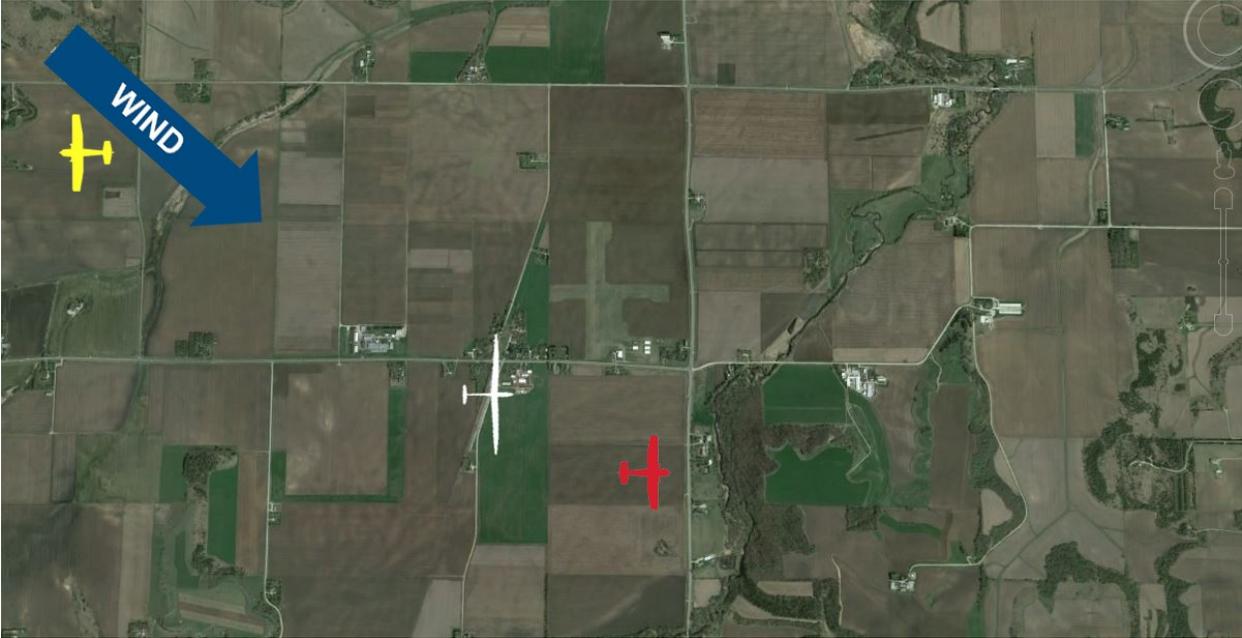
Following are illustrations of the last minutes of the Junior's flight.



Junior entering pattern box. The red plane is the PA-12. The yellow plane is the Stearman Biplane.



Position of the aircraft immediately following the near miss.



Position of the aircraft after the Junior enters base leg.

## **DEVELOPMENTAL PSYCHOLOGY**

### **Abstract Reasoning**

Developmental psychology theory and research holds that abstract reasoning begins around the age of 12 and is fully developed in the mid-20s. This is an average with large variations due to gender (girls often think abstractly before boys), intelligence, education, environment, genetic inheritance, and many other factors. Abstract reasoning does not turn on like a light switch but develops slowly like a dimmer switch brightening a light over 12 to 15 years.

### **Generalization**

Generalization is one of the cognitive skills that develops with abstract reasoning. Generalization is the ability to call on memories of previous experience when facing a new event so that the lessons from the previous experience can be applied to the current event. For example, at its most basic, generalization would allow a pilot who has been trained to fly a right-hand pattern on runway 36 to fly a right-hand pattern on runway 27.

### **Fund of Knowledge**

Experience builds a fund of knowledge. Which is one of the prime reasons pilots with hundreds of flight hours have fewer accidents than student pilots. This knowledge gives them a larger pool of flight experiences to draw from when making critical decisions. It also gives them more repetition of flight experiences so that flight information is more quickly recalled.

### **Cognition Under Stress**

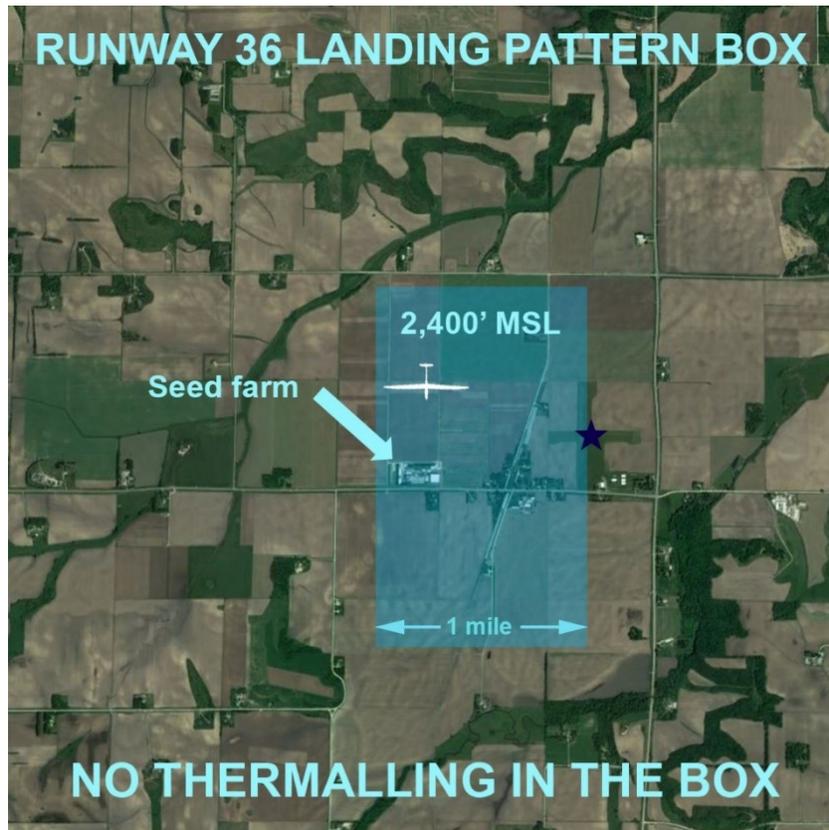
While there are dramatic individual variations to stress responses, studies indicate that mild to moderate stress has beneficial sequelae including improved focus, and increased reaction times. However significant stress has both benefits and risks: while the increased reaction times remain there is frequently a decrease in higher order thinking including a tunneling of focus, diminished cognitive performance with a diminution of access to memory, limited abstract reasoning, and a push towards either making a rapid decision or freezing (the fight, flight, freeze response).

### **Metacognition**

Metacognition is the ability of an individual to think about what the person is thinking about and how they are thinking. Metacognition is an abstract reasoning skill, and therefore develops with maturity. Emotions such as shame interfere with clear metacognition. Humility has a profound impact on the accuracy of metacognition.

## **LANDING PATTERN BOX AT STANTON AIRFIELD**

To maximize safety in the landing pattern MSC, in consultation with the management of Stanton Airfield, established Landing Pattern Boxes for each runway. These boxes are 1.5 miles by 1 mile by 1,500' AGL in dimension.



Landing Pattern Box for runway 36.

The Landing Pattern Boxes cover the airspace in which power aircraft typically fly their pattern. The point of the Pattern Box is to provide separation between landing aircraft and gliders. There are maps of the Pattern Boxes in the airport, in a spiral bound notebook in the MSC gliders, and taped to the Field Operations Officer cart.

All MSC pilots are taught that the only reason to fly in the Pattern Box is to be transitioning into the landing pattern or be flying the landing pattern.

As seen in the illustration, Syngenta Seed Farm is under the Landing Pattern Box.

## AERONAUTICAL DECISION-MAKING

In Chapter 2 (Aeronautical Decision-Making), page 2-12, of the Federal Aviation Administration's (FAA) *Pilot's Handbook of Aeronautical Knowledge*, note that "A single decision or event does not lead to an accident, but a series of events and the resultant decisions together form a chain of events leading to an outcome."

The *Pilot's Handbook of Aeronautical Knowledge* details several models of aeronautical decision making that improves safety. At the most basic, an accident chain is broken when any single link is snapped by a good choice.

## ANALYSIS

Given that the Pilot reports being at approximately 1,500' AGL when the PA-12 flew overhead, but Mr. Biggs reports being approximately 600' AGL when overflying the Junior, it appears that the Pilot misread the altimeter by 1,000'. Further, the altitude reported by Mr. Biggs would be consistent with the observations of pilots on the ground.

The Pilot made a chain of errors:

1. Lost situational awareness.
2. Was blown downwind and got low on a day with moderate winds (20 knots) at flight altitude.
3. Misread the altimeter.
4. Rejected alternative landing patterns (straight in to final or right-hand) that would have better utilized the remaining altitude.
5. Underestimated the amount of altitude that would be lost flying into the wind.
6. Flew without a crab resulting in drift away from the airport.
7. Entered the downwind (Landing Pattern Box) in the wrong direction at a low altitude.
8. Failed to maintain lookout for aircraft landing the standard left-hand pattern and flew directly underneath the PA-12 which was on the downwind leg.

Then the Pilot made a choice which broke the accident chain: turned into the downwind and executed an abbreviated pattern.

The potential loss of life of three pilots from a midair collision between the Junior and the PA-12 makes this incident profoundly significant.

MSC flight instructors have taught glider pilots to enter the Landing Pattern Box "only when entering the pattern or flying the pattern." It would appear that the Pilot believed that, though flying the wrong direction on downwind, was, strictly speaking, entering the pattern to execute a 45° leg into downwind. This is an instructive reminder to MSC's flight instructors of how words assumed to be clear may hold hidden vagueness that can lead to doubt in decision making and result in incidents or accidents.

It is my opinion that the best choice for the Pilot when still southeast of the airport was a base leg entry for a landing on runway 27 and then stopping short of the midfield. This would have maximized separation between the two airplanes in the runway 36 pattern while minimizing the Junior's loss of altitude. The Pilot did not consider this option during the flight.

The Pilot had limited metacognition about why the decisions that were made were chosen. So, the following is my best speculation about the cognitive and affective state of the pilot and the decisions that followed.

The Pilot stated that, despite being low and downwind, the Pilot's focus was on getting to the standard 45° entry point for a landing on runway 36. I believe that this focus caused the Pilot to reject better landing options. It is likely that upon realizing the Junior was low and downwind the Pilot felt unease. Further, the lack of radio calls as the pilot was attempting to arrive at the entry point for a left-hand landing on 36 suggests (given that I have listened to the Pilot give appropriate radio calls while flying solo in the previous weeks) that the pilot was overwhelmed. It is likely, given knowledge of the Pilot's basic decency and appropriate desire to follow the flight instructor's lessons, that shame and a desire to not broadcast the Pilot's flight errors (which a radio call would have done) also contributed to: 1. Emotional distress that limited thinking, and 2. A desire to do the "correct" standard landing. This resulted in the Pilot making optimistic assumptions about the Junior's ability to fly upwind in a 20-knot headwind with the available altitude. Then, the Pilot entered the Landing Pattern Box in the wrong direction thinking that being on the far edge of the box would provide sufficient separation. Finally, the Pilot failed to maintain adequate lookout in the pattern, especially in the direction that aircraft were likely to fly in the Landing Pattern Box. This suggests several issues.

### **Generalization**

I believe the Pilot's abstract thinking was diminished, and given the Pilot's age (15), it is likely there was minimal to no abstract processes occurring during the stressful portions of the flight. Therefore, the Pilot's generalization was not operative, which would explain why the Pilot did not consider a landing on runway 27.

### **Repetition**

Repetition of training makes skills and ideas more available in stressful moments. The Pilot rejected a straight-in landing on final approach because the flight instructors had never flown the maneuver with the Pilot. The Pilot rejected a right-hand pattern because the Pilot's flight instructors had only flown that maneuver with the Pilot one time. This suggests that the flight instructors would provide safer training by flying each non-standard maneuvers, such as a right-hand pattern or a straight-in approach to final, multiple times with each teen student.

### **Narrowing of Focus**

By the time the Pilot was flying north in the Landing Pattern Box the Pilot's focus was so narrow that neither the sound of an approaching airplane, its radio calls, nor the sight of an approaching airplane caused the Pilot to deviate from course, rather the pilot reported never hearing the PA-12 and seeing it only three seconds before it flew overhead. I believe that is likely that the Pilot was so focused on getting to the 45° entry point that virtually all other information was ignored. It's worthy of note, that I do not believe this is an inherent fault in the Pilot's constitution, causing the Pilot to be unsafe for continued instruction and flight, but rather a reflection of the significant stress the pilot was under, and a normal response to such stress.

### **Experience of Acute Stress**

Over time life generally provides ample stressful situations, such as car accidents and injuries, that teach teens and young adults how to manage acute stress. Younger teens usually have

limited acute stress experiences, and therefore, have fewer emotional and cognitive skills to draw on in stressful moments in flight.

These points lead me to conclude that aviation instruction for teenagers needs to be more thorough, especially on nonstandard maneuvers. The Pilot exhibited exceptional stick and rudder skills and an ability to rapidly learn early in the Pilot's flight training. This ability to fly a glider to the *Practical Test Standards* skill levels possibly led MSC flight instructors to assume the Pilot was adequately trained. Clearly, we had not adequately trained the pilot for flight in stressful situations, and this needs to be remedied both for the Pilot and for all future teen student pilots.

### **PARENT-FLIGHT INSTRUCTOR COMMUNICATION ANALYSIS**

The lack of incidents by MSC teen pilots has resulted in the MSC flight instructors not needing to consider how and when to communicate with the parents of a teen student following an incident.

Flying a glider as a teen is an adult action. Students are trained to relinquish their natural tendency to ask permission before performing a flight action, so that they make good choices with initiative when flying. For some (perhaps most) 14 and 15-year-old pilots their solo becomes the moment when they are first given, without reservation or a safety net, an adult responsibility. To build the self-reliance and maturity necessary for safe solo flight MSC flight instructors communicate with teen student pilots as if they were adults. This is good.

However, when an incident occurs, it is insufficient to communicate solely with the teen student pilot. The flight instructor should make a point of talking to a parent (or both parents in some situations) as soon as practical as warranted by the gravity of the incident.

### **FOO ANALYSIS**

While the FOO cannot and should not serve as air traffic control for Stanton Airfield, the glider operations at the airport would be safer for glider and airplane traffic if a lookout is maintained for all aircraft taking off and landing. Because an aviation radio, tuned to the Common Traffic Advisory Frequency, is on the FOO cart, announcements on the radio to increase safety should be considered by the FOO.

### **RECOMMENDATIONS**

1. The Pilot receive additional ground and flight training, especially in unusual pattern entries, flight in moderate to heavy winds, crabbing flight, altimeter covered flights, radio communications in unusual circumstances, aeronautical decision making, and flight in a busy pattern. (In process.)

2. That before the Pilot is cleared to fly solo again, he have a checkout flight with MSCs Chief Flight Instructor.
3. That all teen student pilots be over trained in unusual patterns and emergency procedures, this training to include flights on windy days with busy air traffic.
4. That in consultation with the Chief Flight Instructor the duty flight instructor notify a teenage student pilot's parents expeditiously if there is an incident involving the teen.
5. That MSC endeavor to provide an annual weekday instruction camp to provide training in unusual patterns. The point of this being conducted on weekdays is the likelihood there will be less air traffic and radio use on frequency 122.8, making the training safer.
6. That MSC flight instructors pay special attention to the possibility that their language may be misinterpreted and provide additional and clarifying language in instruction.
7. That a card table with a map of the Stanton Airfield be in the FOO cart to aid flight instructors in explaining safe options to fly in the approach to landing. (In process.)
8. That MSC flight instructors redouble their efforts and training to assure that all glider flights in the Landing Pattern Box be conducted safely.
9. That MSC flight instructors develop a curriculum for radio communications. (In process.)
10. That Director of Operations initiate standards and training focused on assuring FOOs maintain lookout for gliders in the pattern and provide radio advisories as safety warrants. (In process.)

Respectfully submitted,



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

September 17, 2020