



FAA
Aircraft Certification Service
Small Airplane Directorate
ACE-114

2014

Continued Operational Safety (COS) Report
Special Category Light-Sport Aircraft

JULY 2004 THROUGH SEPTEMBER 2014

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

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Introduction

The Small Airplane Directorate, Programs and Procedures office, ACE-114 has established a process to monitor and track **special category 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**. 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.

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

This report **does not include** accidents and incidents involving sport pilots in categories of aircraft other than SLSA that meet the light sport aircraft (LSA) definition in 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), Design, Manufacturing and Airworthiness Division, AIR-100 has responsibility for any oversight of these aircraft.

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 is as follows:

ELSA	
Fatal Accidents	Total Fatalities
72	91

ELSA includes—

- “fat ultralights” not meeting the provisions of Title 14 Code of Federal Regulations (14 CFR) 103.1, ELSA certificated under 14 CFR 21.191(i)(1);
- ELSA aircraft assembled from a “kit” certificated under 14 CFR 21.191(i)(2); 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.

SLSA Airworthiness Certifications

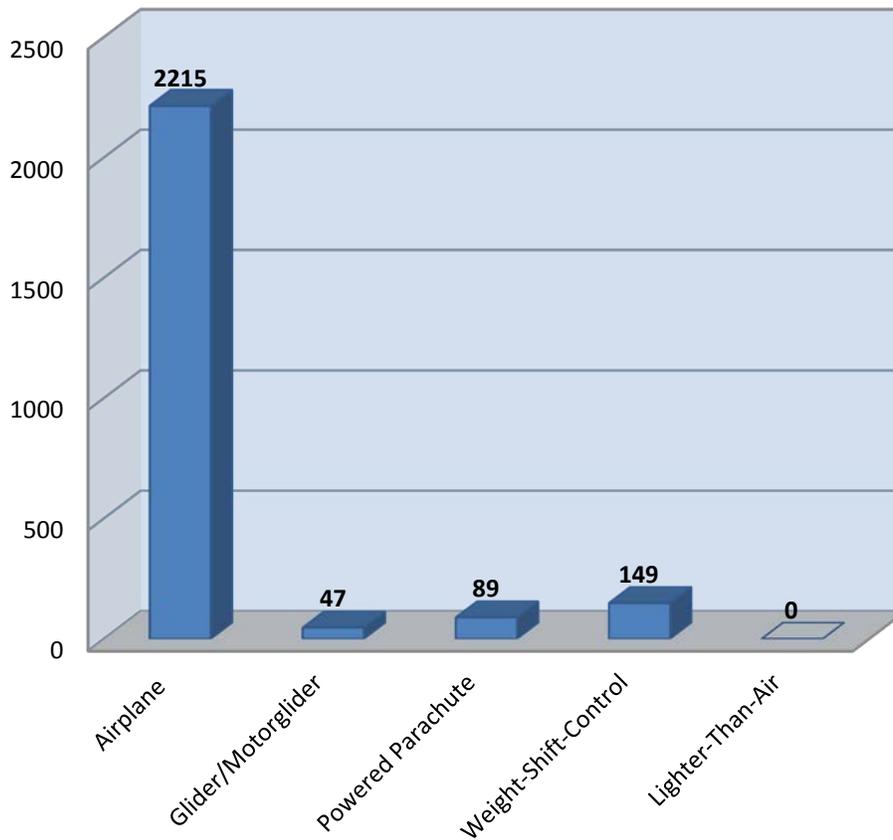
A special airworthiness certificate for an SLSA is issued to an aircraft that meets the definition of LSA, is manufactured to the applicable consensus standards, and is one of the following five classes of the LSA category:

- 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.

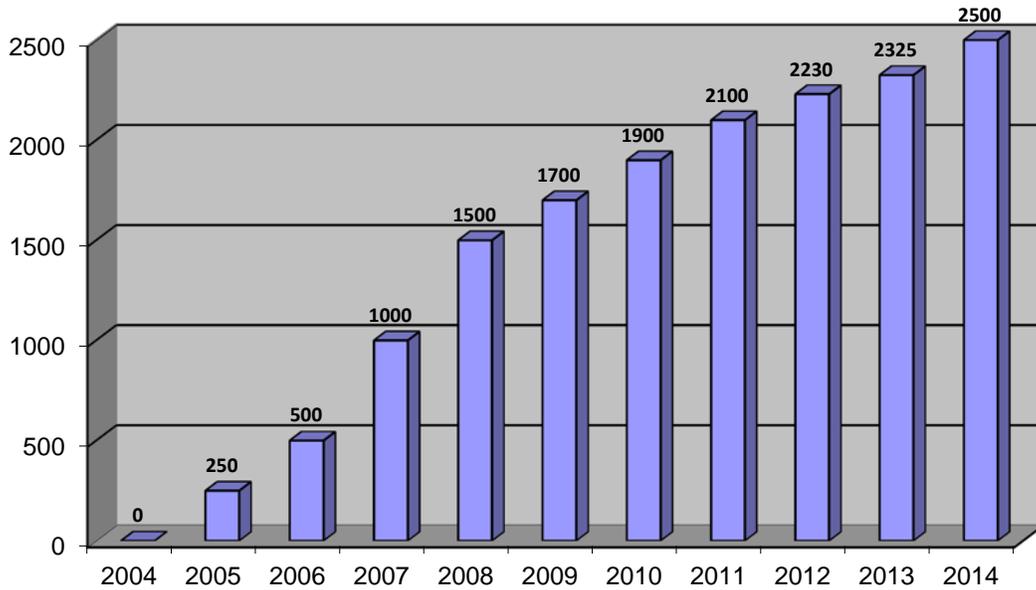
Population Of SLSA By Class

Estimates based on FAA Aircraft Registry, AFS-750 data from October-2014 for **airworthiness certificates issued**.



SLSA Cumulative Fleet Size By Fiscal Year (FY)

Estimates based on FAA Aircraft Registry, AFS-750 data from October-2014 for **airworthiness certificates issued**.



Population Of SLSA Manufacturers

Total Current Active SLSA Manufacturers - **82**

	2008	2010	2012	2013	2014
Airplane/Glider	42	54	63	64	66
PPC	5	8	7	7	7
WSC	5	12	10	10	9

	2008	2010	2012	2013	2014
U.S.	17	26	40	41	37
Outside U.S.	35	48	40	40	45

SLSA Vision For The Future

We are focused on industry accountability and safety with a goal of creating an 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—

- Creating a regulatory and policy structure for industry to achieve FAA safety goals through self-declared compliance with industry developed and maintained consensus standards;
- Relying on an industry-led system of self-audits and statements of compliance;
- Creating a system for FAA oversight of a manufacture's self-auditing and self-declarative systems; and
- 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 investigated, recorded, and analyzed.

This report is based on known data at the time the report is compiled. As new data becomes available, the recording of data elements will be adjusted 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 results in death within thirty (30) days of the accident.

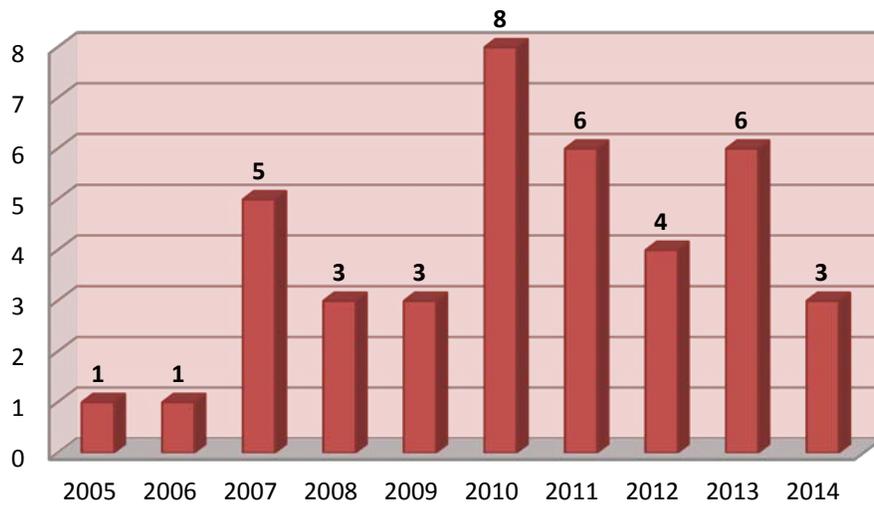
"Aircraft Incident" is an occurrence other than an accident that affects or could affect the safety of operations.

Fatal Accidents vs. Non-Fatal Accidents/Incidents

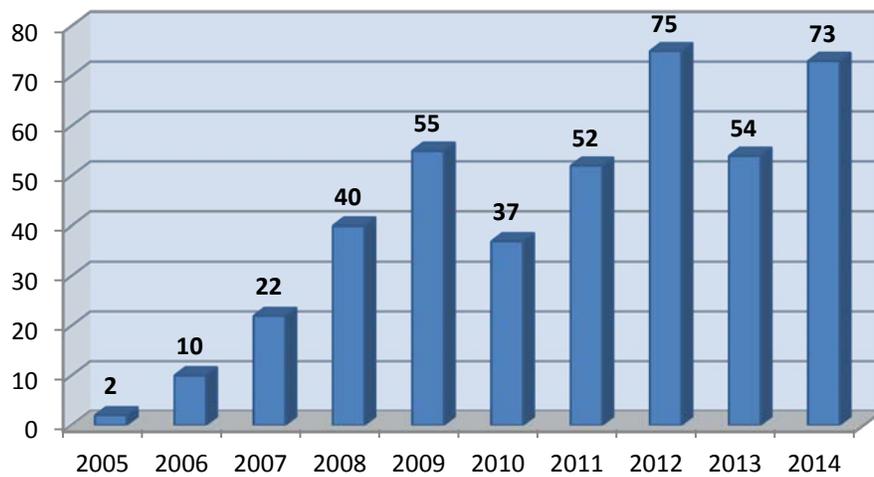
The following tables and charts provide data for SLSA fatal accidents and non-fatal accidents/incidents that occurred during the reporting time period.

Fatal Accidents	Non-Fatal Accidents/Incidents
40	420
Total Fatalities: 56	

Fatal Accidents By FY

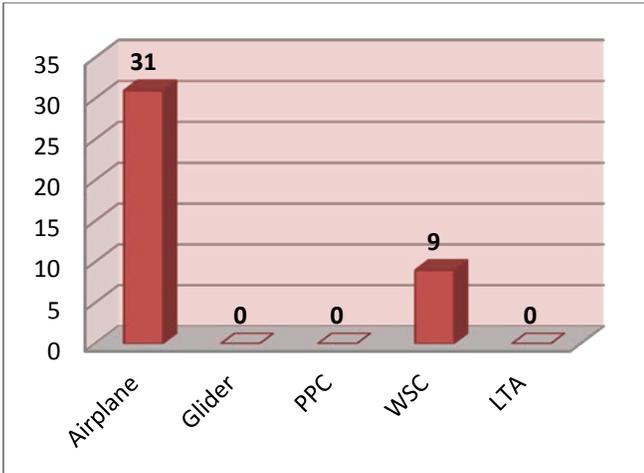


Non-Fatal Accidents/Incidents By FY



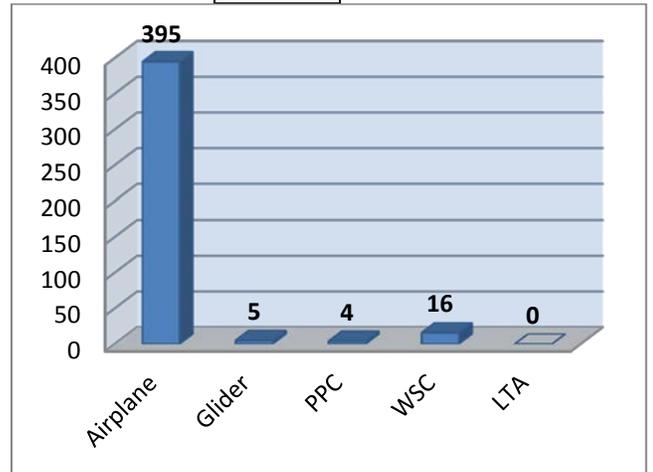
Fatal Accidents By Class Of SLSA

Total: 40

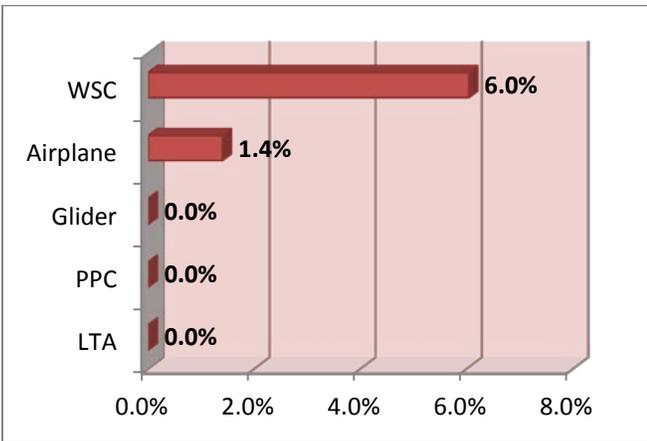


Non-Fatal Accidents/Incidents By Class Of SLSA

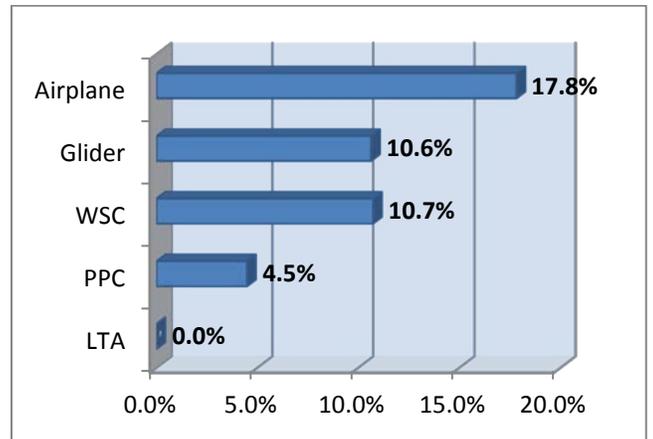
Total: 420



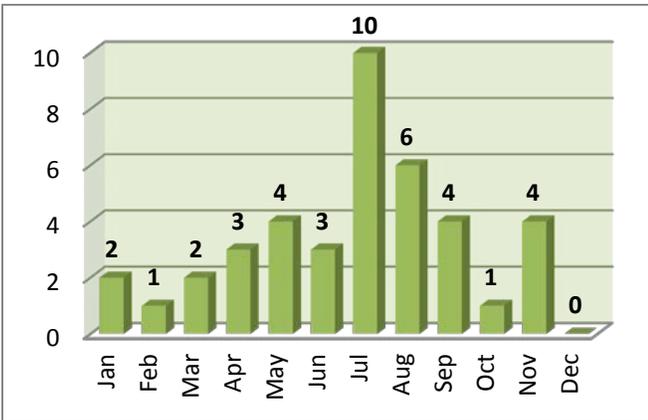
Fatal Accidents By Class To Total Class Fleet



Non-Fatal Accidents/Incidents By Class To Total Class Fleet



Fatal Accidents By Month of Year



Fatal Accidents By Type of Pilot Certificate and Medical Certificate

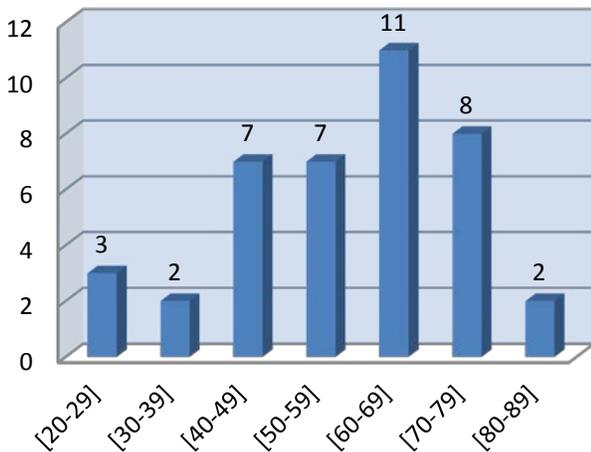
SLSA / Pilot Fatal Accident Matrix

Pilot Rating & Medical	Recreation+ CL3+ (Rated Pilot)	18
	Recreation+ DL (Operating Privileges of Sport Pilot)	7
	Sport Pilot for Aircraft being operated (may hold other ratings)	10
	Student / Solo Privileges	3
	Pilot Not Rated by certificate or for aircraft being operated	2
Total Accidents:		40

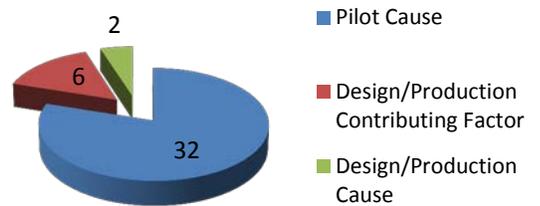
Non-Fatal Accidents/Incidents By Type of Pilot Certificate and Medical Certificate

[Data not collected for this metric.]

Fatal Accidents By Pilot Age Range



Fatal Accidents: Pilot vs Aircraft

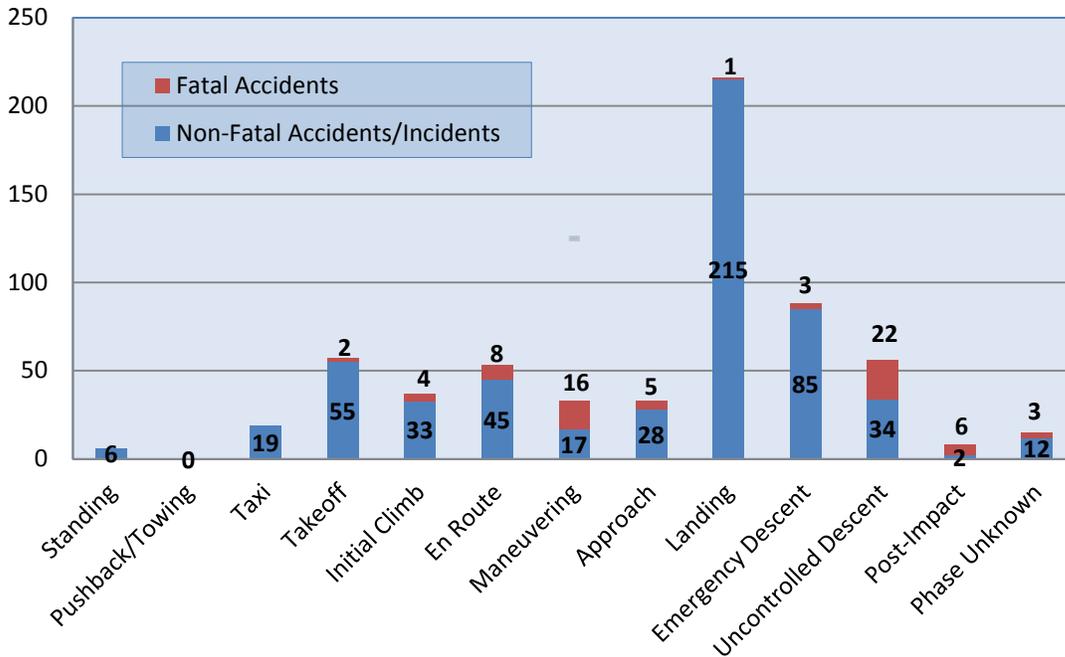


Fatal Accident and Non-Fatal Accident/Incident Phase of Flight
Total Events: 460

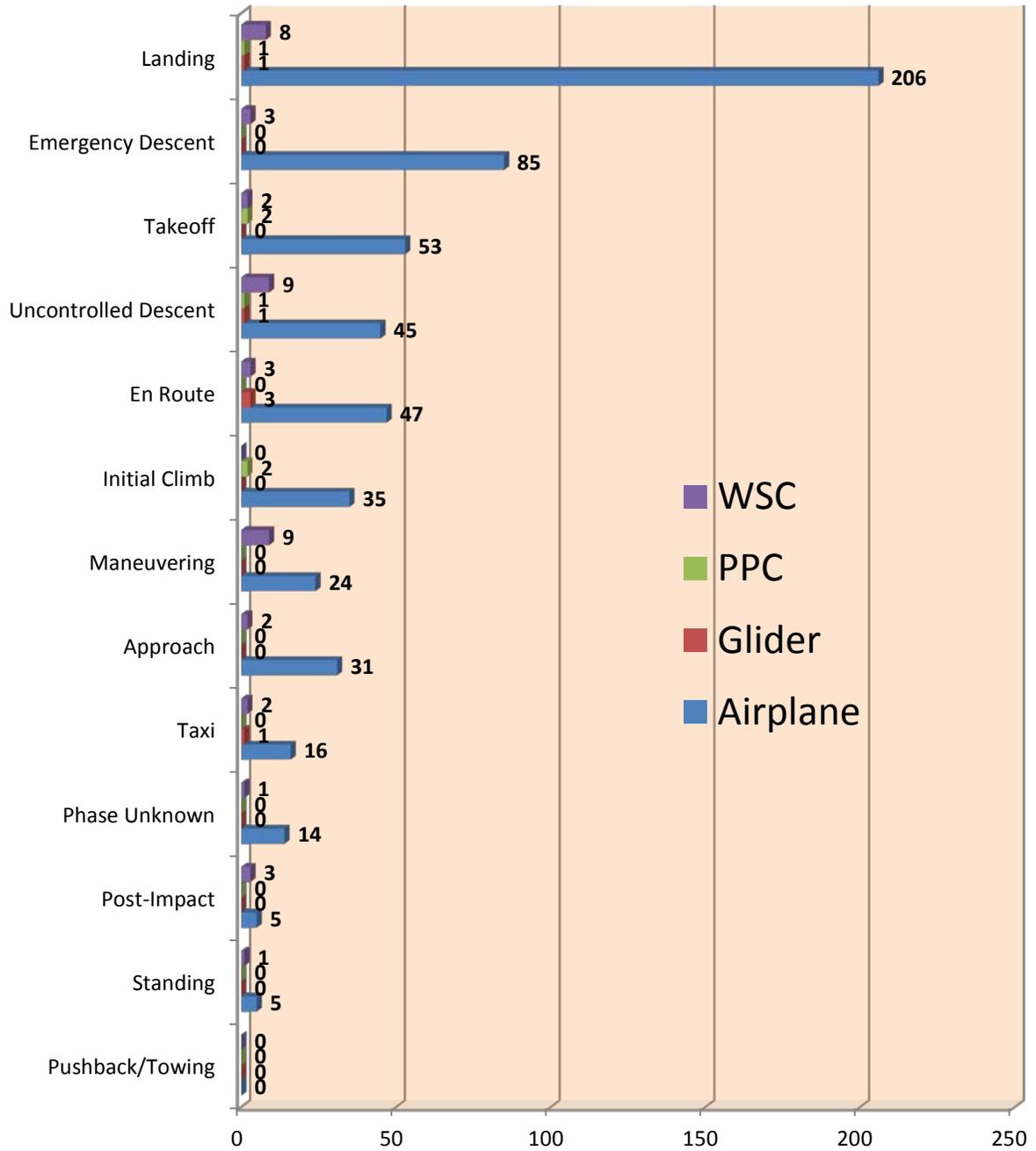
The phase of operation or the phase of flight in which the event reported occurred. The taxonomy used in this report is consistent with that provided by the **Commercial Aviation Safety Team/International Civil Aviation Organization (CAST/ICAO) Common Taxonomy Team (CICTT)**.

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



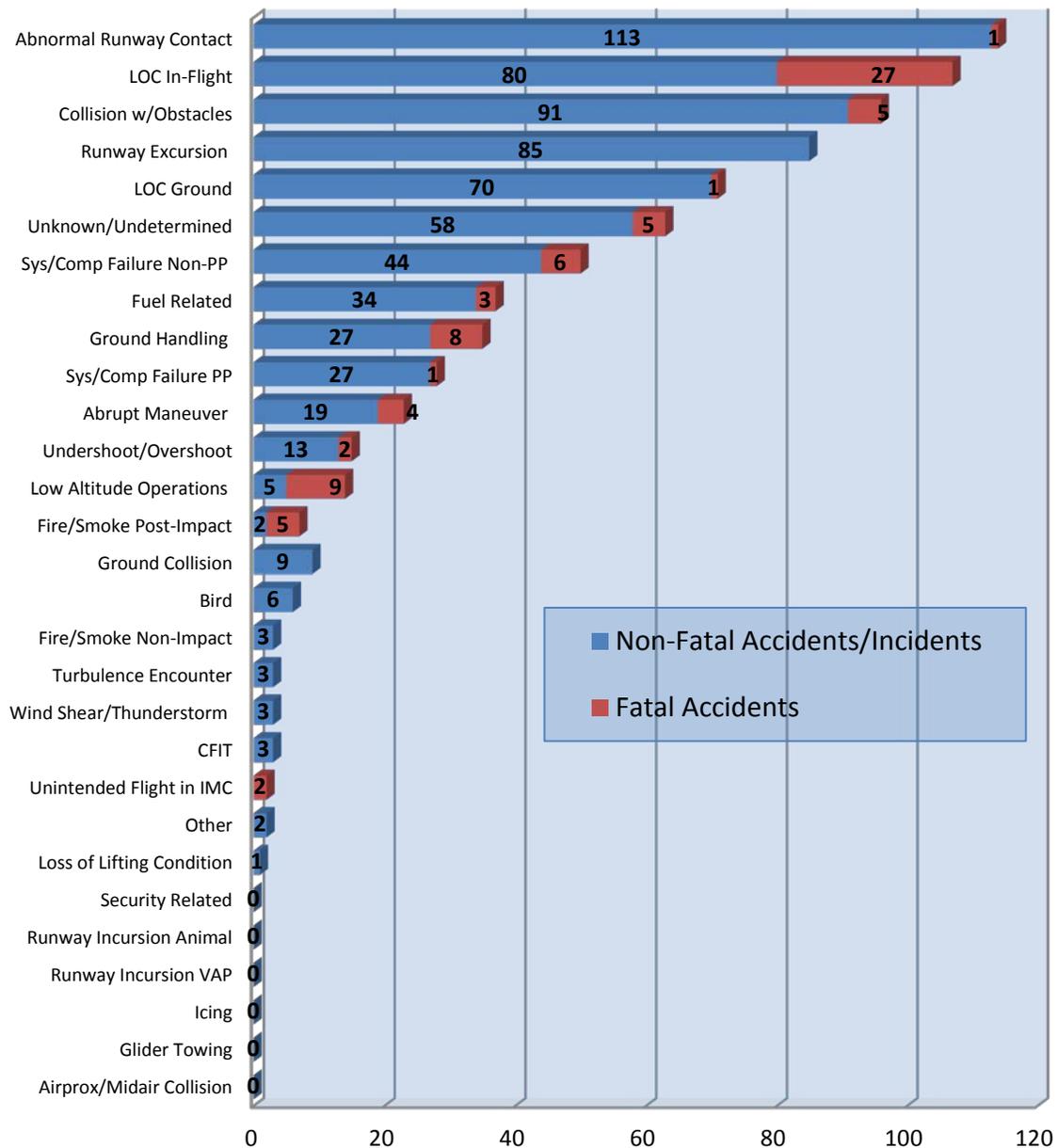
Fatal Accident and Non-Fatal Accident/Incident Occurrence Category

Total Events: 460

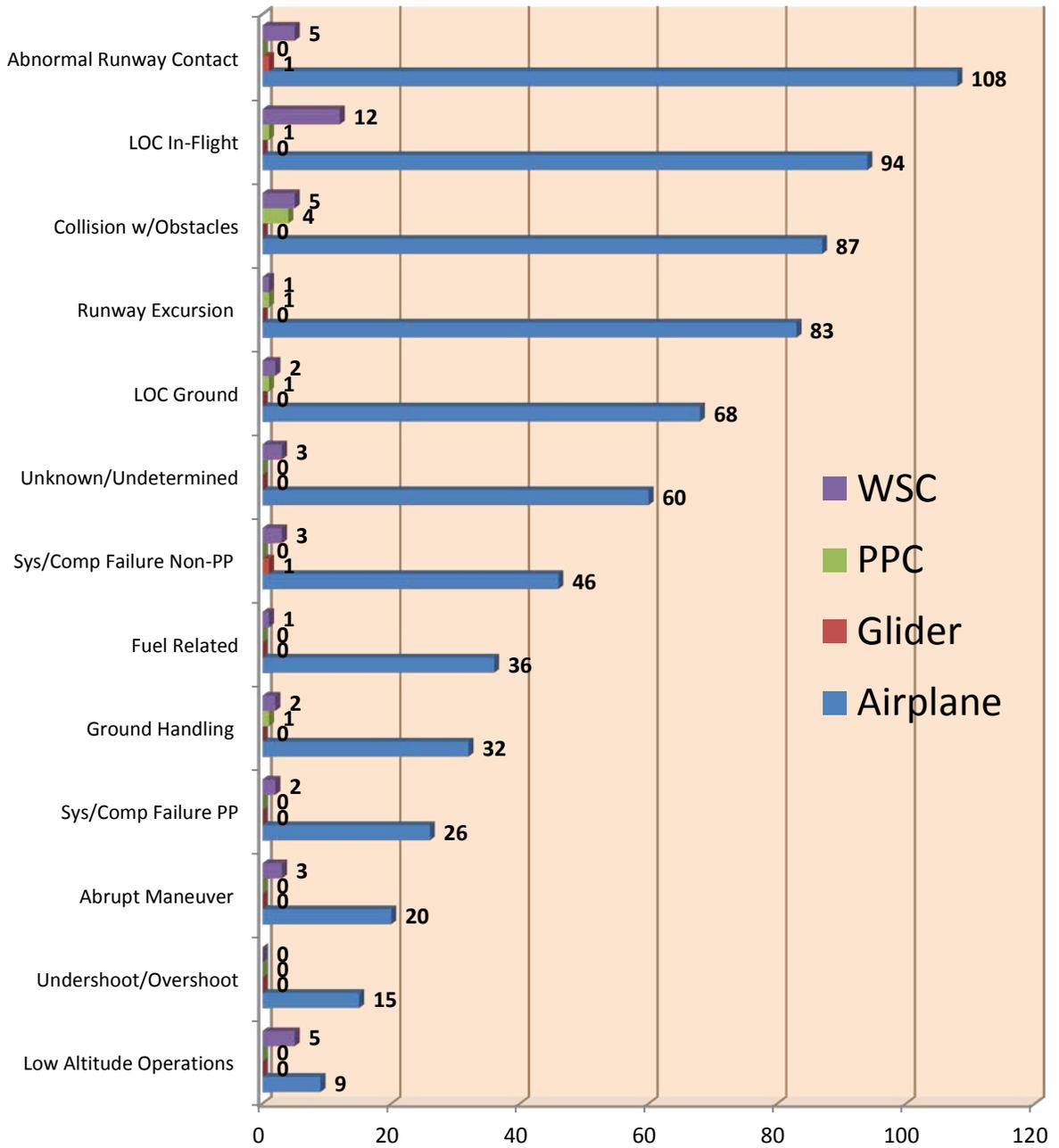
Occurrence categories are used to classify occurrences (i.e., accidents and incidents) at a high level to permit analysis of the data in support of safety initiatives. The taxonomy used in this report is consistent with that provided by the **CICTT**.

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.

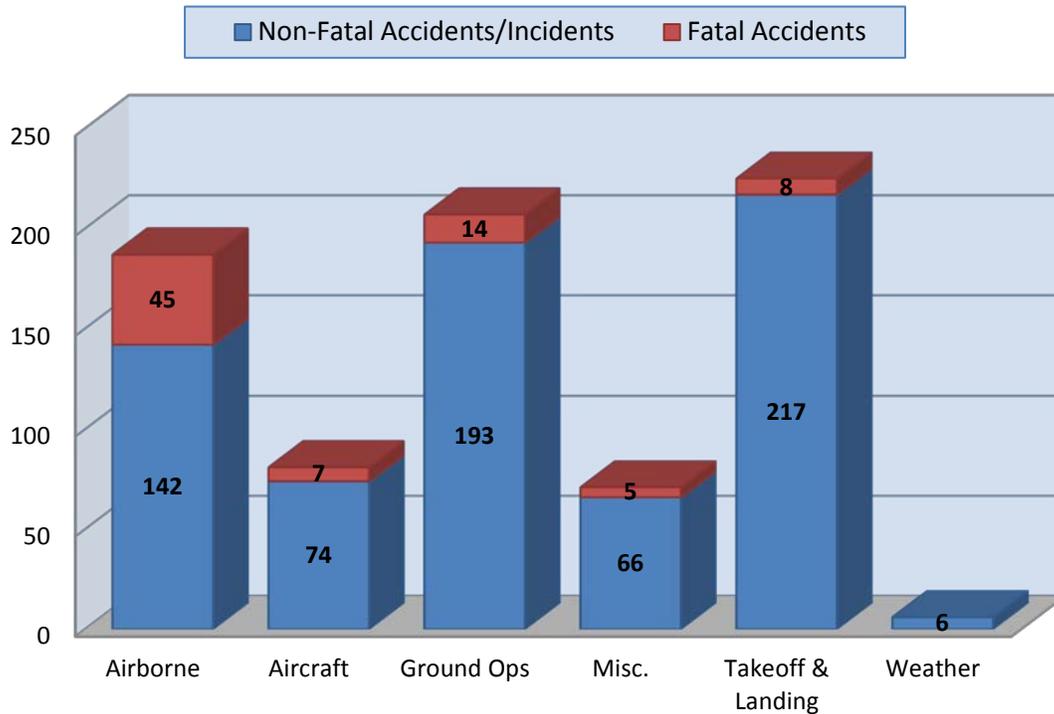
Reference appendix 2 for “**Occurrence Category**” definitions.



Top Thirteen (13) 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

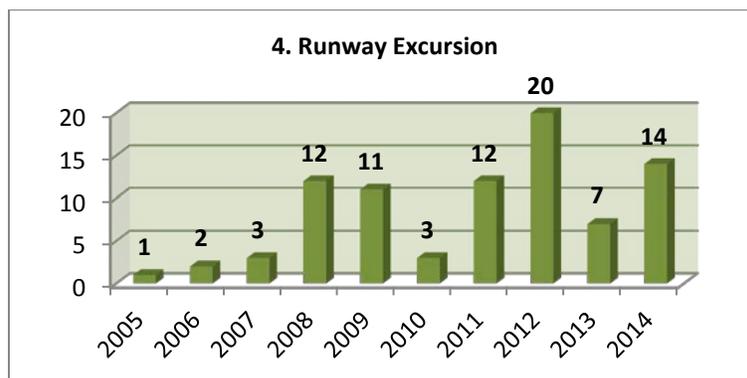
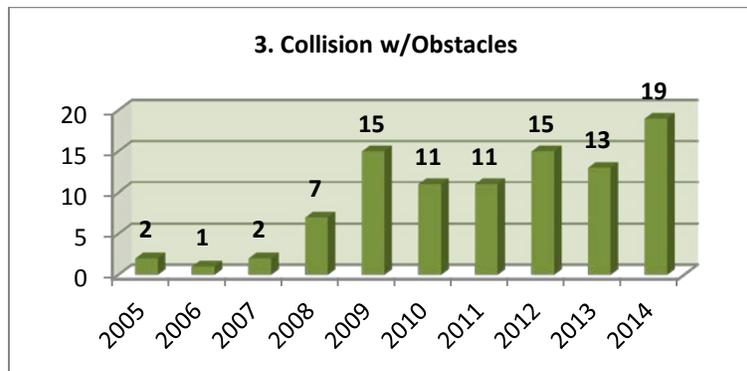
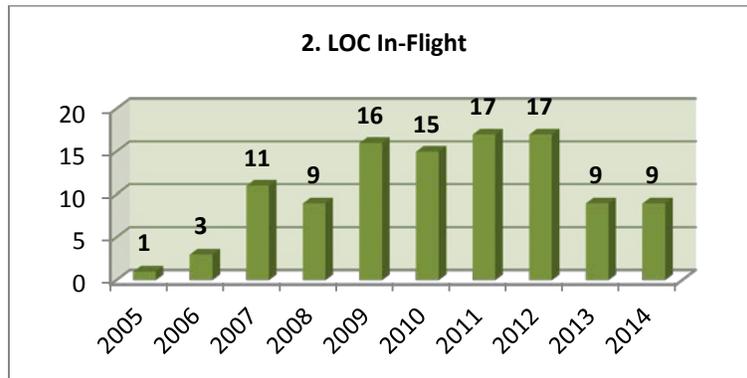
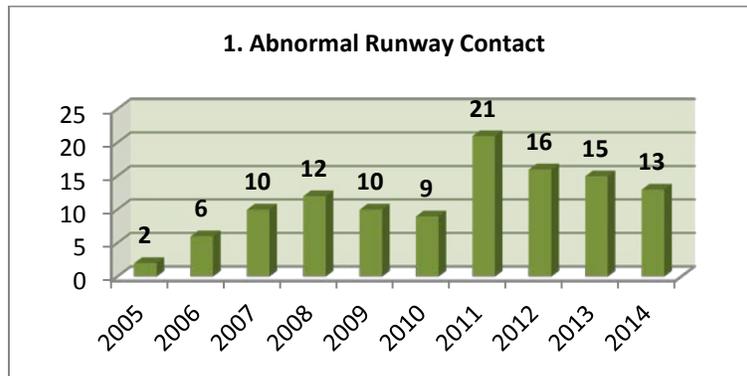
Takeoff & Landing

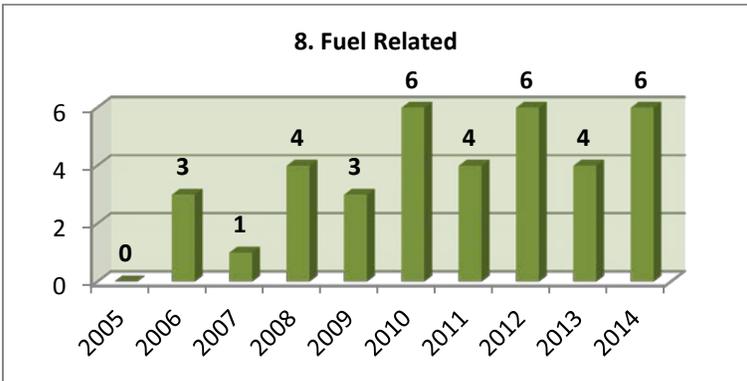
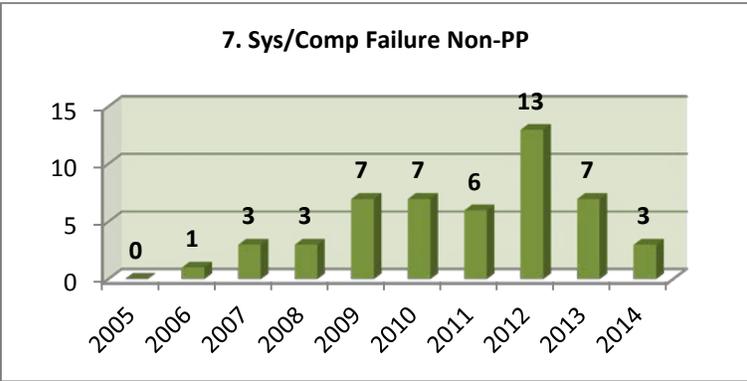
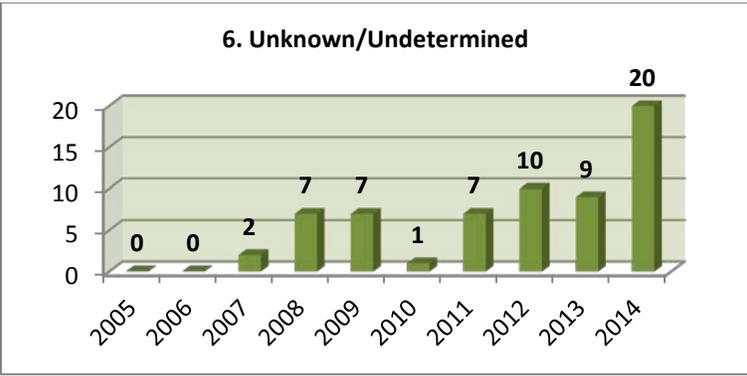
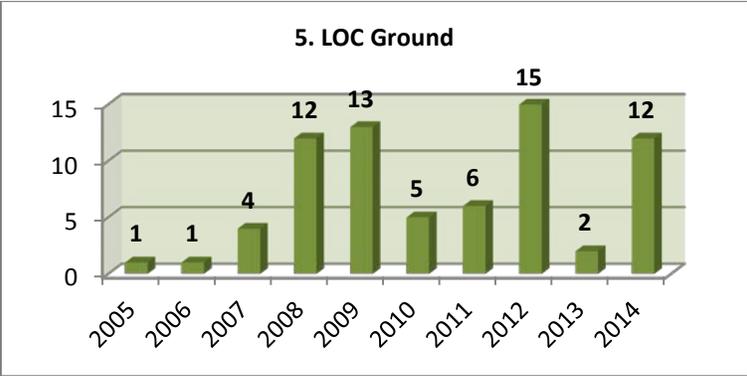
Abnormal Runway Contact
 Collision w/Obstacles
 Undershoot/Overshoot

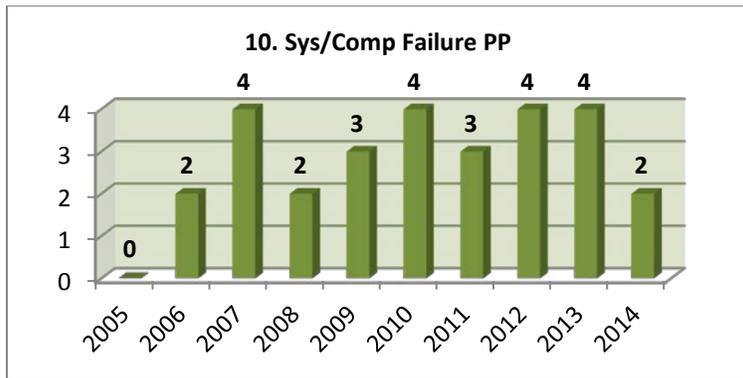
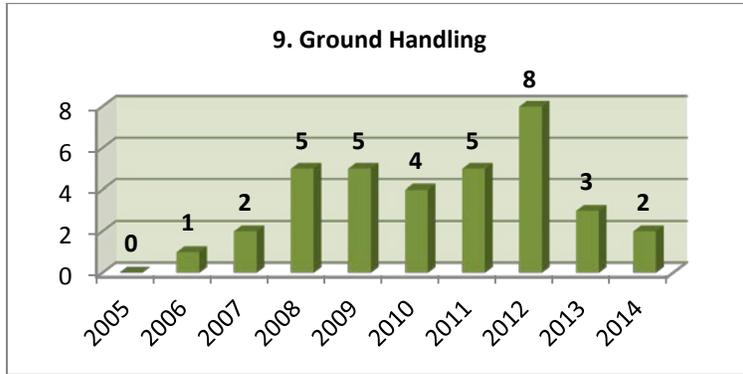
WEATHER

Icing
 Turbulence Encounter
 Wind Shear/Thunderstorm

Top Ten Occurrence Categories (Accidents & Incidents) – Fiscal Year Trends







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
Fuel Tank Vent Line	1		1
MLG Strut Bracket	1		1
Seat Restraint System	1	1	
Emergency Parachute Handle	1	1	

Manufacturing Quality Related Occurrences

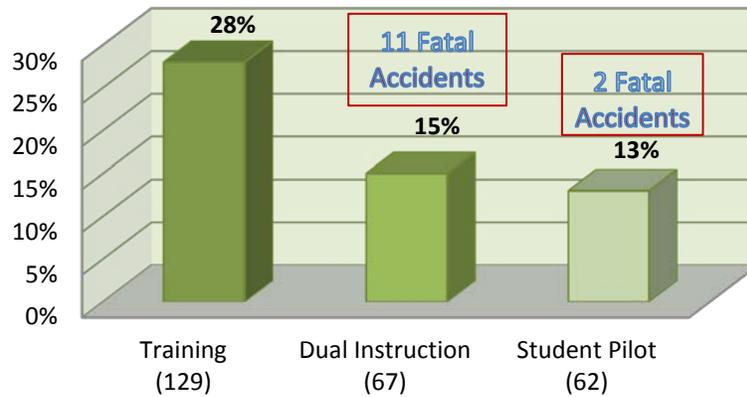
Accidents/incidents with identified manufacturing quality related impact. All identified occurrences have been reviewed by and appropriate corrective action obtained by the SLSA manufacturer in accordance with the applicable industry consensus standards and FAA regulations requirements.

Manufacturing Quality Feature	Number of Occurrences	Fatal Accidents	Non-Fatal Accidents/Incidents
POH Deficiencies [Incorrect / Insufficient Data]	10	3	7
MLG Bolt Failure	2		2
Airspeed Indicator Marking Incorrect	3	1	2
MLG Attach Fitting Failure	1		1
Shoulder Harness Failure	2	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
Throttle Cable Failure	3		3
Engine Mount Failure	1		1

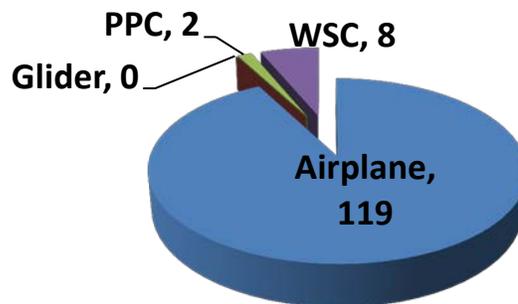
Training Flights

Accidents/Incidents Identified as Training Flights.

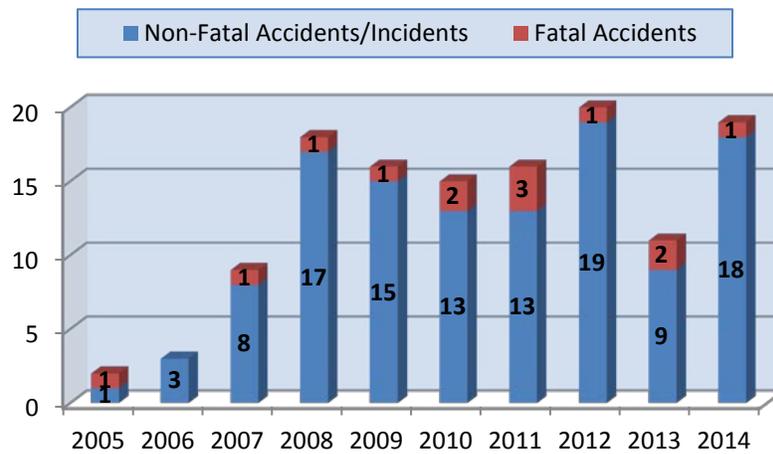
Total Flights - 460



Training Flights By Class Of SLSA



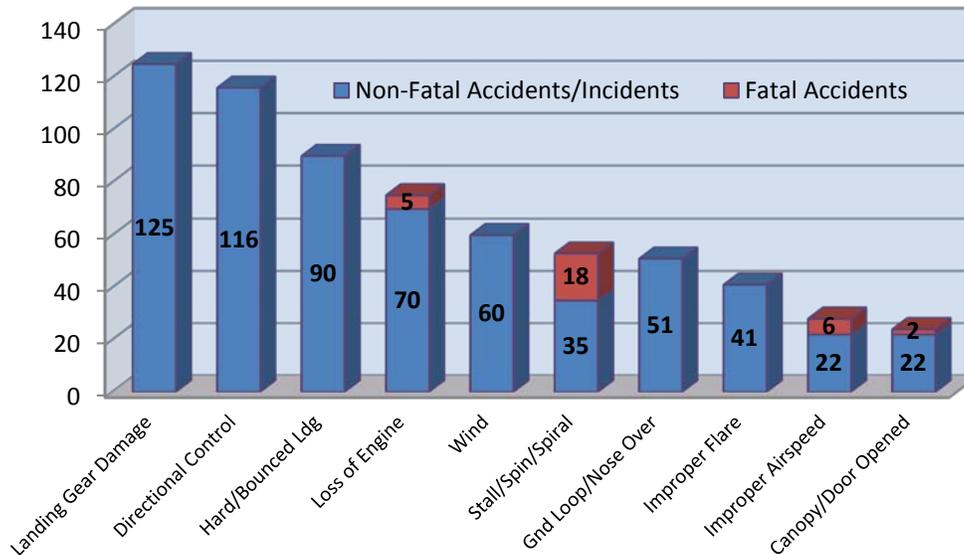
Training Flights (Accidents & Incidents) – Fiscal Year Trends



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 - Factors

LANDING GEAR DAMAGE: No Fatal

38 involved training; 15 dual instruction and 23 student pilot.

DIRECTIONAL CONTROL: No Fatal

42 involved training; 14 dual instruction and 28 student pilot.

HARD/BOUNCED LANDING: No Fatal

36 involved training; 13 dual instruction and 23 student pilot.

LOSS OF ENGINE: Five (5) Fatal

Includes engine failures, malfunctions and any fuel related events
11 involved training; 11 dual instruction and 0 student pilot.

WIND: No Fatal

Includes tailwind, crosswind, and gusty wind
9 involved training; 2 dual instruction and 7 student pilot

STALL/SPIN/SPIRAL: Eighteen (18) Fatal

22 involved training; 18 dual instruction and 4 student pilot.

GROUND LOOP/NOSE OVER: No Fatal

16 involved training; 9 dual instruction and 7 student pilot.

IMPROPER FLARE: No Fatal

17 involved training; 6 dual instruction and 11 student pilot.

IMPROPER AIRSPEED: Six (6) Fatal

11 involved training; 8 dual instruction and 3 student pilot.

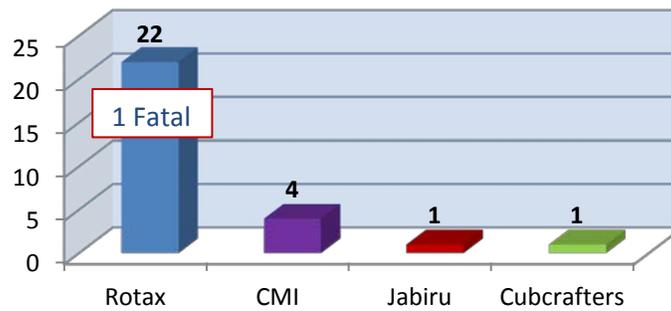
CANOPY/DOOR OPENED: Two (2) Fatal

Involved **eight (8)** different make/model airplanes

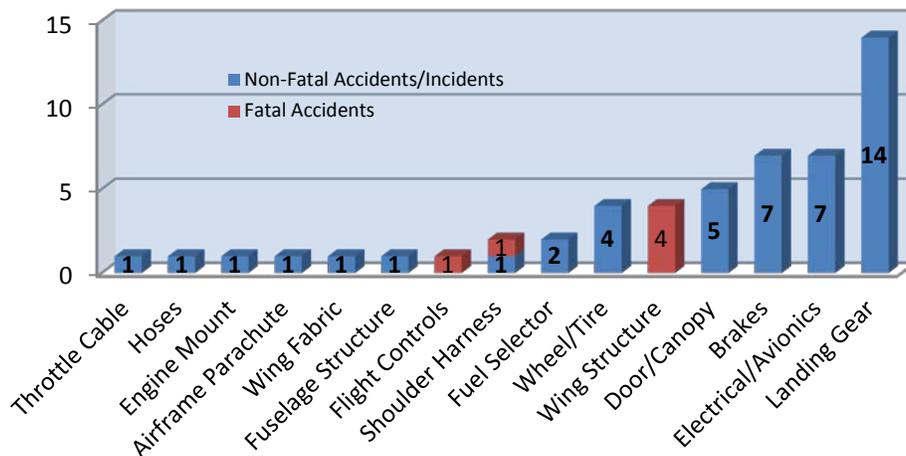
4 involved training; 2 dual instruction and 2 student pilot.

System/Component Failures

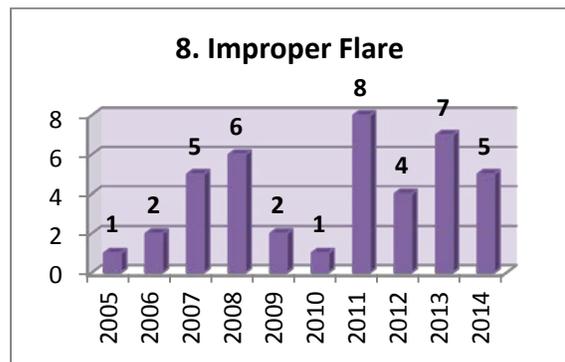
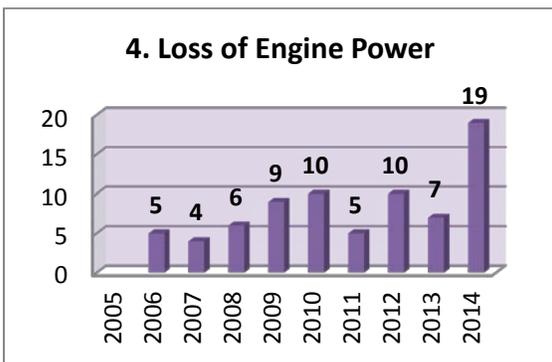
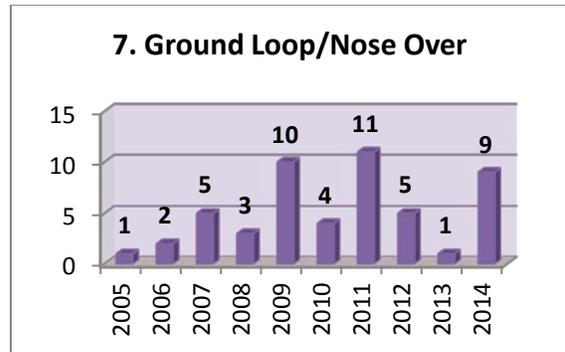
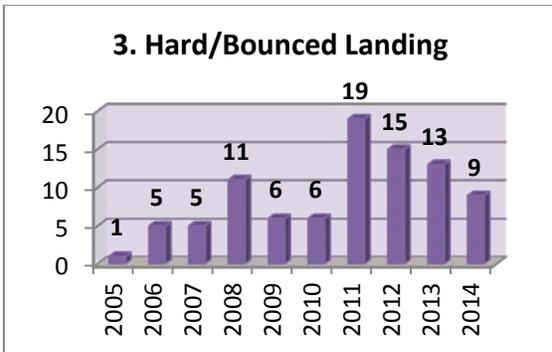
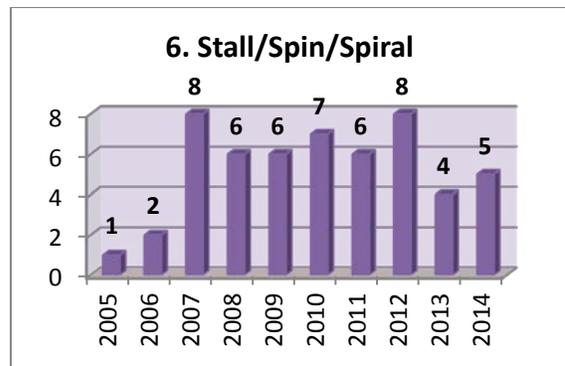
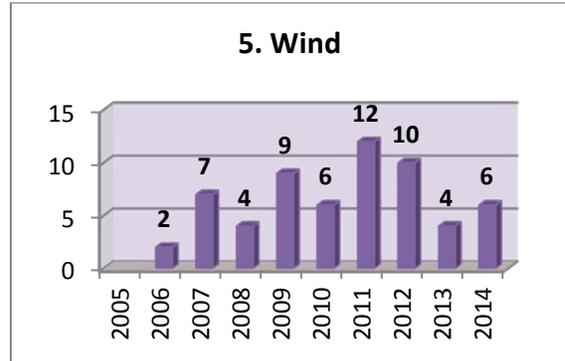
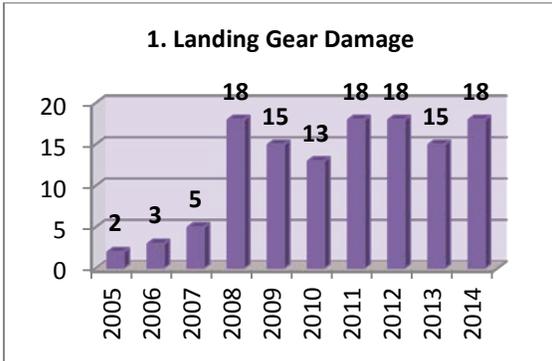
**System/Component Failure or Malfunction Powerplant
(Does not include fuel related events)**



System/Component Failure or Malfunction Non-Powerplant

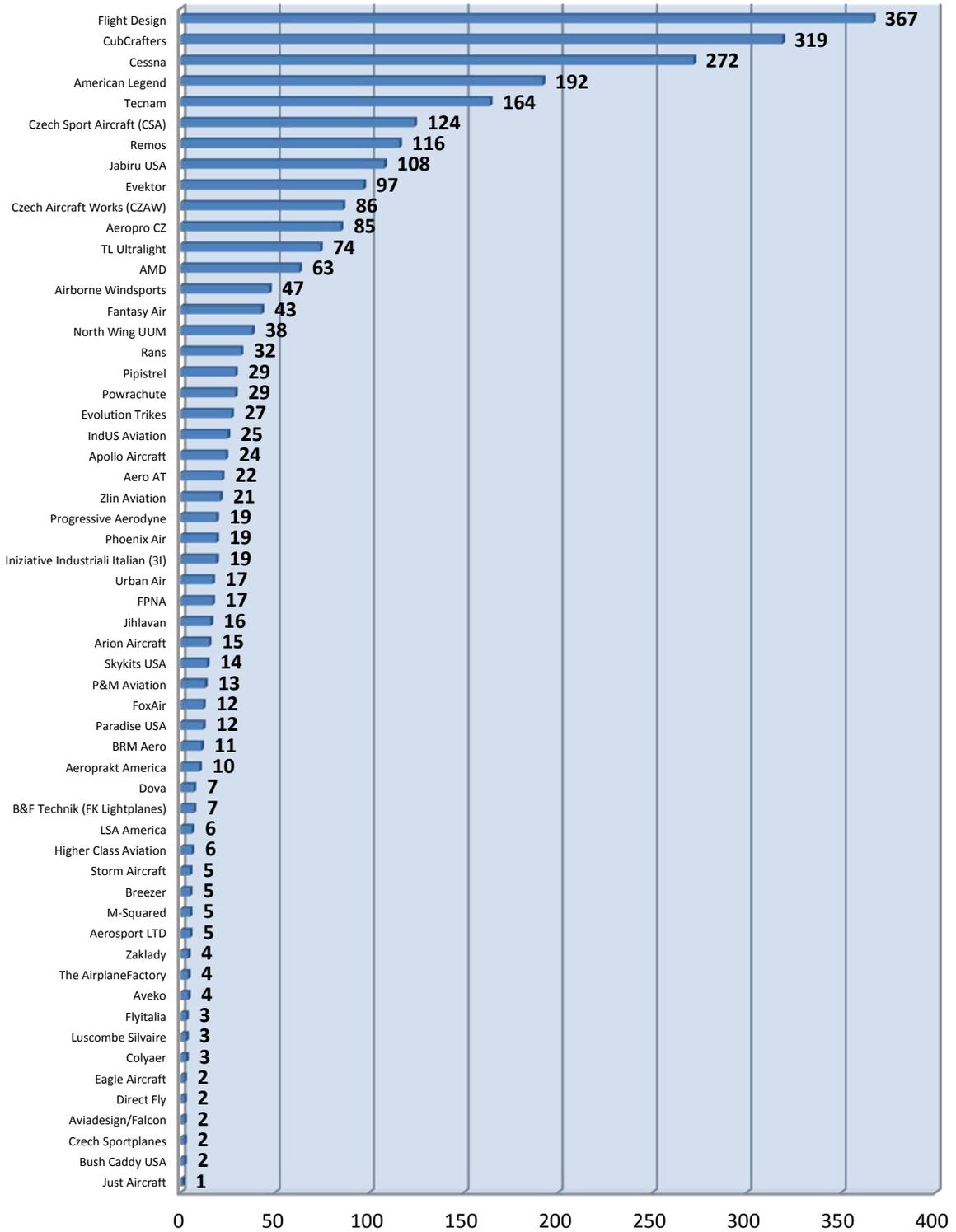


Top Eight Significant Cause/Effect Events – Fiscal Year Trends

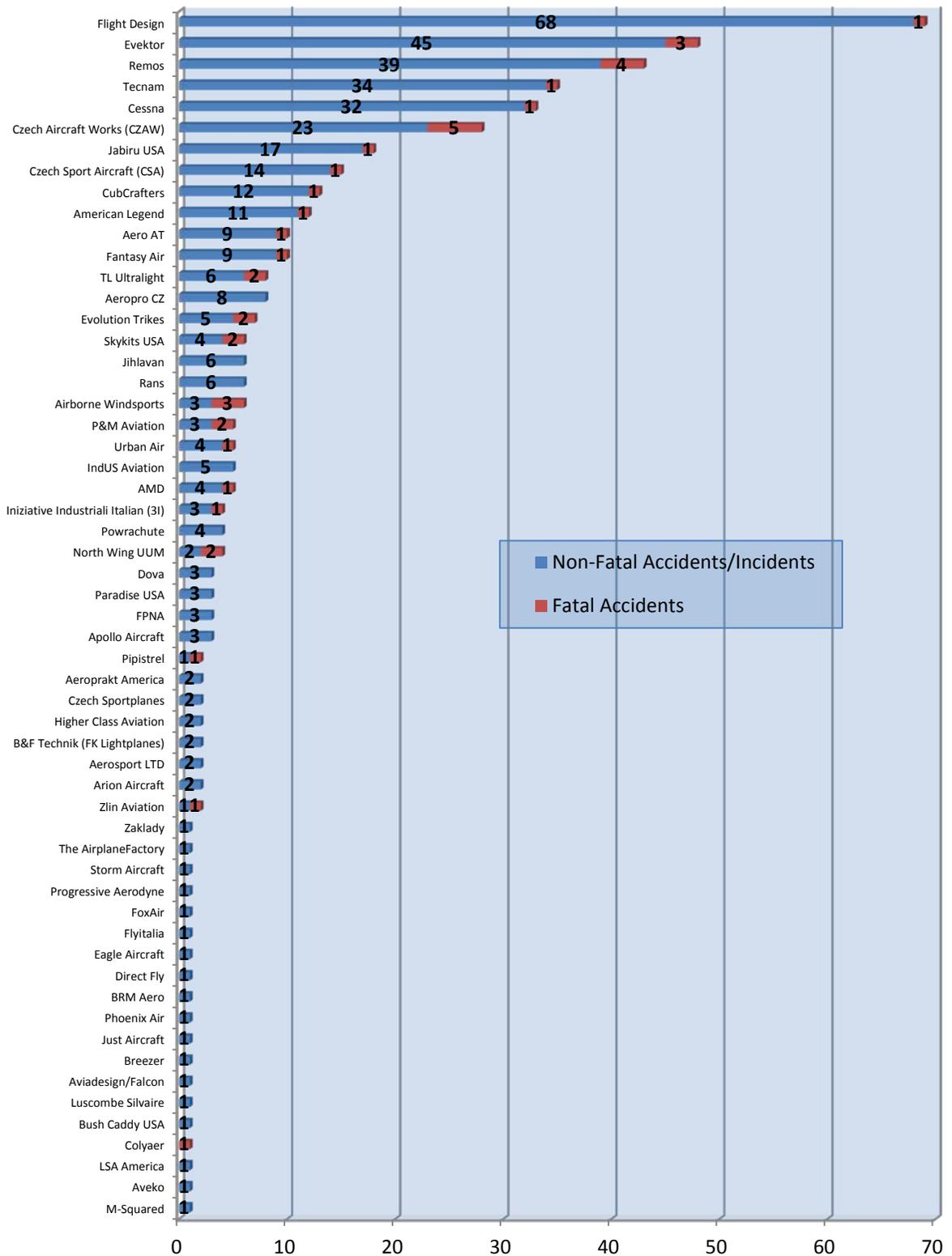


Total Aircraft By Manufacturer

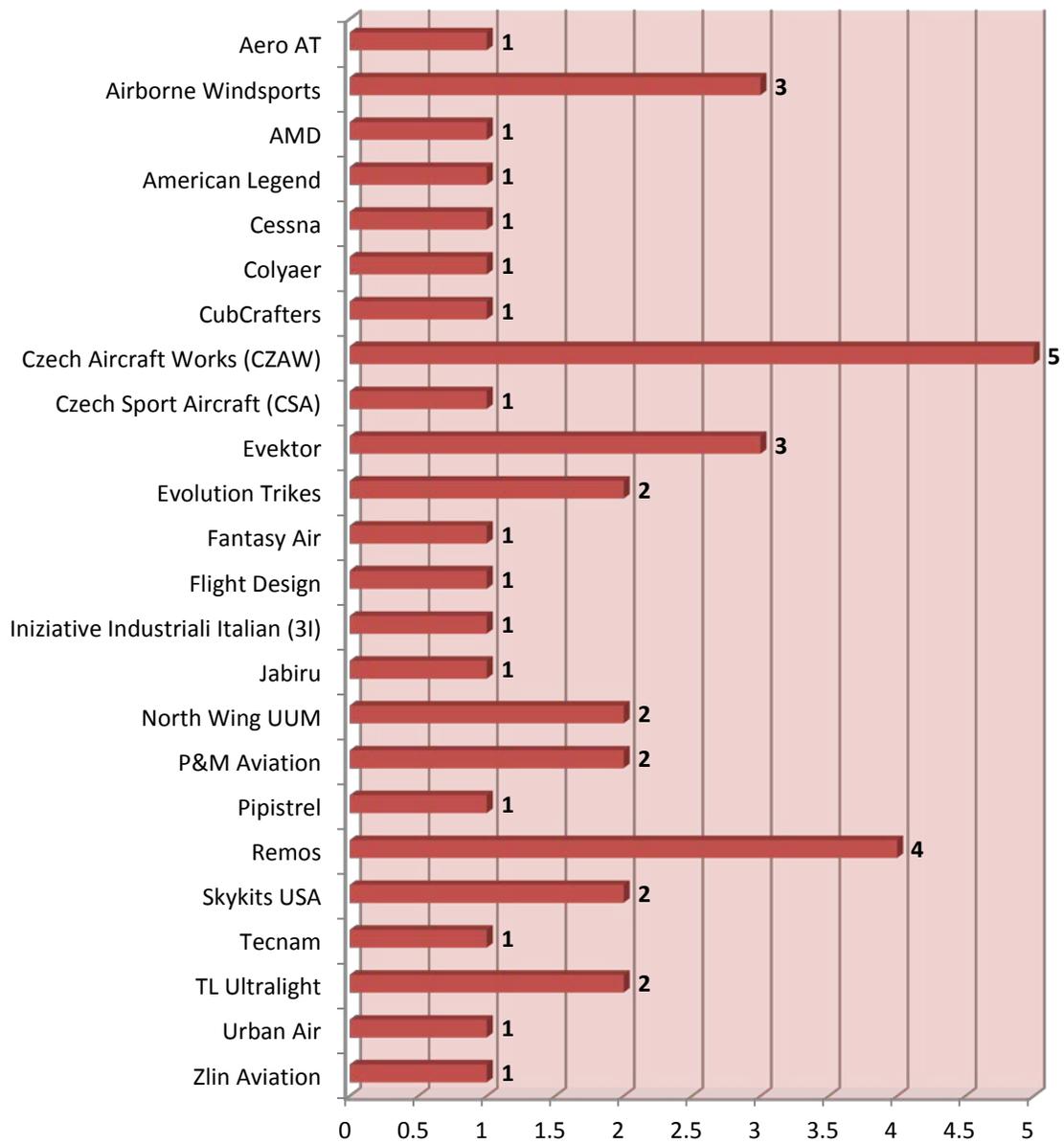
Manufacturers with aircraft involved in accidents/incidents. Based on FAA Aircraft Registry, AFS-750 data from October 2014 for **registration certificates issued**.



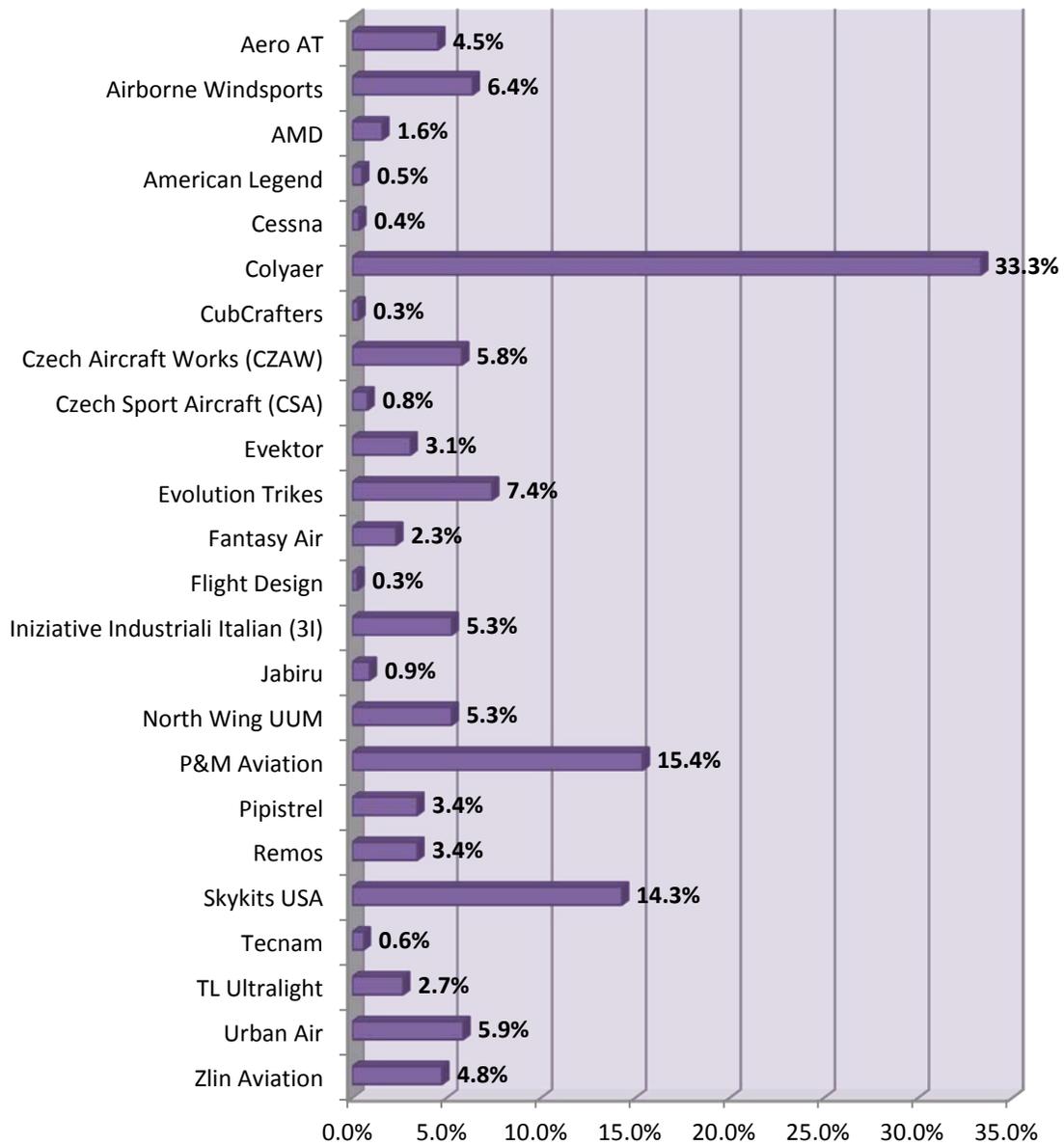
Total Accident/Incident Events By Manufacturer



Total Fatal Accidents By Manufacturer



Total Fatal Accidents By Manufacturer To Total Aircraft By Manufacturer



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.