SOARING SAFETY FOUNDATION

Nov 1, 2020 – Oct 31, 2021

SAFETY REPORT

SOARING SAFETY FOUNDATION

PREFACE

In 1985 the Soaring Society of America (SSA) formally created the Soaring Safety Foundation (SSF). The SSF was tasked with 2 major objectives, (1) to develop methods and techniques that would promote soaring safety in the United States; and (2) review and disseminate flight training information and material. These tasks had previously been performed by several subcommittees of the SSA Board of Directors. The creation of the SSF allowed these tasks to be focused in a single organization whose main mission is the promotion of soaring safety.

Accident data included in this report was obtained from two primary sources: the National Transportation Safety Board (NTSB) accident reports (http://www.ntsb.gov/ntsb/query.asp) and the Federal Aviation Administration (FAA) daily reporting system. These sources were selected because of the specific reporting requirements specified in the Code of Federal Regulations NTSB Part 830. Although it would be ideal to include all accident and incident reports involving gliders, it becomes extremely difficult to confirm accurate reporting from the various entities involved. Consequently, the SSF elected to take advantage of the standardized reporting requirements of NTSB Part 830 to develop its data base of glider/tow-plane accident information. This data base is then used to develop accident prevention strategies and to continuously improve training methods to reduce the number of glider/tow-plane accidents.

The analysis information contained in this report represents data compiled by the SSF and reported in **Soaring** Magazine, at Flight Instructor Refresher Course, at pilot safety seminars, and on the **SSF web site (http://www.soaringsafety.org)**.

Funding for the SSF is obtained through donations from individuals and organizations interested in the promotion of soaring safety. These funds are then used to develop, promote, and conduct programs such as soaring safety seminars, flight instructor refresher courses, posters, safety-related articles in *Soaring* Magazine, the SSF web site, and the newsletter of the SSF, *Sailplane Safety*. The Trustees of the Soaring Safety Foundation sincerely hope that this report and the publication of accident data are beneficial in assisting members of the soaring community in developing a greater awareness of current issues and emerging trends in soaring safety.

Additional copies of this report may be obtained from the Soaring Safety Foundation web site http://www.soaringsafety.org. Select the "Accident Prevention – SSF Reports" tab or write to:

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EXECUTIVE SUMMARY

For the twelve-month period ending October 31, 2021, nineteen (19) gliders, three (3) motorgliders, and one (1) towplane were involved in twenty-two (22) separate accidents meeting the reporting requirements of NTSB Part 830 of the Code of Federal Regulation. A mid-air collision between 2 gliders accounts for the discrepancy between 23 aircraft and 22 accidents. This represents no change in the number of accidents reported during the previous 12 month reporting period. The five-year average for the FY17 – FY21 reporting period is 23.8 accidents per year, representing a 2.5% increase in the average number of accidents from the previous five-year period.

While the average number of accidents per year has shown a steady decline since 1981 (averaging 45.6/year in the 80's, 38.6/year in the 90's, 33.5/year in the 00's, 25.5/year for the 10's, and 22/year for this decade) the number of accidents each year remains too high.

In addition, the average number of fatalities has remained nearly constant, at just under 6 per year since the mid 1990's and is also considered too high. In the FY21 reporting period two (2) accidents resulted in fatal injuries to two (2) pilots. In addition, ten (10) pilots and one (1) passenger received serious injuries while eighteen (18) pilots/passengers received minor or no injuries in these twenty (20) non-fatal accidents.

While the number of accidents reported to the NTSB is easy to track (Figure 1), and that number has been declining for both Gliders and General Aviation as a whole, it is important that this number must be combined with flight hours or launches to determine the accident rate. Several years ago the SSF Trustees began asking all soaring organizations (clubs, chapters, commercial operators) to submit their flight times/launches in a confidential manner. This is done by mailing postcards to the organization representative listed in the SSA's database. For the past four (4) years approximately 30% of the organizations have returned these postcards. In March 2022, another mailing occurred, readers of this article are encouraged ask their organization to respond.

In addition to requesting data from soaring organizations, the FAA sends survey requests to some glider owners. The On-line Contest (OLC) also posts data on its web site allowing the SSF to gain another proxy for flight time/launch data. Finally, the SSF has been looking at contest traces posted to the SSA's web site to gather this type of data during sanctioned contests. While the SSF Trustees are not convinced that the times/launches provided by any of these proxies are accurate enough to draw final conclusions, the trends from all of them show a wide fluctuation in accident rates over the past 5 years. Getting better data via soaring organizations confidentially reporting this data will help clarify this situation.

A review of the two (2) fatal accidents showed that the pilot of a SGS 1-35 glider in NY was fatally injured after failing to recover from an unintentional stall/spin after aborting the aerotow launch between 100 and 200 ft AGL for unknown reasons. The pilot of a Moni glider in OK received fatal injuries after failing to recover from an apparent stall/spin. All fatal accidents are still under investigation by the NTSB, more details may be given in the full report available at (http://www.soaringsafety.org/accidentprev/ssfreports.html).

Unlike previous years the NTSB aviation accident database does not contain any description of the accident in seven (7)[1] of the twenty-two (22) or 32% of the accidents. This makes it impossible to place these 7 accidents in one of the 3 (take-off, cruise, landing) categories the SSF uses. While it is expected that descriptions will be added as investigations are concluded, it is not know when that will happen. The SSF will update the community as information becomes available.

In FY21 ten (10) landing accidents represented 45.5% of all accidents. Continuing the historical trend, approximately half (50%) of the landing accidents occurred during off airport landings while the other half (50%) occurred while landings at an airport. Details of these accidents are given in the full report.

Three (3) non-fatal and one (1) fatal aborted launch accidents, called PT3 (premature termination of the tow) events, occurred in FY21 accounted for 19.1% of the accidents. The fatal accident, described above, involved a SGS 1-35. See the full report for more detail.

There were three (3) motorgliders involved in accidents during the FY21 reporting period. See the full report for more details.

The Soaring Safety Foundation offers both anonymous Site Surveys as well as Safety Seminars at your location as a part of our ongoing commitment to safety. The SSF also offers Flight Instructor Refresher Courses for Flight Instructor recurrent training. More information on these and our growing collection of on-line safety and training programs can be found on our website. http://www.soaringsafety.org

[1]The April issue of SOARING gave this number as 12, the NTSB completed 5 more investigations in the month of March 2022

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ANNUAL SAFETY REPORT
FY 2021

This report covers the FY21 (November 1, 2020 to October 31, 2021) reporting period. A review of the NTSB accident database shows no change (22 vs 22) in the number of US soaring accidents during this time period compared to the FY20 reporting period. The number of fatal accidents in FY21 decreased from eight (8) to two (2), a 75% decline. Both of these fatal accidents involved single place sailplanes. In addition to seeing no change in the number of accidents reported to the NTSB 2021 also saw a 4% increase in the number of insurance claims compared to 2020. The rising value of gliders being damaged and wrecked is leading to higher insurance premiums. Reducing the total number of accidents, both in-flight and ground, is the best way to help contain these costs. While the long term trend in accidents reported to the NTSB continues to decline, there is general agreement that more steps must be taken to continue reducing the number of accidents and to eliminate all fatal accidents.

Number of Accidents since 1987

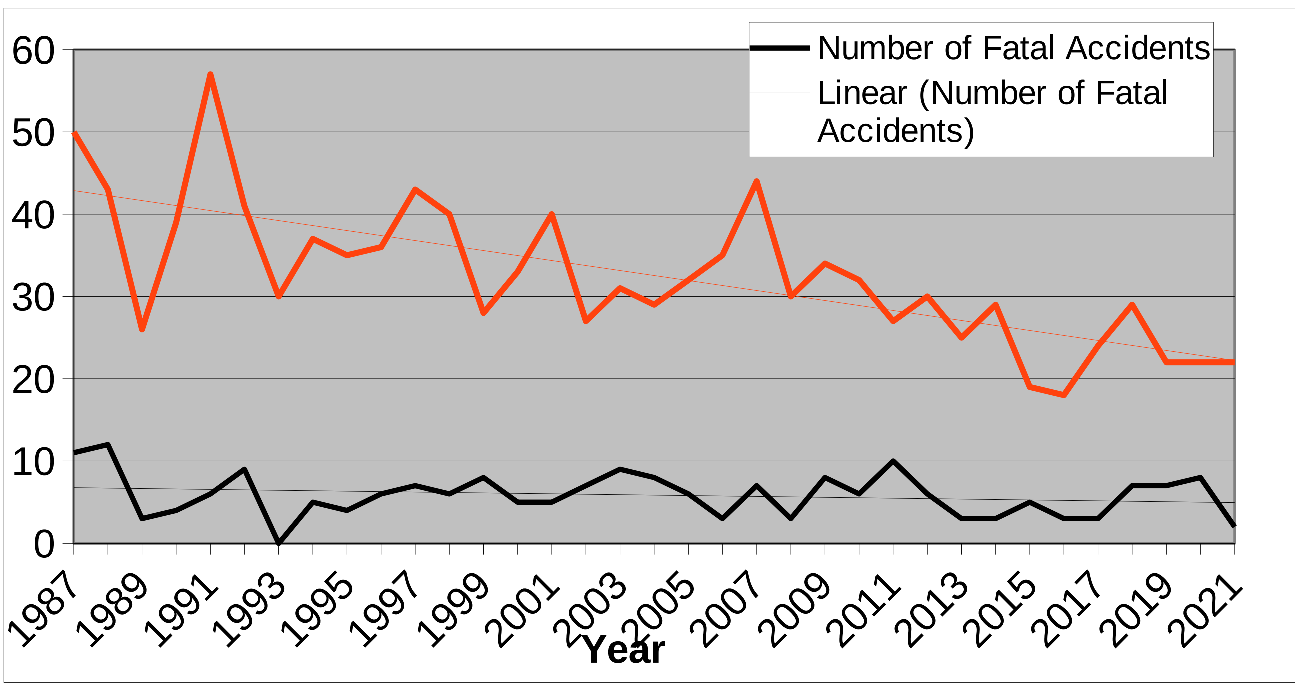


Figure 1 Total number of accidents and fatal accidents on a per year basis.

Figure 1 shows the total number of accidents and the number of fatal accidents from 1987 to the present. The top line is the total number of accidents each year, while the lower line is the number of fatal accidents. An analysis of this data shows two trends. One is that the total number of accidents is declining and has been trending down since the SSF began recording this data. The rate of decline is not as rapid as we would like, but the long term trend is in the right direction. The other is that fatal accidents have remained constant averaging just under 6 fatal accidents each year. See the **Fatal Accidents** section for more details on this topic.

For many reasons[2], this report represents an incomplete view of the accidents involving US glider pilots. Despite these limitations, this annual report is published to highlight glider/towplane accidents listed in the NTSB aviation accident database. Examination of these accidents can help point out trends and issues that need to be resolved. Safety is everyone's business, every pilot must continuously evaluate their flying skills, proficiency, and decision making skills to ensure every flight begins with a safe departure and ends with a safe arrival at the intended point of landing.

Another important point to make is that figure 1 shows the number of accidents, it does not show the accident statistics. To make a statistically significant figure the SSF would need to know the number of flights or the number of hours flown in the US. While this information has been hard to collect at the national level, it is believed that every club and commercial operation has this information (at least they know the number of launches they do). See the **SSF Trustee Action: Glider Flight Data** section for more details. For the past 4 years the SSF mailed postcards and letters to the individual every club, chapter, and commercial operator in the U.S. indicated to the SSA as their point of contact. In each of these 4 years approximately 33% of these clubs, chapters, and commercial operators anonymously responded with this flight time data. In March of 2021 the SSF again sent requests to every club, chapter, and commercial operator in the US. The **SSF Trustee Action: Glider Flight Data** section contains the results from 2017-2020 data. The SSF Trustees encourage everyone to contact their club/chapter/commercial operator leadership to verify that they are responding to this important confidential request.

This trend, where the total number of accidents is declining while the number of fatal accidents remain constant does NOT appear in the General Aviation accident numbers. As figures 2 and 3 show, GA percentage of fatal to non-fatal accidents has remained constant at about 20% while Glider fatal to non-fatal percentages have increased from 12% to 40% over the last 15 years. While the large decrease in the number of fatal accidents in 2021 changes this picture, it will take some time to see if this is a trend or just a single blip.

As shown below, while the largest number of accidents occur during the landing phase of flight, the largest number of fatal accidents occurs during the cruise phase of flight. This means that different programs are needed to address the different causes of these accidents. Landing accidents are primarily due to the pilots coming in low and striking an object short of the runway. Fatal accidents are primarily due to pilots accepting a high level of risk while maneuvering close to the terrain. This maneuvering leads to a stall/spin without enough altitude to recover. This issue is discussed in more detail in the **Fatal Accidents** section.

To continue reducing all accidents and to eliminate all fatal accidents, ALL glider pilots must realize that this is not a problem with individual pilots. These accidents are typically not caused by pilots ignoring the rules or taking incredible risks. Instead we must recognize that pilots are responding to situations in the manner in which they were trained. These Human-Factors errors are symptoms of a deeper systemic problem with our training environment and club/commercial operator safety cultures. In other words, this is a cultural problem within the soaring community.

[2] See Appendix A for a detailed list of reasons and steps you can take to address these issues.

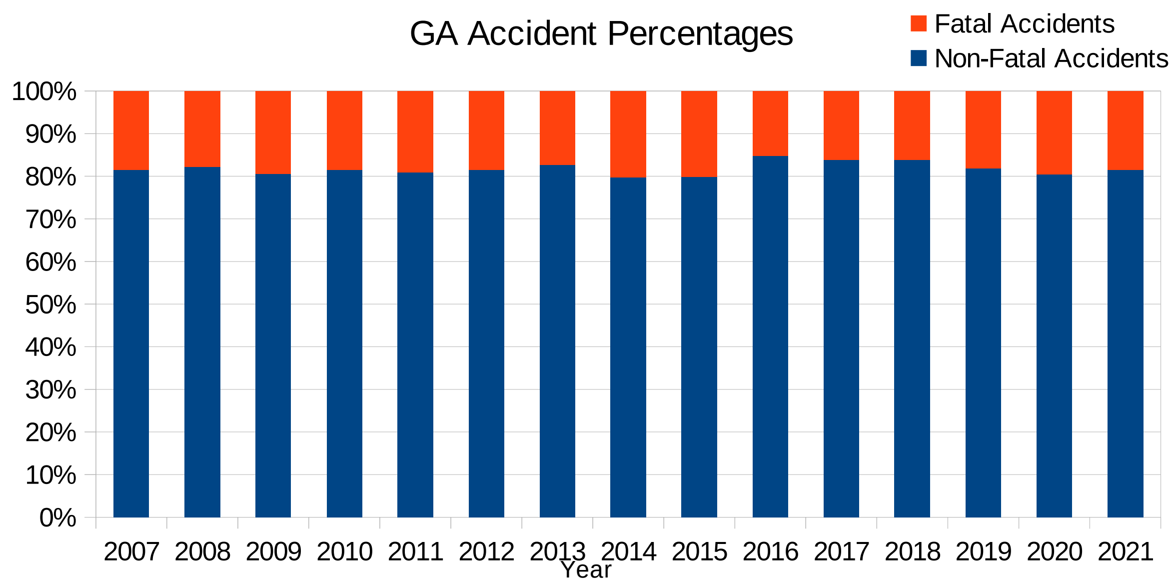


Figure 2: Percentage of fatal to non-fatal accidents in GA

For the past few years the SSF has been promoting the use of Scenario Based Training (SBT) as a viable method for establishing and maintaining a strong safety culture. The use of SBT in primary training establishes a habit pattern that new pilots will adopt and use throughout their aviation career. The use of SBT with rated pilots during flight reviews and spring check-outs will help them understand how risks are evaluated and mitigated. The more flight instructors use SBT the better we will all be in the soaring community. Using SBT, you can help change the safety culture of your club or commercial operation, and help the SSA membership reach its goal of zero fatal accidents each year. For more details see the **SBT training** section later in this report.

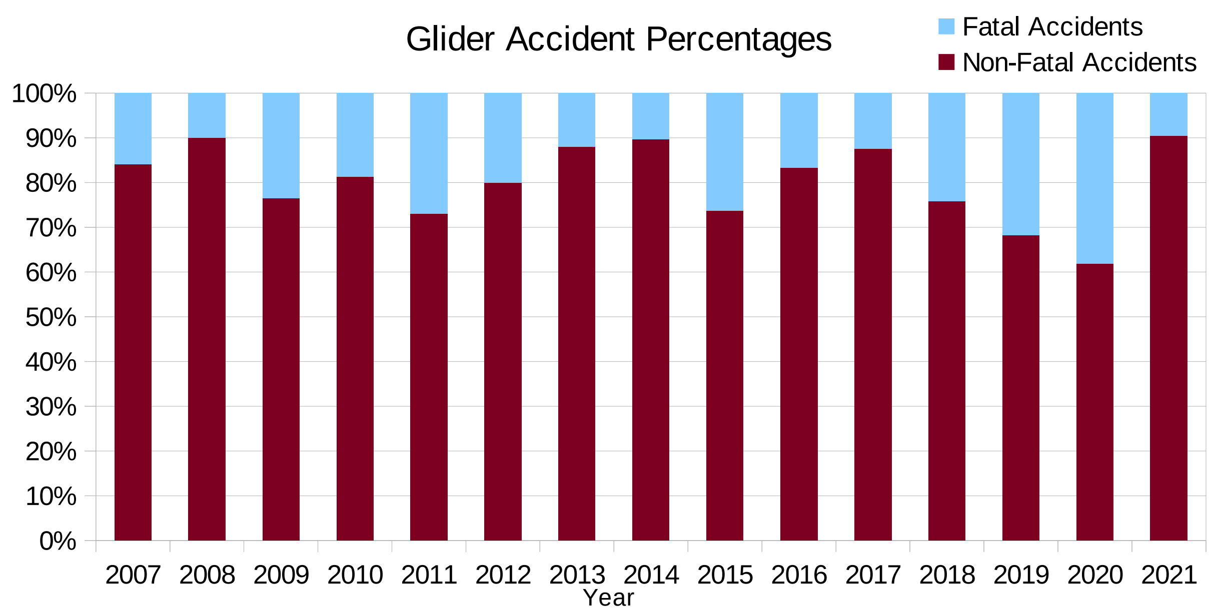


Figure 3: Percentage of fatal to non-fatal accidents in Gliding

FY21 ACCIDENT SUMMARY

Number of Accidents

For the twelve-month period ending October 31, 2021, nineteen (19) gliders, three (3) motorgliders, and one (1) towplane, were involved in twenty-two (22) separate accidents meeting the reporting requirements of NTSB Part 830 of the Code of Federal Regulation. A mid-air collision between 2 gliders accounts for the discrepancy between 23 aircraft and 22 accidents. This represents no change in the number of accidents reported during the previous 12 month reporting period. The five-year average for the FY17 – FY21 reporting period is 23.8 accidents per year, representing a 2.5% increase in the average number of accidents from the previous five-year period.

While the average number of accidents per year has shown a steady decline since 1981 (averaging 45.6/year in the 80's, 38.6/year in the 90's, 33.5/year in the 00's, 25.5/year for the 10's, and 22/year so far this decade) the number of accidents each year remains too high. During this same period, the average number of fatal accidents has remained nearly constant, at just under 6 per year and is definitely too high. In the FY21 reporting period two (2) accidents resulted in fatal injuries to pilots. In addition, ten (10) pilots and one (1) passenger received serious injuries while eighteen (18) pilots or passengers received minor or no injuries in these twenty (20) non-fatal accidents

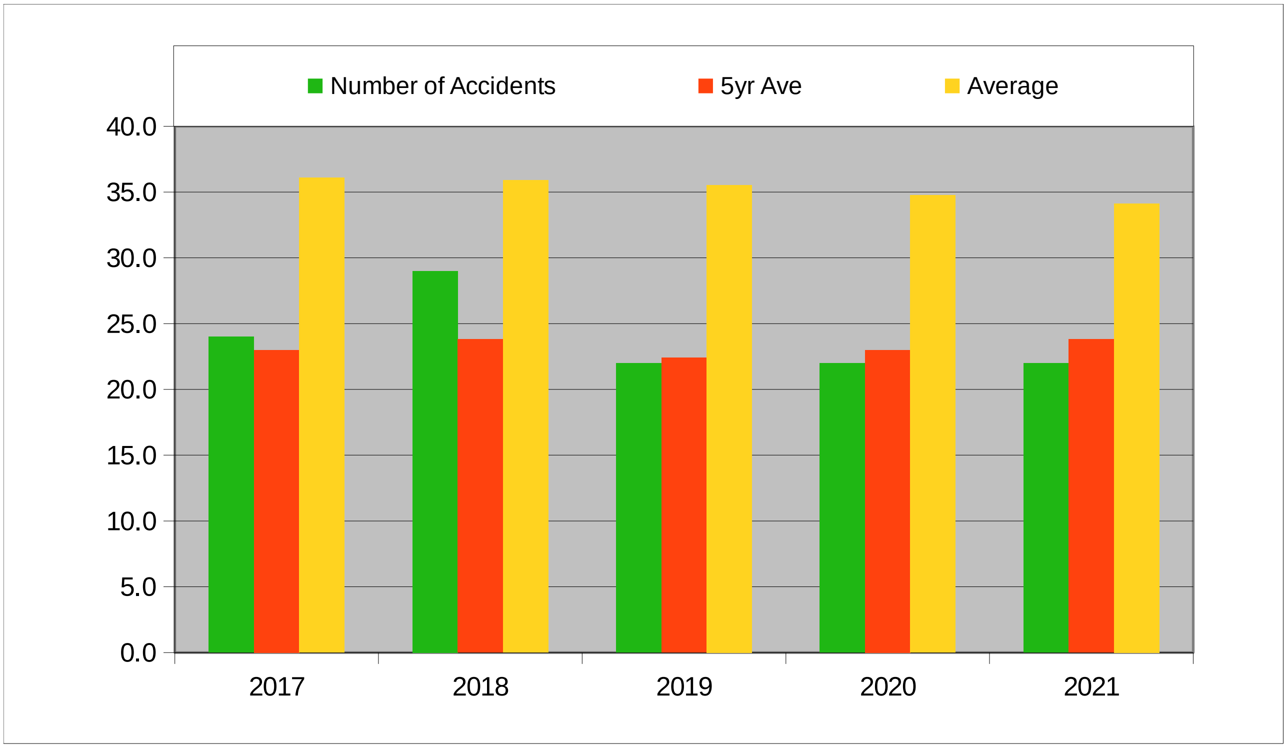


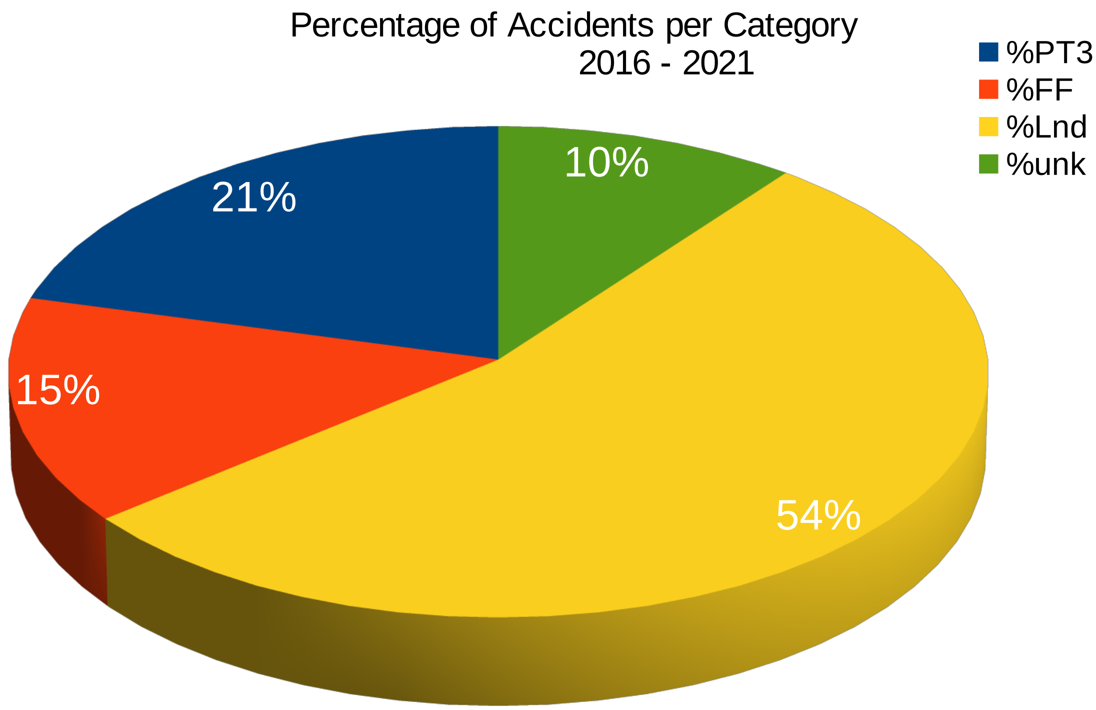
Figure **4 Number of accident, 5 year average 2017 - 2021**

Figure 4 shows the number of accidents that occurred in each year (green bar), the 5 year moving average that covers the noted year and the 4 previous years (red bar), and the long term average from 1981 to the listed year (yellow bar).

Phase of Flight

The number of accidents that occur during the approach and landing phase of flight again surpasses those recorded during any other phase of flight. For the FY21 reporting period, approach and landing accidents were 45% of the total number of accidents reported for the year[3]. Continuing the historical trend, just under half (40% or 4/10) of the landing accidents occurred when the pilots attempted an off-airport landing while the remaining accidents (60% or 6/10) occurred while landing at an airport. Historically landing accidents contribute to the largest number of accidents year in and year out.

Takeoff accidents accounted for 18% of the number of accidents in this reporting period, meaning that 63% of the number of accidents occurred during the takeoff or landing phase of flight. The NTSB data show that remaining 37% of the accidents occurred while the glider was in cruise flight (5%) or for unknown reasons (32%). These percentages match quick well with the longer term averages as show in figure 5.



It should come as no surprise that a majority of accidents occur during the takeoff and landing phase of flight, where the tolerance for error is greatly diminished and opportunities for pilots to overcome errors in judgment or the use of poor decision-making skills become increasingly difficult. Pilots need to become proficient in dealing with launch emergencies. Having a pre-planned set of actions that they will execute if the launch starts to go wrong. Pilots should conduct a proper pre-launch written checklist and use a pre-launch briefing to mentally prepare for contingencies.

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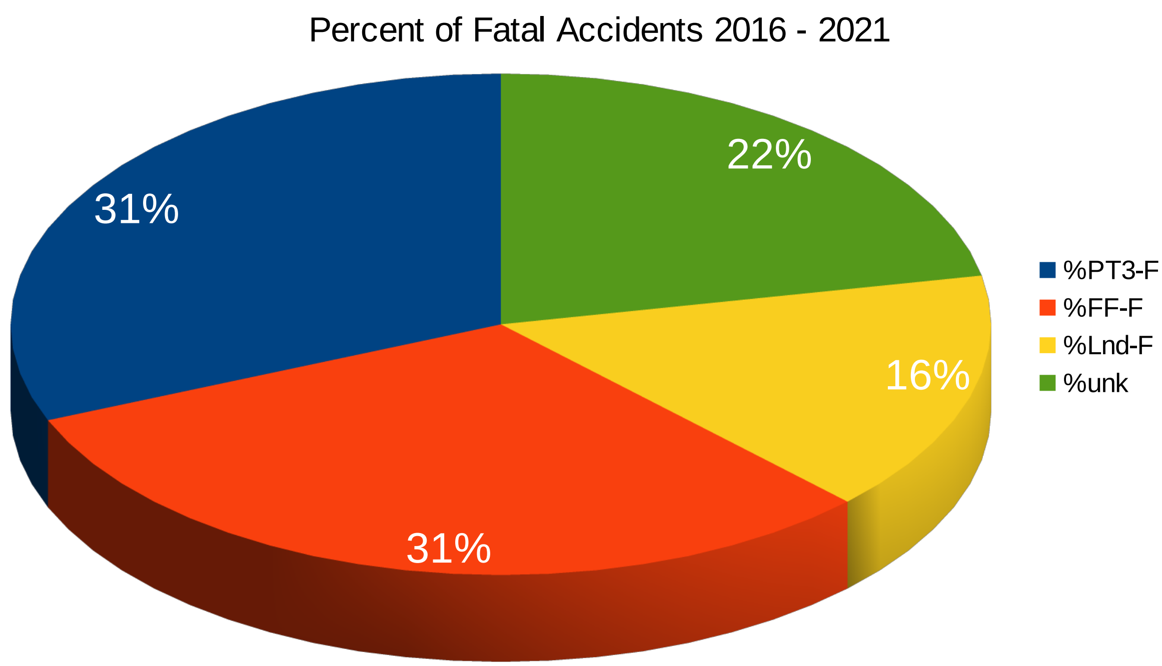
[3]This is the percentage of the accidents that the NTSB has completed investigating and has released a probably cause.

Take-off scenarios can help students and pilots mentally walk though numerous potential launch failures. What would you do if the launch failed while the glider was still on the ground, just lifting off, somewhere above 500 ft, or just prior to release? What would you do if the towplane pilot fanned the rudder during tow (*Check Spoilers!*)? How would a cross-wind affect the towplane and glider (*weather-vane on the ground, drift downwind in the air*), or what would you do in the self launching glider who's engine just sputtered (*pitch to a best glide speed attitude*)? Can you explain to your instructor why these answers are correct? How can you and your instructor develop a realistic scenario to safely practice these potentially hazardous events (*use Condor*)? NTSB accident reports are also an excellent resource for creating these scenarios. Remember, the better the learning the more the pilot will get out of the training. See the **Launch Accidents** section for more details on how to deal with launch failures.

Figure 5 shows the percentage of accidents that occur in the various phases of flight over the past 6 years. TO/Tow accidents are classified as those where a Premature Termination of The Tow (PT3) event occurred ending the tow before the time/altitude the pilot intended when the launch began. Landing accidents are classified as those where the pilot is clearly attempting to land, eye witness reports or other indications such as a retractable gear being extended or GPS trace data are used to validate this decision. Cruise accidents are classified as those where the pilot had released as intended, and it is not apparent that there was an intent to land. Unknown accidents are classified as such by NTSB reports providing little or no factual data or where no probable cause has been determined.



As shown in figure 5, the largest number of soaring accidents occurs during the landing phase of flight. However, Figure 6 shows an entirely different picture when just fatal accidents are considered. It may surprise SSA members to learn that more fatal accidents occur during the cruise phase of flight than during the landing phase of flight. Table 1 shows the number of fatal and non-fatal accidents for the years 2016 – 2021. The suffix notation "-F" (fatal) and "-NF" (nonfatal) is attached to each of the 3 major phases of flight Launch (PT3), Cruise (Free Flight - FF), Landing (Lnd), and Unknown (Unk). Accidents during ground handling are not broken out, but are included in the totals. Table 1 shows the same information as was found graphically in Figures 5 and 6, Note that 50% of the cruise flight accidents that result in fatal injures compared to 36% during the launch phase and 7% during the landing phase of flight in this 6 year period.

	PT3-NF	PT3-F	FF-NF	FF-F	Lnd-NF	Lnd-F	Unk-NF	Unk-F	Total
2016	2	1	3	2	10	0	0	0	18
2017	4	2	3	2	11	0	0	1	23
2018	3	1	1	4	17	1	0	1	29
2019	3	1	1	1	11	3	0	2	22
2020	3	4	1	1	7	1	1	2	22
2021	3	1	1	0	10	0	6	1	21
Total	18	10	10	10	68	5	9	7	135

Table 1: Number of non-fatal (NF) and fatal (F) accidents from 2014 - 2019

Pilots need to recognize the risks of low altitude thermalling. Circling at low speeds in turbulent air close to the ground can easily lead to an unintentional stall or spin entry in many gliders. Recovery, even for a proficient pilot can be impossible. Pilots must also learn how to deal with problems and emergencies in the launch and landing phases of flight. The SSF Goal Oriented Approach, described below, provides guidance on how to plan and execute safe landings.

Launch Accidents

Three (3) non-fatal and one (1) fatal aborted launch accidents, called PT3 (Premature Termination of The Tow) events, accounted for 18% of the FY21 accidents. Three (3) of the accidents involved the glider being aerotowed, while the fourth was a winch launch. Pilots can mentally prepare for a failed launch by developing a specific set of action plans to deal with several contingencies. The task is then to execute the proper plan at the proper time. Flight instructors should continue to emphasize launch emergencies during flight reviews, club check rides and initial flight training.

Soaring operations (clubs and commercial operators) should evaluate their training syllabus to ensure that this training is provided to both students and rated pilots. It should also be noted that just 'pulling the release' to simulate a rope break is not sufficient. Accident reports indicate that over 60% of PT3 accidents occur after the pilot intentionally pulled the release. In FY21 four (4) of these PT3 accidents occurred after some issue caused the pilot to lose control of the aircraft during the initial portion of the launch. Being prepared can help pilots better deal with these types of unexpected events. Instructors should evaluate and critique the pilots decision making skills in addition to the in-flight piloting skills.

Aerotow Launch Accidents

The commercial pilot in a Mini-Nimbus was seriously injured, and the glider was substantially damaged after impacting a parked truck after dropping a wing during the take-off roll. The pilot reported that the left wing dropped and the glider departed the runway immediately after the launch started. His hand slipped off the release knob on the 1st attempt, and he successfully released moments before impacting a truck that had been left parked by the side of the runway. The glider had traveled approximately 400 ft in under 10 seconds before the impact occurred. *NTSB ERA21LA156*

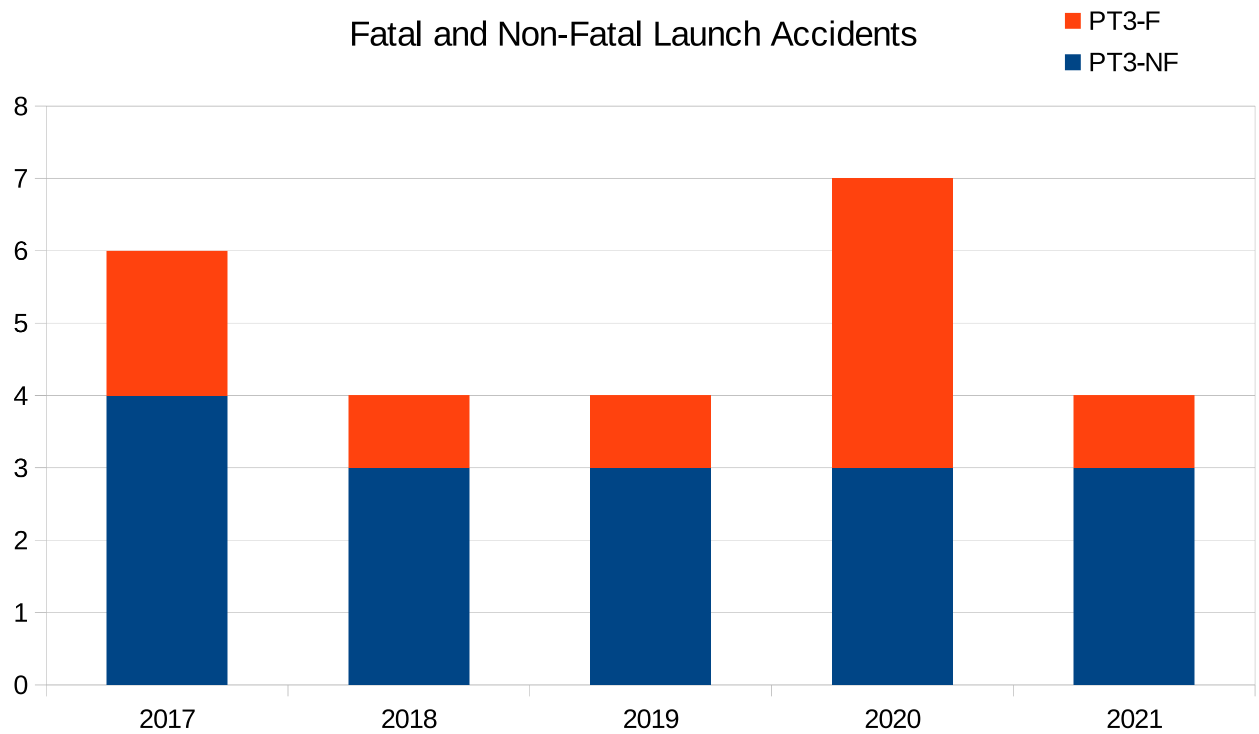


Figure 7: Number of fatal and non-fatal launch accidents

The pilot of a HPH 304S was seriously injured and the glider was substantially damage after aborting the aerotow launch about 300 ft AGL. The tow pilot reported that the glider unexpected released and then entered a left turn before landing in what appeared to be a wings level attitude. Examination of the glider revealed that the elevator push-rod located in the horizontal stabilizer failed due to corrosion. *NTSB CEN21LA346*

The fatal aerotow launch accident will be discussed below in the F**atal Accidents** section.

Ground Launch Accidents

The student pilot was seriously injured while the flight instructor receive minor injuries when their IS-28B2 'Lark' impacted trees and terrain after a failed winch launch. The weak link broke about 800 ft AGL after the pilot exceeded the normal winch tow speed. The instructor then maneuvered the glider for a normal landing. During the base/final turn the glider stalled and entered a spin from which the instructor was not able to recover. *NTSB CEN21LA226*

Self-Launch Accidents

There were no self-launch PT3 accidents reported in the FY21 reporting period.

Towplane Accidents

There was one (1) towplane accident reported in the FY21 reporting period. The details are found in the **Accidents involving Tow Aircraft** section.

As can be seen by the above accidents, every pilot should be prepared for a failed launch. This includes making sure the launch area is free of obstructions, the aircraft is properly assembled and rigged, the pilot/passenger is briefed on possible actions, a proper written pre-launch chedklist has been completed without interruption, and the pilot is operating within their abilities. Every glider pilot must have a predetermined plan of action that can be executed immediately if the launch does not go as planned.

When practicing emergency procedures pilots should consider all factors such as wind, terrain, density altitude, glider and towplane performance. An exact plan of action should include how the towplane will maneuver, stay on the extended runway centerline or drift downwind after clearing obstacles to give the glider pilot a more direct turn into the wind. While altitude is important the lateral position is also important as a low climb rate or terrain features may place the glider in a position where a safe return to the runway is not possible.

It is also important that the glider has sufficient airspeed to safely maneuver for the intended landing. The pitch attitude of a launching glider (regardless of launch method) is not the pitch attitude that must be achieved once off tow, or when the engine is stopped. The immediate pilot action must be to establish the proper nose low pitch attitude and then wait several seconds to ensure that the proper airspeed has been obtained. Only then can any turn be made. Pilots who make an immediate turn without ensuring the proper pitch attitude and airspeed are at high risk of a stall/spin accident.

It is also desirable to perform any turns with as much altitude as possible. This means the pilot should consider an initial turn away from the extended runway centerline to give the glider turning room so a final turn will allow the glider to roll out on the runway centerline avoiding a final alignment turn much closer to the terrain. Finally the pilot must be prepared to change plans and make a safe off-airport landing if it becomes clear that making the runway is no longer an option.

Once a decision to abort the launch is made and a decision to turn back toward the field is made, the most important task to concentrate on is the **quality** of the turn, pitch attitude and proper coordination. **MAINTAIN THE PROPER PITCH ATTITUDE (AIRSPEED) AND MAKE A COORDINATED TURN!**

Using SBT techniques pilots can be taught to deal with these situations. Pilots and instructors can practice these scenarios at a safe altitude and with the full knowledge and involvement of the tow pilot. Using a guided discussion format the instructor can ensure the pilot recognizes all of the internal and external factors that must be accounted for. The pilot and instructor should then develop an initial plan to safely practice this maneuver. With this initial plan in place, the pilot and instructor must then talk with the tow pilot to get agreement between all 3 pilots that the plan can be safely executed. The final step is to fly this flight. The instructor can now evaluate the glider pilots flight skills and his/her decision making skills.

All tow operations need to have a Standard Operation Procedure for tow. This SOP should define the normal tow procedures and set the expectations for both the glider and towplane pilots. Any deviation from these SOPs needs to be communicated between both pilots before the launch begins. Abnormal operations like holding the towplane in ground effect before zoom climbing at the end of the runway need to be completely discussed before the launch begins. Failure to do so leaves the glider pilot in a difficult situation not knowing if the towplane is having a performance problem or if both aircraft will clear any obstacles off the end of the runway.

Finally, but most importantly, it is critical for pilots to understand that a pilot's most basic responsibility is control of the aircraft. Loss of Control is the leading cause of fatal Glider and General Aviation accidents in the US. Remember, Regardless of the circumstances, **FLY THE AIRCRAFT!!**

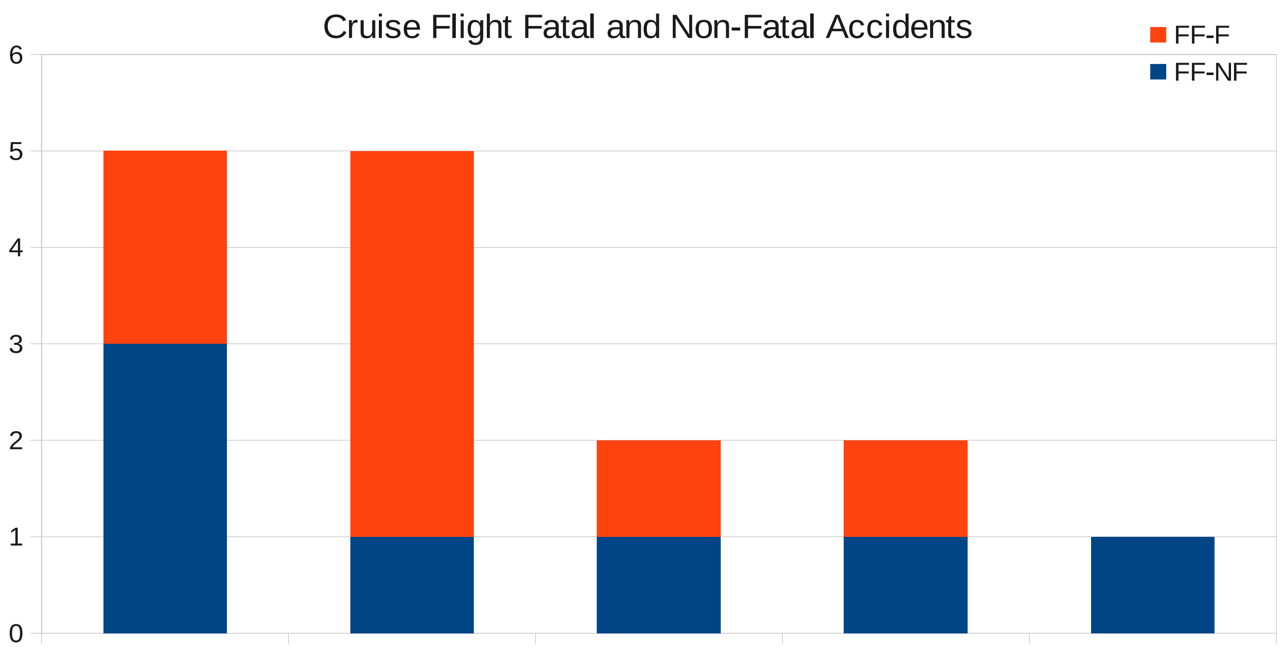


Figure 8: Cruise Flight Fatal and Non-Fatal Accidents in FY21

Cruise Flight Accidents

There was one (1) non-fatal cruise flight accidents reported during the FY21 reporting period.

The pilot of a ASW-20C and the pilot of a ASW-27 were both seriously injured and both gliders were substantially damaged following a mid-air collision. The plot of the ASW-20 reported seeing the ASW-27 about to pass in front of him traveling right to left. His attempt to avoid a collision by entering a steep dive, failed and the impact rendered both gliders unflyable. Both pilots exited their respective gliders by parachute. Both gliders were FLARM equipped but the ASW-27's system was inoperative awaiting the annual software update. *NTSB WPR21LA040*

Landing Accidents

Accidents occurring during the landing phase of flight again accounted for the majority of injuries to pilots and damaged or destroyed gliders. During the FY21 reporting period, gliders hitting objects on final or during the landing roll accounted for the majority of the landing accidents. Continuing a historical trend, over half of the landing accidents (60%) occurred while the pilot was landing at an airport. The remaining 4/10 accidents occurred while the pilot was making an off-airport landing.

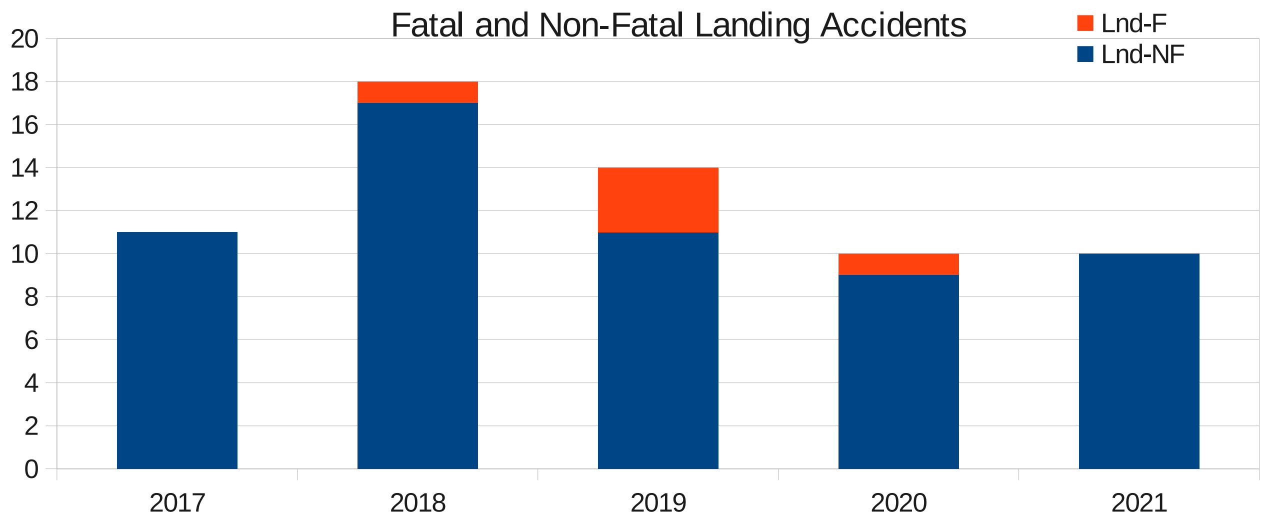


Figure 9 shows the total number of landing accidents from 2017 – 2021 broken down by fatal and non-fatal accidents. This figure shows that the majority of landing accidents do not result in fatal injuries to the pilot. A deeper analysis of the landing accidents in FY21 indicate pilots continue to strike objects during the final approach (2 accidents) or while on the ground roll (4 accident). See figure 10 for a complete breakdown of landing accident factors.

During the FY21 reporting period ten (10) non-fatal landing accidents met the reporting requirements of NTSB part 830. The NTSB reports indicate that one (1) student pilot, three (3) private pilots, two (2) commercial pilots one (1) ATP rated pilot, and three (3) CFI-G rated pilot were involved in these accidents.

The private pilot in a Libelle 205 received serious injures while the glider was substantially damaged after it struck a tree while turning to final. The pilot reported that during the flight the glider descended to 1,500 ft AGL and the pilot was unable to find the glider port. At an altitude of 1,100 ft AGL the pilot began searching for a suitable field to land in. A witness reporting seeing the glider clip the top of tree before colliding with the ground while on final to the field. *NTSB ERA21LA089*

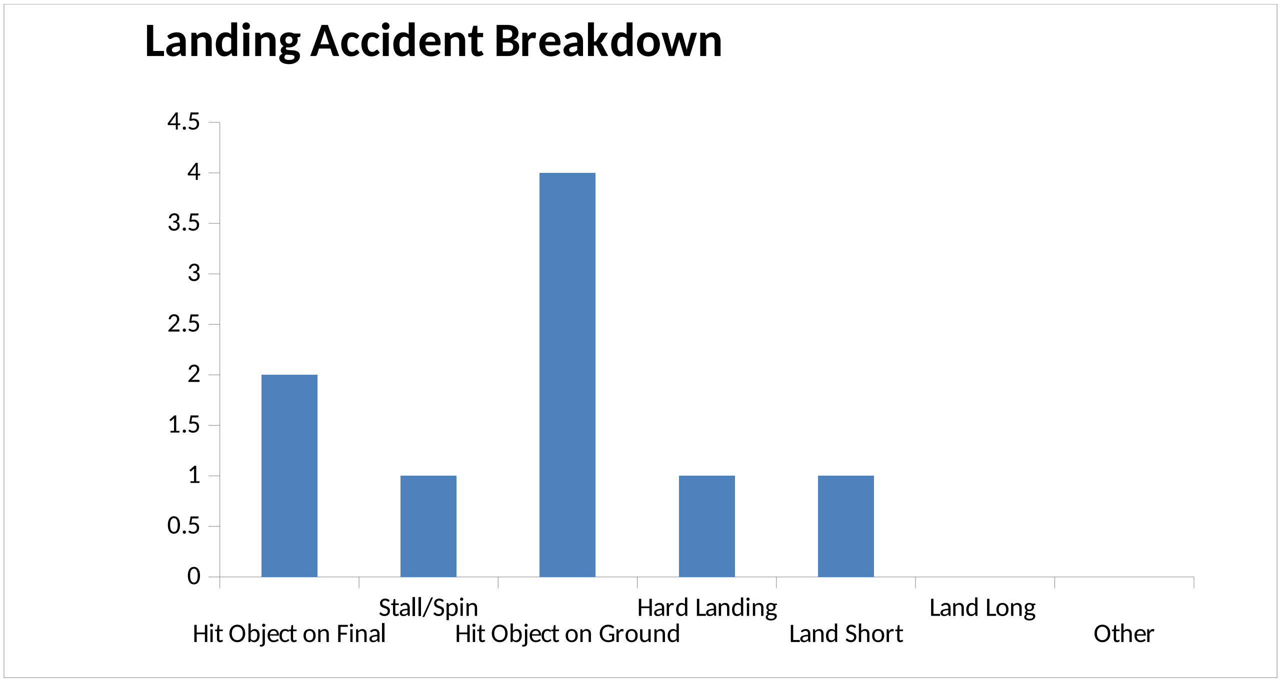


Figure 10: Reported factors in landing accident

The private pilot in a SGS 1-35 was not injured while the glider was substantially damaged after it impacted terrain next to the airport runway. The pilot reported that he was making his 1st landing at a new airport and was distracted by a number of factors (right hand pattern, other traffic, and unfamiliar environment). He overshot the turn to final and wound up low with rising terrain blocking his sight to the runway. He forced the glider onto the ground to avoid colliding with a building, landing hard and ground-looped coming to rest in a large ditch. *NTSB CEN21LA281*

The commercial pilot of a HPH 304CZ glider received minor injuries while the glider was substantially damaged after striking a tree during the landing roll. The pilot reported that he was unable to find lift and could not glide to an airport. The glider landed successfully in a valley clearing and the right wing struck a tree during the landing roll. *NTSB WPR21LA235*

The student pilot of a Blanik L-23 glider was not injured while the glider was substantially damaged after striking a runway light and drainage culvert. The pilot reported that he while on final he developed a cramp in his right leg, leading to a high descent rate and hard landing. After touchdown the pilot lost control of the glider and veered off the left side of the runway striking a light and drainage culvert with the right wing. *NTSB ERA21LA242*

The CFI and student were not injured but the SGS 2-33A was substantially damaged while landing. The instructor reported while on final a gust of wind displaced the glider to the left of their intended centerline. Seeing another glider parked on the side of the runway, the pilot landed diagonally, lost control and ground looped causing damage to the fuselage and both wings.. *NTSB ERA21LA244*

The CFI in a Grob 103 Twin II received minor injuries while the student was not injured and the glider was substantially damaged after it struck a barbed wire fence while landing. The instructor reported that the glider had descended to a point where a return to the airport was not possible so he selected a landing site north of a local reservoir. The pilot did not see any obstacles while on downwind, however during the landing roll the glider collided with a barbed wire fence damaging the right wing and rear canopy. *NTSB WPR21LA290*

The CFI in a Blanik L-23 glider was seriously injured while the student was not injured and the glider received minor damaged after a hard landing. The instructor reported that the student was attempting to land when he flared to a pitch high attitude causing the glider to stall several feet above the runway. The glider landed hard severely injuring the instructor. *NTSB ERA21LA327*

The commercial pilot in a SGS 2-32 was seriously injured while one of the two passengers was also seriously injured and the other was not injured while the glider was substantially damaged after it struck an iron post while making an off-airport landing. The pilot reported that the winds were stronger than predicted and he was not able to glide back to the airport on a sightseeing flight. The pilot determined that an off-airport landing was necessary and he picked a dirt road bounded by harvested fields for the landing. About 4 ft AGL while in the landing flare the left wing struck an iron post causing the glider to yaw and touch down going sideways. *NTSB WPR22LA007*

The private pilot in a Pipistrel Apis Bee motorglider was seriously injured and the motorglider was substantially damaged after impacting terrain. The pilot reported that he successfully landed the motorglider with engine expended and at idle power. The accident occurred on the next landing with the engine stowed. The pilot reported being high turning final, and using a combination of spoilers and slips to increase the descent rate. While over the runway and entering the 3^{rd} forward slip the glider stalled and impacted terrain. *NTSB ERA22LA025*

Even pilots on local flights should consider using good ADM/RM skills to consider the possibility of an off-airport landing. Picking a field that has sufficient length even when obstacles like trees and power lines exist is a primary task. Being able to judge the landing without reference to the altimeter and without reference to specific objects on the ground (e.g., turn base over the field where Joe’s garage used to be) are essential skills all pilots need to develop.

Picking a landing field based on the ease of the retrieve vs the safety of the landing has lead to many accidents and incidents. It is always better to land and stop safely and then figure out how to get the glider next to the trailer.

Scenario based training techniques can be used to help pilots develop the necessary ADM/RM skills they need. In addition, the SSA ABC/Bronze Badge program can help all pilots develop the piloting skills needed to make off-airport landings. The Bronze Badge program requires the pilot demonstrate some soaring skills (2 – 2 hour flights) and the landing skills (spot landings and landings without reference to the Altimeter). Talk to your clubs/schools SSA-Instructor (SSAI) to participate in this program and develop/demonstrate your skills.

Remember, that all skills atrophy if not used so practice them on a regular basis. Make every landing a spot landing. Don’t allow yourself to simply ‘stop somewhere on the airport’. Before launch, or before entering the pattern, pick a specific stopping spot on the runway. Then use the skills you developed during your primary training to land and stop at this spot. Talk to you instructor if you have trouble accomplishing this task and re-develop these skills, remember you demonstrated them to the pilot examiner when you initially got your license.

Another fun way to practice is to hold a spot landing contest. Pick an afternoon when conditions are calm and put an orange highway cone on the runway. Give everyone a pattern tow and have classes for students, private, and commercial pilots. See who can get the closest without overrunning the cone. You may be amazed with the results.

Fatal Accidents

Two (2) glider pilots were involved in two (2) fatal accidents during the FY21 reporting period. This represents a 75% decrease in the number of fatal accidents (2 vs 8) from previous reporting period. One (1) accident occurred during the launch phase of flight (auto-tow), one (1) and the remaining accident occurred for unknown reasons.

Fatal Accidents 2017-2021

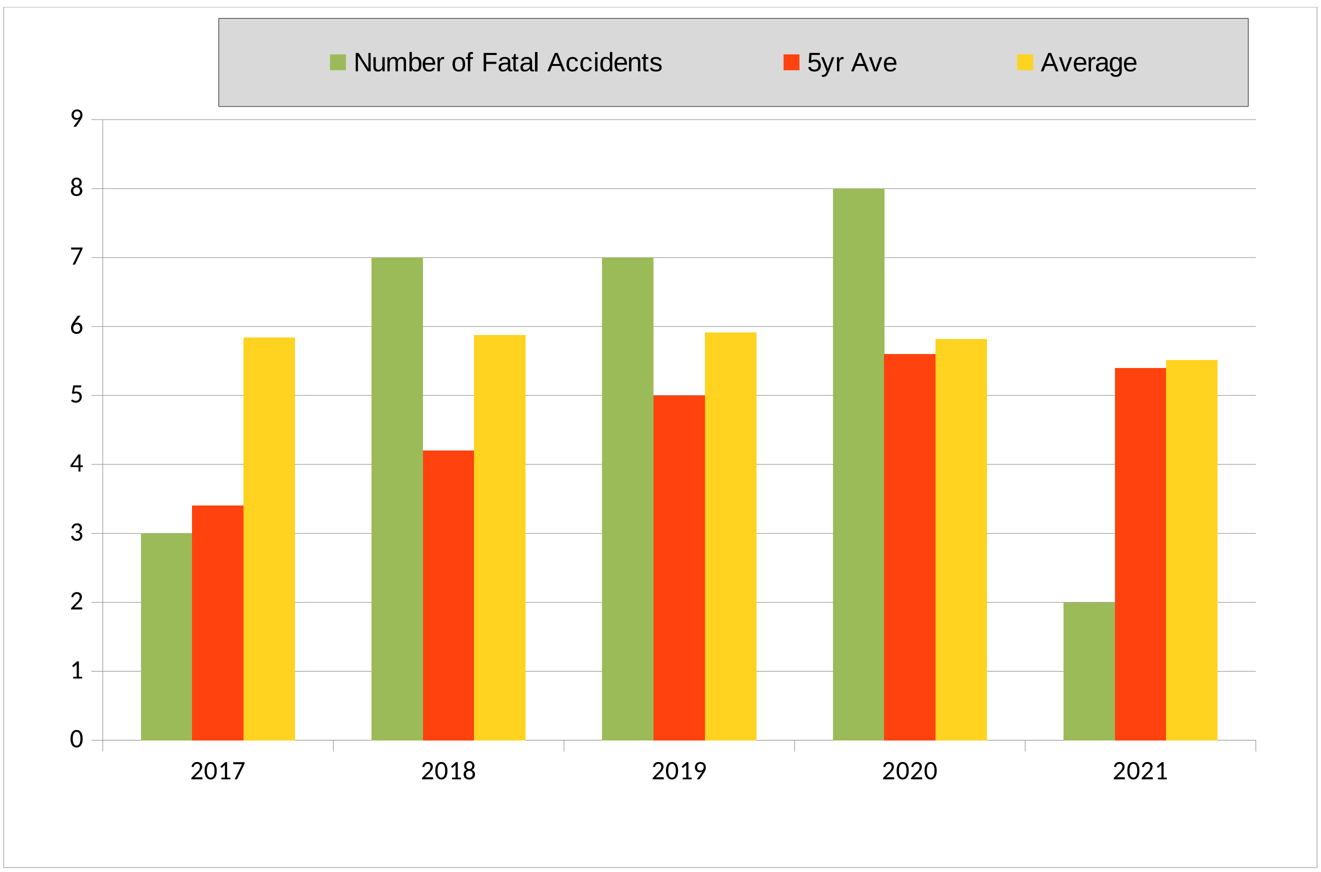


Figure 11: Number of fatal accidents, 5 year average, and average since 1987

It should also be noted that this report continues showing the breakdown of fatal and non-fatal accidents in the launch, cruise, and landing phase of flight. Figures 7, 8, and 9 (above) show the number of non-fatal accidents (blue column) and the number of fatal accidents (orange column). The total number of accidents is the sum of both fatal and non-fatal accidents. Figure 11 shows the number of fatal accidents in all phases of flight. The green bar shows the number of fatal accidents that occurred during that year, the red bar is a moving 5 year average, while the yellow bar is the average starting from 1987 to the year shown in the X-axis.

The NTSB is still investigating these fatal accidents and no probable cause has been issued for any of them. The reports below summarize the two (2) accidents that occurred during this reporting period.

The pilot of a SGS 1-35 was fatally injured after the glider impacted terrain following an aborted aerotow. Witnessed report seeing the glider release between 100 and 200 ft AGL before beginning a turn to return to the airport. The glider departed controlled flight and impacted terrain during this maneuver. *NTSB ERA21FA239*

The pilot in a Moni was fatally injured and the glider was substantially damaged after impacting terrain in a nose low attitude. Preliminary indications show that the impact is consistent with the glider entering a stall/spin condition for unknown reasons. *NTSB CEN21LA396*

For the five-year period 2017 – 2021, 28 pilots and 5 passengers received fatal injuries while soaring. This equates to a five-year average of 6.6 fatalities per year, a slight decrease in the number of pilots and passengers lost from the previous 5-year period. The data shows the long term average of 5.5 fatal accidents per year since the SSF began collecting fatal accident data in 1987. While the current 5-year average is down from the initial rate of 7.2 fatal accidents per year recorded in 1991 (1987-1991), the long-term trend is not encouraging. All glider pilots need to evaluate their skills and procedures with an eye toward determining how we can eliminate fatal accidents from our sport.

In 2011 the SSF began taking a closer look at fatal glider and tow-plane accidents. From 2002 – 2021 there were 104 fatal glider or tow-plane accidents in the US involving 110 pilots and 14 passengers in 110 aircraft (mid-air collisions account for the additional aircraft). The NTSB database contains a probable cause (PC) for 92 of these accidents leaving 12 still under investigation.

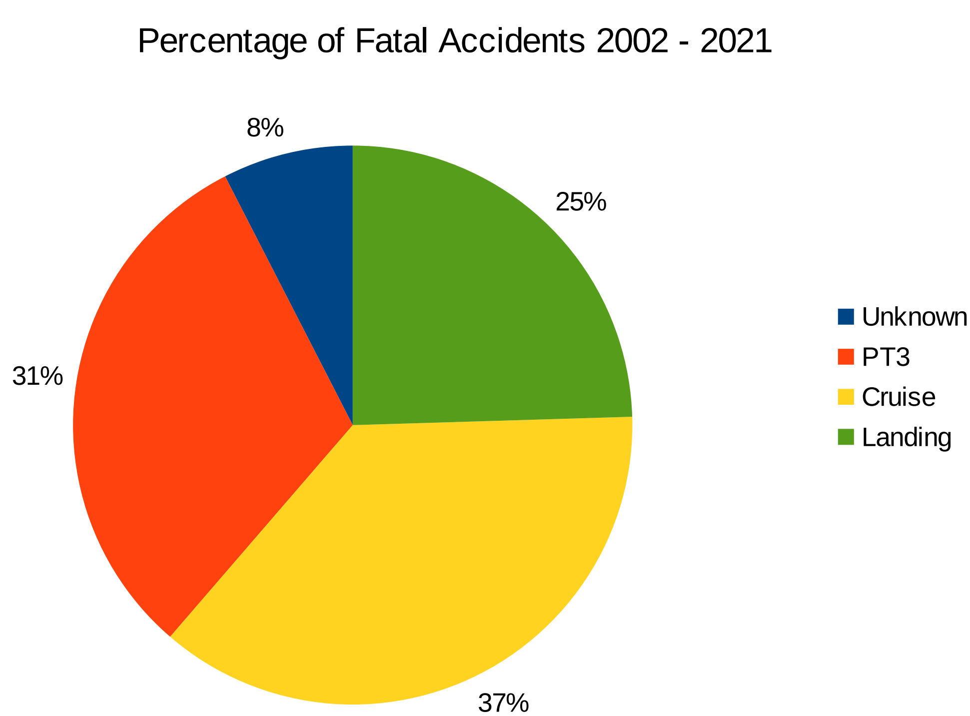


Figure 12: Percentage of Fatal Accidents in various phases of flight

Figure 12 shows the percentage of fatal accidents in the 3 major phases of flight (launch, cruise, and landing) from 2002 thru 2021. It is instructive to compare these percentages to the percentage of accidents as shown in Figure 5. While the majority of accidents occur in the landing phase of flight and the fewest percentage of accidents occur in the cruise phase of flight, fatal accidents show a complete different trend. In this case fatal accidents occur most often in the cruise phase of flight with the fewest number of fatal accidents occurring in the landing phase of flight.

Figure 13, shows the breakdown of probable causes in 9 major areas, with a 10th (no P.C. - Probable Cause) meaning the accident is still under investigation. It is informative to see that the majority of fatal accidents occur after the glider stalled and/or spun. As described later in this report, stall/spin recognition and recovery should be a major flight training activity.

The SSF Trustees will continue to work with the soaring community to find ways to eliminate fatal glider/tow-plane accidents.

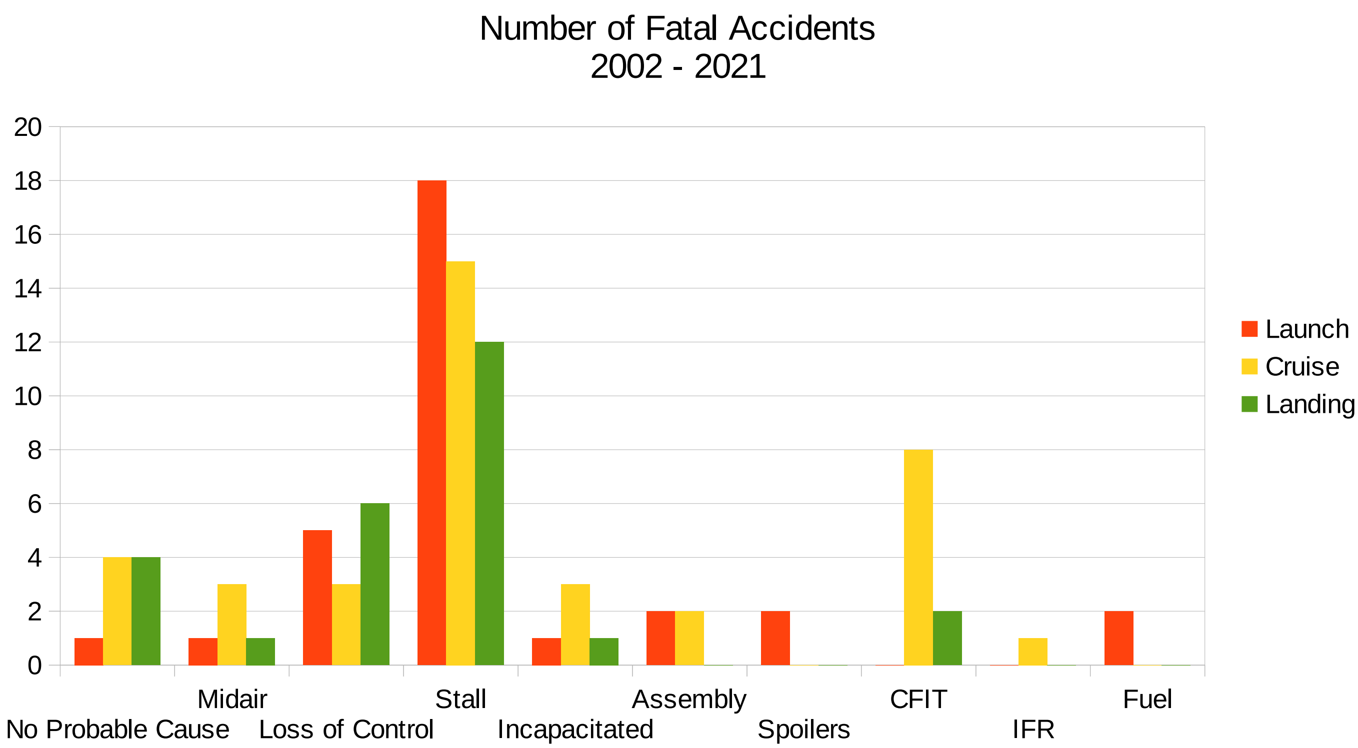


Figure 13: Number of fatal accidents by NSTB defined Probable Cause

Damage to Aircraft

A total of sixteen (16) gliders, three (3) motorgliders, and one (1) towplane received structural or substantial damage during the FY21 reporting period. While two (2) gliders were destroyed and one (1) received minor damage during accidents in this reporting period.

The large number of damaged gliders has a significant impact on club and commercial operators flight operations. Not only is there the immediate issue of dealing with the injuries resulting from the accident but also the long-term impact cannot be forgotten. Typically the damaged glider will be out of service for several months while it is being repaired. During this time flight operations may be reduced or suspended if this is the operation's only glider. This can place a significant financial strain on the club or commercial operator and makes it harder for members or customers to obtain and maintain both currency and proficiency.

Auxiliary-Powered Sailplanes

Three (3) gliders equipped with some kind of internal powerplant (gas or electric) were involved in accidents during this reporting period. In this report a glider that can self-launch, or simply sustain flight after a conventional glider launch has been completed is referred to as a motorglider. Details of those accidents are reported in the appropriate section (launch or landing) above.

It should be noted that in two (2) of these accidents the motorgliders had self-launched. The details of 1 accident can be found in the **Lsnding Accidents** section of this report, the other 2 and discussed in the **Accidents with no know cause** section.

Accidents Involving Tow-Aircraft

The ATP rated pilot was not injured but the Pawnee towplane was substantially damaged after the right wing struck a berm during the landing roll. The pilot reported that there was significant play in the aileron control so the pilot stopped towing and investigated. Nothing apparent was found so the pilot began another tow. During this tow the control stick came out of it's holder. The pilot was able to return and land using power, rudder, and trim. During the landing roll the airplane ran off the side of the runway and the right wing struck a berm. *NTSB WPR21LA238*

Accidents with no known cause

At the time this report was created there were seven (7) accidents entered into the NTSB database that do not contain enough information to determine why the accident happened. One of these resulted in fatal injuries to the pilot it is so noted in the **Fatal Accidents** section of this report.

The following accidents appear in the NTSB database:

- Piliatus B4 – NTSB ERA21LA266
- SGS 2-33A – NTSB ERA21LA248
- SGS 1-26E – NTSB ERA21LA276
- ASW 27-18 – NTSB ERA21LA329
- SGS 2-33A – NTSB ERA21LA330
- Moni (F) – NTSB CEN21LA396
- ANT 100 – NTSB CEN21LA407

Accidents by SSA Region

A comparison of the geographic locations of accidents in relation to SSA Regions tends to reflect the geographic distribution of the SSA membership. In general, those regions having the greatest populations of SSA members and soaring activity tend to record the highest numbers of accidents[4].

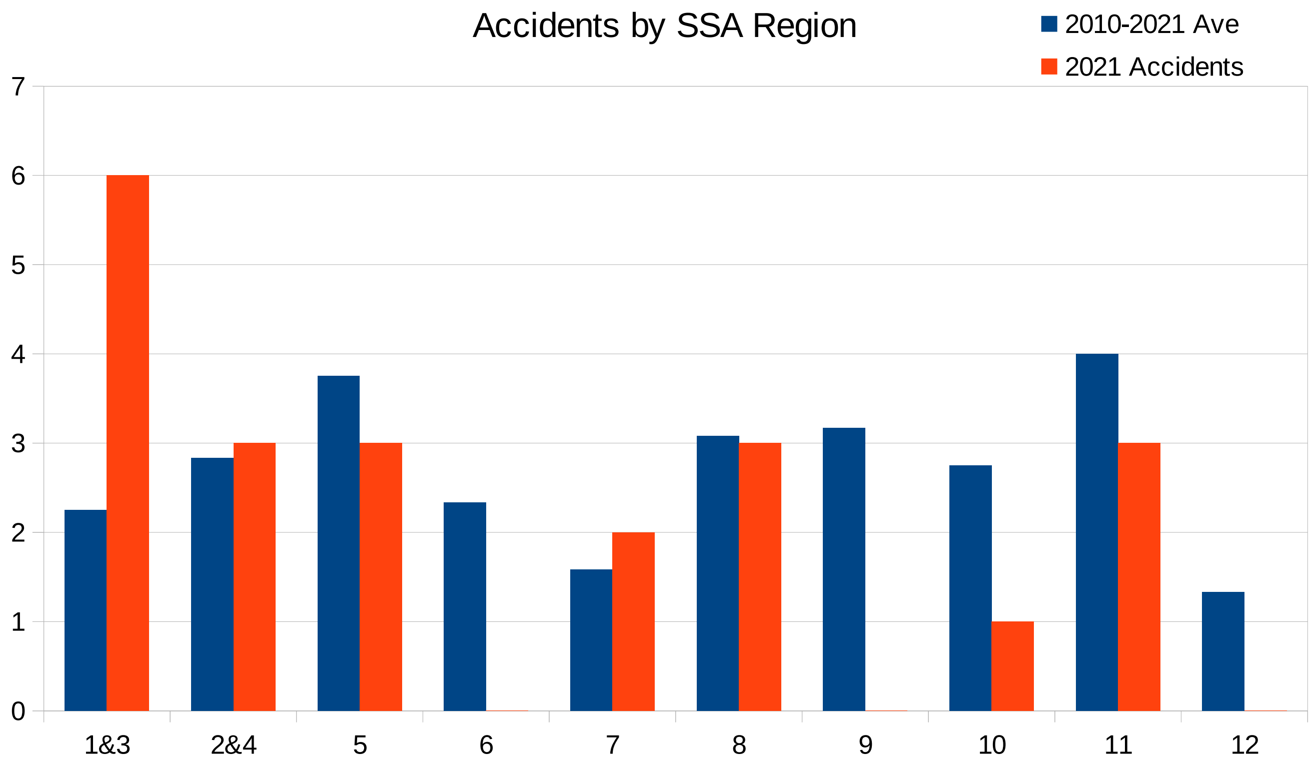


Figure 14: FY21 and average Number of accident per SSA Region

Figure 14 compares the number of accidents in each SSA region with the average number of accidents in that region during the previous 12 years (FY10-FY21). Figure 15 shows the same information for fatal accidents during the same periods.

As can be seen, accidents occur in all regions. Due to the different geography in the US, it is difficult to compare one region against the other. However, it is possible to see how each region compares to its historical trend. The intent of these graphs is to show how the current reporting period compares to the historical trend for each region.

A strong 'safety culture' is a large part of the solution to reducing the number and severity of glider and towplane accidents. Every pilot must continuously evaluate the ground and flight operations with an eye toward preventing incidents from becoming accidents.

[4] See Appendix A for more details

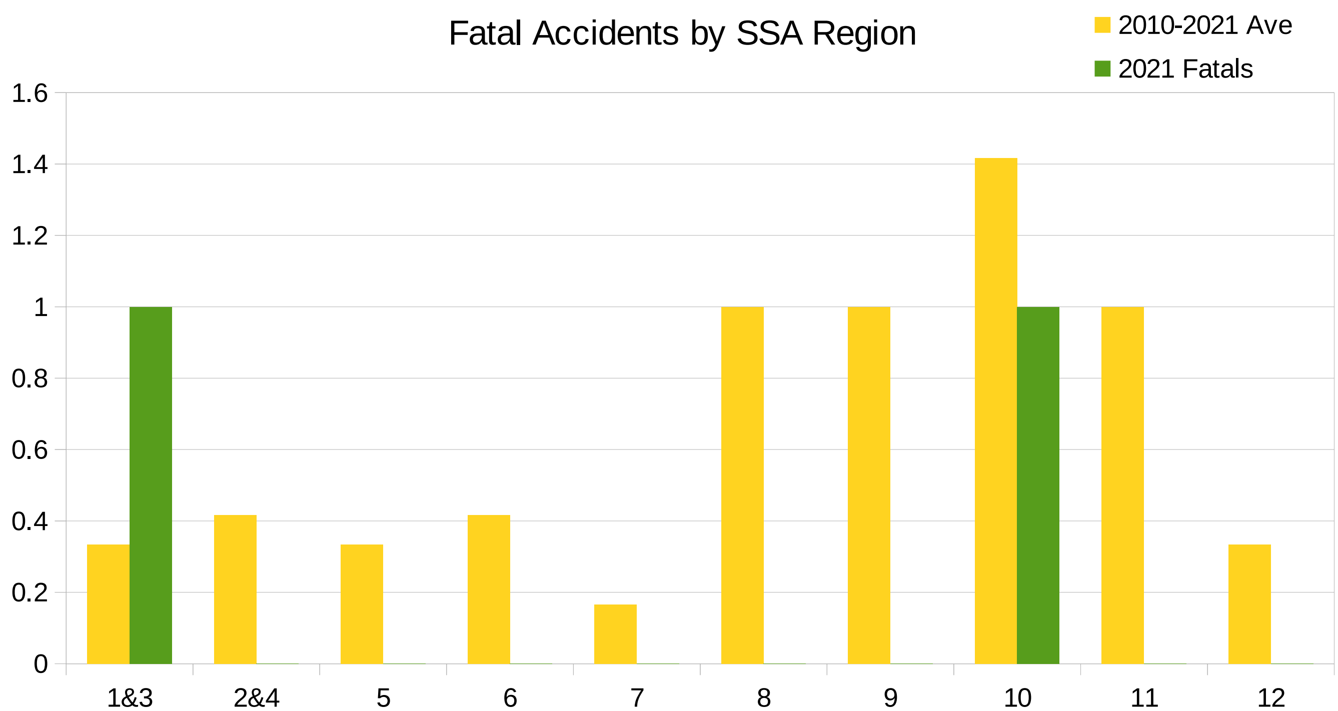


Figure 15: FY21 and Average number of Fatal Accidents per SSA Region

The SSF web site contains an incident reporting form (http://www.soaringsafety.org/incident.html) that individuals can use to anonymously report issues that might impact a pilot's or passenger's safety. The SSF will use this information to aid in identifying trends and to formulate procedures to assist pilots and instructors in preventing future accidents.

Flight Training and Safety Report

The SSF generates this safety report based on data extracted from the NTSB aviation accident database. We also receive summary and trend information from the SSA's group insurance program. Slow, long term progress continues to be made. The number of claims rose 4% from last year, while the claims value fell about 20% even as more valuable gliders are being wrecked and damaged. Obviously that there are still more things we all need to do.

First and foremost, we all need to accept the fact that the causal factor behind most glider and towplane accidents is the Human Error factor. The question then is what does this mean?

In some cases it means that the pilot does not have the necessary skills to control the glider within certain parameters. An example would be failure to maintain a constant airspeed when making a steep turn. With instruction and practice the pilot can develop the skills needed to perform this maneuver.

In some cases it means that the pilot does not have the necessary aeronautical decision making skills (ADM) to recognize the risks that arise from a specific action. An example would be failure to pick and maintain the proper approach speed when landing into a decreasing headwind (a wind gradient). With instruction and practice the pilot can learn how to make the decision in order to make a safe approach and landing in these conditions.

In some cases it means that the pilot had the necessary skills and ADM knowledge, but failed to apply good Risk Management (RM) skills to mitigate those risks. An example would be that the pilot attempts to make a low altitude save because a landout and retrieve would mean getting home much later than expected.

In some cases it means that the pilot has succumbed to a condition known as ‘Normalization of Deviance’. This means that the pilot has successfully gotten away with a risky behavior (e.g., climbing up from 600 ft AGL) so a new tolerance limit is set at a lower level (e.g., going down to 500 ft AGL is now acceptable).

Aviation safety experts consider the cause of an accident to be Human Factors when any or even all of these factors are at work. What is important to understand is, that with training and practice we can develop the skills to recognize when we are susceptible to falling into a Human Factors accident chain. Constantly practicing those skills can significantly reduce the accident rates in the U.S. Thus, building and maintaining a safety culture where everyone involved in the organization holds themselves and others to the standards agreed upon by those members is the best safety action you can take.

According to Sidney Dekker[5] author of “The Field Guide to Understanding Human Error” we all need to accept the, apparently, radical view that simple human error is not the cause of an accident. Rather, the error is a symptom of a deeper problem (education, knowledge, and proficiency). If we accept this view, then we can begin to identify the underlying causes that lead to the accident and fix them.

[5] Professor of Human Factors and System Safety at Lund University, Sweden and Director of the Leonardo Da Vinci Laboratory for Complexity and Systems Thinking.

If a pilot fails to clear his turns, then how many times did he successfully make turns without looking? It could be thousands. Thus the problem is not simply that the pilot failed to clear his turns, the problem is that the flight instructor(s) he trained with failed to emphasize the importance of this task. The operations training syllabus may not have emphasized this task and instructors may not have been given the post-flight time to evaluate and critique the pilots actions on this critical skill. The flight instructor(s) also failed to catch this sub-par performance during recurrent training (flight review) and fellow pilots failed to critique the pilots performance of this critical task if/when it was noticed.

It is this structural problem with the organizations initial and recurrent training programs that need to be fixed. Thus the solution is to ensure that pilots are taught to clear turns and that their proficiency at this task is verified on a regular basis.

If a pilot continues to fly a 'normal' landing pattern despite being low, how many times has he successfully done this before? Again the problem is that the soaring operations training syllabus did not provide the pilot with the skills needed to recognize both normal and abnormal landing patterns. The syllabus did not allow the instructor the time to practice multiple normal and abnormal approaches to build the pilots proficiency levels up to the point they should be. The operation also failed to notice, and provide the recurrent training necessary to correct this poor performance. The solution is to ensure that the pilot is trained to modifying the pattern as necessary to deal with normal and abnormal situations. This can be easily accomplished through the use of scenario based training (SBT) which allows the instructor to evaluate a pilot’s response to different scenarios as presented.

This view of human factors errors can help us break through the accident plateau we currently suffer from. However, it will take an effort from each of us to examine our operations both initial and recurrent training program to determine what is broken and how to fix these problems.

SSF Trustee Action: Glider flight Data

As noted earlier in this report, the SSF accident reports have historically reported on the number of accidents that are reported to the National Transportation Safety Board. The SSF Trustees search the NTSB aviation accident database several times a year to collect accident reports and identify accident trends and probable causes. The SSF trustees started capturing NTSB data in 1981 and have continued to do so annually for the past 41 years.

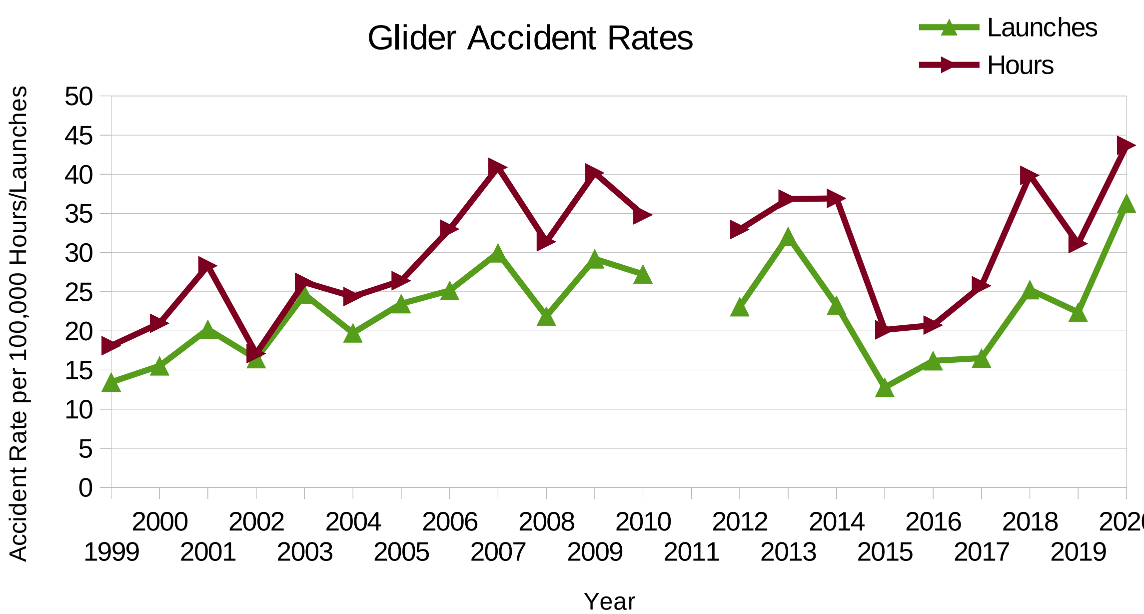
However, while this data can show trends, it does not show the accident rates that are commonly shown in General Aviation or Commercial aviation publications. To have statistically meaningful data you need to have both the number of accidents and the number of flights or flight hours. Without that flight/time component you can’t tell if the number is decreasing because pilots are making better decisions or because pilots are flying less.

Getting flight hour data has stymied the SSF since it was formed in 1981. Try as we might, the community has been unable or unwilling to reliably submit flight hours to the SSF. However, getting this data is crucial to understanding if the decline in accident numbers is due to a lower accident rate or just fewer pilots flying fewer hours.

At the 2018 Soaring Convention the SSF Chairman gave a presentation on the U.S. glider accident rate, using several proxies and assumptions. The presentation, available on the http://www.soaringsafety.org/presentations/presssa.html web page, shows how these proxies and assumptions were generated and what they say about accident rates. The absolute number given by these proxies and assumptions is suspect, or flat out wrong, but all of them show the same trend. The Accident Rate for gliders has been declining for the past few years.

Since that time, the SSF has continued to gather raw accident numbers from the NTSB database and flight hours/launches from both the FAA survey data and data submitted to the SSF via our annual postcard request. A comparison of this data is shown below.

FAA Survey Data:
Every year the FAA sends a random subset of glider owners (pilots, clubs, and commercial operators) a letter requesting that they go on-line and fill out a usage survey. This survey data is then placed on the FAA web site and the files can be downloaded for review. This data shows that U.S. glider pilots are flying an average of 102,907 hours/year are flown between 1999 and 2020. This has ranged from a high of 157,831 hours in 2002 to a low of 50,352 in 2020. This accident rate is shown in figure 16 (accident rate per 100,000 hours/year and launches/year). Figure 17 shows the accident rates (per



100,000 launches and hours) based on the date collected by the SSF. Clubs, chapters, and commercial operators who return their postcards. Comparing figures 16 and 17 helps demonstrate the value of returning your postcard.

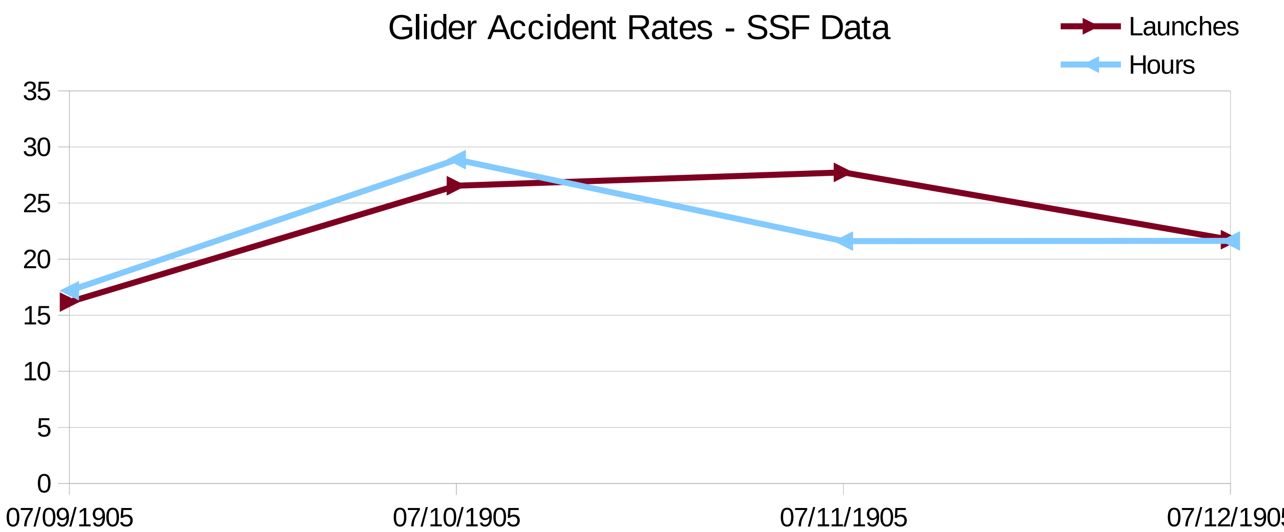


Figure 17: Glider Accident Rate based on SSF Postcard data

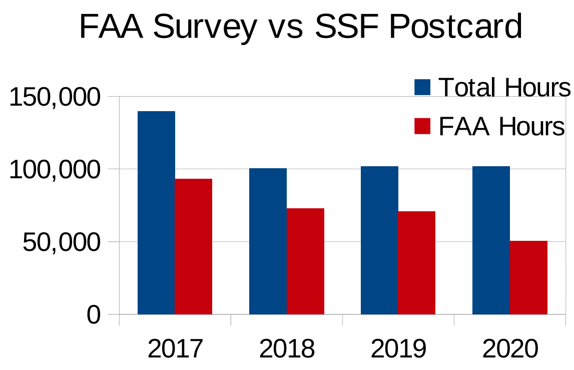
For the past 5 years the SSF has been asking clubs, chapters, and commercial glider operators to complete an anonymous and confidential usage survey. In late February or early March the SSF requests a list of mailing addresses from the SSA office in Hobbs, for all soaring organizations and mails them a letter and postcard seeking that organizations flight information. So far approximately 30% of those organizations respond by returning the postcard to us. Now it is time for every club, chapter, and commercial operator to step up and help the SSF obtain this missing data. What is the real glider accident rate in the U.S.?   The SSF Board of Trustees has decided to take 2 approaches to get this data.

1) We have asked the soaring contest community to provide us with the number of launches and number of flight hours from each sanctioned glider contest. The contest committee will look for ways to easily extract this information and submit it to the SSF.

2) The SSF will contact every club, chapter, and commercial operator, via email and US postal mail, in the U.S. asking that they annually submit, on a voluntary basis, the following 6 pieces of information:

A) The number of gliders located at your field
B) The number of club/commercial gliders located at your field
C) The number of tow-planes and/or winches at your field
D) The number of launches (broken down by type) you gave
E) The number of club/commercial glider launches you gave
F) The number of hours your club gliders flew

You will notice that we are not asking for the number of hours the privately owned gliders fly. We realize that the club or commercial operator probably doesn’t have that information. The SSF will attempt to estimate those hours in other ways.



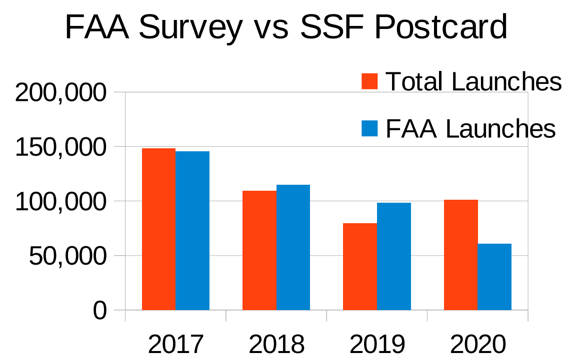


Figure 18 compares the flight hours and the number of launches between the data extracted from the FAA Survey data and that obtained from clubs, chapters, and commercial operators responding to the SSF's annual postcard request. Up until 2020, the number of launches reported by these member organizations had been tracking closely with the numbers found in the FAA survey. Since we expect that these organizations do not have good numbers on private glider flight times, the SSF calculates private hours by taking the average length of a club flight and estimating that a private flight is 4 times longer. In 2020 the SSF switched from this method to a flat 3 hours per launch. This matches the long term average in SAA sanctioned contests. Given that about 30% of the member organizations respond, the total number of hours and flights is calculated by multiplying the sum total of the reported hours and flights by 3.

The accident rates data shown in figures 16 & 17 have begun to dramatically diverge as the FAA survey data shows a significant decline in operations that is not shown in the SSF annual postcard data. This should give everyone pause! Only by getting better data, meaning more clubs, chapters, and commercial operators reporting data in an anonymous and confidential manner can that happen.

Getting real data from the SSA membership will go a long way towards giving us realistic accident rates. We can then compare these rates to our European colleagues to see how we fare. We can compare the data to General Aviation and Sport Aviation communities to see if there are common elements that we can all work to solve. Most importantly, we can demonstrate to ourselves and our community that Soaring pilots really are developing the Risk Management (RM) and Aeronautical Decision Making (ADM) skills needed to fly safely while having fun doing so.

So, step up and submit your data. The SSF letter/email will provide details on how to submit your club, chapter, commercial operate data.

SSF Trustee Action: Anatomy of a Kiting Accident

In August 2011 an ATP rated towplane pilot was fatally injured when the glider it was towing kited soon after takeoff. The glider released around 300 ft AGL, while the towplane stalled and crashed off the end of the runway. In October 2017 another ATP rated towplane pilot was fatally injured when the glider it was towing kited after the flight instructor became distracted in the cockpit shortly after takeoff. The glider returned safely to the airport while the towplane crashed. In March 2020 it happened again. An experienced towplane pilot was fatally injured when the glider kited shortly after takeoff. This occurred even through the towplane pilot successfully released the glider, the tow pilot was unable to recover before impacting the terrain. The glider pilot reported being distracted during that portion of the tow.

We all understand that getting out of position during an aerotow places the towplane pilot is a potentially deadly position. Studies done by the British showed that a towplane pilot would have difficulty recovering from a kiting glider below 1500 ft AGL. That is almost the typical release altitude for most of us. So what is going on that leads to this need for altitude?

In a kiting incident the glider is not simple gaining altitude extremely rapidly, it is creating a large amount of drag that is impacting the towplane. What we tend to see is that as the glider climbs, the towplane pilot adds increasing amounts of up elevator in an attempt to maintain the towplane's pitch attitude. What we fail to see is that as the glider climbs the energy it is gaining is coming directly from the towplane.

Thus, when the glider disconnects, either by the rope breaking or one/both of the pilots activating their release, the towplane is at an extremely low airspeed, possibly below stall speed, with the flight controls configured to pitch the towplane's nose up. The towplane may also have pitched nose down due to a combination of the glider pulling up on the tail and the stall caused by the low airspeed. The tow pilot is now faced with the situation where there is not enough altitude to regain flying speed that no amount of piloting skill can overcome.

The only solution to this accident scenario is for the glider pilot to remain focused on a single task. Stay behind the towplane and ignore any distractions that may occur. Failure to do so has deadly consequences.

What can cause these distractions? Reports from these accidents and from incidents show that a wide variety of distractions can occur. Canopies opening in flight seem to be a leading cause in many fatal and non-fatal launch accidents. Adjusting the radio, altimeter, flight computer, or camera have all been reported as distractions. Even closing the vent window can cause a distraction. In one case the student pilot looking for traffic was enough of a distraction to make the flight instructor take over the flight controls.

Dealing with these distractions starts with a good written preflight checklist that configures the instrument, flight controls, and other items like vent windows in their proper position prior to beginning the launch. This is followed by the sterile cockpit concept used by airlines and the military. In a sterile cockpit only safety essential conversations are allow during critical phases of flight when close to the ground. Using this concept helps glider pilots focus on the task at hand, following the towplane and reducing distractions caused by focusing attention inside the cockpit.

SSF Recommendation: Proactive Safety Programs

The traditional method for creating safety programs is to have the club or commercial operator designate someone to lead a safety committee. This committee investigates reported incidents or accidents and draws conclusions about why the event occurred. Once a probable cause has been established, the team recommends a set of steps or actions that the organization can take to prevent this type of event from occurring in the future. This type of reactive safety program has been used for decades and it has been successful in reducing the number of accidents throughout the world.

However as Human Factors errors have become the leading cause of accidents, this reactive approach is having less and less effect. This has led to the creation of proactive safety programs. In a proactive safety program all pilots, from student to flight instructor, actively look for situations or conditions that could potentially lead to an incident or accident.

Consider the following example: the club recently refurbished their SGS 2-33 and replaced the fixed tailwheel with a new swivel tailwheel. Knowing that the glider will be parked along side other gliders near the flight line between fights it is recognized that due to also having wingtip wheels, it may easily rotate in windy conditions, potentially striking a person or other glider. To prevent this from happening, the parking procedures are modified to include chocking the tailwheel to reduce the potential for this to occur and paying more attention to how the glider is parked when not in use. This demonstrates that the club thought about the potential for an incident and planned ahead to reduce the impact of this new threat.

In 2009 Tony Kern authored the book "Blue Threat – Why to Err is Inhuman"[6] which provides the reader with a guide to help themselves understand how they can develop the skills needed to detect and prevent Human Factor errors. Accepting the idea that humans will always make errors implies that there is nothing individuals can do prevent them. As shown in the example above, this is not true. We can examine our environment and personal behaviors to detect where we are likely to make mistakes. We can then modify the environment or change our behavior to reduce the likelihood of this mistake occurring.

The SSF recommends that all clubs and commercial operators implement a proactive safety program. Have all pilots search for and document potential threats or issues that could lead to incidents or accidents. A key element of this program is to document things in writing, electronic or on paper, relying on passing information verbally will lead to incomplete or compartmentalized information silos. The SSF Incident Reporting Database https://www.soaringsafety.org/forms/incident.html is one venue for recording this information.

SSF Recommendation: Scenario Based Training

From October 2015 to February 2016 the SSF published a series of articles in SOARING dealing with Scenario Based Training (SBT). Reprints of those articles can be found on the SSF's web site at http://www.soaringsafety.org/publications/soaring-articles.html These articles were followed by a special SBT training session during the 2016 Convention in Greenville SC. Copies of the presentation slides can also be found on the SSF's web site at http://www.soaringsafety.org/presentations/presssa.html

As these articles describe, SBT is the training method the airlines and military use to train their pilots, flight crews, and other personnel involved in flight and ground operations. The idea is to provide a realistic situation that either has occurred in the past, or might occur in the future and discuss the potential threats this situation presents to the pilot and/or aircraft. The pilots and instructors then determine potential mitigation strategies that can range from not taking the flight, to deviating to an alternate destination, to ensuring that an emergency plan is developed and practiced in case this

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situation occurred. The flight instructor should use a guided discussion technique to ask questions that lead the pilot to consider all the factors that must be considered to safely mitigate this situation.

The question you may be asking now is, “How do I create a scenario”? The answer to that is “it’s easy”. The SSF has created an on-line database http://www.soaringsafety.org/forms/sbt.html with dozens of scenarios that were created for flight instructor training. You can use these as is, or modify them slightly to fit your local situation. Another good method is to look at the NTSB data base, or review the accidents listed in this report. These are real life examples that you can use to talk about how your students and pilots can learn from the mistakes of others. You can look at the SSF's on-line Incident Reporting Database http://www.soaringsafety.org/forms/incident.html to find out what problems and issues other clubs are having.

Finally, as the SSF recommended in 2011, take a video camera out to your field and film your operation. Then evaluate that video with an eye toward looking for problems. You might just capture an incident or issue that would make a great scenario. The point is, scenarios aren't hard to create, they happen all around us. You just need to look for them and you will have plenty of canned versions and plenty more occurring in real life.

In addition to finding issues and problems at your soaring site, the SSF also suggests that you recognize students and rated pilots when they make a good decision. If you do not have a system in place to recognize and reward pilots for making good decisions, should we be surprised when they don't value this skill? One approach would be to award a free tow, or some other tangible benefit, to the individual who makes the biggest contribution to the organization’s safety culture each year

SBT is an excellent way to provide the ADM/RM skills CFIs are required to teach. It is well recognized that ADM/RM skills are a learned behavior, just as you need to learn how to keep the yaw string centered, you need to learn how to make good decisions. Also, just as you have to continuously practice keeping the yaw string centered, you need to practice making good decisions. The SSF's role is to provide you, your instructor, and your club's management with the resources and support systems needed to help you obtain and maintain good ADM/RM skills.

A good example of this is the glider assembly process. The process starts with having sufficient knowledge to complete the process successfully, sufficient room, a knowledgeable assistant and no distractions. There are then multiple checks after the assembly process is completed, including a walk-around inspection, positive control checks (PCC), and critical assembly checks (CAC) to ensure that the assembly process was correctly completed. These multiple barriers allow the pilot to catch errors or mistakes.

Imagine that during the assembly process you are installing the horizontal stabilizer and after putting it in place you realize you forgot the assembly tool in the cockpit side pocket. No problem you think, I'll just walk around the wing and get it. While digging in the cockpit a fellow pilot comes up and asks you a question about the day's task. You interrupt your assembly process and begin to answer his question when you notice the weather is changing so you decide to go into the clubhouse and check the radar returns. The check reveals that things will be OK, but the day will be shorter than you expected so you need to hurry if you are to get a short X-C flight in. You go back out and rush though the rest of the prep work before pushing the glider out to the flight line for your launch. Being rushed, the pilot also decides the PCC and CAC checks are not needed, as they have never found anything before and he needs to get going now.

In this scenario you can see that the pilot failed to finish the assembly process, and due to the distraction he failed to notice this mistake. We all need to realize that this mistake is not because the pilot was inexperienced, but that distractions caused the pilot to miss an important step and then the changing conditions caused him to ignore the other actions that would have caught this mistake. It should also be noted that the pilot failed to adequately evaluate the potential risks he was facing. In this case the changing conditions and need to rush the launch created increased risks that the pilot needed to manage.

As noted above, pilots need to be trained to recognize and evaluate potential risks. Risk Management (RM) skills are the 1st step in building an effective ADM program. Not performing this RM task can be as deadly as entering a stall/spin at 100 ft AGL. The airlines and military have found that scenario based training, such as the scenario presented above, is an effective ADM/RM training method. Pilots who receive this type of training, and then continue to practice it have fewer accidents that pilots who ignore or avoid this training.

When reading this type of scenario, you should begin by identifying the potential risk factors and then determine how they are changing. You then need to determine what actions you can take to mitigate those risks. Note that eliminating the risks is one strategy, but reducing them to an acceptable level is also a reasonable approach. In the scenario above, the risk mitigation or elimination actions could include, but are not limited to: (1) decide not to fly after all, (2) perform the PCC and CAC checks; (3) have the wing runner ask every pilot if they have completed the PCC/CAC checks, (4) remove the horizontal stabilizer from the tail when you go to get the assembly tool, (5) have other pilots check and report on the changing weather. The list can go on, and needs to be tailored to the skill and experience level of the pilot.

Also notice that actions 3 and 5 uses good Single Pilot Resource Management (SPRM) skills, where the pilot involves others in helping to evaluate and manage the potential Risks.

Only by improving, and continuously practicing, your ADM/RM skills will the number of accidents in the US soaring community be reduced.

SSF Recommendation: Stall Recognition Proficiency

As aviation accident statistics show, low altitude stall/spin accidents are often fatal. All pilots should evaluate their skill and proficiency in stall/spin recognition. Practice at a safe altitude with a competent instructor and also learn how the glider you fly reacts to stalls while thermaling. Have your instructor create a realistic distraction or do something to create an ‘inadvertent stall’. Pay particular attention to the altitude loss after you recover, now imagine this happening while you are thermaling close to the ground in mountainous terrain. It should be noted that a wind-shear stall is quicker and more violent than the type of stall that can be practiced using the elevator to stall the aircraft.

See a more complete set of recommendations in the SSF 2013 Annual Report.
https://www.soaringsafety.org/accidentprev/SSF_2013_annual_report.pdf

SSF Goal Orientated Approach

As the FY17 statistics show, the majority of glider/towplane accidents continue to occur in the approach and landing phase of flight. For one reason or another, the pilot fails to make it to the landing area. Pilots need to consider multiple factors including: other traffic, wind, lift/sink, location, glider performance, and distance remaining to the landing area in order to safely land a glider. Failure to account for one or more of these factors can leave the pilot unacceptably low or high on the approach with very few corrective options available. The "enter the pattern over the white silo and turn base over the red barn" method is not a good teaching practice and can lead a pilot to making critical errors during the approach. Instructors need to understand the Goal Orientated Approach method and teach this method of approach to a landing to all pilots

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Flight Instructor Roles

Flight instructors play an important safety role during every day glider operations. They need to supervise flying activities and serve as critics to any operation that is potentially unsafe. Other pilots and people involved with the flying activity also need to be trained to be alert to any safety issues during the daily activity.

The FAA has mandated that all instructors must include judgment training and ADM/RM in the flight training process. Examiners will check for this training during the practical test. The regulations require that all flight instructors provide some kind of aeronautical judgment training as well as ADM/RM training during pilot training flights (student, private, commercial, and flight instructor). 14 CFR 61.56 flight reviews also offer the flight instructor an opportunity to reach the glider pilot population on a continuing basis. Stressing judgment skills, as well as piloting skills, can help reduce the glider/towplane accident rate.

The SSF offers Flight Instructor Refresher Courses throughout the country each year. The SSF Trustees strongly recommend that ALL instructors (experienced and inexperienced alike) avail themselves of these courses to keep updated of the latest safety trends in training including ADM/RM skills and Scenario Based Training skills as well as Stick and Rudder skills. This kind of continuing education course allows for meaningful interaction between fellow CFI's and will help to keep the training we offer "standardized" throughout the country.

SSA REGIONS

Region 1-3 Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont New York (north of 42nd parallel), Pennsylvania (west of 78th meridian).

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Region 2-4 New Jersey, New York (south of 42nd parallel), Pennsylvania (east of 78th meridian) Delaware, District of Columbia, Maryland, Virginia, West Virginia..

Region 5 Alabama, Florida, Georgia, Mississippi, North & South Carolina, Tennessee, Puerto Rico, The Virgin Islands.

Region 6 Indiana, Kentucky, Michigan, Ohio.

Region 7 Illinois, Iowa, Minnesota, Missouri (east of 92nd meridian), North & South Dakota, Wisconsin.

Region 8 Alaska, Idaho, Montana, Oregon, Washington.

Region 9 Arizona, Colorado, New Mexico, Utah, Wyoming.

Region 10 Arkansas, Kansas, Louisiana, Missouri (west of 92nd meridian), Nebraska Oklahoma, Texas.

Region 11 California (north of 36th parallel), Guam, Hawaii, Nevada.

Region 12 California (south of 36th parallel).

APPENDIX A

NTSB Part 830

The responsibility for investigation of aircraft accidents in the United States was mandated by Congress to the National Transportation Safety Board (NTSB) through The Department of Transportation Act of 1966. This act tasked the NTSB with determining the probable cause of all civil aviation accidents in the United States.

From 1991 - 94, the general aviation community alone accounted for approximately 1,800 aircraft accidents per year. Due to this high level of investigative workload and limited available resources, the NTSB often delegates to the Federal Aviation Administration (FAA) the authority to investigate accidents involving aircraft weighing less than 12,500 pounds maximum certified gross weight. Consequently, many glider/tow-plane accidents meeting the NTSB reporting criteria are investigated by representatives of the FAA.

All aircraft accidents involving injury to passengers or crew-members or substantial damage to the aircraft must be reported to the NTSB.

The terms used in this report to define injury to occupants and damage to aircraft are included in NTSB Part 830 of the Code of Federal Regulations.

Definitions

Aircraft - a device that is used or intended to be used for flight in the air.

Operator - Any person who causes or authorizes the operation of an aircraft.

Aircraft Accident - An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or, in which the aircraft receives substantial damage.

Fatal Injury - Any injury that results in death within 30 days of the accident.

Serious Injury - Any injury which:

1) Requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received;
2) Results in the fracture of any bone except simple fractures of fingers, toes, or nose;
3) Causes severe hemorrhages, nerve, muscle, or tendon damage;
4) Involves any internal organ; or
5) Involves second- or third-degree burns, or any burns affecting more than 5 percent of the body surface.

Minor Injury - Injury not meeting the definition of fatal or serious injury.

Substantial Damage - Damage or failure which adversely affects the structural strength, performance, or Flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected component. Engine failure or damage limited to an engine if only one engine fails or is damaged, bent fairings or cowling, dented skin, small punctured holes in the skin or fabric, ground damage to rotor or propeller blades, and damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wingtips are not considered substantial damage for the purpose of this part.

Destroyed - Damage to an aircraft which makes it impractical to repair and return it to an airworthy condition. This definition includes those aircraft which could have been repaired, but were not repaired for economic reasons.

Minor Damage - Damage to an aircraft that does not meet the definition of Substantial or Destroyed.

APPENDIX B

Phase of Operation

Ground Movement - Re-positioning of the glider while on the ground. To meet the definition of an accident, occupants must be on-board the glider and movement must be conducted immediately preceding or subsequent to a flight operation that demonstrates the intention of flight. This includes taxi operations of auxiliary-powered sailplanes.

Takeoff - Begins at initiation of the launch operation, including aerotow, ground launch, and self-launch, and is concluded at the point the glider reaches the VFR traffic pattern altitude. For ground launch operations, the takeoff phase continues until release of the towline.

Assisted Climb - Begins at the conclusion of the takeoff phase or point at which an auxiliary powered sailplane or a sailplane using an aero-tow launch climbs above traffic pattern altitude. This phase of operation is not included in ground launch operations.

In-flight - Begins at the point of release of the towline for aerotow and ground launches or the pilot shuts down the engine when self launching and concludes at the point of entry into the traffic pattern or landing approach pattern for an off-airport landing.

Approach/Landing - Begins at the point of entry into the traffic or landing approach pattern and concludes as the glider is brought to a stop at the completion of the ground roll.

APPENDIX C

Accident Category Definitions

Hit Obstruction - Accident occurring during a ground or flight phase as a result of the glider colliding with a fixed object. This classification does not include bird strikes or ground / in-flight collisions with other aircraft.

Ground Collision - Collision of two or more aircraft while being re-positioned or taxied while on the ground.

Loss of Directional Control - Accident which occurs as a result of a loss of directional control of the glider during takeoff or landing operations while the glider is on the ground.

Premature Termination of the Tow (PT3) - Any event, pilot, mechanical, or otherwise induced, which results in a premature termination of the launch process. This classification includes ground, aerotow, and self-launch.

Mechanical - An event that involves a failure of any mechanical component of the glider. This classification includes accidents that result from faulty maintenance or a failure to properly install or inspect primary flight controls. In-flight structural failures caused by fatigue of structural components or pilot induced over-stress of the airframe are included in this classification category.

Loss of Aircraft Control - An accident which occurs as a result of the loss of control of the glider for any reason during takeoff, assisted climb, in-flight, or approach / landing. This classification includes failure to maintain proper tow position during assisted climb.

Mid-air Collision - A collision of two or more aircraft which occurs during the takeoff, assisted climb, in-flight, or approach / landing phase of flight. This classification includes collisions involving gliders and other categories of aircraft (airplane, rotorcraft, etc.).

Land Short - Any accident which occurs as a result of the glider being landed short of the physical boundaries of the intended runway or landing area. This classification includes off airport landing operations.

Land Long - Any accident which occurs as a result of the glider being landed beyond the physical boundaries of the intended runway or landing area. This classification includes off airport landing operations.

Stall / Spin - Any accident which results from the inadvertent stall and/or spin of the glider during takeoff, assisted climb, in-flight, or approach / landing phases of flight.

Hard Landing - Any accident caused by a hard landing during the approach / landing phase of flight.

Other – Any accident caused by factors not defined within the previous categories.