



FAA
Aircraft Certification Service (AIR)
Policy & Innovation Division, AIR-600
Small Airplane Standards Branch, AIR-690

2017

Continued Operational Safety (COS) Report

Special Category Light-Sport Aircraft

JULY 2004 THROUGH SEPTEMBER 2017

Issued January 2018

This report provides an overview of the continued operational safety of special category light-sport aircraft since the establishment of the Sport Pilot/Light-Sport Aircraft rule in July 2004. The specific focus of this report is on accidents and incidents. Report data have been coordinated with AVP-210.

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New for Fiscal Year (FY) 2017

- Updated report with new 2017 data and revised data from previous years
- Updated office designators to reflect *AIR Transformation* office realignment
- Added data from the General Aviation and Part 135 Activity Surveys related to SLISA
- Adjusted data related to “Loss of Engine Power” to include any cause
- Adjusted data related to “System/Component Failure or Malfunction (Powerplant)” to include only engine and propeller specific items (e.g., does not include fuel-related items)

Send comments or questions regarding this report to the following email address:
9-AIR-ACE-SAD-LSA-SAFETY@faa.gov

General Information

The Small Airplane Standards Branch, AIR-690, Programs and Procedures Section, AIR-694 has established a process to monitor and track **special light-sport aircraft (SLSA) accident and incident data** to identify and consider accident/incident causes and trends. This report presents information on **all known accidents and incidents involving SLSA at the time of this report**. Review and analysis of the accident/incident data may result in recommendations to improve the SLSA industry consensus standards and/or may be used in determination of risk factors relating to conducting oversight of SLSA manufacturers' continued operational safety (COS) programs.

Data sources for this report include FAA Forms 8020-9 *Aircraft Accident/Incident Preliminary Notice* and the National Transportation Safety Board (NTSB) aviation accident database. The Monitor Safety/Analyze Data (MSAD) database established by the FAA through Order 8110.107A *Monitor Safety/Analyze Data* is another data source.

This report **does not include** accidents and incidents involving sport pilots operating aircraft in categories of aircraft other than SLSA that meet the light sport aircraft (LSA) definition in Title 14 Code of Federal Regulations (14 CFR) 1.1.

This report **does not include** data on aircraft that originally obtained an SLSA airworthiness certificate and then subsequently changed the airworthiness certification to experimental light-sport aircraft (ELSA).

This report **does not provide** any data analysis for accidents and incidents of aircraft certificated as ELSA. Due to the experimental nature of these aircraft and the lack of FAA design review there is limited FAA continued operational safety oversight and coordination with the owners/operators of these aircraft. The Aircraft Certification Service (AIR), Policy & Innovation Division, AIR-600, Airworthiness Certification Section, AIR-6C3 has responsibility for any oversight of these aircraft.

ELSA Limited Data

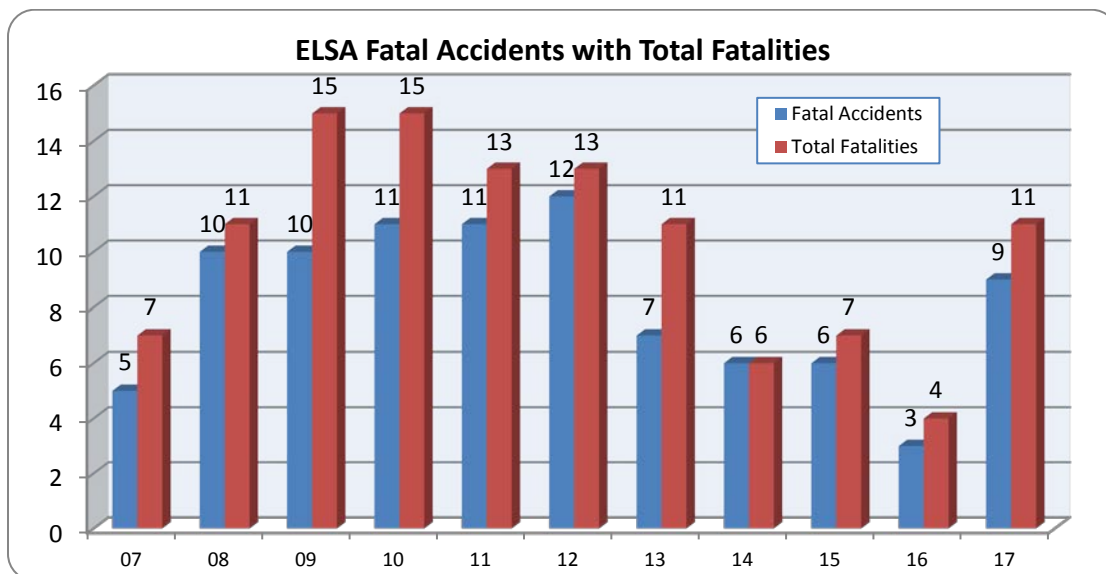
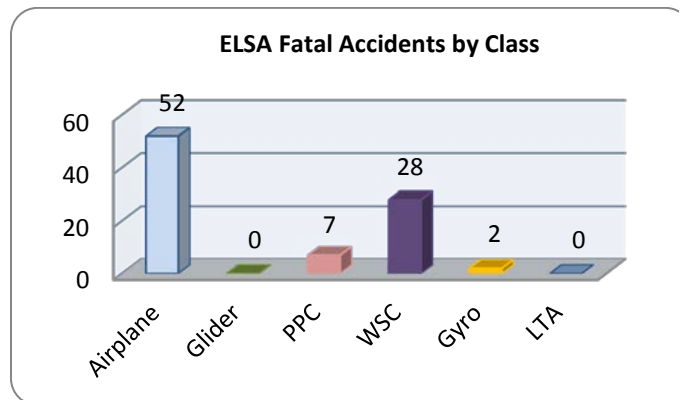
Non-fatal accidents and incidents involving ELSA have not been tracked and are not reported as part of this report.

Known fatal accidents involving ELSA during the reporting time period are as follows:

Fatal Accidents	Total Fatalities
90	113

ELSA includes—

- “fat ultralights” not meeting the provisions of 14 CFR 103.1, ELSA certificated under 14 CFR 21.191(i)(1); [85 fatalities]
- ELSA aircraft assembled from a “kit” certificated under 14 CFR 21.191(i)(2); [3 fatalities] and
- ELSA aircraft certificated under 14 CFR 21.191(i)(3), aircraft that had been previously issued an SLSA airworthiness certificate under 14 CFR 21.190. [2 fatalities]



SLSA Airworthiness Certifications

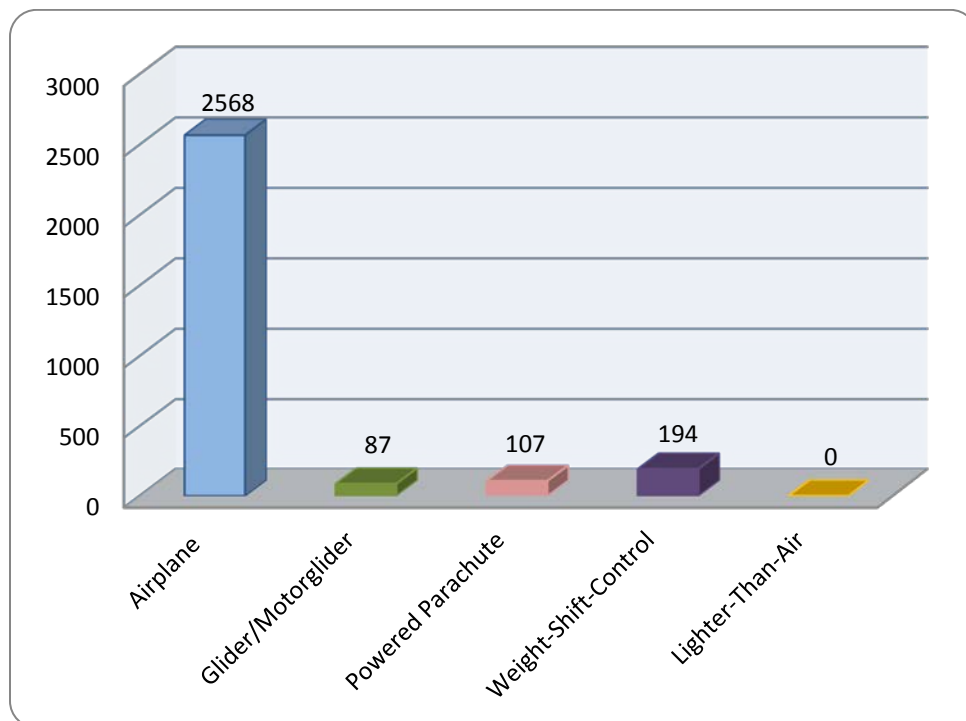
A special airworthiness certificate for an SLSA is issued to an aircraft that meets the definition of LSA, is manufactured to the applicable consensus standards, and is one of the following five classes of the LSA category:

- Airplanes
- Gliders
- Powered parachutes (PPC)
- Weight-shift-control (WSC) aircraft (commonly called “trikes”)
- Lighter-than-air (LTA) aircraft (balloons and airships)

When the aircraft meets all the eligibility requirements of 14 CFR 1.1 and § 21.190, it may be issued an SLSA airworthiness certificate.

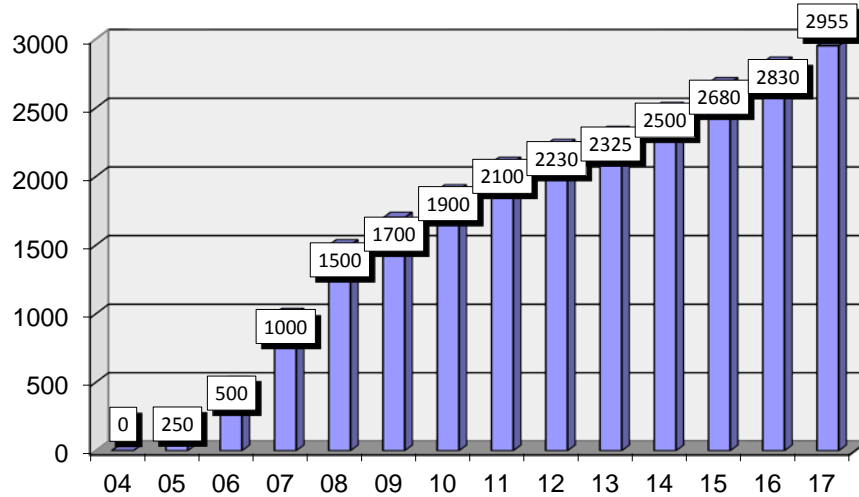
Population of SLSA by Class

Estimates based on FAA Aircraft Registry, AFS-750 data from October-2017 for **SLSA airworthiness certificates issued under aircraft manufacturer code “060.”**



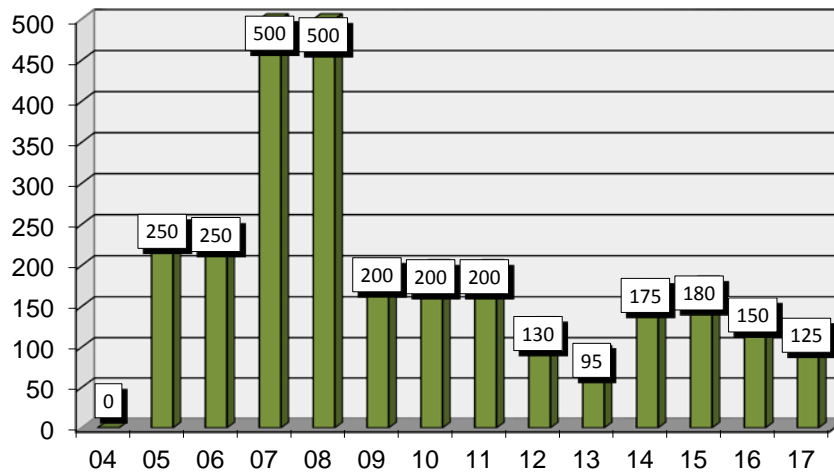
SLSA Cumulative Fleet Size by Fiscal Year (FY)

Estimates based on FAA Aircraft Registry, AFS-750 data from October-2017 for **SLSA airworthiness** certificates issued under aircraft manufacturer code "060."



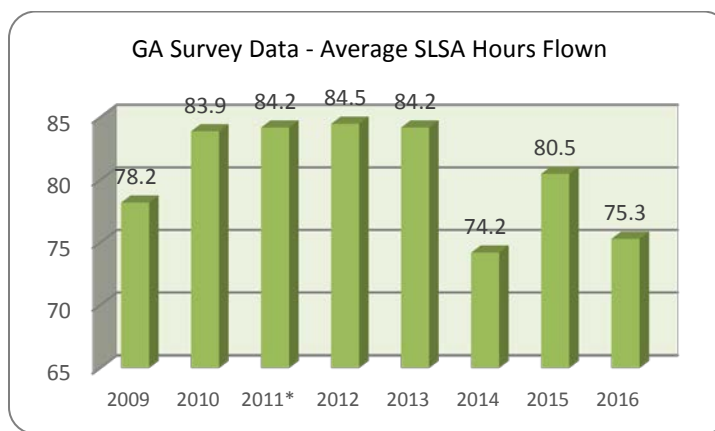
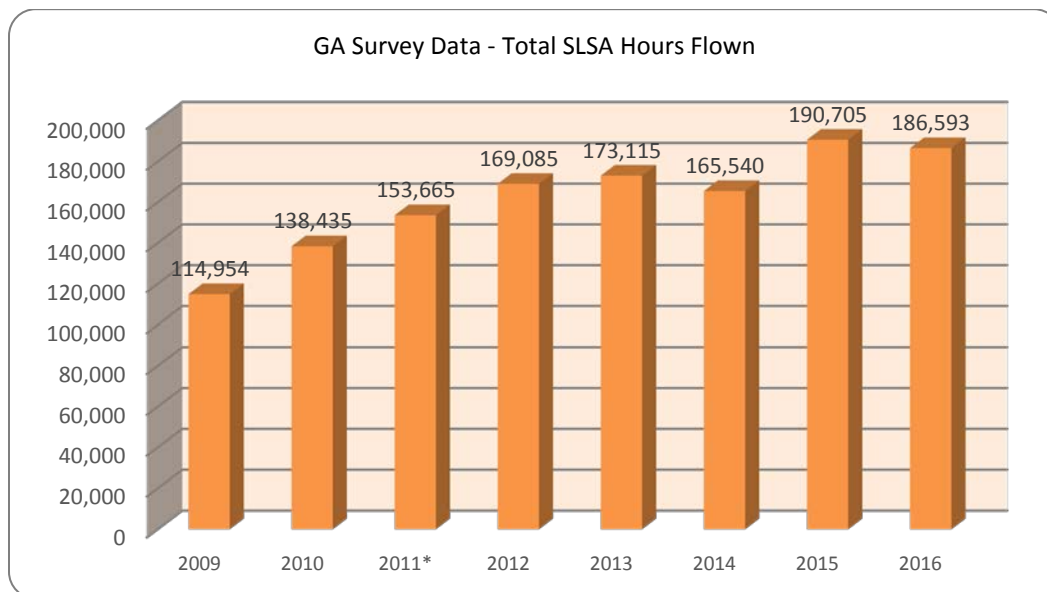
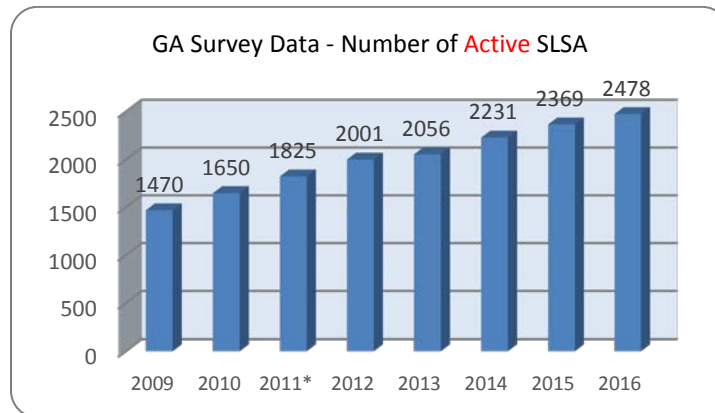
New Manufactured Aircraft by FY

Estimates based on FAA Aircraft Registry, AFS-750 data from October-2017 for **SLSA airworthiness** certificates issued under aircraft manufacturer code "060."



General Aviation and Part 135 Activity Surveys

Data from the General Aviation and Part 135 Activity Surveys are currently available for only FY2009 through FY 2016. NOTE: *No GA Survey data available for 2011 – estimate provided.



Population of SLSA Manufacturers

Fiscal Year 2017

Total 2017 **Active** SLSA Manufacturers – **62**

	2008	2010	2012	2013	2014	2015	2016	2017
Airplane / Glider	42	54	63	64	66	65	43	46
PPC	5	8	7	7	7	6	7	7
WSC	5	12	10	10	9	8	9	9
TOTAL:	52	74	80	81	82	79	59	62

“**Active Manufacturer**” - actively producing SLSA for operation in the U.S.

	2008	2010	2012	2013	2014	2015	2016	2017
U.S.	17	26	40	41	37	34	28	28
Outside U.S.	35	48	40	40	45	45	31	34

Note 1: Manufacturers **NOT** included in data –

- “**Non-active Manufacturer**” – manufacturer with SLSA operating in the U.S.; however, new production/sales very limited: **21** (11 in U.S.).
- Manufacturers not in compliance with 14 CFR 21.190(d) – Bilateral Airworthiness Agreement (these companies are no longer in production): **3**.
- Manufacturers that have stopped doing business with the U.S. market, after at least one SLSA: **30** (14 in U.S.).

Note 2: Potential known new make/model aircraft pursuing SLSA (from new or existing manufacturer): **49**.

Note 3: Data for 2008 thru 2015 include all manufacturers; data from 2016 and on separate “active” from “non-active” manufacturers.

Note 4: Data source for 2008 and 2010: www.bydanjohnson.com & Light Aircraft Manufacturers Association (LAMA).

Note 5: Data source for 2012 and on: AFS-750 Registry Database.

SLSA Vision for the Future

We are focused on increasing industry accountability and safety with a goal of creating a light-sport aircraft (LSA) system with an equivalent or lower fatal accident rate than other segments of “personal” aviation without requiring FAA type design certification or FAA production oversight by:

- Supporting a regulatory and policy structure for industry to achieve FAA safety goals through self-declared compliance with industry developed and maintained consensus standards.
- Enabling an industry-led system of self-audits and statements of compliance.
- Applying a scalable oversight approach to a manufacturer’s self-auditing and self-declarative certification process.
- Committing FAA resources to actively participate in the development and acceptance of industry consensus standards.

Recording/Reporting of Data

It is important to note that **“phase of flight”** (Ref. Appendix 1) and **“occurrence categories”** (Ref. Appendix 2) may have multiple data elements identified for an individual accident/incident event. This is intentional in order to allow for every pertinent element to be recorded and analyzed.

This report is based on known data at the time the report is compiled. As new data become available, the recording of data elements will be adjusted as needed and the reporting of these changes will be reflected in the next revision of this report.

Definitions (Ref. NTSB Form 6120.1)

"Aircraft Accident" means an occurrence associated with the operation of an aircraft that 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.

"Substantial Damage" means 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.

"Serious Injury" means any injury that (1) requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; (2) results in a fracture of any bone (except simple fracture of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, muscle, or tendon damage; (4) involves injury to any internal organ; or (5) involves second- or third-degree burns, or any burns affecting more than 5 percent of the body surface.

"Fatal Injury" means any injury that result in death within thirty (30) days of the accident.

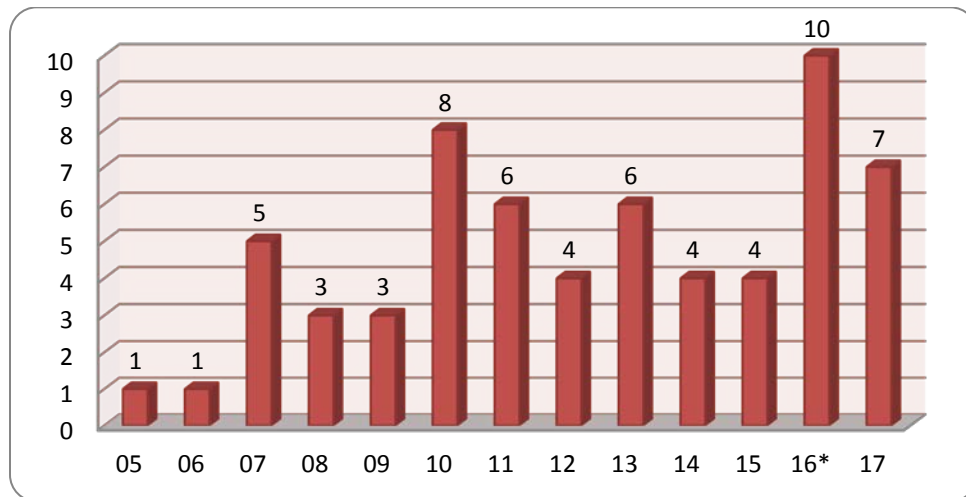
"Aircraft Incident" is an occurrence other than an accident that affects or could affect the safety of operations.

Fatal Accidents vs. Non-Fatal Accidents/Incidents

The following tables and charts provide data for known SLSA fatal accidents and non-fatal accidents/incidents that occurred during the reporting time period.

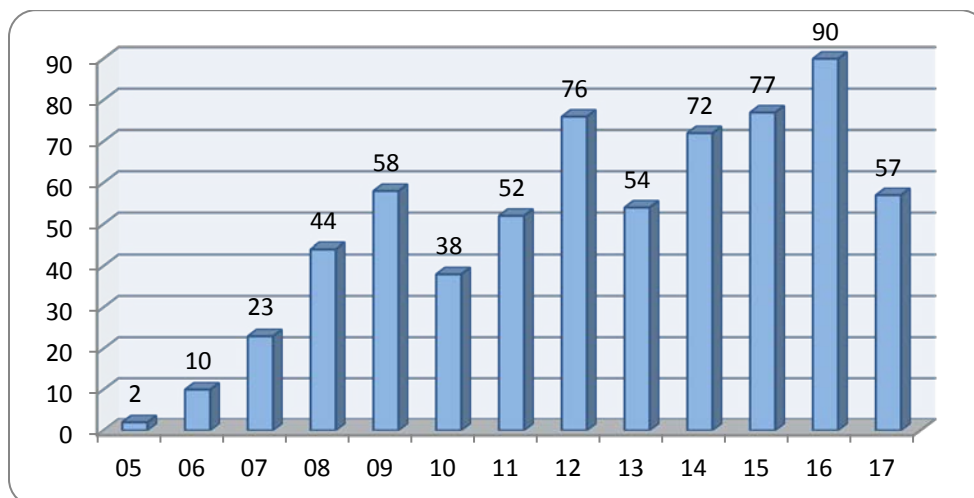
Fatal Accidents	Non-Fatal Accidents/Incidents	Total Events
62	653	715
Total Fatalities: 84		

Fatal Accidents by FY

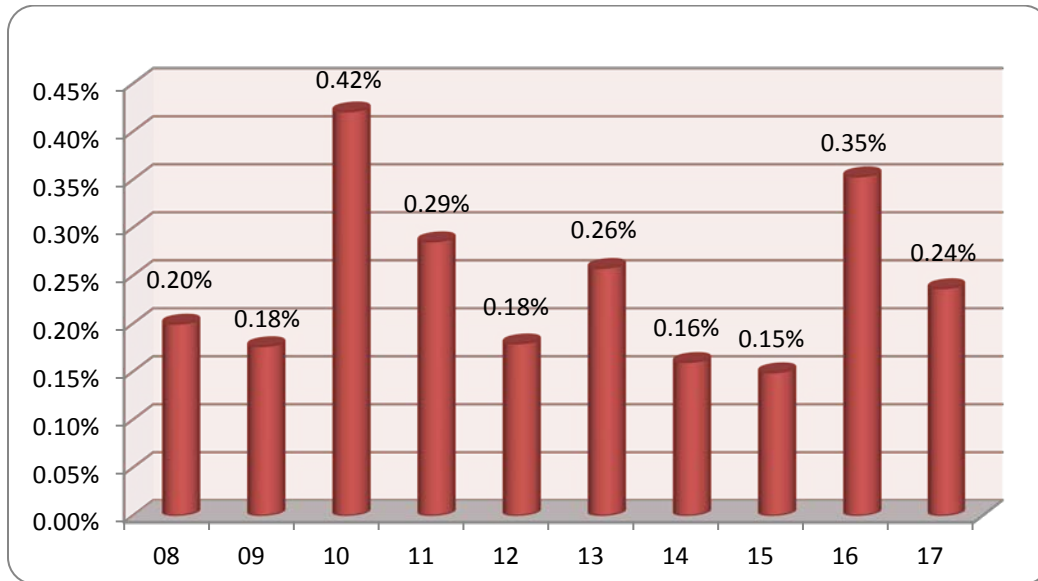


***NOTE:** For 2016 – One fatal accident aircraft was operating as law enforcement under public aircraft operations (PAO).

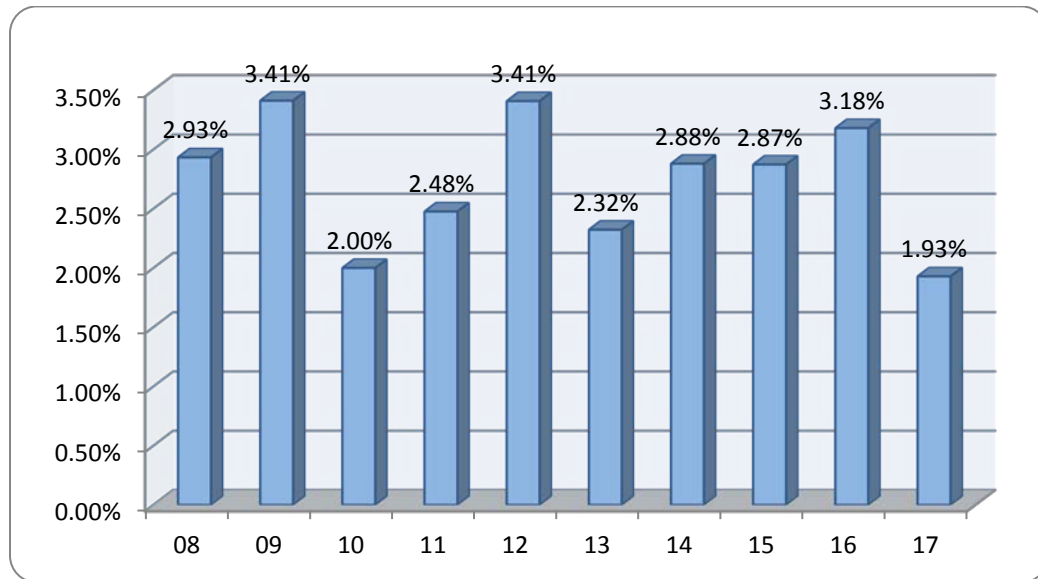
Non-Fatal Accidents/Incidents by FY



Fatal Accidents by FY to Total LSA Aircraft Fleet by FY [10 Year Trend]

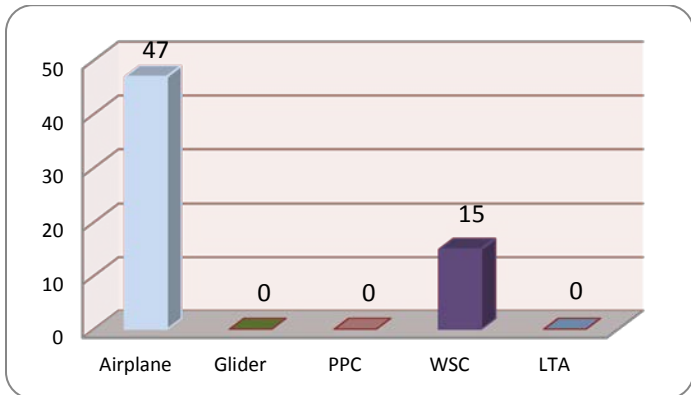


Non-Fatal Accidents/Incidents by FY to Total LSA Aircraft Fleet by FY [10 Year Trend]



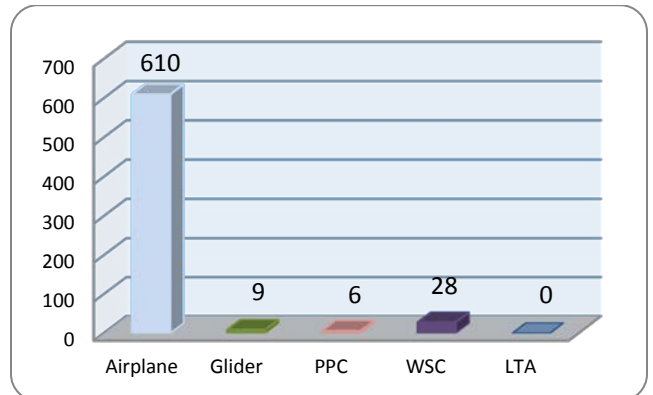
Fatal Accidents by Class of SLSA

Total: 62

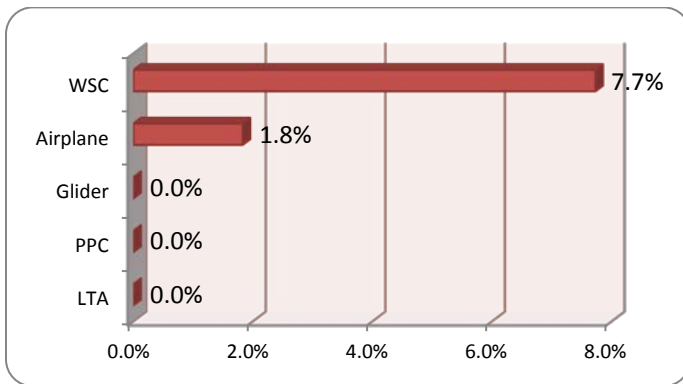


Non-Fatal Accidents/Incidents by Class of SLSA

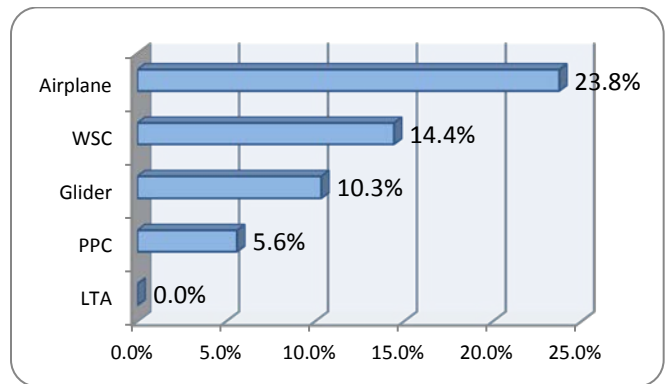
Total: 653



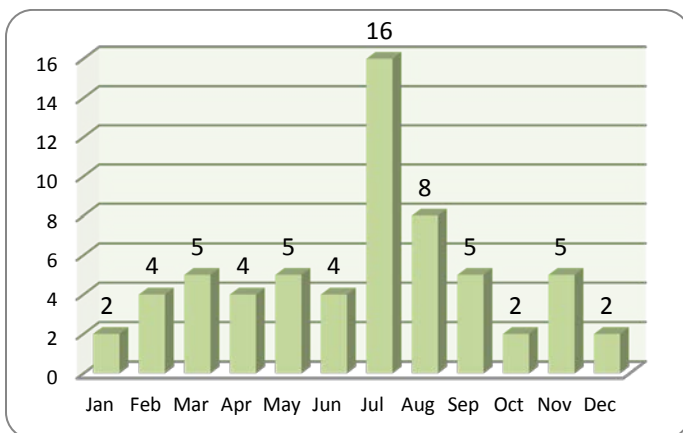
Fatal Accidents by Class to Total Class Fleet



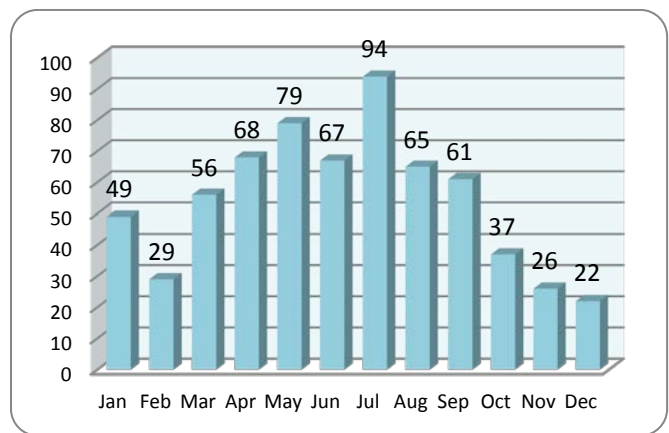
Non-Fatal Accidents/Incidents by Class to Total Class Fleet



Fatal Accidents by Month of Year



Non-Fatal Accidents/Incidents by Month of Year



Fatal Accidents by Type of Pilot Certificate and Medical Certificate

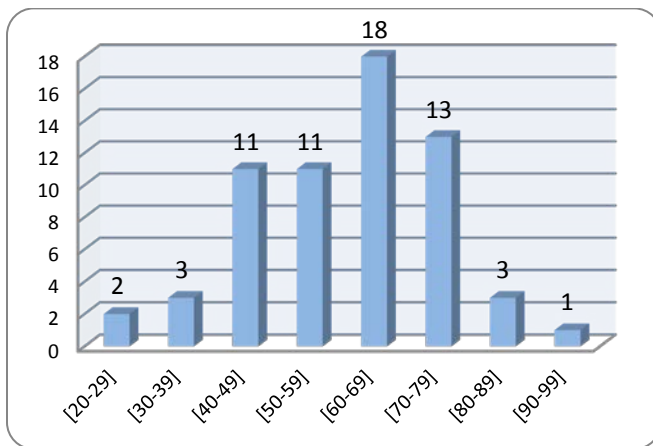
SLSA / Pilot Fatal Accident Matrix

Pilot Rating & Medical	Recreation+ CL3+ (Rated Pilot)	26
	Recreation+ DL (Operating Privileges of Sport Pilot)	14
	Sport Pilot for Aircraft Being Operated (may hold other ratings)	12
	Student / Solo Privileges	7
	Pilot Not Rated by Certificate or for Aircraft Being Operated	3
Total Accidents:		62
Total Fatalities:		84

Non-Fatal Accidents/Incidents by Type of Pilot Certificate and Medical Certificate

[Data not collected for this metric.]

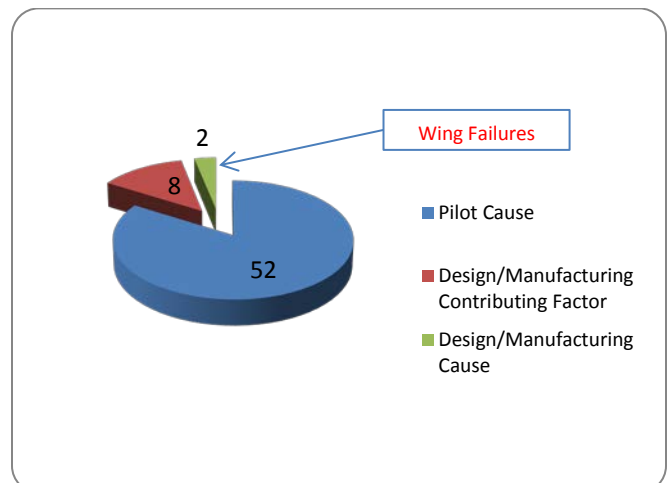
Fatal Accidents by Pilot Age



Median Age: 63

Average Age: 60

Fatal Accidents: Pilot vs Aircraft



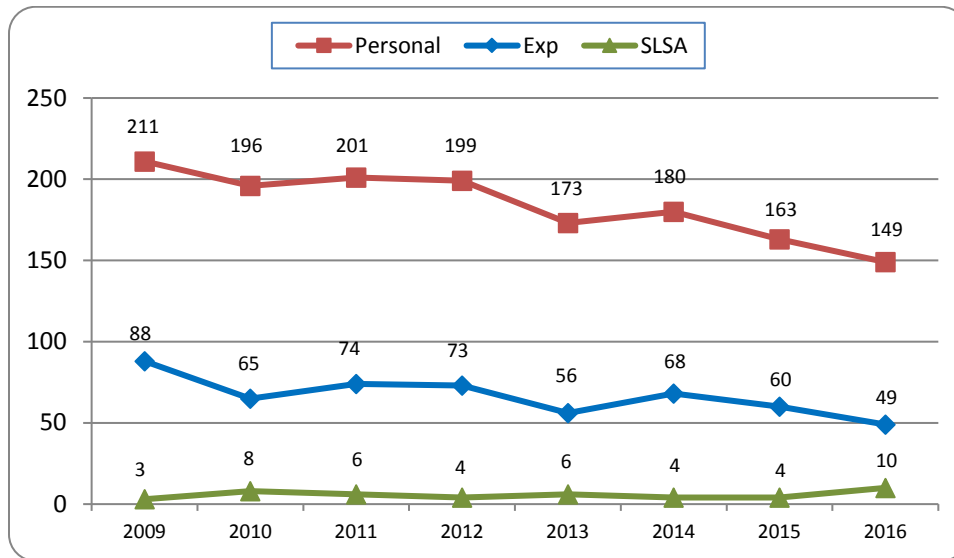
Fatal Accidents: Comparison of SLSA, Personal, and Experimental Aircraft

Data from the General Aviation and Part 135 Activity Surveys used for these charts are currently available for only FY2009 through FY 2016.

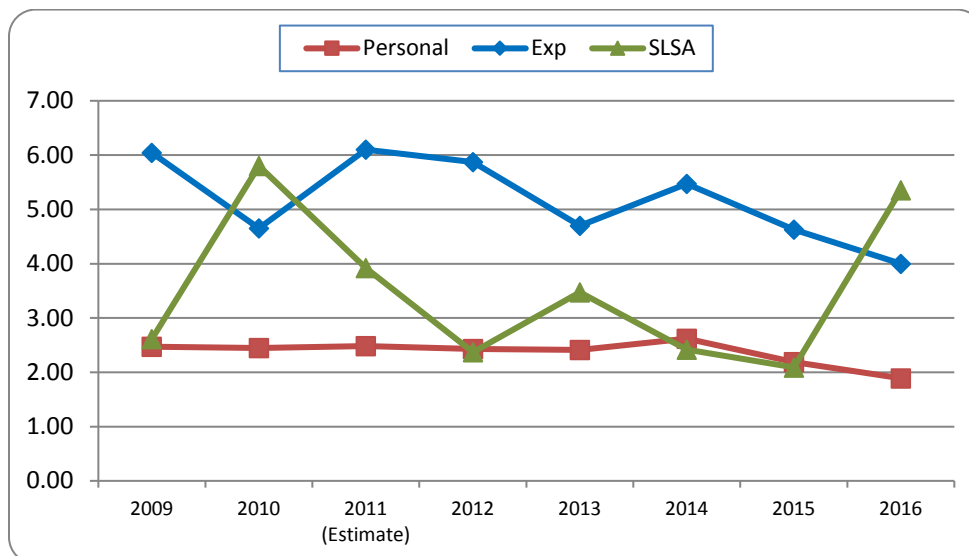
Chart Notes:

- 1) Personal – not for the furtherance of a business, revenue producing or instructional.
- 2) Experimental – includes Exhibition / Amateur-Built / ELSA / Other

Comparison Chart Showing Total Fatal Accidents per Fiscal Year



Comparison Chart Showing Fatal Accidents per 100K Hours of Operation



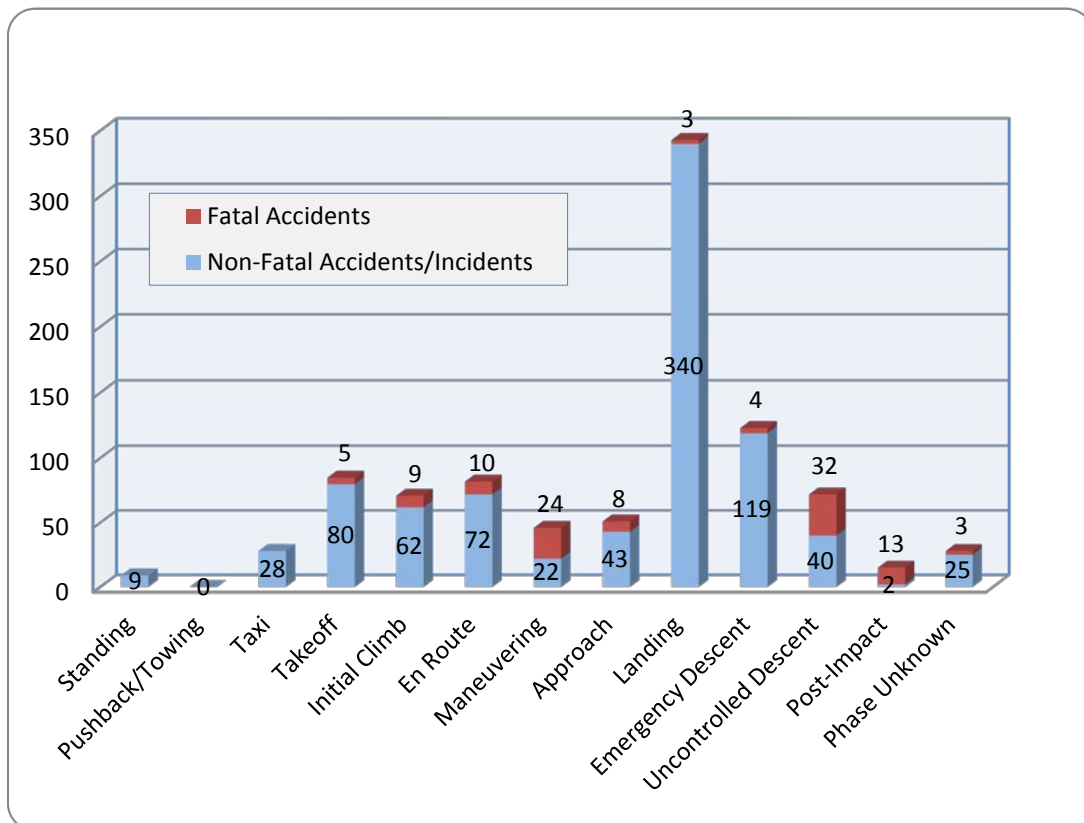
Fatal Accident and Non-Fatal Accident/Incident Phase of Flight

Total Events: 715

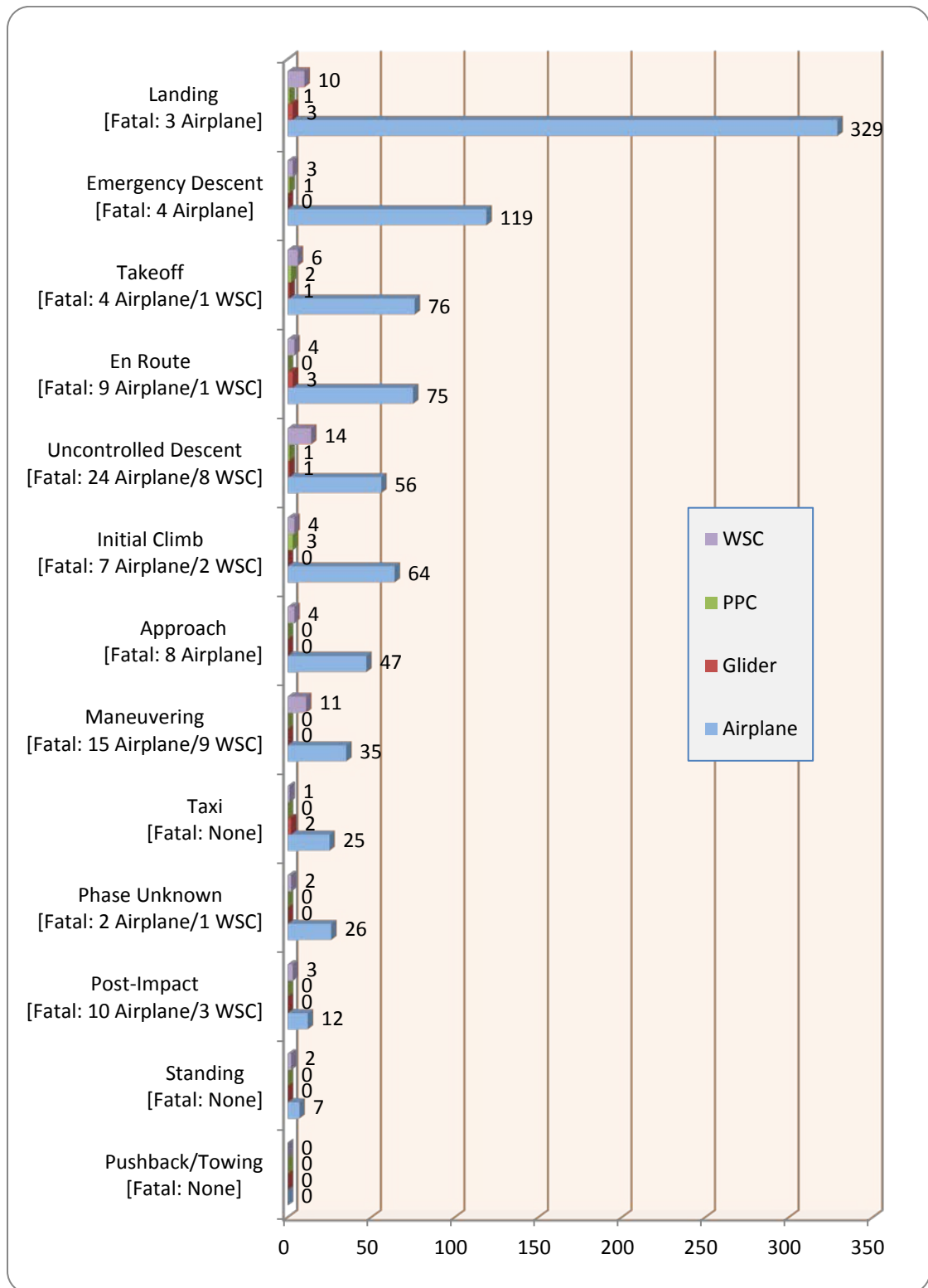
The phase of operation or the phase of flight in which the event reported occurred. The taxonomy used in this report is consistent with that provided by the Commercial Aviation Safety Team/International Civil Aviation Organization (CAST/ICAO) Common Taxonomy Team (CICTT).

NOTE: An accident/incident event can have more than one phase of flight reported. Multiple coding supports the primary focus of CICTT – accident prevention – in which every pertinent element should be investigated, recorded, and analyzed.

Reference *Appendix 1* for “**Phase of Flight**” definitions.

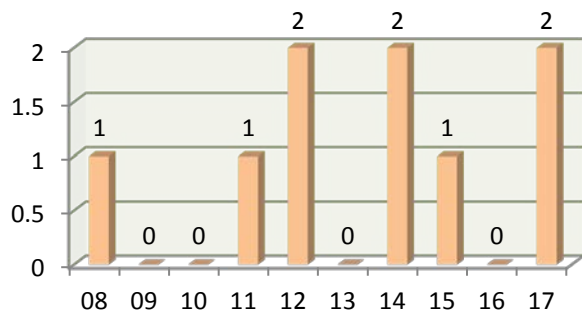


Phase of Flight by Class of SLSA

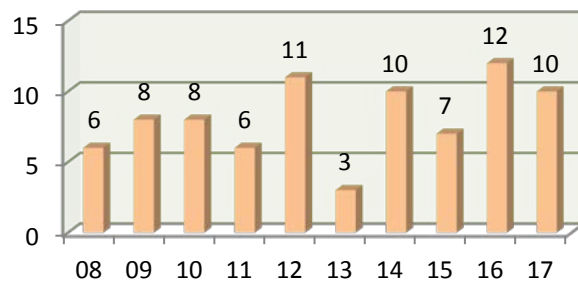


Phase of Flight – Fiscal Year Trends [10 Years]

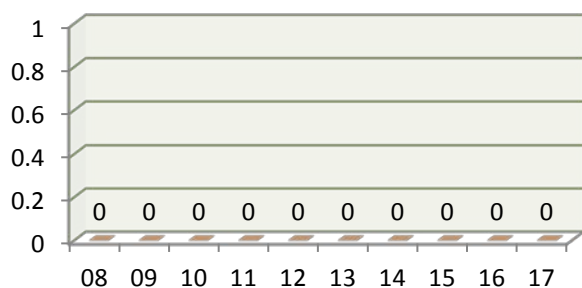
1. Standing



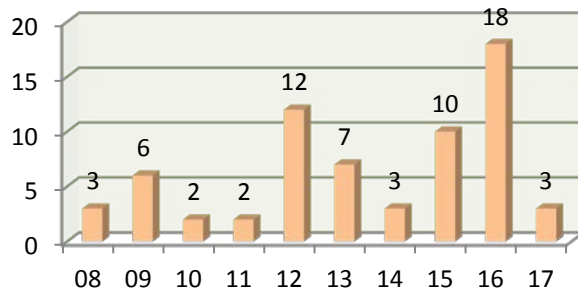
4. Takeoff



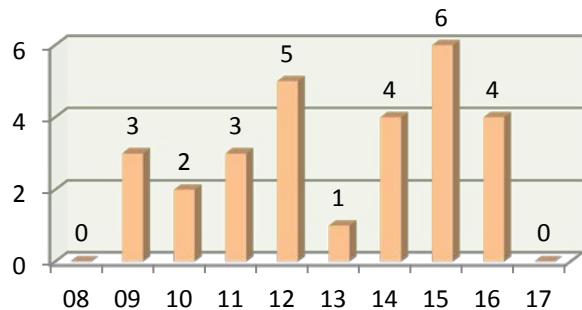
2. Pushback / Towing



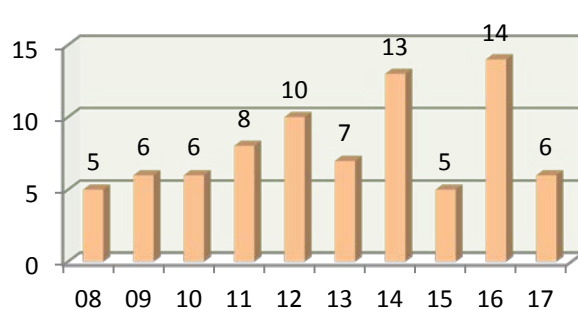
5. Initial Climb



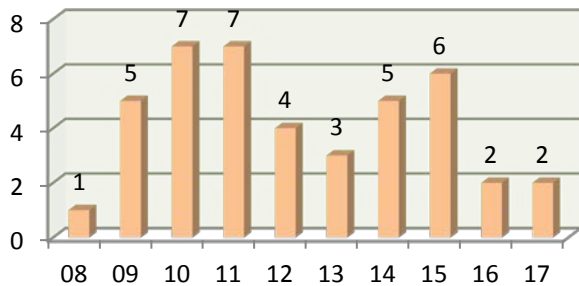
3. Taxi



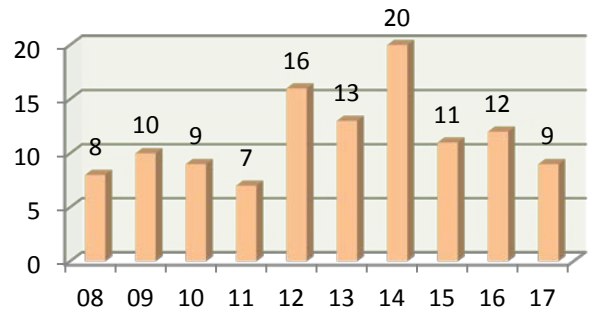
6. En Route



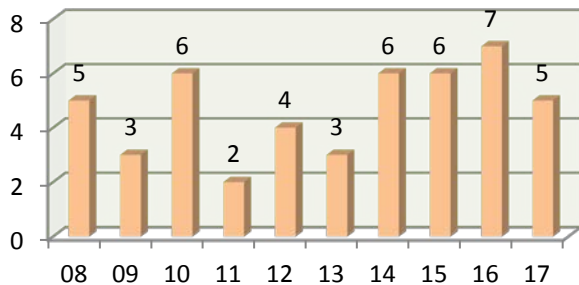
7. Maneuvering



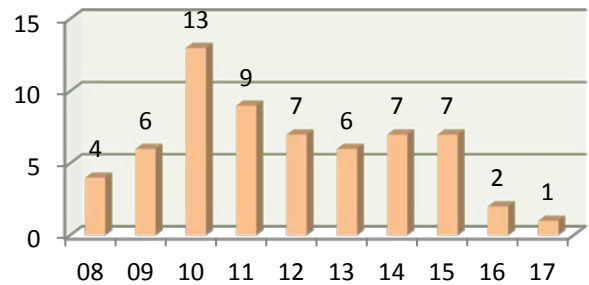
10. Emergency Descent



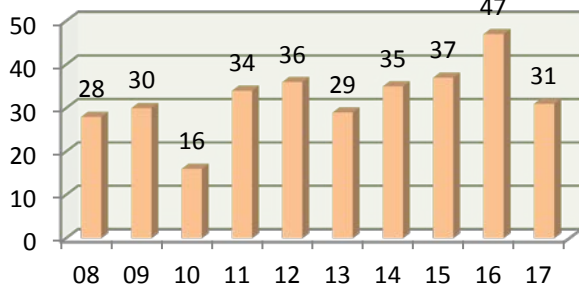
8. Approach



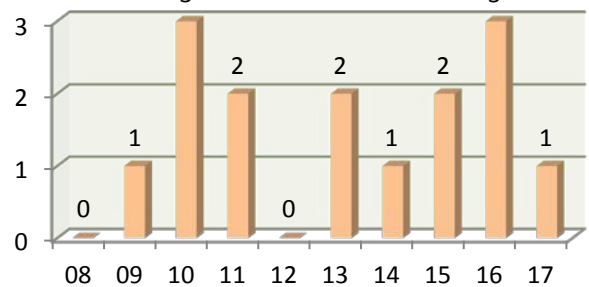
11. Uncontrolled Descent



9. Landing



12. Post Impact



NOTE: While not a Phase of Flight per se, this phase is added to permit accurate sequence of event reconstruction for occurrences. For example, to capture post-impact fire.

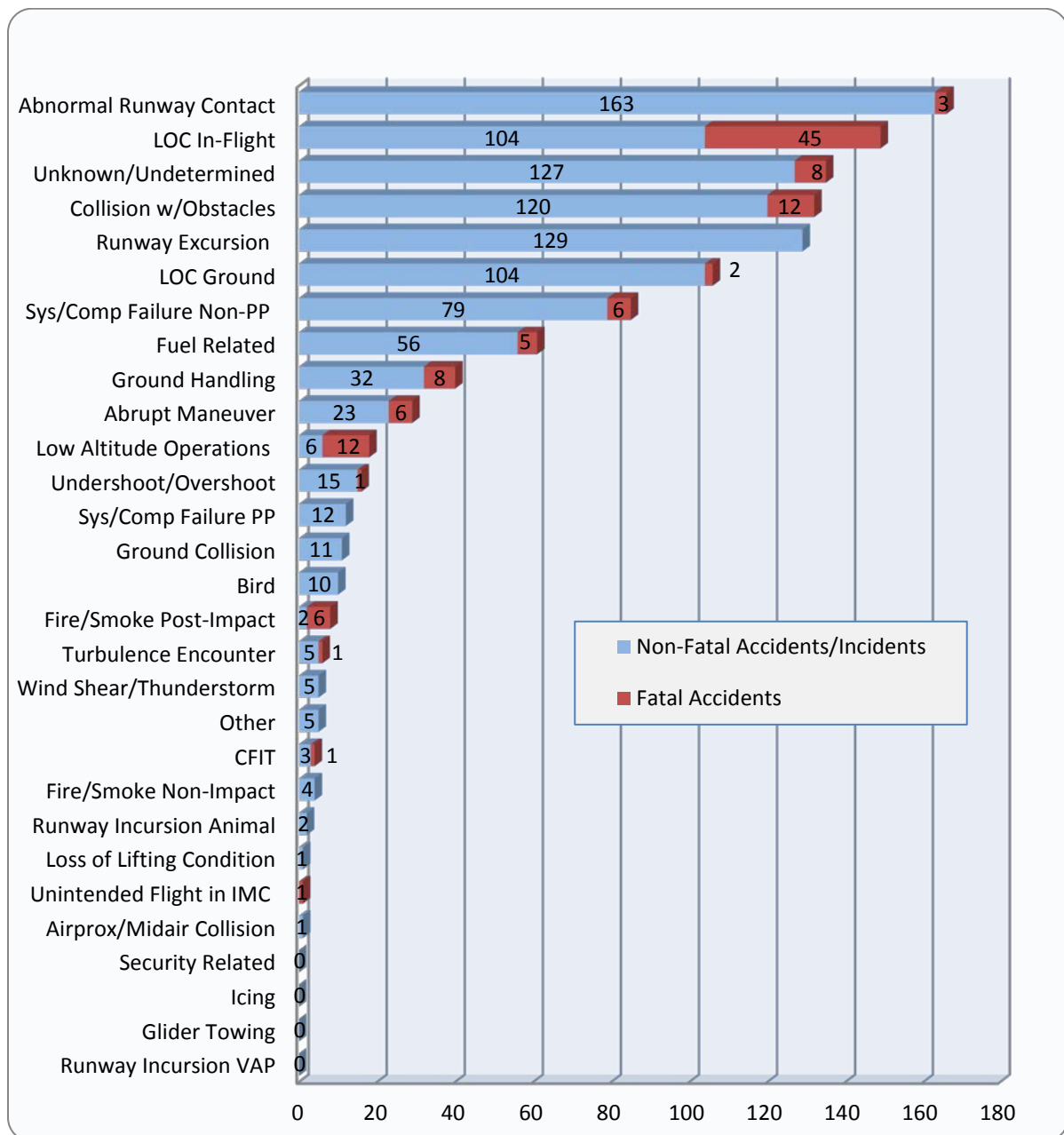
Fatal Accident and Non-Fatal Accident/Incident Occurrence Category

Total Events: 715

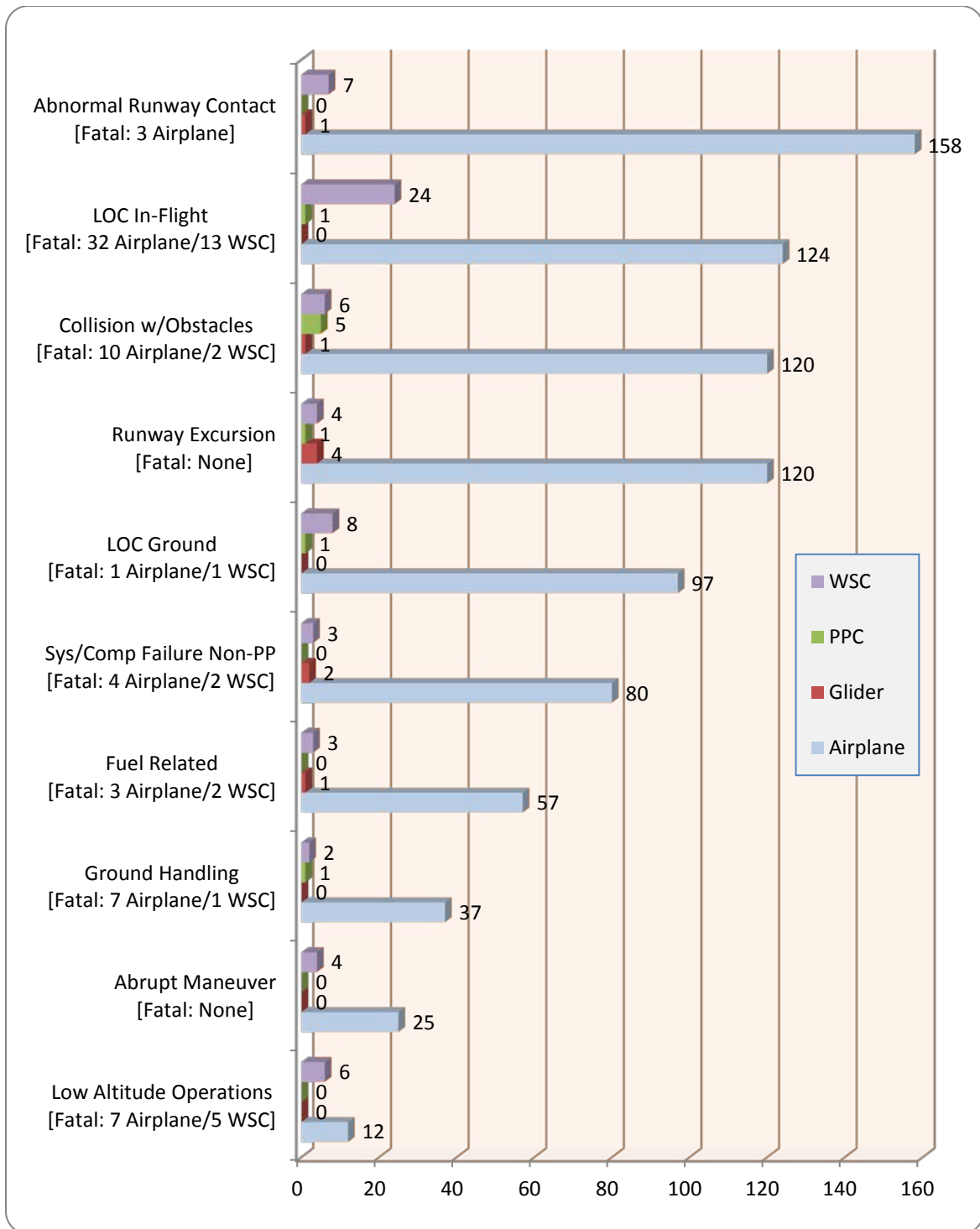
Occurrence categories are used to classify occurrences (i.e., accidents and incidents) at a high level to permit analysis of the data in support of safety initiatives. The taxonomy used in this report is consistent with that provided by the CICTT.

NOTE: An accident/incident event can have more than one occurrence category reported. Multiple coding supports the primary focus of CICTT – accident prevention – in which every pertinent element should be investigated, recorded, and analyzed.

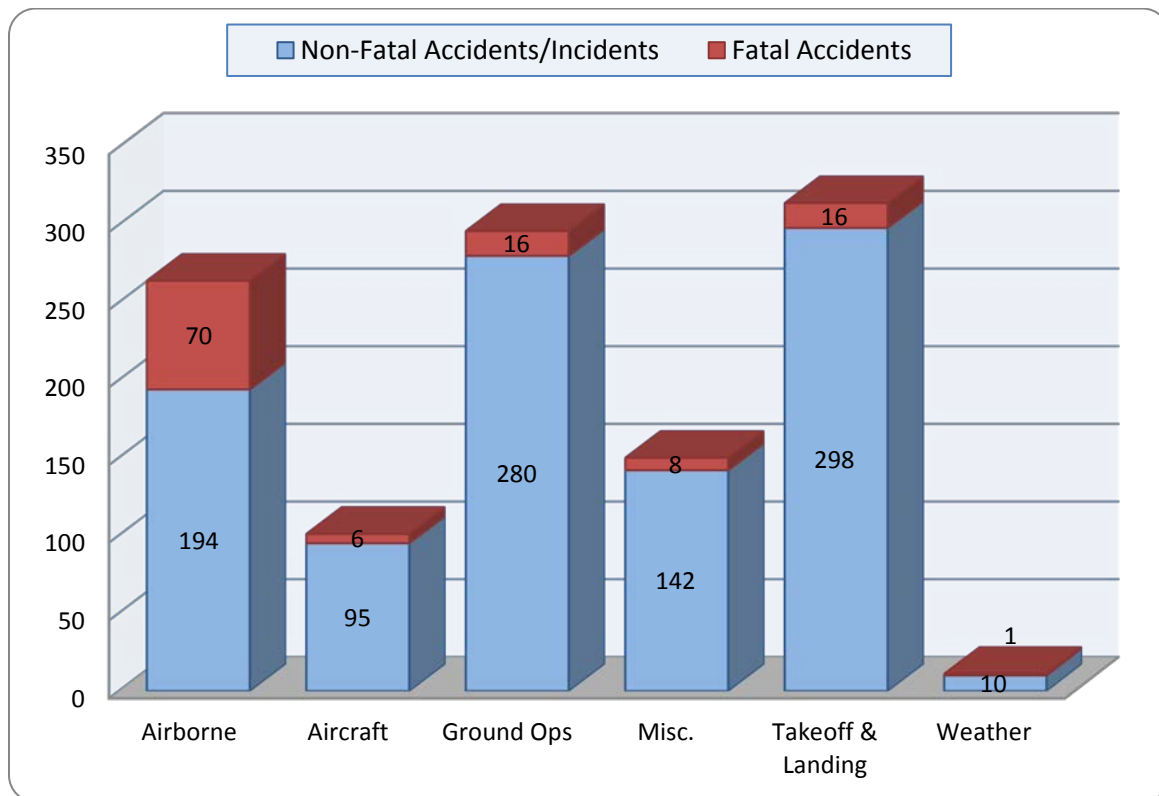
Reference *Appendix 2* for “**Occurrence Category**” definitions.



Top Ten Occurrence Categories by Class of SLSA



Grouping of Occurrence Categories



AIRBORNE

- Abrupt Maneuver
- Airprox/Midair Collision
- CFIT
- Fuel Related
- Glider Towing
- LOC In-Flight
- Loss of Lifting Condition
- Low Altitude Operations
- Unintended Flight in IMC

AIRCRAFT

- Fire/Smoke Non-Impact
- Sys/Comp Failure Non-PP
- Sys/Comp Failure PP

GROUND OPS

- Fire/Smoke Post-Impact
- Ground Collision
- Ground Handling
- LOC Ground
- Runway Excursion
- Runway Incursion Animal
- Runway Incursion VAP

MISC.

- Bird
- Other
- Security Related
- Unknown/Undetermined

Takeoff & Landing

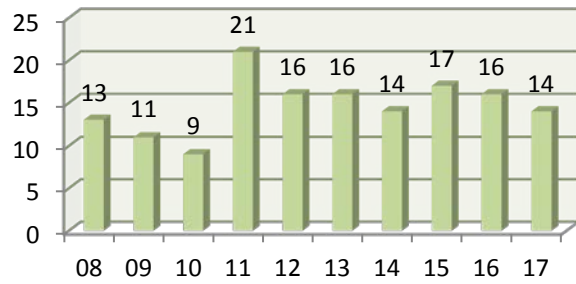
- Abnormal Runway Contact
- Collision w/Obstacles
- Undershoot/Overshoot

WEATHER

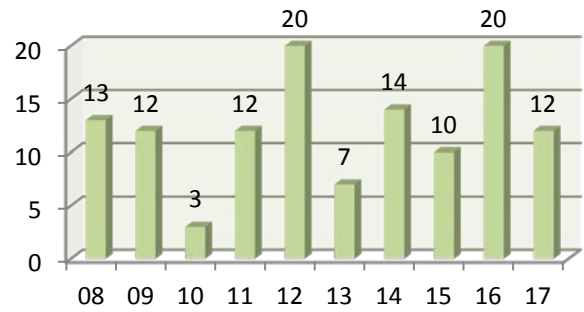
- Icing
- Turbulence Encounter
- Wind Shear/Thunderstorm

Top Ten Occurrence Categories – Fiscal Year Trends [10 Years]

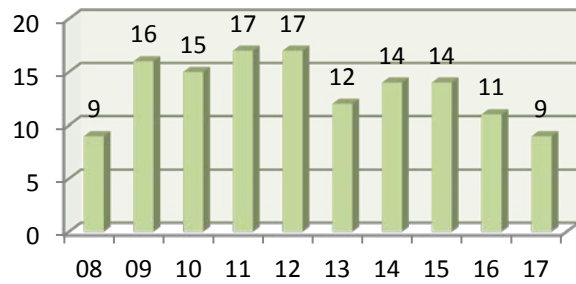
1. Abnormal Runway Contact



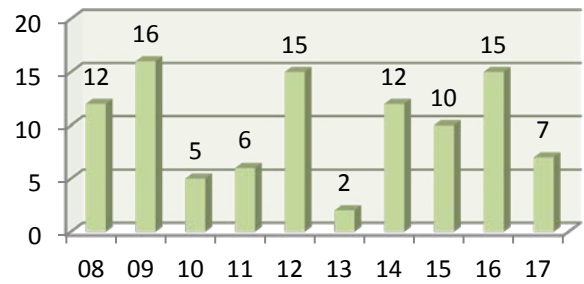
4. Runway Excursion



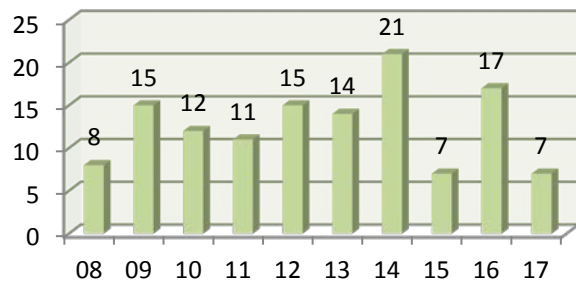
2. LOC In-Flight



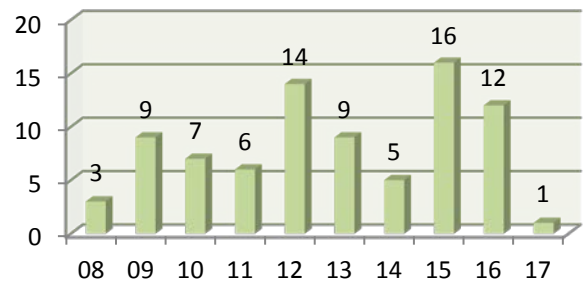
5. LOC Ground



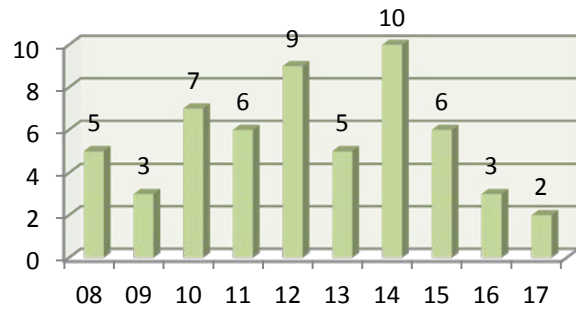
3. Collision w/Obstacles



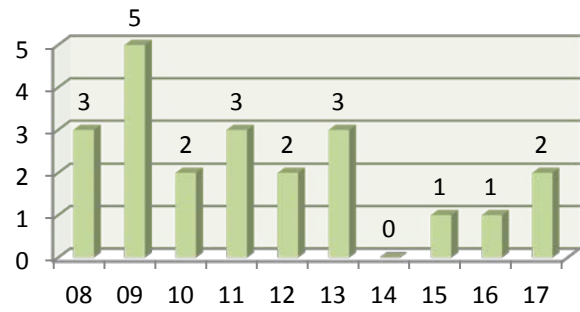
6. Sys/Comp Failure Non-PP



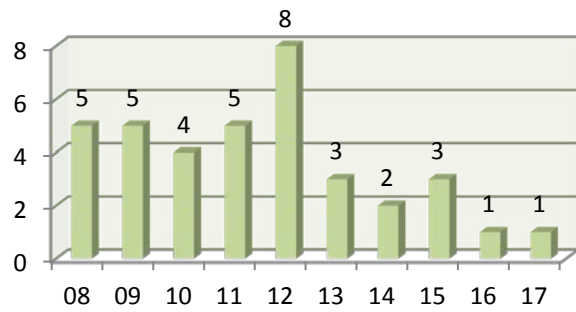
7. Fuel Related



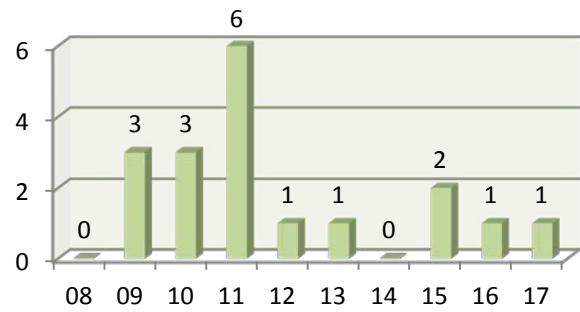
9. Abrupt Maneuver



8. Ground Handling



10. Low Altitude Operations



Design Related Occurrences

Accidents/incidents with identified design related impact. All identified occurrences have been reviewed by and appropriate corrective action obtained by the SLSA manufacturer in accordance with the applicable industry consensus standards and FAA regulations requirements.

Design Feature	Number of Occurrences	Fatal Accidents	Non-Fatal Accidents/Incidents
Canopy / Door Latch	5		5
Wing Structure*	3	3	
Rudder Pedals	2		2
Seat Restraint System	2	1	1
MLG Strut Bracket	1		1
Fuel Tank Vent Line	1		1
Emergency Parachute Handle	1	1	
Throttle Cable	1		1
Fuel System	1		1

* One fatal accident caused by intentional unapproved maneuver

Last known occurrence: 15-June-2017

Manufacturing Quality Related Occurrences

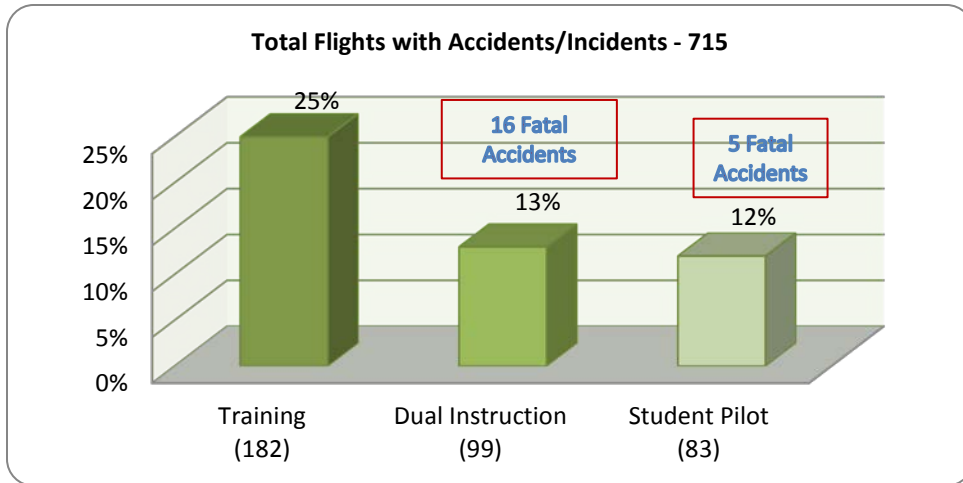
Accidents/incidents with identified manufacturing quality related impact. All identified occurrences have been reviewed by and appropriate corrective action obtained by the SLSA manufacturer in accordance with the applicable industry consensus standards and FAA regulations requirements.

Manufacturing Quality Feature	Number of Occurrences	Fatal Accidents	Non-Fatal Accidents/Incidents
POH Deficiencies [Incorrect / Insufficient Data]	11	4	7
Throttle Cable Failure	4		4
Airspeed Indicator Marking Incorrect	3	1	2
MLG Bolt Failure	2		2
Shoulder Harness Failure	2	1	1
MLG Attach Fitting Failure	1		1
Main Fuse Block Failure	1		1
Airframe Emergency Parachute Failure	1		1
Engine Exhaust Spring Fatigue Failure	1		1
Improper Rivet Installation – Wing Skins	1		1
Incorrect Engine Intake/Exhaust Rocker Arms	1		1
Engine Mount Failure	1		1
MLG Leg Failure	1		1
Canopy Latch Spring Failure	1		1

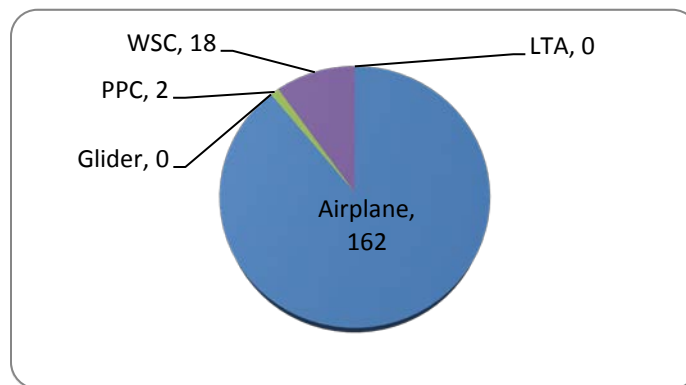
Last known occurrence: 22-June-2015

Training Flights

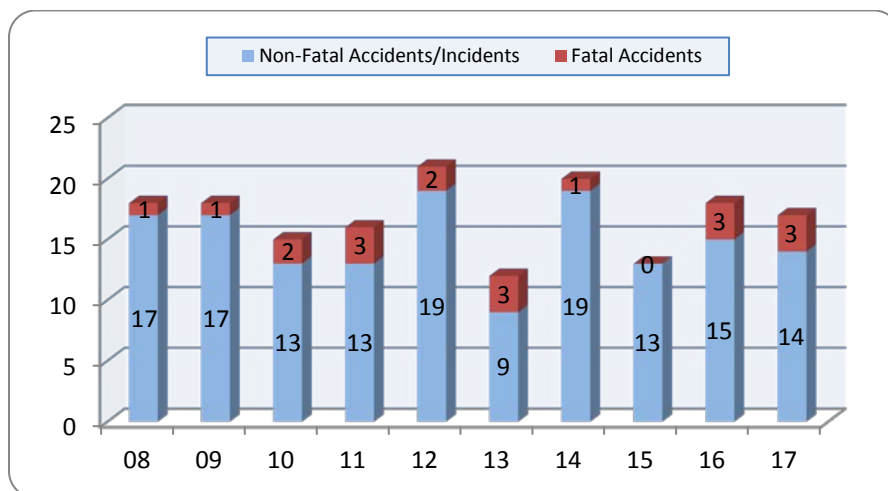
Fatal Accident and Non-Fatal Accidents/Incidents Identified as Training Flights.



Training Flights by Class of SLSA



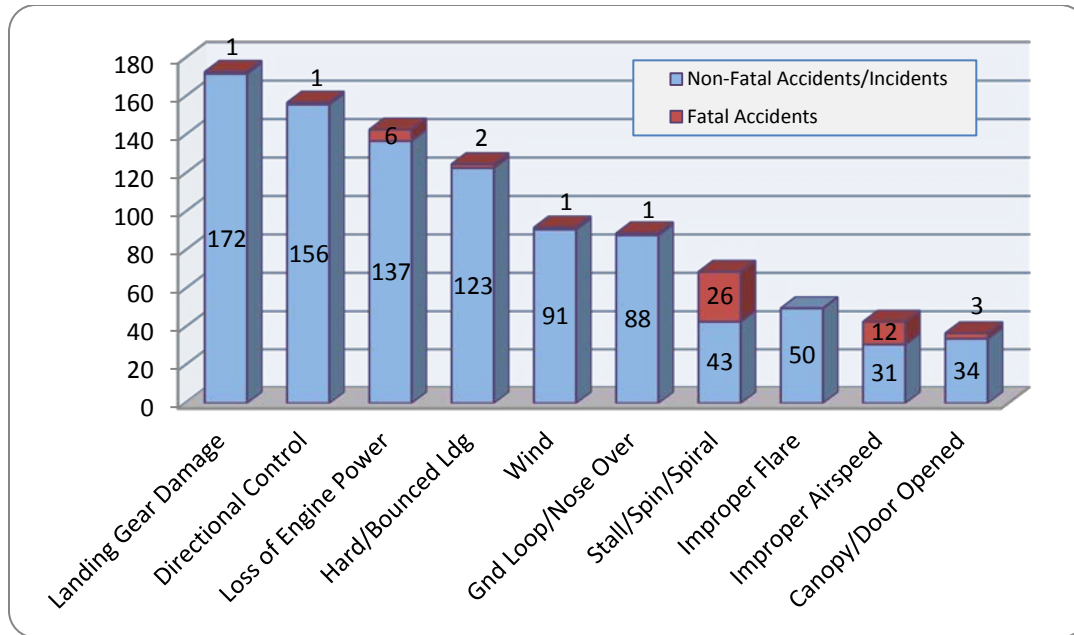
Training Flights – Fiscal Year Trends [10 Years]



Fatal Accident and Non-Fatal Accident/Incident Significant Cause/Effect Events

These events were either the causes or the effects of the accidents/incidents.

Significant Cause/Effect Events – Numbers



Significant Cause/Effect Events – Additional Factors

LANDING GEAR DAMAGE:

56 involved training; 23 dual and 33 student solo.

DIRECTIONAL CONTROL:

62 involved training; 22 dual and 40 student solo.

HARD/BOUNCED LANDING:

53 involved training; 20 dual and 33 student solo.

LOSS OF ENGINE:

Includes engine failures, malfunctions and any fuel related events

Engine failures and malfunctions: 54 (No fatal events)

Fuel related: 59 (5 fatal events)

21 involved training; 18 dual and 3 student solo.

WIND:

Includes tailwind, crosswind, and gusty wind

19 involved training; 6 dual and 13 student solo

GROUND LOOP/NOSE OVER:

26 involved training; 16 dual and 10 student solo.

STALL/SPIN/SPIRAL:

28 involved training; 23 dual and 5 student solo.

IMPROPER FLARE:

23 involved training; 8 dual and 15 student solo.

IMPROPER AIRSPEED:

20 involved training; 13 dual and 7 student solo.

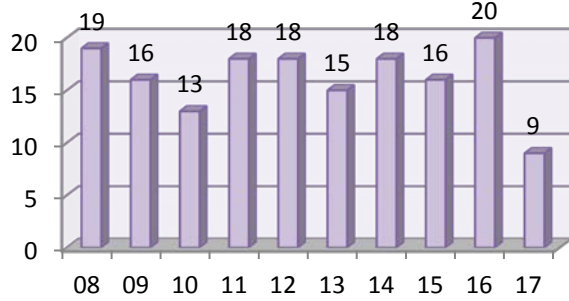
CANOPY/DOOR OPENED:

Involved 8 different make/model airplanes

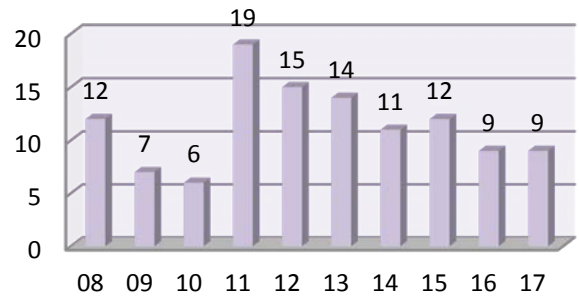
7 involved training; 4 dual and 3 student solo.

Top Ten Significant Cause/Effect Events– Fiscal Year Trends [10 Years]

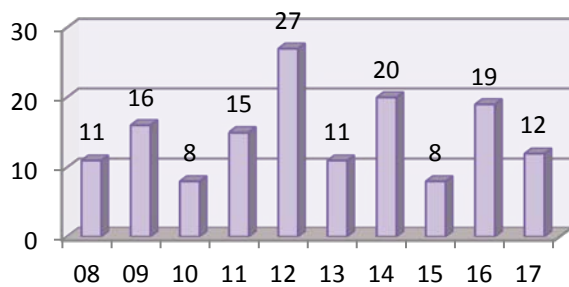
1. Landing Gear Damage



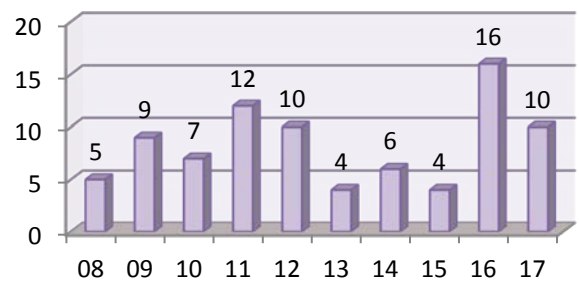
4. Hard/Bounced Landing



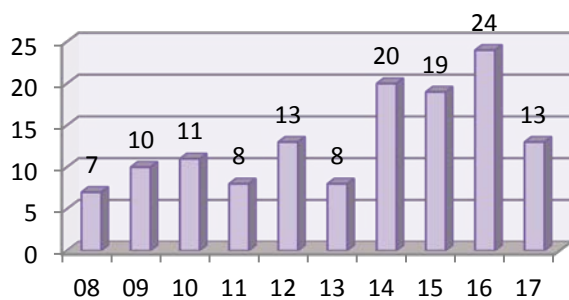
2. Directional Control



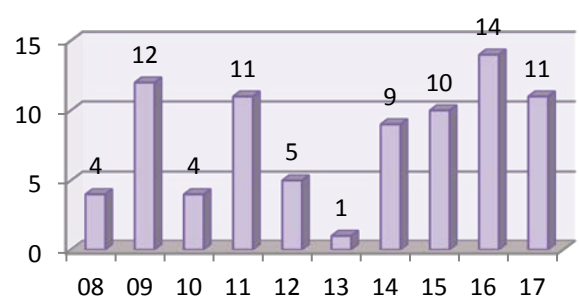
5. Wind



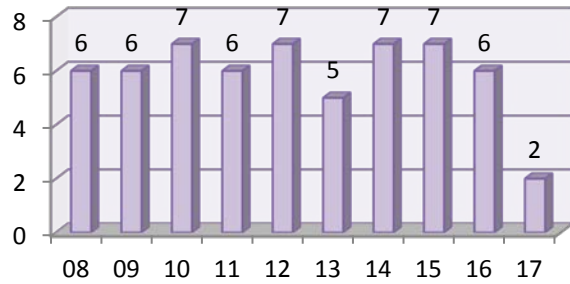
3. Loss of Engine Power (For Any Reason)



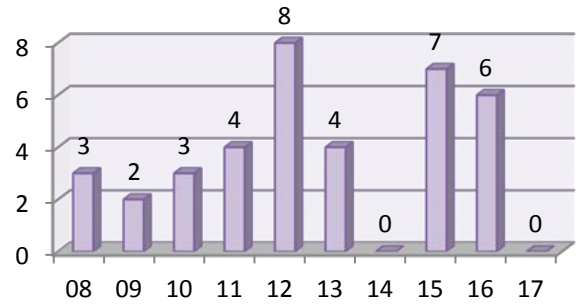
6. Ground Loop/Nose Over



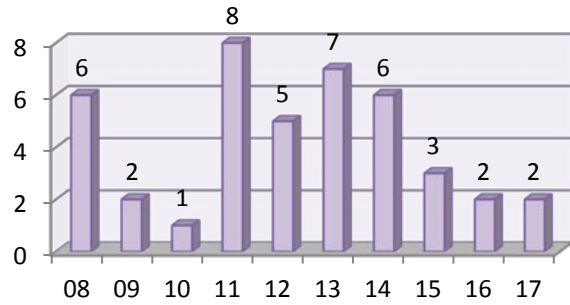
7. Stall/Spin/Spiral



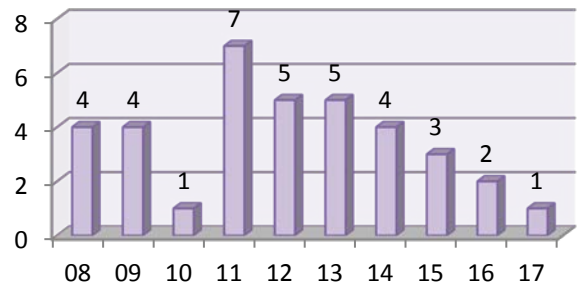
9. Canopy/Door Opened



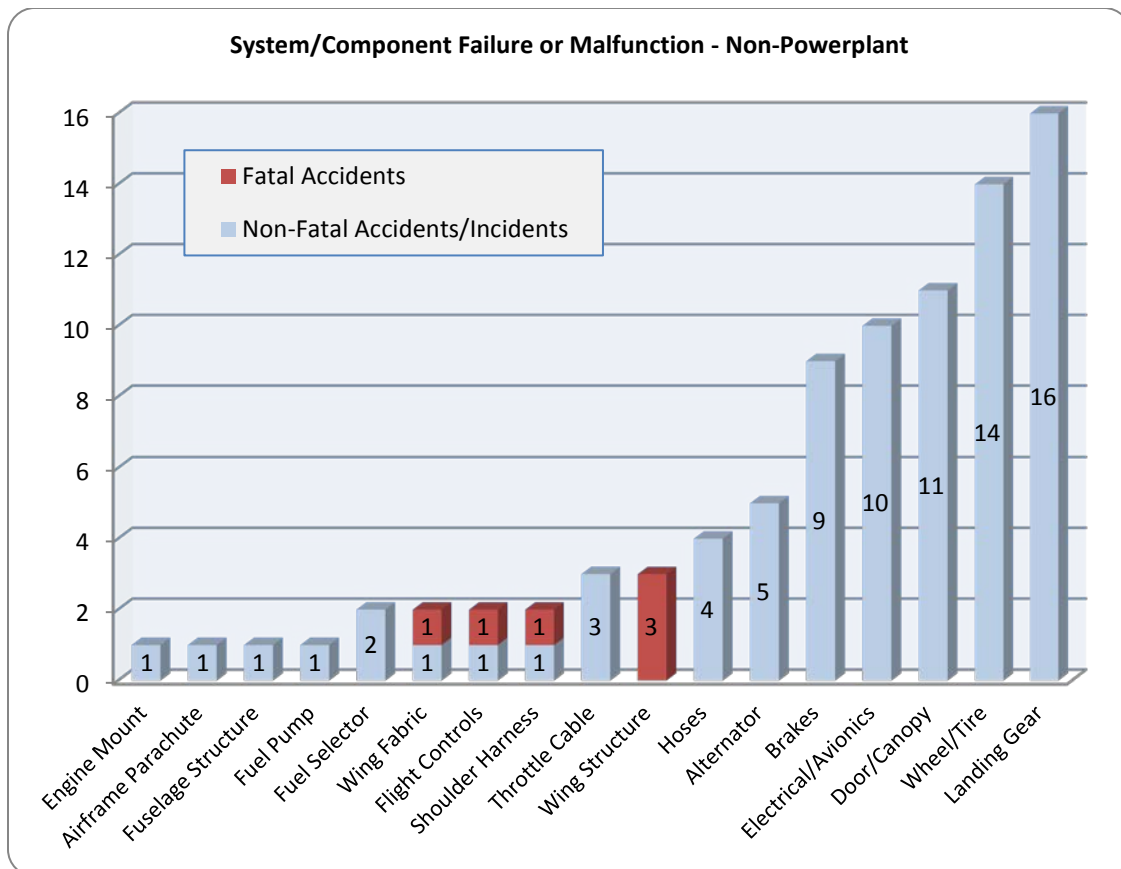
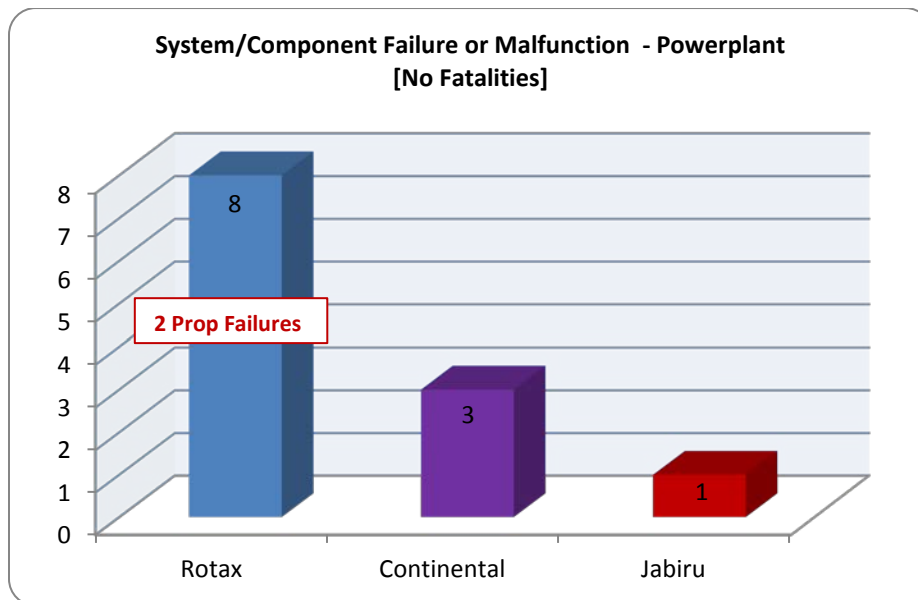
8. Improper Flare



10. Improper Airspeed

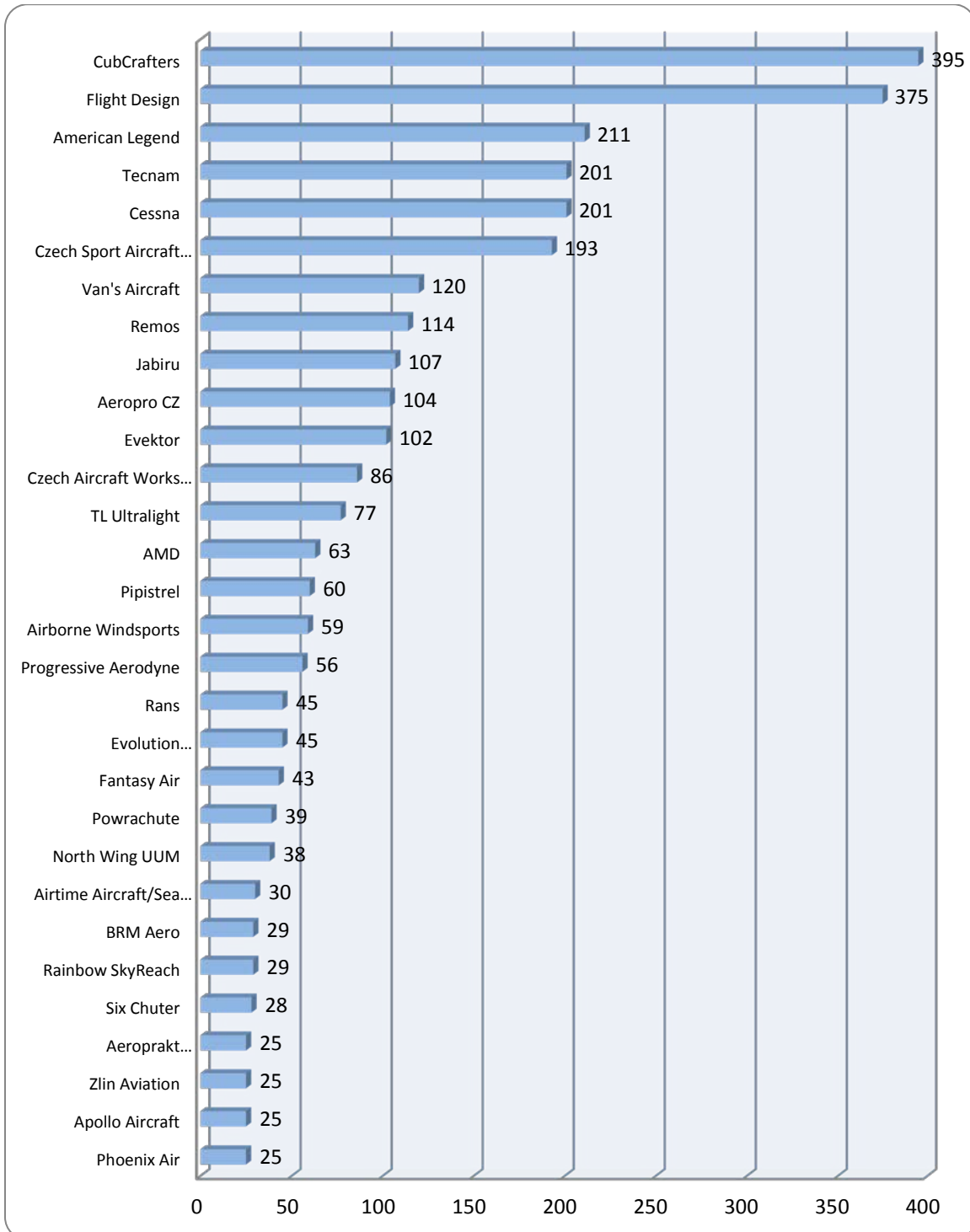


System/Component Failures

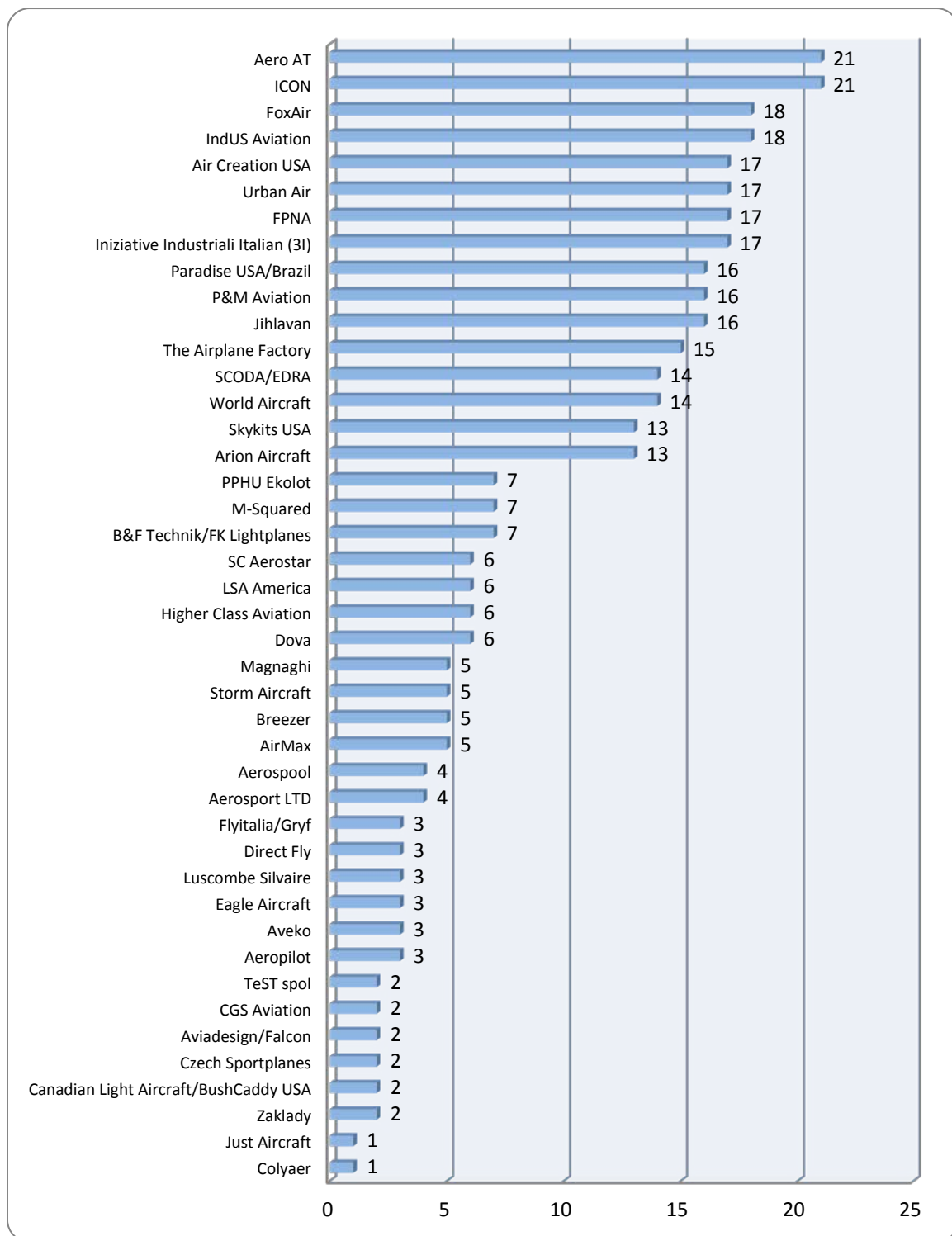


Total Aircraft by Manufacturer

Manufacturers with 25 or more registered aircraft and had at least one aircraft involved in an accident/incident. Based on FAA Aircraft Registry, AFS-750 data from October 2017 for **SLSA registration** certificates issued under aircraft manufacturer code "060."

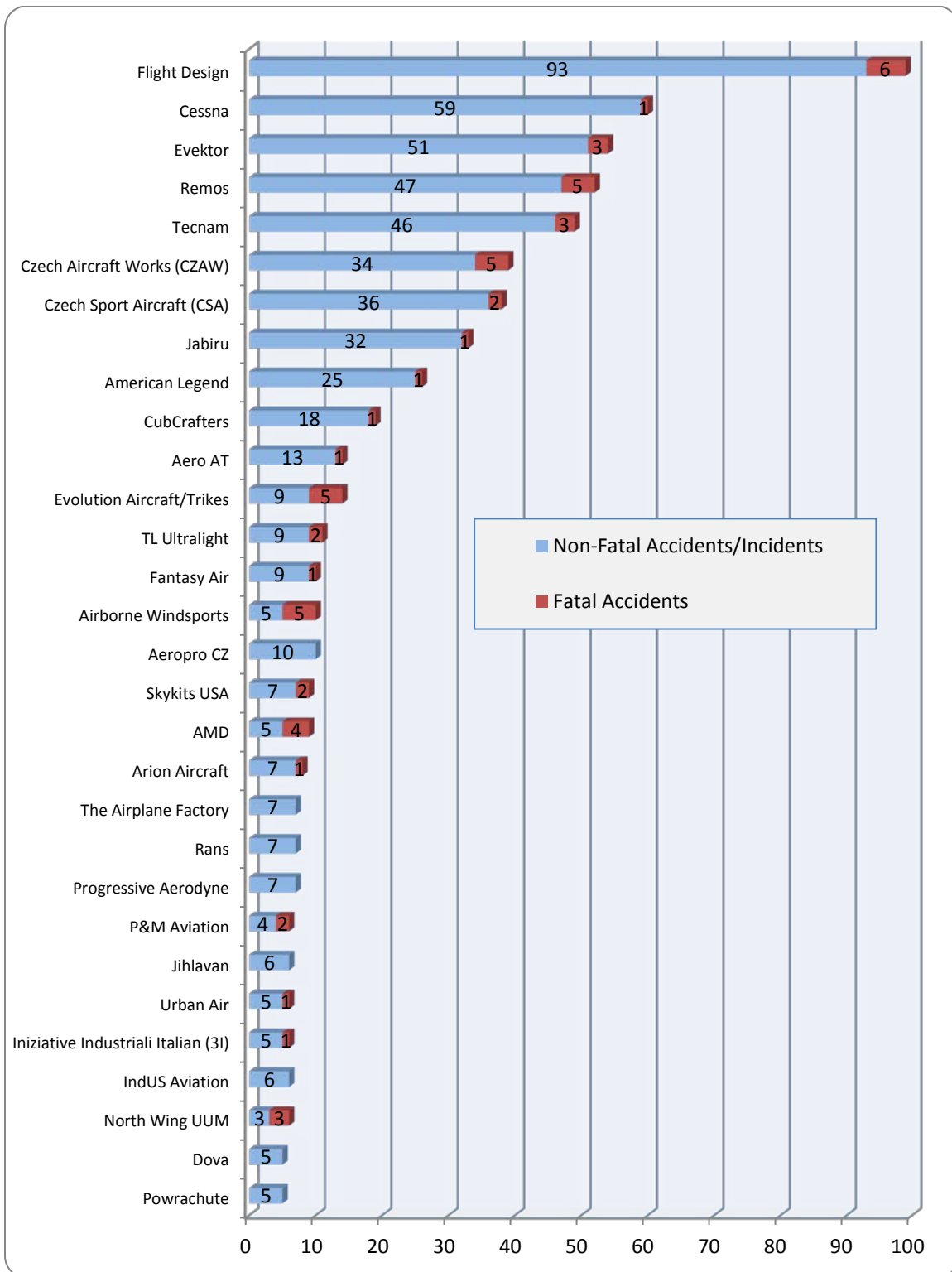


Manufacturers with less than 25 registered aircraft and had at least one aircraft involved in an accident/incident. Based on FAA Aircraft Registry, AFS-750 data from October 2017 for **SLSA registration certificates issued under aircraft manufacturer code "060."**

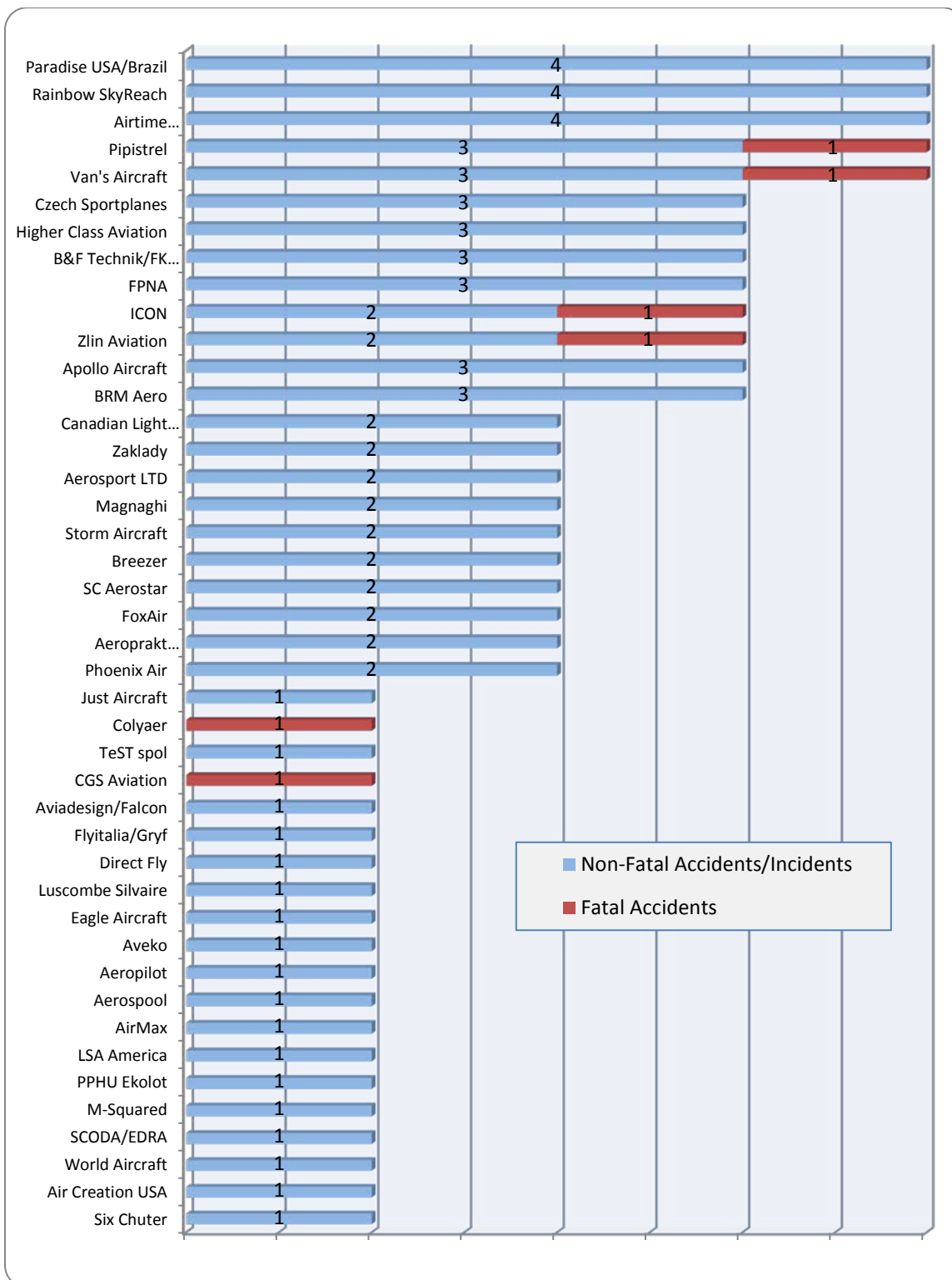


Total Fatal and Non-Fatal Accident/Incident Events by Manufacturer

The following manufacturers have 5 or more fatal accident and/or non-fatal accident/incident events.

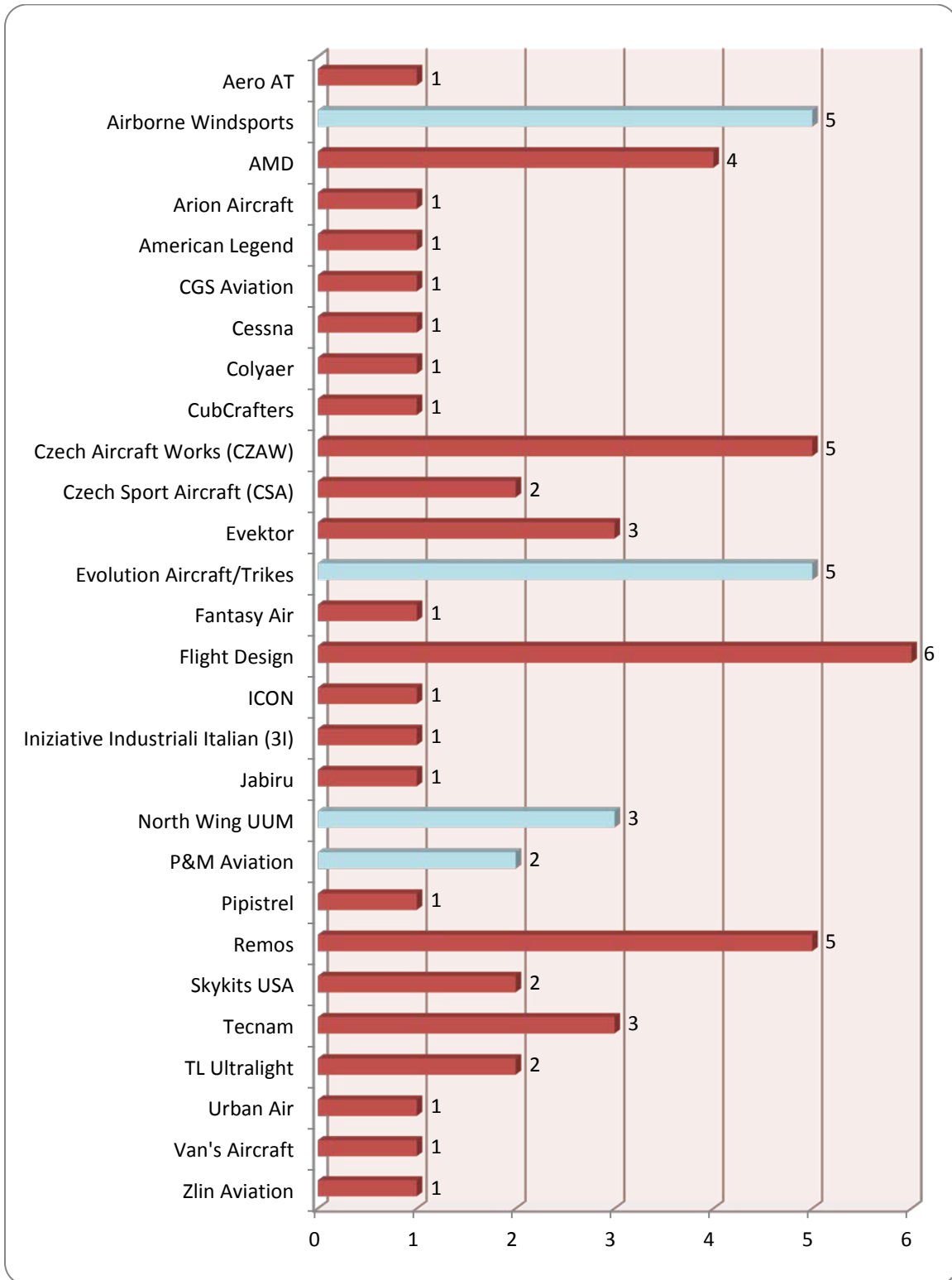


The following manufacturers have less than 5 fatal accident and/or non-fatal accident/incident events.



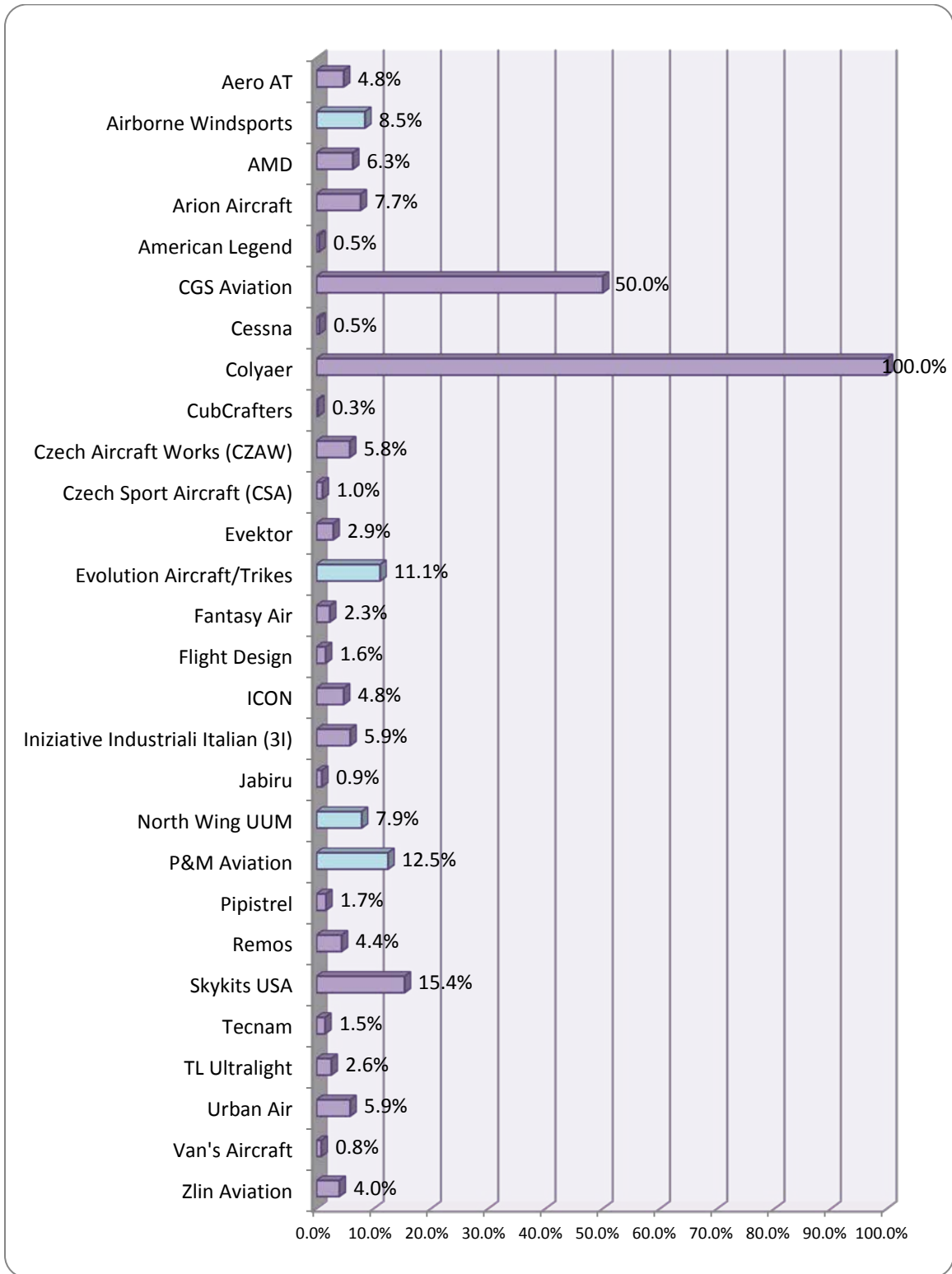
Total Fatal Accidents by Manufacturer

Chart Note: WSC shown in blue; all others are airplane.



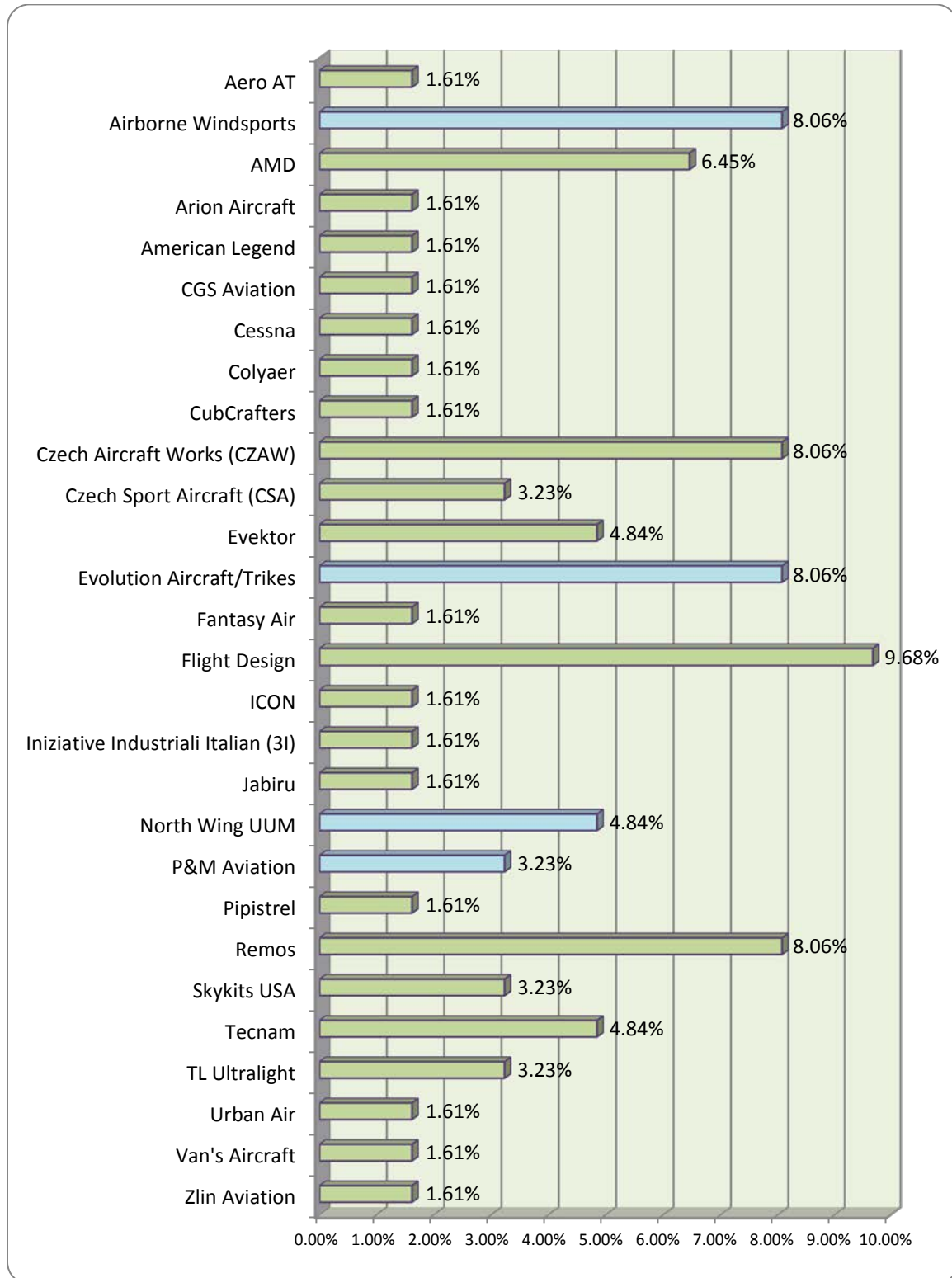
Total Fatal Accidents by Manufacturer to Total Aircraft by Manufacturer

Chart Note: WSC shown in blue; all others are airplane.



Total Fatal Accidents by Manufacturer to Total Fatal Accident Events

Chart Note: WSC shown in blue; all others are airplane.



Fatal Accidents – Probable Cause(s)

The National Transportation Safety Board determines the probable cause(s) of the fatal accidents as follows:

Reg. Number	Make & Model	S/N	Date of Accident	NTSB No	NTSB Cause
N9164M	Fantasy Air Allegro 2000	05-208	8/7/2005	ATL05LA140	The instructor pilot's failure to maintain airspeed for unknown reasons, resulting in an aerodynamic stall and subsequent collision with the ground.
N848LC	American Legend AL11	AL-1047	7/30/2006	CHI06FA224	The failure of both pilots to assure that the fuel cap was securely in place prior to takeoff which resulted in fuel siphoning and ultimately fuel exhaustion. An additional cause was the decision to fly over the lake outside of gliding distance to shore along with the delay in diverting to refuel the airplane.
N158MD	AMD CH601XL	601-0165	11/4/2006	LAX07FA026	In-flight structural failure of the horizontal stabilizer and wings for undetermined reasons.
N601VA	Czech Aircraft Works (CZAW) CH601XL	6-9734	11/11/2006	NYC07FA025	The pilot's inadequate preflight inspection, which resulted in a total loss of engine power due to fuel exhaustion.
N222TB	CubCrafters CC11-100	CC11-00030	7/7/2007	LAX07FAMS1	The airplane is missing.
N808GS	Zlin Aviation Savage	0073	8/15/2007	DEN07FA136	The pilot's failure to maintain airspeed while maneuvering, resulting in an aerodynamic stall. Contributing to the accident was the conflicting airspeed information provided by the manufacturer, the incorrect airspeed indicator markings, and the high density altitude.
N616EV	Evektor SportStar	20060709	9/15/2007	DEN07FA158	The flight instructor's failure to maintain sufficient airspeed during takeoff-initial climb to avoid a stall/spin. Contributing to the accident was the flight instructor's inadequate preflight planning, his failure to calculate the airplane's weight and balance, the high density altitude, inadequate information for preflight planning provided by the manufacturer, and the insufficient standards for Pilot Operating Handbook information required by the ASTM consensus standards.
N357DT	Czech Aircraft Works (CZAW) CH601XL	6-9733	4/8/2008	NYC08FA158	The in-flight failure of the left wing for undetermined reasons.
N4450E	Colyaer Freedom S-100 (Amphibian)	130-001-028	7/9/2008	MIA08LA138	The pilot's loss of aircraft control for undetermined reasons while making a water landing.
N602CF	Czech Aircraft Works (CZAW) SportCruiser	08SC129	7/21/2008	CHI08FA196	The pilot's failure to maintain control of the airplane in the landing pattern. Contributing to the severity of injuries was the failure of the pilot's shoulder harness.

Reg. Number	Make & Model	S/N	Date of Accident	NTSB No	NTSB Cause
N454SA	Iniziativa Industriali Italian (3I) Sky Arrow 600 Sport	LSA012	10/7/2008	WPR09FA005	The pilot's failure to maintain aircraft control during a low-altitude maneuver. Contributing to the accident was the pilot's decision to perform a maneuver at a low altitude that was insufficient to allow him to recover from the loss of control. Contributing to the occupants' injuries was the inadequacy of the restraint system design by the manufacturer.
N9GX	Remos GX	299	1/25/2009	ERA09FA141	The pilot's inadequate preflight assembly and inspection which resulted in the pushrod connection to the left aileron not being connected, which led to a subsequent inflight loss of control and impact with terrain.
N433PM	P&M Aviation QuikR	8433	6/25/2009	ERA09LA369	A loss of aircraft control for an undetermined reason.
N145AG	Tecnam P2002	316	1/23/2010	CEN10FA107	A loss of aircraft control while maneuvering for undetermined reasons.
N930LA	Evektor SportStar Plus	20070930	3/5/2010	CEN10FA141	The pilot's improper decision to initiate and continue a flight into instrument meteorological conditions that led to spatial disorientation and a loss of control during cruise flight.
N853CZ	Czech Aircraft Works (CZAW) Mermaid (Amphibian)	06MM008	4/1/2010	CEN10FA182	The pilot's loss of control resulting from an aerodynamic stall/spin while maneuvering at low altitude.
N34TH	Airborne Windsports Edge XT-912	XT-912-0335	4/21/2010	WPR10FA211	The pilot's intentional in-flight maneuvers that exceeded the structural limits of the aircraft, which resulted in structural failure of the wings.
N121EV	Evektor SportStar Plus	20081011	5/29/2010	CEN10FA278	The opening of the cockpit canopy in-flight due to improper latching, which resulted in a LOC and impact with terrain.
N8549S	Aero ATAT-4	AT4-004	7/28/2010	CEN10LA470	The pilot's failure to maintain adequate airspeed which resulted in a stall and subsequent loss of control of the airplane.
N417JN	North Wing UUM Scout XC	LS9007	8/21/2010	ERA10FA435	The pilot's loss of aircraft control for an undetermined reason.
N268RA	Remos G-3/600	231	8/28/2010	WPR10FA435	The pilot's failure to maintain airplane control while maneuvering at a low altitude.
N29EP	Airborne Windsports Edge XT-912	XT-912-0131	2/15/2011	WPR11FA138	The flight instructor did not maintain aircraft control while maneuvering at low altitude. Contributing to the accident was the inadvertent application of the choke, which resulted in a momentary interruption of engine power.
N420PS	Czech Sport Aircraft (CSA) SportCruiser	P1001009	5/6/2011	ERA11FA287	The pilot's inadvertent application of control inputs that resulted in rapid, right-rolling, negative g-forces during night cruise flight and his subsequent ejection from the airplane. Contributing to the accident was the pilot's decision to fly at night in an airplane not approved for night flight, his unbuckling of the seat belt portion of the restraint harness, and the inadvertent opening of the airplane's canopy.
N282SC	Czech Aircraft Works (CZAW) SportCruiser	06SC006	5/14/2011	WPR11LA223	The pilot's failure to maintain control during the takeoff climb, which resulted in a stall at low altitude and collision with terrain. Contributing to the accident was the pilot's impaired performance from over-the-counter medications.

Reg. Number	Make & Model	S/N	Date of Accident	NTSB No	NTSB Cause
N705PM	P&M Aviation Quik	8245	5/17/2011	WPR11FA225	The pilot's continued operation of the aircraft with deteriorated wing fabric and his aggressive maneuvering at low altitude, which resulted in the right wing fabric's failure during flight. Contributing to the accident was the pilot's loading of the aircraft in excess of the MTOW limit.
N2442	TL Ultralight Sting S3	TLUSA1 74	7/29/2011	ERA11LA427	The inability of the PIC to recover from an inadvertent spin following a stall demonstration for reasons that could not be determined because aircraft and engine examinations did not reveal any anomalies that would have precluded recovery from the spin. Contributing to the severity of the accident were the PIC's failure to remove the airframe parachute system safety pin before takeoff, the exceedance of the left-seat weight limitation, and the location of the parachute system activation handle behind the PIC's seat, which prevented easy access during the uncontrolled descent.
N107GX	Remos GX	293	9/15/2011	CEN11FA645	The pilot's failure to maintain adequate airspeed while maneuvering at a low altitude. Contributing was the pilot's decision to maneuver at an altitude below that required for congested areas, which did not afford an adequate margin for stall recovery.
N61XT	Skykits USA Savannah VGW	10-03-51-905	11/20/2011	CEN12FA073	The non-certificated pilot's decision to fly the airplane without receiving any flight instruction in the airplane, which resulted in his failure to maintain sufficient airspeed during takeoff and the subsequent aerodynamic stall.
N206GX	Remos GX	335	6/15/2012	ERA12FA395	The pilot's inadequate preflight inspection, which failed to ensure that the elevator quick-fastener was properly secured, resulting in an inflight elevator control disconnect and subsequent loss of control during the ensuing emergency landing. Contributing to the accident was the pilot's failure to remove the padlock from the airplane's ballistic recovery system parachute activation handle.
N177N	TL Ultralight StingSport	TLUSA1 53	7/5/2012	WPR12FA295	The pilot's failure to recover from a stall, which resulted in a spin. Contributing to the accident was the instructor's inadequate remedial action.
N976AJ	Skykits USA Savannah ADV	07-07-51-621	9/3/2012	WPR12FA395	The pilot's failure to maintain adequate airspeed while maneuvering at or above the airplane's maximum ceiling, which resulted in a stall and a subsequent loss of airplane control. Contributing to the accident was the pilot's decision to operate the airplane in the high density altitude conditions, which placed the airplane near or above its maximum ceiling.
N635J	Jabiru USA Sport Aircraft J250-SP	500	11/18/2012	CEN13LA062	The pilot's failure to maintain adequate airspeed during initial climb following an aborted landing, which resulted in an aerodynamic stall and spin at a low altitude.
N477PA	PipistrelAlpha Trainer	453AT9 12LSA	6/11/2013	CEN13FA338	The loss of engine power due to fuel exhaustion as a result of the manufacturer providing the incorrect Pilot's Operating Handbook to the owner, which prevented the pilot from accurately calculating the fuel requirements before the flight. Contributing to the accident were the pilot's inadequate preflight planning and poor decision-making.
N467YN	North Wing UUM Sport X2	LS7022	7/7/2013	WPR13LA313	The student pilot's abrupt maneuver to avoid transmission wires, which resulted in his loss of airplane control. Contributing to the accident was the pilot's decision to perform a low-altitude flight, his distracted attention, and his failure to monitor the environment for objects.

Reg. Number	Make & Model	S/N	Date of Accident	NTSB No	NTSB Cause
N424CT	Flight Design CTSW	05-06-02	7/10/2013	CEN13LA409	The airplane's unexpected encounter with a dust devil, which resulted in the loss of airplane control.
N123FJ	Airborne Windsports Edge XT-912-L	XT-912-0294	7/29/2013	WPR13LA347	The pilot's failure to properly secure himself in the cockpit with the seat belt, which resulted in his inability to control the airplane after takeoff.
N19UA	Urban Air Samba XXL	SA XL 79	8/16/2013	WPR13FA376	The pilot's failure to maintain adequate airspeed while maneuvering, which led to the airplane exceeding its critical angle of attack and experiencing an aerodynamic stall/spin. Contributing to the accident was the improper location of the parachute activation handle and the pilot's failure to remove the handle's locking pin before flight.
N98EV	Evolution Aircraft Revo	000551	3/11/2014	WPR14FA135	The pilot's reconfiguration of the fuel venting system, which resulted in a loss of engine power and subsequent loss of aircraft control.
N508CT	Flight Design CTSW	06-10-06	7/5/2014	ERA14LA329	The pilot's failure to maintain adequate airspeed following a left turn during takeoff, which led to the airplane exceeding its critical angle-of-attack and experiencing an aerodynamic stall.
N214EV (N779ST)	Evolution Aircraft Revo	000604	8/11/2014	CEN14LA419	The non-instrument-rated pilot's decision to continue visual flight into instrument meteorological conditions, which resulted in his loss of aircraft control and the resultant overstress and in-flight breakup of the weight-shift-control aircraft.
N3037H	Cessna 162	16200115	9/19/2014	WPR14FA381	The pilot's failure to recover from a stall, which resulted in a subsequent spin from which he did not recover because he did not immediately apply the proper stall and spin recovery techniques.
N916H	CGS Aviation Hawk Arrow II	HAIL-316-700E-TRI	10/20/2014	CEN15LA022	The pilot's loss of airplane control while turning onto the base leg of the traffic pattern due to his failure to maintain sufficient speed and/or overbanking, which resulted in the airplane impacting trees. Contributing to the pilot's fatal injuries was his fall from a tree after exiting the airplane.
N623HS	AMD CH601XLi	601-026S	3/31/2015	CEN15FA187	The pilot's excessively high angle-of-attack on rotation that prevented the airplane from climbing sufficiently to avoid the approaching trees.
N35EP	Czech Sport Aircraft (CSA) SportCruiser	P1001059	6/21/2015	ERA15FA245	The pilot's failure to maintain airplane control after the cockpit canopy opened during initial climb. Contributing to the accident was the pilot's failure to securely lock the canopy before takeoff.
N2264X	Evolution Aircraft Revo	000594	9/5/2015	ERA15LA339	The sport pilot's improper decision to operate the weight-shift-control aircraft at low altitude and his subsequent failure to maintain control of the aircraft, which resulted in a subsequent collision with terrain.
N622BT	Flight Design CTLS	11-11-05	11/4/15	ERA16FA031	The non-instrument-rated pilot's spatial disorientation and subsequent loss of airplane control while maneuvering at low altitude, over water with no visible horizon, in dark night conditions, which resulted in a collision with the water.
N323BR	Tecnam P92 Echo Super	986	2/1/16	CEN16FA094	The student pilot's loss of control after exceeding the airplane's critical angle-of-attack, which lead to a power-on, aerodynamic departure stall. Contributing to the accident was the flight instructor's inadequate oversight of the student pilot.

Reg. Number	Make & Model	S/N	Date of Accident	NTSB No	NTSB Cause
N911TS	Flight Design CTLS (CTLE)	F-11-02-05	2/10/16	WPR16FA067	The pilot's failure to maintain adequate airspeed while maneuvering at low altitude in hilly terrain, which resulted in the airplane's wing exceeding its critical angle-of-attack and a subsequent aerodynamic stall. Contributing to the accident were the pilot's inability to recognize the rising terrain due to the sun glare and the pilot's operation of the airplane in excess of its gross weight.
N107SB	Evolution Aircraft Revo	000608	2/16/16	WPR16LA071	The pilot's improper decision to operate the high-performance aircraft despite warnings from a flight instructor that he did not have the experience to operate the aircraft that had different and more sensitive handling characteristics than the low-performance weight-shift-control aircraft that he was used to flying, which led to his improper control inputs and resulted in his loss of aircraft control and ground impact immediately after takeoff.
N28GX	Remos GX	356	3/11/16	CEN16FA122	<i>Still under investigation at the time of this report.</i>
N670EM	Airborne Windsports XT-912	XT-912-0214	3/21/16	WPR16FA086	<i>Still under investigation at the time of this report.</i>
N276VA	Van's Aircraft RV-12	12056	4/19/16	ERA16FA165	<i>Still under investigation at the time of this report.</i>
N9912S	Evolution Trikes Revo	1002	7/9/16	CEN16LA263	The student pilot's failure to maintain directional control on landing. Contributing to the accident was the pilot's lack of flight experience.
N527TS	Flight Design CTLS	08-02-04	7/28/16	CEN16FA290	<i>Still under investigation at the time of this report.</i>
N341AL	Arion Aircraft Lightning LS-1	166	8/2/16	WPR16FA157	<i>Still under investigation at the time of this report.</i>
N188M	Airborne Windsports XT-912-L	XT-912-0502	12/6/16	WPR17FA033	<i>Still under investigation at the time of this report.</i>
N4218	AMD CH601XL	601-068S	12/9/16	CEN17FA053	<i>Still under investigation at the time of this report.</i>
N184BA	ICON Aircraft A5	00007	5/8/17	WPR17FA101	The pilot's failure to maintain clearance from terrain while maneuvering at a low altitude. Contributing to the accident was the pilot's mistaken entry into a canyon surrounded by steep rising terrain while at a low altitude for reasons that could not be determined.
N62JN	Flight Design CTSW	06-01-09	7/1/17	CEN17FA249	<i>Still under investigation at the time of this report.</i>

Reg. Number	Make & Model	S/N	Date of Accident	NTSB No	NTSB Cause
N492XB	North Wing UUM Scout X-C	LS9014	7/1/17	WPR17FA139	<i>Still under investigation at the time of this report.</i>
N601PH	AMD CH601XLi	601- 040S	7/19/17	ERA17FA248	<i>Still under investigation at the time of this report.</i>
N319TA	Tecnam P2004	125	8/18/17	ERA17LA280	<i>Still under investigation at the time of this report.</i>

Appendix 1

Phase of Flight Definitions (from CICTT)

Abbreviated definitions are provided; further explanation is available from the CICTT definition and usage notes document.

STANDING (STD)

Prior to pushback or taxi, or after arrival, at the gate, ramp, or parking area, while the aircraft is stationary.

PUSHBACK/TOWING (PBT)

Aircraft is moving in the gate, ramp, or parking area, assisted by a tow vehicle (tug).

TAXI (TXI)

The aircraft is moving on the aerodrome surface under its own power prior to takeoff or after landing.

TAKEOFF (TOF)

From the application of takeoff power, through rotation, and to an altitude of 35 feet above runway elevation. Includes rejected takeoff.

INITIAL CLIMB (ICL)

From the end of the Takeoff sub-phase to the first prescribed power reduction, or until reaching 1,000 feet above runway elevation or the VFR pattern, whichever comes first.

EN ROUTE (ENR)

Visual Flight Rules (VFR): From completion of Initial Climb through cruise and controlled descent to the VFR pattern altitude or 1,000 feet above runway elevation, whichever comes first.

MANEUVERING (MNV)

Low altitude/aerobatic flight operations.

APPROACH (APR)

Visual Flight Rules (VFR): From the point of VFR pattern entry, or 1,000 feet above the runway elevation, to the beginning of the landing flare. Includes missed approach/go-around.

LANDING (LDG)

From the beginning of the landing flare until aircraft exits the landing runway, comes to a stop on the runway, or when power is applied for takeoff in the case of a touch-and-go landing. Includes aborted landing after touchdown.

EMERGENCY DESCENT (EMG)

A controlled descent during any airborne phase in response to a perceived emergency situation.

UNCONTROLLED DESCENT (UND)

A descent during any airborne phase in which the aircraft does not sustain controlled flight.

POST-IMPACT (PIM)

Any of that portion of the flight which occurs after impact with a person, object, obstacle or terrain. While not a Phase of Flight per se, this phase is added to permit accurate sequence of event reconstruction for occurrences. For example, to capture post-impact fire.

UNKNOWN (UNK)

Phase of flight is not discernible from the information available.

Appendix 2

Occurrence Categories Definitions (from CICTT)

Abbreviated definitions/notes are provided; further explanation is available from the CICTT definition and usage notes document.

ABNORMAL RUNWAY CONTACT (ARC)

Any landing or takeoff involving abnormal runway or landing surface contact.

Hard/heavy landings, long/fast landings, off center landings, crabbed landings; nose wheel first touchdown, tail strikes, and wingtip/nacelle strikes; gear-up landings. Includes waterways.

ABRUPT MANEUVER (AMAN)

The intentional abrupt maneuvering of the aircraft by the flightcrew.

Hard braking or rapid change in direction to avoid collision, etc.

AIRPROX/MIDAIR COLLISIONS (MAC)

Air proximity issues, TCAS/ACAS alerts, loss of separation as well as near collisions or collisions between aircraft in flight.

BIRD (BIRD)

Occurrences involving collisions/near collisions with bird(s)/wildlife.

May occur in any phase of flight.

COLLISION WITH OBSTACLES(S) DURING TAKEOFF AND LANDING (CTOL)

Collision with obstacle(s) during takeoff or landing while airborne.

Contact with obstacles, such as vegetation, trees and walls, snowdrifts, power cables, wires, land structures and buildings, and water obstacles.

CONTROLLED FLIGHT INTO OR TOWARD TERRAIN (CFIT)

In-flight collision or near collision with terrain, water, or obstacle without indication of loss of control.

Only for airborne phases of flight. Includes objects extending above the surface (e.g., towers, trees, power lines, wires). Includes instances when the flightcrew is affected by visual illusions or degraded visual environment.

FIRE/SMOKE (NON-IMPACT) (F-NI)

Fire or smoke in or on the aircraft, in flight, or on the ground, which is not the result of impact.

FIRE/SMOKE (POST-IMPACT) (F-POST)

Fire/Smoke resulting from impact.

Only used for occurrences in which post impact fire was a factor in the outcome. This category is only used in conjunction with another category.

FUEL RELATED (FUEL)

One or more powerplants experienced reduced or no power output due to fuel exhaustion, fuel starvation/mismanagement, fuel contamination/wrong fuel, or carburetor and/or induction icing.

For problems that are not the result of mechanical failures which are coded elsewhere.

GLIDER TOWING RELATED EVENTS (GTOW)

Premature release, inadvertent release or non-release during towing, entangling with towing, cable, loss of control, or impact into towing aircraft/winch.

Applicable both to aircraft under tow by winch or by another aircraft, or to aircraft executing towing.

GROUND COLLISION (GCOL)

Collision while taxiing to or from a runway in use.

Includes collisions with an aircraft, person, animal, ground vehicle, obstacle, building, structure, etc., while on a surface other than the runway.

GROUND HANDLING (RAMP)

Occurrences during (or as a result of) ground handling operations.

Includes collisions that occur while servicing, boarding, loading, and deplaning; includes injuries to people from prop strikes; includes towing events; includes jet blast and prop/rotor downwash; includes aircraft external preflight configuration errors (e.g., improper loading and improperly secured doors and latches).

ICING (ICE)

Accumulation of snow, ice, freezing rain, or frost on aircraft surfaces that adversely affects aircraft control or performance.

Includes accumulations that occur in flight or on the ground; includes windscreen icing and ice on sensors, antennae, and other external surfaces; does not include carb or induction icing events that are coded in the FUEL category.

LOSS OF CONTROL—GROUND (LOC-G)

Loss of aircraft control while the aircraft is on the ground.

Used only for non-airborne phases of flight; may result from a contaminated runway or taxiway (e.g., rain, snow, ice, slush); may occur as the result of other occurrence categories; do not use when a mechanical failure rendered the aircraft uncontrollable.

LOSS OF CONTROL-INFLIGHT (LOC-I)

Loss of aircraft control while, or deviation from intended flight path, in flight.

Used only for airborne phases of flight; may occur as a result of a deliberate maneuver (e.g., stall/spin practice); includes stalls; includes pilot-induced or assisted oscillations; includes occurrences involving configuring the aircraft (e.g., flaps, slats, onboard systems, etc.)

LOSS OF LIFTING CONDITIONS EN ROUTE (LOLI)

Landing en route due to loss of lifting conditions. Applicable only to aircraft that rely on static lift to maintain or increase flight altitude, namely sailplanes, gliders, hang gliders and paragliders, balloons and airships.

Applicable to gliders, motorgliders, balloons, and airships.

LOW ALTITUDE OPERATIONS (LALT)

Collision or near collision with obstacles/objects/terrain while intentionally operating near the surface (excludes takeoff or landing phases).

“Terrain” includes water, vegetation, rocks, and other natural elements lying on, or growing out of, the earth; includes aerobatics, sightseeing, demo flights, aerial inspection, ostentatious display, maneuvering in close proximity to cliffs, mountains, into box canyons, and similar flights.

OTHER (OTHR)

Any occurrence not covered under another category.

RUNWAY EXCURSION (RE)

A veer off or overrun off the runway surface.

Only applicable during either the takeoff or landing phase; may be intentional or unintentional (e.g., to avoid a collision).

RUNWAY INCURSION-ANIMAL (RI-A)

Collision with, risk of collision with, or evasive action taken by an aircraft to avoid an animal on a runway or on a helipad/helideck in use.

RUNWAY INCURSION-VEHICLE, AIRCRAFT OR PERSON (RI-VAP)

Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft.

SECURITY RELATED (SEC)

Criminal/Security acts which result in accidents or incidents (per Annex 13 to the Convention on International Civil Aviation).

Examples include hijacking and/or aircraft theft, unruly passenger, flight control interference, sabotage, suicide, and acts of war.

SYSTEM/COMPONENT FAILURE OR MALFUNCTION (NON-POWERPLANT) (SCF-NP)

Failure or malfunction of an aircraft system or component other than the powerplant.

Includes errors or failures in software and database systems; includes non-powerplant parts or pieces separating from an aircraft; includes all failures/malfunctions, including those related to or caused by maintenance issues.

SYSTEM/COMPONENT FAILURE OR MALFUNCTION (POWERPLANT) (SCF-PP)

Failure or malfunction of an aircraft system or component related to the powerplant.

Includes props, prop system, and engine gearbox and powerplant controls; includes powerplant parts or pieces separating from a powerplant; includes all failures/malfunctions, including those related to or caused by maintenance issues.

TURBULENCE ENCOUNTER (TURB)

In-flight turbulence encounter.

Includes encounters with turbulence in clean air, mountain wave, mechanical, and/or cloud-associated turbulence; includes wake vortex encounters; includes turbulence when operating around or at buildings, structures, and objects.

UNDERSHOOT/OVERSHOOT (USOS)

A touchdown off the runway/helipad/helideck surface.

For occurrences during the landing phase; includes offside touchdowns.

UNINTENDED FLIGHT IN IMC (UIMC)

Unintended flight in Instrument Meteorological Conditions (IMC).

Only to be used when loss of visual reference is encountered and if pilot not qualified to fly in IMC and/or aircraft not equipped to fly in IMC.

UNKNOWN OR UNDETERMINED (UNK)

Insufficient information exists to categorize the occurrence.

Includes cases in which the aircraft is missing or in which there is not enough information at hand to classify the occurrence.

WINDSHEAR OR THUNDERSTORM (WSTRW)

Flight into wind shear or thunderstorm.

Includes in-flight events related to hail; includes events related to lightning strikes; includes events related to heavy rain.