



# **SOARING SAFETY FOUNDATION**

**Nov 1, 2015 – Oct 31, 2016**

**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.nts.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 Clinics, 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 and promote programs such as soaring safety seminars, flight instructor refresher clinics, 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.

**Richard Carlson - Chairman**  
**Burt Compton**  
**Stephen Dee**  
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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

This report covers the FY16 (November 1, 2015 to October 31, 2016) reporting period. This summary was printed in SOARING, the complete report can be found on the SSF web site (<http://www.soaringsafety.org/accidentprev/reports.html>). A review of the NTSB accident database shows a 15.8% decrease (16 vs 19) in the number of US soaring accidents during this time period compared to the FY15 reporting period. The number of fatal accidents in FY16 also decreased by 40% (3 vs 5) compared with FY15. It should also be noted that the number of insurance claims increased by 9% in 2016 compared to 2015. 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.

For the twelve-month period ending October 31, 2016, nine(9) gliders, six (6) motorgliders, and one (1) tow-plane were involved in sixteen (16) separate accidents meeting the reporting requirements of NTSB Part 830 of the Code of Federal Regulation. This represents a 15.8% decrease in the number of accidents reported during the previous reporting period. The five-year average for the FY12 – FY16 reporting period is 23.8 accidents per year, representing a 15.8% decrease 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, and 25.4/year for the first 7 years of 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. In the FY16 reporting period three (3) accidents resulted in fatal injuries to three (3) pilots and one (1) passenger. In addition, one (1) pilot received serious injuries while eleven (11) pilots and two (2) passengers received minor or no injuries.

A review of the three (3) fatal accidents showed that a private pilot in IL was fatally injured during a failed aerotow launch. A commercial pilot and passenger in CO were fatally injured when their motorglider impacted mountainous terrain in cruise flight. A motorglider pilot in NV was fatally injured when the glider impacted terrain for unknown reasons. All fatal accidents are still under investigation by the NTSB, more details are given in the body of this report.

Continuing a long historical trend, the largest number of accidents occurred during the landing phase of flight during this reporting period. In FY16 landing accidents represented 56% of all accidents. In an unusual trend only three (3) of the nine (9) landing accidents, or 33%, occurred while the pilot was attempting to land at an airport. The remaining six (6) accidents occurred while the pilot was attempting to land in a field. Details of these accidents are given later in this report.

Proper training and an operational focus on safe arrivals can go a long way toward addressing the landing accident problem. The SSF continues to promote that pilots and instructors adopt a 'goal oriented approach' to pattern planning and execution. The 'goal' is to arrive at your selected landing spot, so that you can stop at a predetermined point. This same procedure should be used during every landing, either at an airport or in a field. In addition, for off-airport landings it is important that the pilot mentally transition from cruise flight mode to landing mode with enough

altitude to examine the prospective field to determine what obstacles the pilot must deal with. A good rule of thumb is 3-2-1, at 3,000 ft AGL the pilot should have at least one landable field within gliding range. At 2,000 ft AGL the pilot should select a specific field and examine it for obstacles and obstructions. At 1,000 ft AGL the pilot is committed to an outlanding, and mentally switching to landing mode. Making last minute changes while on short final to deal with obstructions is a leading cause of off-airport landing accidents.

Three (3) aborted launch accidents, called PT3 (premature termination of the tow) events, accounted for 18.8% of the FY16 accidents.

- The pilot received minor injuries while attempting to land after the canopy opened during the self-launch.
- The left wing of the motorglider struck trees while attempting to land with the engine extended and not running.
- The pilot of a glider was not injured after the rear canopy opened during the ground roll, the pilot elected to continue the tow releasing at pattern height before returning for a successful landing.

Pilots can, and should, 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, check rides and flight training.

There were six (6) motorgliders involved in accidents during the FY16 reporting period. In addition to the 2 fatal and 1 self-launching accident noted above, the following accidents occurred.

- The pilot was not injured after the touring motorglider landed in trees short of the intended runway.
- The pilot was not injured after the touring motorglider veered off the runway during the ground roll, striking cornstalks with the left wing.
- The pilot of a motorglider was not injured after striking trees while attempting an off-airport field landing.

Flight instructors play an important safety role during everyday glider operations. They need to supervise flying activities and serve as critics to any operation that is potentially unsafe. Their main job is to provide the foundation upon which a strong safety culture can be built. Other pilots and people involved with the ground and flying activities also need to be trained to recognize and properly respond to any safety issues during the daily activity. Everyone, students, pilots, ground operations staff, and instructors, should continuously evaluate both ground and flight operations at US chapters, clubs, commercial operations and at contests. An operations safety culture should train everyone to raise safety issues with fellow pilots, club officers, and instructors. By addressing issues before they become accidents, we can improve soaring safety. Only by the combined efforts of ALL pilots can we reduce the number of accidents.

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# SOARING SAFETY FOUNDATION

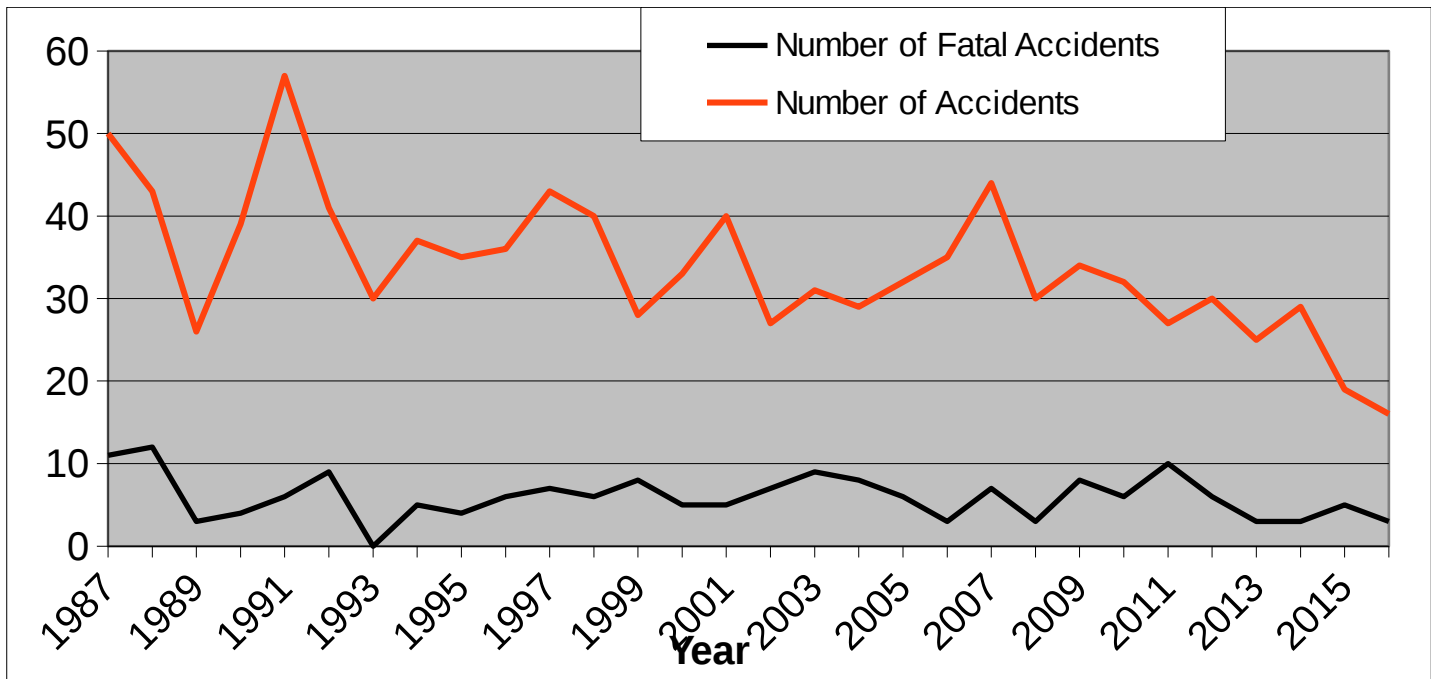
## ANNUAL SAFETY REPORT

### FY 2016

This report covers the FY16 (November 1, 2015 to October 31, 2016) reporting period. A review of the NTSB accident database shows a 15.8% decrease (16 vs 19) in the number of US soaring accidents during this time period compared to the FY15 reporting period. The number of fatal accidents in FY16 also decreased by 40% (3 vs 5) compared with FY15. It should also be noted that the number of insurance claims increased 9% in 2016 over the 2015 number. 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.

For many reasons<sup>1</sup>, this report represents an incomplete view of the accidents involving US glider pilots. Despite these limitations, this annual report is published to highlight glider/tow-plane 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 ends with a safe arrival at the intended point of landing.

**Number of Accidents since 1987**



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

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

<sup>1</sup> See Appendix A for a detailed list of reasons and steps you can take to address these issues.

believed that every club and commercial operation has this information (at least they know the number of launches they do). At the February 2017 SSA Board of Directors meeting the board voted to task the SSA office to begin asking clubs for number of launch data. The annual club registration package will be updated to ask for this information. Please do your part and submit this data to the SSA when you renew your club or chapter.

Figure 1 shows the total number of accidents and fatalities from 1987 to the present. The top line is the 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 reached a plateau. There are on average 6 fatal accidents each year. See the **Fatal Accidents** section for more details on this topic.

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 culture. In other words, this is a cultural problem within the soaring community.

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.

## **FY16 ACCIDENT SUMMARY**

### ***Number of Accidents***

For the twelve-month period ending October 31, 2016, nine(9) gliders, six (6) motorgliders, and one (1) tow-plane were involved in sixteen (16) separate accidents meeting the reporting requirements of NTSB Part 830 of the Code of Federal Regulation. The five-year average for the FY12 – FY16 reporting period is 23.8 accidents per year, representing a 15.8% decrease 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, and 25.4/year for the first 7 years of 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. In the FY16 reporting period three (3) accidents resulted in fatal injuries to three (3) pilots and one (1) passenger. In addition, one (1) pilot received serious injuries while eleven (11) pilots and two (2) passengers received minor or no injuries.

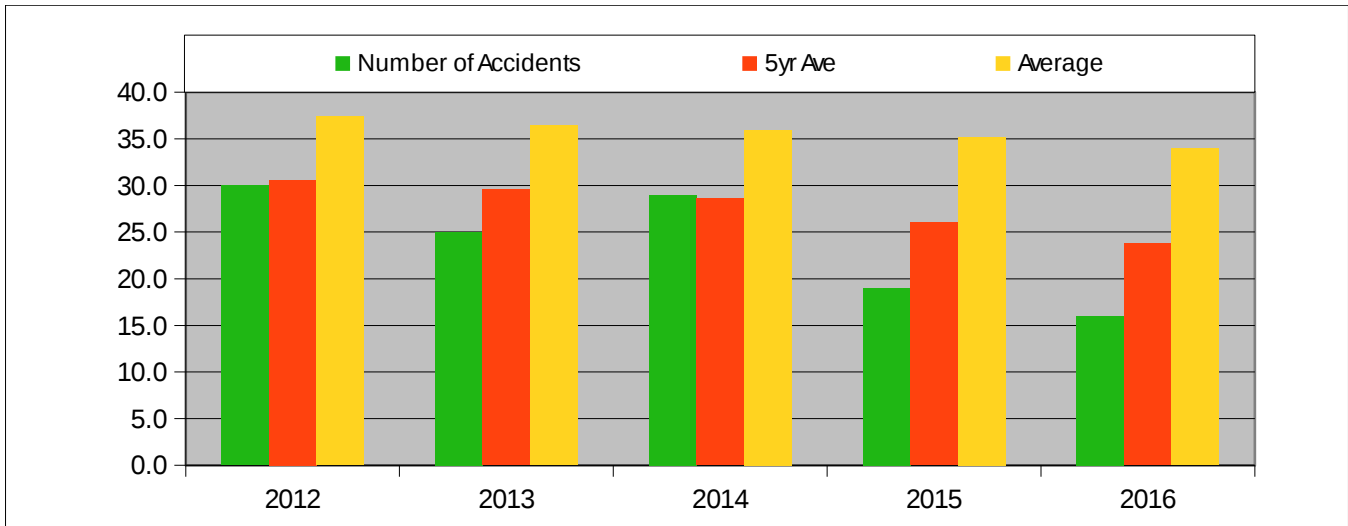


Figure 2 Number of accident, 5 year average 2012 - 2016

## Phase of Flight

The number of accidents that occur during the approach and landing phase of flight again surpass those recorded during any other phase of flight. For the FY16 reporting period, approach and landing accidents were 56.3% of the total number of accidents reported for the year. These accidents are split between pilots landing on an airport (33%) and pilots landing off-airport (67%). Historically landing accidents contribute to the largest number of accidents year in and year out. Takeoff accidents accounted for 18.8% of the number of accidents in this reporting period, meaning that 75.1% of the number of accidents occurred during the takeoff or landing phase of flight. The NTSB data show that remaining 24.9% of the accidents occurred while the glider was in cruise flight.

It should come as no surprise that a majority of accidents occur during takeoff and landing, where the tolerance for error is greatly diminished and opportunities for pilots to overcome errors in judgment and decision-making become increasingly limited. 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 checklist and use a pre-launch briefing to mentally prepare for contingencies. Pilots should also learn how to deal with problems and emergencies in the landing phase of flight. The SSF Goal Oriented Approach, described below, provides guidance on how to accomplish this task.

Take-off scenarios can help students and pilots mentally walk through numerous failed launches. 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 tow-plane pilot fanned the rudder during tow (Check Spoilers!)? How would a cross-wind affect the tow-plane 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? Remember, the better the learning the more the pilot will get out of the training.

Figure 3 shows the percentage of accidents that occur in the various phases of flight. TO/Tow accidents are classified as an aborted launch up until the time/altitude the pilot intended to end the tow. 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 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.

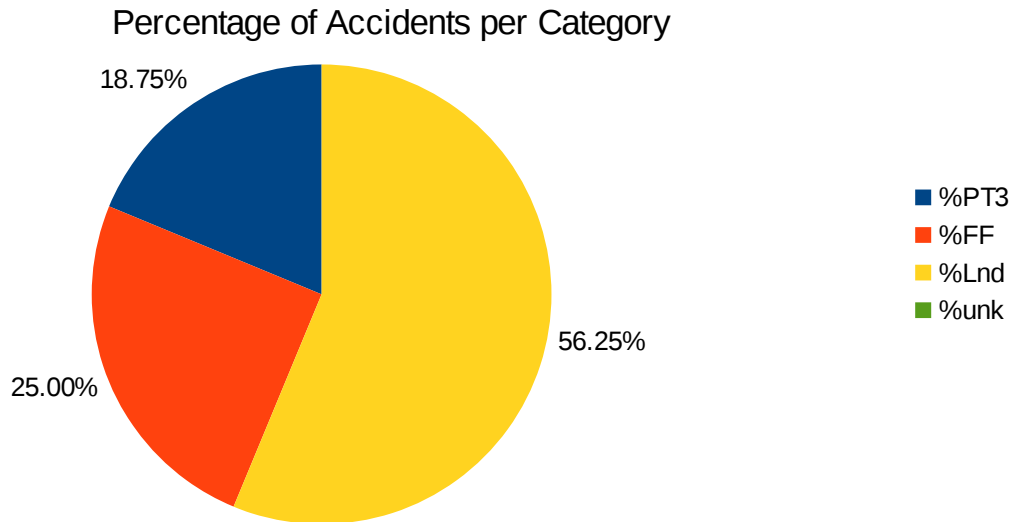


Figure 3 Percentage of FY16 Accidents in defined phase of flight

### Launch Accidents

Two (2) non-fatal and one (1) fatal aborted launch accidents, called PT3 (Premature Termination of The Tow) events, accounted for 18.8% of the FY16 accidents. Two (2) of the accidents involved the glider being aerotowed and one (1) occurred while the motor glider was self launching.. Pilots must be mentally prepared 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.

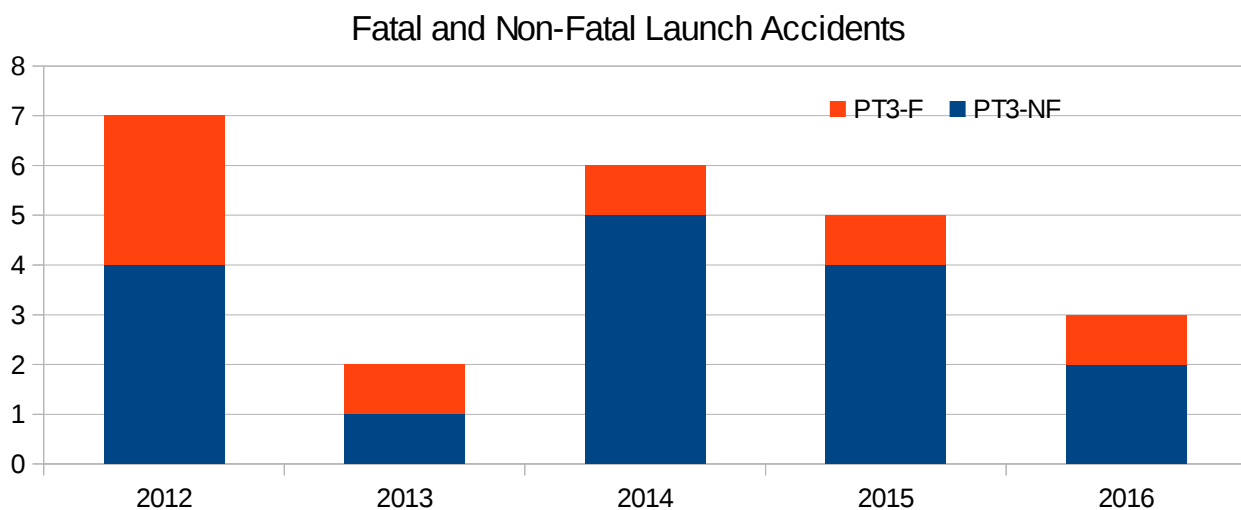


Figure 4: Number of fatal and non-fatal launch accidents

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. A better approach is to have the instructor evaluate and critique the pilots decision making skills in addition to the in-flight piloting skills.

The pilot received minor injuries while the Silent 2 Targa was substantially damaged after striking a tree while attempting to return to the runway. The pilot reported having problems closing the right canopy latch. After correcting the problem the engine was started and the pilot launched. At 700 ft AGL at 50 kts the pilot noticed that the right latch had opened followed shortly by the left latch. The pilot shutdown the engine but did not retract it and turned base to land. The glider descended below glideslope as the pilot attempted to fly while holding the canopy closed. The left wing struck trees and the glider impacted terrain in a nose low attitude. *NTSB ERA16LA274.*

The pilot of a PW 6U was not injured, but the glider was substantially damaged after the rear canopy departed during the take-off ground roll and struck vertical stabilizer. The pilot reported hitting a bump and hearing a loud bang during the take-off ground roll. He also acknowledged a radio call noting that the rear canopy had departed the glider. The glider pilot and tow pilot communicated and agreed to conduct a pattern tow, and the glider pilot successfully landed without further incident. *NTSB GAA16CA430*

The fatal launch accident will be discussed below in the fatal accident 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, 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.

It should be noted that both accidents resulted from the pilots failure to securely latch the canopy prior to beginning the launch. In 2 place gliders with separate canopies it is important to know how both canopies close and latch. Is there an interlock system that aids the pilot in recognizing that the rear canopy is not latched? There should also be a checklist item that calls for a physical check of the status of both canopies.

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 pilots flight skills and his/her decision making skills.

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!!**

## **Ground Launch Accidents**

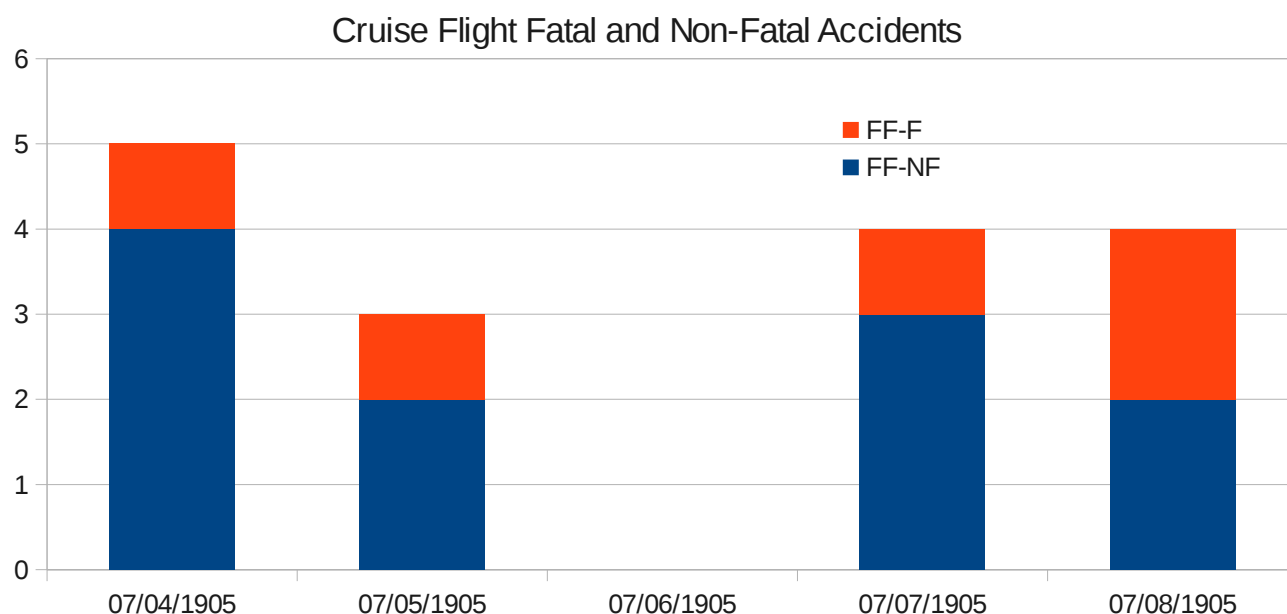
There were no ground launch accident during the FY16 reporting period.

## Cruise Flight Accidents

There were two (2) non-fatal and two (2) fatal cruise flight accidents reported during the FY16 reporting period. The fatal accidents will be discussed in the fatal accident section.

The pilot and passenger of an Grob Twin Astir received minor injuries while the glider was substantially damaged impacting trees while attempting to return to the airport. The pilot reported that while flying at 2,900 ft AGL the glider encountered severe sink causing the glider to rapidly lose altitude. The pilot made a radio call indicating that he would not be able to make the runway. The glider impacted trees about  $\frac{3}{4}$  of a mile short of the runway. *NTSB GAA16CA205*

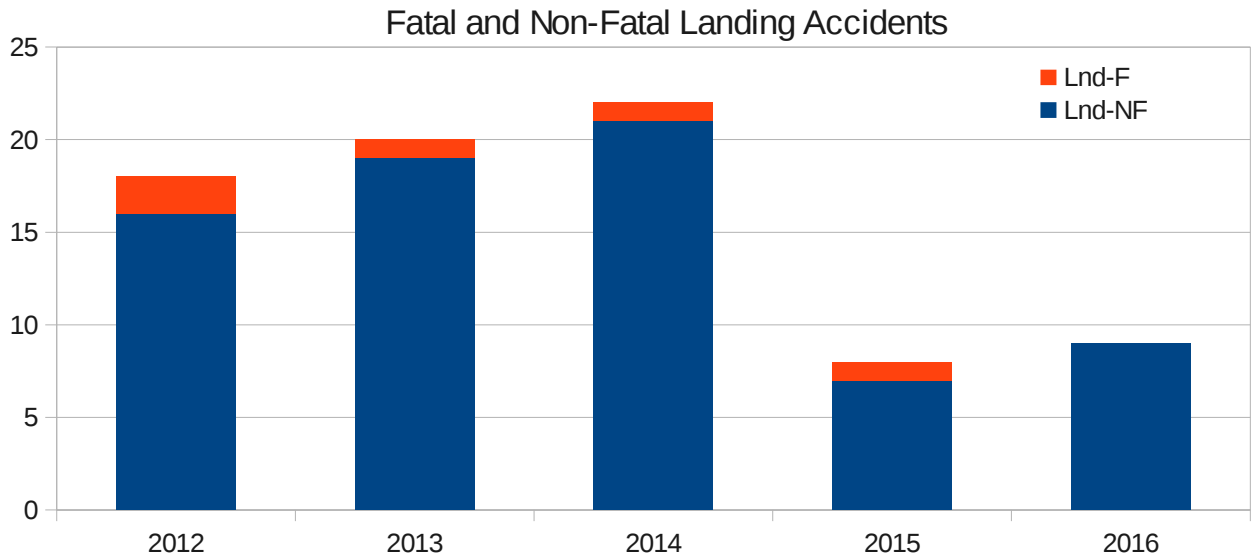
A LS-8 and ASW 27 were involved in a mid-air collision while participating in an SSA sanctions contest. Neither pilot was injured while both the glider were substantially damaged while working a weak thermal.. *NTSB*



**Figure 5: Number of Fatal and non-Fatal Cruise flight Accidents**

## 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 FY16 reporting period, gliders hitting objects on final or during the landing roll accounted for the majority of the landing accidents. This was followed by hard landings, long/short landings, and stall/spin accidents. Bucking the normal trend, three of the nine landing accidents (33%) of the reported landing accidents occurred while the pilot was landing at an airport.



**Figure 6: Number of Fatal and non-Fatal Landing Accidents**

Figure 6 shows the total number of landing accidents from 2012 – 2016 broken down by fatal and non-fatal accidents. This figure shows that the vast majority of landing accidents do not result in fatal injuries to the pilot. A deeper analysis of the landing accidents in FY16 indicate pilots continue to strike objects during the final approach (3 accidents) or while on the ground roll (2 accidents). See figure 7 for a complete breakdown of landing accident factors.

The pilot of a LS 8 was not injured while the glider was substantially damaged after it impacted trees while conducting an off-airport landing. Due to a change in wind conditions, the pilot ridge flying determined that an off-airport landing was necessary. The pilot reported flying a normal pattern before encountering ‘strong sink’ on final that forced the glider to descend into trees surrounding the selected field. (It should be noted that ‘strong sink on short final’ is a strong indication that the glider is flying through a wind shear.) *NTSB GAA16CA156*

The private pilot of a DG-800B was not injured while the glider was substantially damaged after striking a group of eucalyptus trees short of the runway. The pilot reported overflying the intended off-airport landing site from 1,700 to 1,100 ft AGL. The pilot was unable to start the engine during the landing approach. He continued the landing approach, but extended downwind too far and was unable to penetrate back to the landing field while on final. *NTSB WPR16LA096*

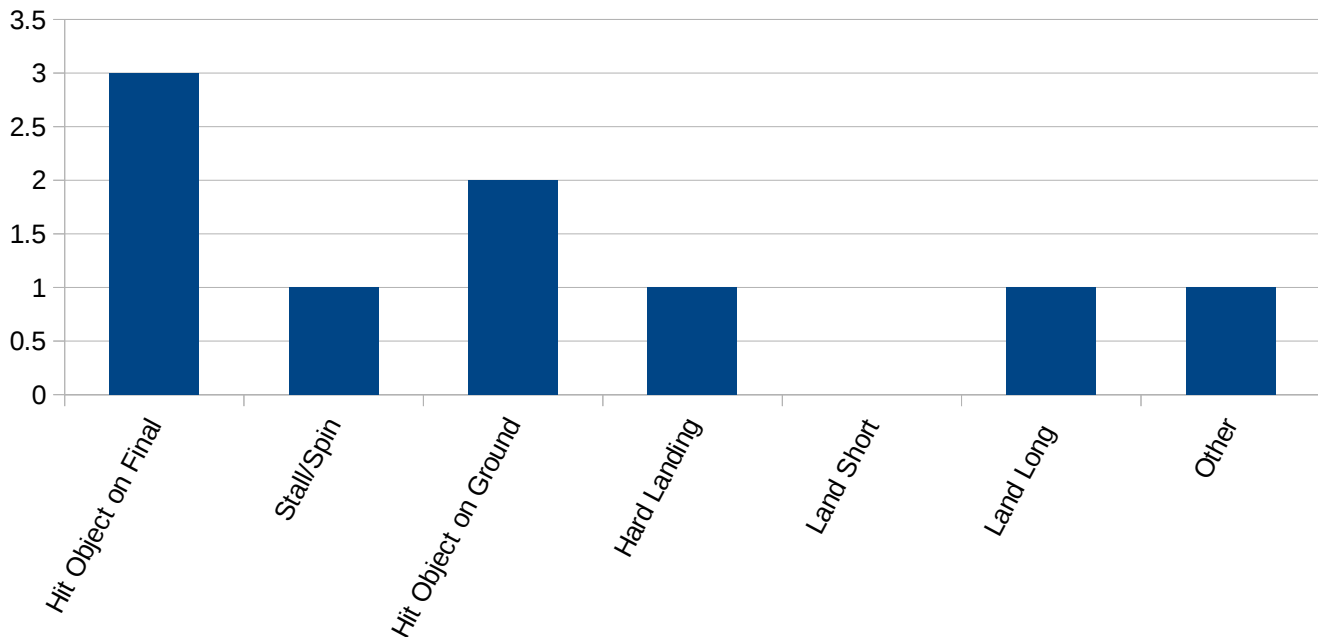
The pilot of an ASW 19 received minor injured while the glider was substantially damaged after impacting terrain while executing an off-airport landing. The pilot reported that he was unable to find lift and decided to make an off-airport landing. While 20 ft above the ground on final the glider encountered turbulence and stalled. The glider impacted terrain in a nose low attitude. (Establishing and maintaining the proper approach speed is essential for a safe landing. Note that a low energy touchdown does NOT require a low energy approach.) *NTSB GAA16CA244*

The pilot of a LS 3 was seriously injured while the glider was substantially damaged after the left wing struck trees while attempting an off-airport landing. The pilot reported a pre-flight weather briefing indicated thermal activity in the mountainous terrain. Arriving low over the ridge, the pilot was unable to find a thermal and decided an immediate landing was required. The pilot select a 1,000 ft long field surrounded by trees as the

landing site. The pilot descended over the field but the left wing struck trees while maneuvering to land. *NTSB GAA16CA261*

The pilot of an ASW 28 was not uninjured but the glider was substantially damaged after it struck trees at the departure end of the off-airport landing site. The pilot reported encountering an area of sink and decided to execute an off-airport landing at a pre-selected field. The field had trees on both the approach and departure ends of the landing site. The pilot reported overshooting the intended touchdown point and impacting the trees at the departure end of the field. *NTSB GAA16CA34*

### Landing Accident Breakdown



**Figure 7: Reported factors in landing accident**

The pilot and passenger of a Diamond HK 36 were not injured while the glider was substantially damaged after a ground loop during the landing roll. The pilot reported that while landing on a narrow grass airport the glider veered to the left. He was unable to correct with right rudder and the left wing struck corn stalks causing the glider to ground loop. *NTSB GAA16CA391*

The commercial pilot of a Piper PA-18 (Supercub) was not injured while the towplane was substantially damaged after it departed the left side of the runway during the landing roll. *NTSB CEN16CA348*

The pilot of an ASW 27 was not injured while the glider was substantially damaged after a hard landing while executing an off-airport landing. The pilot reported being unable to ridge soar so he decided to return to the airport. He encountered sink while on the return flight and he decided to make an off-airport landing. While on final to a large field the pilot reported overflying a set of power lines and noticing a 2<sup>nd</sup> set in his flight path. The pilot turned away from the second set and landed hard in the field. *NTSB GAA16CA497*

The pilot of a Grob 109 Touring Motor Glider was not injured but the glider was substantially damaged after it impacted trees while attempting an off-airport landing. The pilot reported flying under power in mountainous terrain and being concerned that the glider would not overfly the rising terrain. ATC reported an airport located 5 NM from the pilots position so the pilot decided to fly towards that airport into rising terrain. The pilot was

unable to spot the airport and decided to make an off-airport landing. The glider landed in trees approximately ½ NM from the ATC identified airport. *NTSB GAA16CA489*

One point that should be made is that many pilots report encountering ‘heavy sink’ on short final. There are numerous reasons for this, and one of the most insidious is a condition known as wind gradient. It is well known that wind speeds can, and do, vary with altitude. A wind gradient is a change in wind speed and/or direction with altitude.

When a gradient, or shear, is encountered the forces acting on the glider change and the glider responds to those changes. One noticeable change is an increase in the gliders sink rate with a reduction in wind speed, resulting in a tendency to land short. This occurs as the glider attempts to maintain its trimmed airspeed or as the pilot pushes forward to maintain the desired airspeed. An analysis shows that a glider approaching at 60 kts will land 53% shorter than expected when landing into a 20 Kt decreasing wind gradient. The exact decrease in glide distance will depend on the gliders initial and final airspeed as it descends through the gradient. The mass of the glider is a minor factor in this situation<sup>2</sup> (in other words a 1-26 and Nimbus 4 will both fall just as short). All pilots need to be trained to recognize and respond to wind gradient/shear conditions. The SSF’s goal orientated approach (see below) can help pilots accomplish this task.

### Fatal Accidents

Three (3) glider pilots and one (1) passenger were involved in fatal accidents during the FY16 reporting period. This represents a 40% decrease in the number of fatal accidents (3 vs 5) from previous reporting period. One (1) accident occurred during the launch phase of flight (aerotow) and the remaining two (2) accidents occurred in cruise flight.

### Fatal Accidents 2012-2016

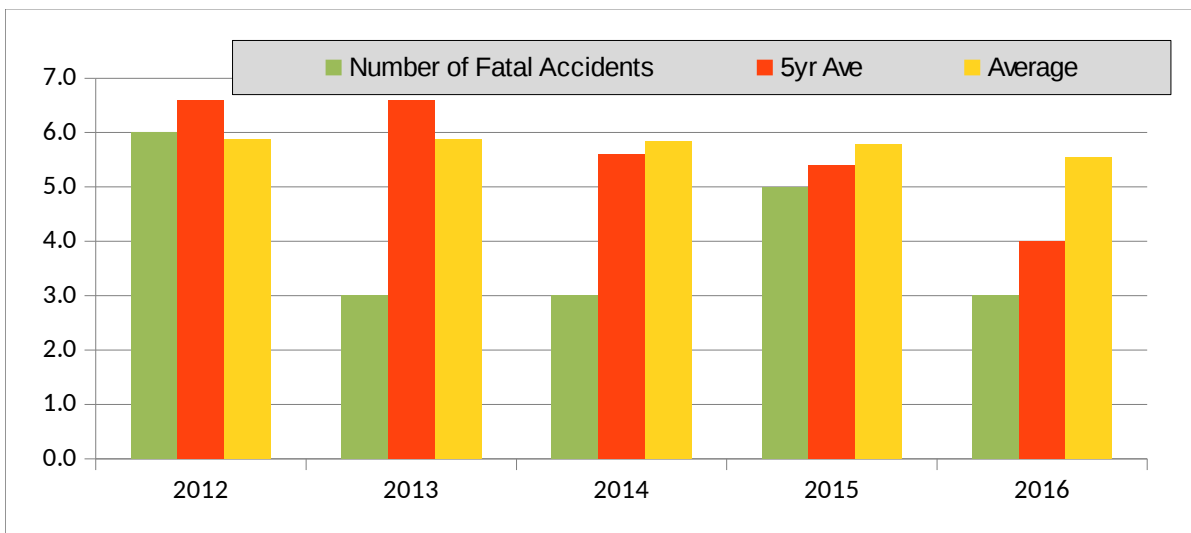


Figure 8: Number of fatal accidents, 5 year average, and average since 1987

<sup>2</sup>The mass (weight) of the glider will have a small effect as a heavier glider will have more momentum allowing it to continue on its original flight path than a lighter glider. The initial airspeed of the glider has a much larger impact than the weight.

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 4, 5, and 6 (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 8 shows the number of fatal accidents in all phases of flight.

The NTSB is still investigating these fatal accidents and no probable cause has been issued for any of these accidents. The reports below summarize the three (3) accidents that occurred during this reporting period.

The private pilot of a SZD 55-1 was fatally injured and the glider substantially damaged after it collided with terrain during a failed aerotow launch. Witnesses reported that the glider's right wing struck the ground as the wing runner released the glider. The pilot momentarily leveled the wings and then the left wing descended and struck the ground. The pilot was again able to level the wings but then began to kite on tow in a 30 – 40 deg nose high pitch attitude. The glider pilot released and appeared to regain a level flight attitude between 100 and 200 ft AGL. The glider appeared to start a right turn before stalling and entering a right hand spin which ended when the glider impacted terrain. *NTSB CEN16FA306*

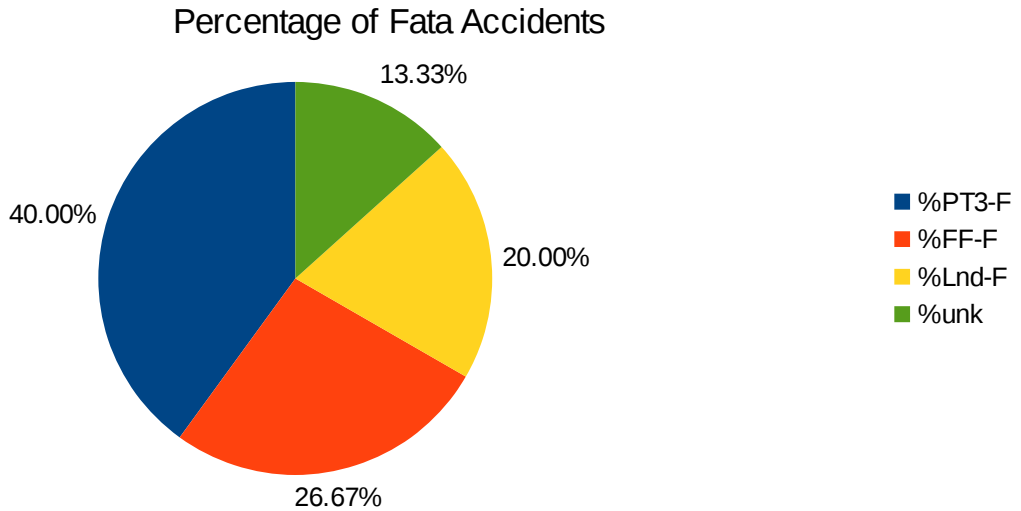
The private pilot of a CARAT A motor glider was fatally injured and the glider destroyed after it impacted terrain for unknown reasons. The pilot reported via radio that he had departed the airport and was climbing about 4 miles from the airport. The propeller was found stowed and the magneto and fuel pump switches were in the 'off' position. There were no witnesses and the NTSB report offers no further details at this time. *NTSB WPR16FA160*

The pilot and passenger in a Stemme S-10 VT motor glider were fatally injured and the glider was substantially damaged after it impacted trees in mountainous terrain. Witnesses reported observing the glider flying 'unusually low' in the accident area. No other information is available at the time this report was written. *NTSB CEN16FA331*

For the five-year period 2012 – 2016, 25 pilots and passengers received fatal injuries while soaring. This equates to a five-year average of 5.0 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.

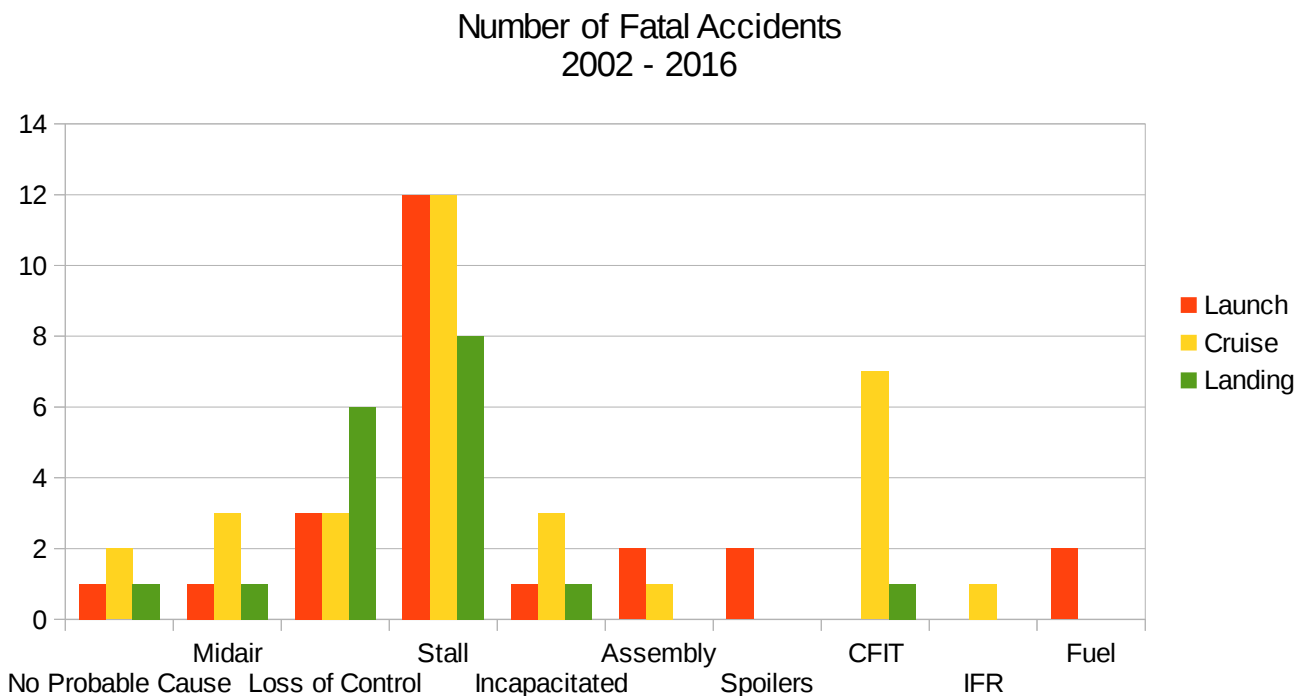
In 2011 the SSF began taking a closer look at fatal glider/tow-plane accidents. At the 2013 SSA convention the SSF began discussing the results of this analysis and updates to this analysis continue today. From 2002 – 2016 there were 80 fatal glider/tow-plane accidents in the US involving 92 pilots and passengers and 85 aircraft (mid-air collisions account for the additional aircraft). The NTSB database contains a probable cause (PC) for 66 of these accidents leaving 14 still under investigation.

Figure 8 shows the number of fatal accidents per year and averaged over 2 different time periods. The green bar shows the number of fatal accidents that occurred during that reporting period (Nov 1 – Oct 31). The red bar shows a 5 year moving average and the yellow bar shows the average number of fatal accidents since the SSF began keeping statistics in 1987.



**Figure 9: Percentage of Fatal Accidents in various phases of flight**

Figure 9 shows the percentage of fatal accidents in the 3 major phases of flight (launch, cruise, and landing) from 2011 thru 2016. It is instructive to compare these percentages to the percentage of accidents as shown in Figure 3. 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 launch phase of flight followed by cruise flight fatal accidents.



**Figure 10: Number of fatal accidents by NTSB defined Probable Cause**

As shown in Figure 10, the NTSB has determined the probable cause of the accident in 76 of the 80 fatal glider/tow-plane accidents that occurred between 2002 and 2016. These causes break down into 9 major areas, with a 10<sup>th</sup> (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.

### ***Damage to Aircraft***

A total of eight (8) gliders, six (6) motorgliders, and one (1) tow-plane received structural or substantial damage during this reporting period. One (1) glider was destroyed during accidents in the FY16 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/customers to obtain and maintain both currency and proficiency.

### ***Auxiliary-Powered Sailplanes***

Six (6) motorgliders were involved in accidents during this reporting period. As noted earlier in this report one MG was damaged after the engine failed to start while attempting to land, one MG was damaged while operating with the engine deployed but not running, two MGs were damaged while operating as gliders and two TMGs were damaged while operation with the engine running.

Pilots should be familiar with the flight and handling characteristics of their motorglider with the engine off and retracted (clean configuration) with the engine off and extended (dirty configuration) and with the engine out an running. Pilots should develop SBTs to help them identify the threats for each condition and determine how to safely prepare to deal with emergencies when they occur.

### ***Accidents Involving Tow-Aircraft***

During the FY16 reporting period one (1) accident involving a tow-plane occurred resulting in no injuries to the tow-pilot. .

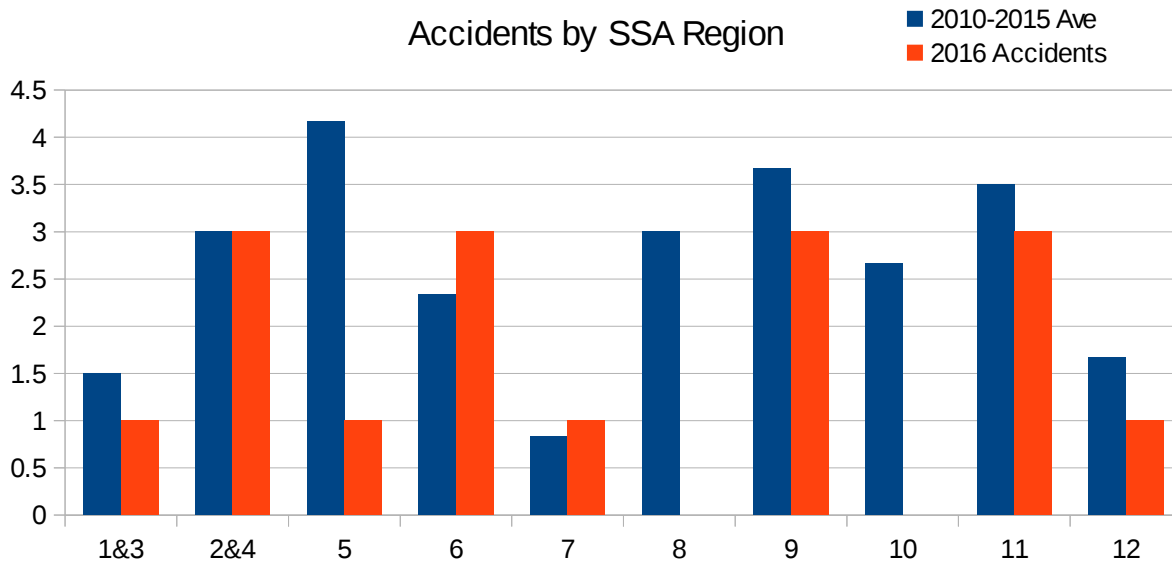
Details for this tow-plane accident is noted in the Landing accident section of this report.

### ***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<sup>3</sup>.

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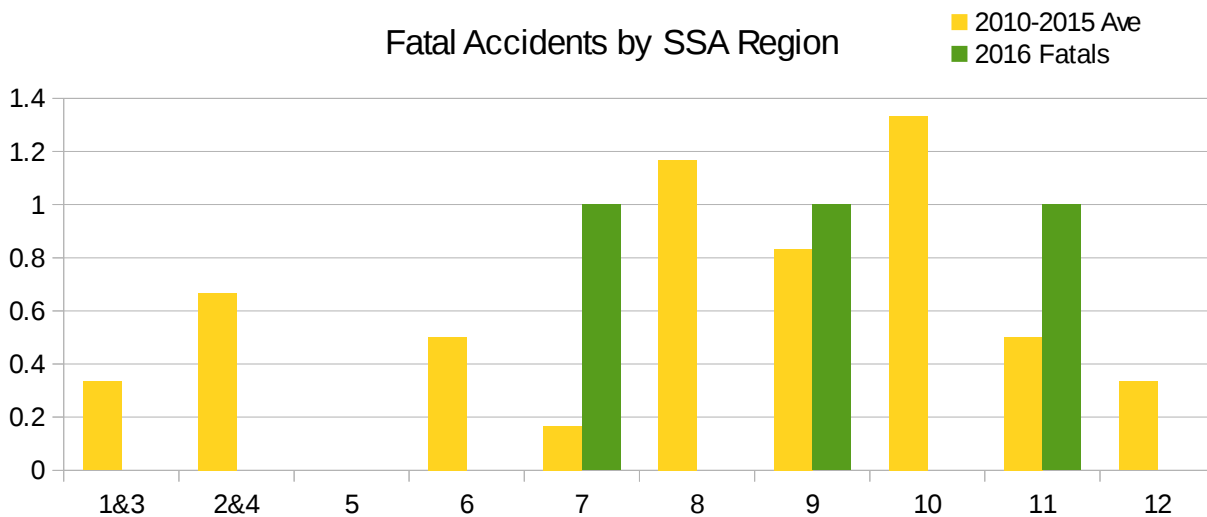
<sup>3</sup> See Appendix A for more details



**Figure 11: FY16 and average Number of accident per SSA Region**

Figure 11 shows the number of accidents in each SSA region along with the average number of accidents in that region during the previous 6 years (FY10-FY15). Figure 12 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.



**Figure 12: FY16 and Average number of Fatal Accidents per SSA Region**

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

The SSF web site now 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 accident 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, insurance claims were up 9% in 2016. While the number of claims is up last year it is still lower than the number of claims in 2012. However, it is obvious 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/tow-plane accidents is a Human Factor error. The question then is how can we reduce these errors? Fortunately for us, there is a body of knowledge on this topic that we can tap into. If we accept a new premise and follow a few simple guidelines we can significantly reduce the number of accidents.

According to Sidney Dekker<sup>4</sup> 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.

The traditional view of a human error accident is that the pilot having the accident failed in some way. Either this pilot failed to learn a key fact (a mid-air occurred because the pilot failed to clear his turn), or the pilot ignored a rule or regulation (a stall/spin turning to final because the pilot entered the pattern too low or flew too slow). While it might be comforting to accept that this single pilot was at fault, in reality this is not the case.

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 soaring operation he trained in failed to emphasize the importance of this task. The operations training syllabus did not emphasize 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 soaring operations 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.

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<sup>4</sup>Professor of Human Factors and System Safety at Lund University, Sweden and Director of the Leonardo Da Vinci Laboratory for Complexity and Systems Thinking.

This new 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 current initial and recurrent training program to determine what is broken and how to fix these problems.

### ***SSA Board 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 35 years.

However, while this data can show trends, it does not show the accident rates that are commonly shown in General Aviation publications or Commercial 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.

The SSF has tired numerous times to capture the usage (flights or hours) data from SSA clubs, chapters, and commercial operators. The SSF has asked soaring operations to report this data directly to the SSF chairman. Few reports have been received. In the early 2000's the SSF created an on-line form on the SSF web site and encouraged pilots and soaring operations to self report. A small number of individuals and clubs did report the 1<sup>st</sup> year, but the number of reports quickly evaporated after that.

The SSF trustees then looked to see if there was a correlation between the number of accidents and the number of flights reported to the On Line Contest. The OLC web page allows individuals to download flight statistics showing data for different regions. Unfortunately this is cumulative data, starting from the 1<sup>st</sup> contest day and ending on the day you download. At a minimum to build meaningful statistics you would need to have monthly reports, which would require manually downloading data every month. Despite this impediment the SSF did collect OLC data for several years and found no discernible correlation between the number of OLC flights, soaring accidents, or the local weather.

As noted above, soaring weather can play a big part in soaring accidents. The simple fact is that glider pilots do not fly when the weather is bad. Rain and low clouds are not conducive to long soaring flights. However, poor soaring conditions may not have as much impact on glider training flights. As long as cloud bases and visibility are adequate for the training flight, they can be conducted. This may mean that the number of flights does not diminish as much as we might expect over the past few years when large sections of the country have had long periods of rainy weather.

Lastly, the SSF trustees have noted that the FAA aircraft survey data is on-line and downloadable for free. As many aircraft owners know the FAA sends out letters and emails asking owners to voluntarily complete an annual usage survey. This survey asks for flight times, numbers, installed equipment and many other pieces of information. Data is broken down by aircraft category and other factors. However, the data does not give you any indication of how many owners responded or if the same owners are responding on an annual basis. Thus it is difficult to determine if decreases in flights and hours demonstrates a trend in soaring or just the reporting.

To help address this problem the SSA board of directors recently approved a plan to have the SSA office staff begin collecting data from clubs and chapters. Today when a club or chapter renews they provide a list of member names to the SSA and indicate if members are paying individually or as a group. Starting this spring,

the SSA will also ask the club or chapter to submit flight data along with the member list. By collecting this data on an annual basis, the SSF will be able to begin creating accident statistics.

Clubs, chapters, and commercial operators that would like to help create some historical data should contact any SSF trustee and discuss how you can submit this data. While starting to collect data now will be beneficial, having some historical data would be extremely valuable for understanding why the number of accidents has decreased by 50% over the past 4 years.

## ***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. 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/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/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 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 'its 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 organizations safety culture each year

SBT is an excellent way to provide the ADM skills CFIs are required to teach. It is well recognized that ADM 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 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 through 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 1<sup>st</sup> 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 RM/ADM training method. Pilots who receive this type of training, and then continue to practice it have fewer accidents than 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) check with other pilots about the changing weather, (6) change your flight plan to conduct a local flight. 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 use 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 RM/ADM 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.

### ***SSF Goal Orientated Approach***

As the FY16 statistics show, the majority of glider/tow-plane 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.

See a more complete set of recommendations in the SSF 2013 Annual Report.

### ***Flight Instructor Roles***

Flight instructors play an important safety role during everyday 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 in the flight training process. Examiners will check for this training during the flight test. The regulations require that all flight instructors provide some kind of aeronautical judgment 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/tow-plane accident rate.

## SSA REGIONS

- Region 1 Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont.
- Region 2 New Jersey, New York (south of 42<sup>nd</sup> parallel), Pennsylvania (east of 78<sup>th</sup> meridian).
- Region 3 New York (north of 42<sup>nd</sup> parallel), Pennsylvania (west of 78<sup>th</sup> meridian).
- Region 4 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 92<sup>nd</sup> 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 92<sup>nd</sup> meridian), Nebraska Oklahoma, Texas.
- Region 11 California (north of 36<sup>th</sup> parallel), Guam, Hawaii, Nevada.
- Region 12 California (south of 36<sup>th</sup> parallel).



## APPENDIX A

### ***Request for Club, Chapter, and Commercial Operator information***

The Soaring Safety Foundation is tasked with evaluating US glider/tow-plane accidents and developing plans that can help reduce these accidents. Since 1981 the SSF has developed and implemented numerous programs and ideas. While the accident rates are trending in the right direction, one serious question remains. How can the SSF generate meaningful accident statistics which can then be used to devise appropriate response plans?

The difficulty is that the SSF can easily obtain the raw number of accidents (the accident rate), but it has few, if any, means to turn these raw numbers into meaningful statistics. Most aviation accident statistics are reported as a fraction or percentage of accidents per flights or accidents per flight hours. To obtain these statistics the SSF needs to know the number of flights or the number of flight hours. Historically, these flight numbers/hours have not been made available to the SSF.

Other general aviation groups calculate their flight numbers/hours by noting the gallons of aviation gas sold throughout the US. Statistical analysis methods can be used to determine the average fuel burn rate for the fleet of general aviation airplanes. Thus, these aviation groups can compute meaningful accidents statistics. Since gliders use little or no fuel, we do not have an easy way to generate the flight number/hours valued needed to create meaningful statistics.

The SSF needs the support of a majority of the clubs, chapters, and commercial operators in the US to help correct this problem. Only by voluntarily submitting this information can the SSF really achieve its goal of reducing accidents. Once the SSF trustees have these number we can combine them with the raw NTSB accident numbers to generate meaningful statistics.

What can your club, chapter, or commercial operator do? At a minimum use the pilot/club flight time form on the SSF web site <http://www.soaringsafety.org/forms/pilot-times.html> annually to report the number of launches and the total flight time that your club ships performed. If you also launch private gliders, then determine their total flight time as well. This information should easily come from your club records, and these two numbers would greatly help the SSF and they will be considered strictly confidential unless otherwise specified.

Do you want to do more? Then send us as much additional detail as you feel comfortable doing. One option would be to extract your club records into an Excel spread sheet and email the file to the SSF. The more details we have, the more analysis we can perform.

One word of caution, in order for these numbers to be statistically valid, we must get details from a majority of the clubs, chapters, and commercial operators. If not, then the number will be skewed and could reflect specific operator issues instead of national trends. Thus, the SSF needs the support from a large portion of the soaring community.

Email your report to any SSF trustee. Rich Carlson <[rcarlson501 at comcast.net](mailto:rcarlson501@comcast.net)>, Burt Compton <[burtcompton at aol.com](mailto:burtcompton@aol.com)>, Stephen Dee <[goflysteve at gmail.com](mailto:goflysteve@gmail.com)> Ron Ridenour <[ronsnimbus3 at aol.com](mailto:ronsnimbus3@aol.com)>, Tom Johnson <[ttjj757 at live.com](mailto:ttjj757@live.com)>, or the generic SSF Webmaster <[webmaster@soaringsafety.org](mailto:webmaster@soaringsafety.org)>.

# APPENDIX B

## ***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 C

### *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 D

### *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.