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# Frequency of Specific Categories of Aviation Accidents and Incidents During 2001-2010

*Joni K. Evans*  
*Analytical Mechanics Associates, Inc., Hampton, Virginia*

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March 2014

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*Joni K. Evans*

*Analytical Mechanics Associates, Inc., Hampton, Virginia*

National Aeronautics and  
Space Administration

Langley Research Center  
Hampton, Virginia 23681-2199

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## Introduction

The primary purpose of the analysis reported here is to identify the types of accidents and incidents with the greatest impact on the overall safety risk in U.S. civil aviation. The safety risk is here defined to include five elements:

- the number of total accidents
- the number of fatal accidents
- the number of incidents
- the number of total injuries
- the number of fatal injuries

Accident types have been shown to vary considerably among different flight operations (e.g., large air carriers versus general aviation). For this reason, all analyses were done separately for four types of flight operations (Part 121, Scheduled Part 135, Non-Scheduled Part 135 and Part 91).

## Nomenclature

NTSB	National Transportation Safety Board
FAA	Federal Aviation Administration
CAST	Commercial Aviation Safety Team
ICAO	International Civil Aviation Organization
CICTT	CAST/ICAO Common Taxonomy Team
ARC	Abnormal Runway Contact
AMAN	Abrupt Maneuver
ADRM	Aerodrome
ATM	Air Traffic Management
BIRD	Bird Strike
CABIN	Cabin Safety Events
CTOL	Collision with Obstacle(s) during Takeoff and Landing
CFIT	Controlled Flight Into or toward Terrain
CWO-PL	Collision with Object – Precautionary Landing
CWT-PL	Collision with Terrain – Precautionary Landing
EVAC	Evacuation
EWT-PL	Encounter with Terrain – Precautionary Landing
FI-NI	Fire/Smoke Non-Impact
FI-POST	Fire/Smoke Post-Impact
FUEL	Fuel Related
GCOL	Ground Collision
ICE	Icing
INCAP	Pilot Incapacitation or Severe Impairment
LOC-G	Loss of Control – Ground
LOC-I	Loss of Control – In flight

LALT	Low Altitude Operations
MAC	Airprox/TCAS Alert/Loss of Separation/Near Mid-Air Collision/ Mid-Air Collision
PL-FUEL	Loss of Engine Power – Fuel Related (same as FUEL)
PL-OTHER	Loss of Engine Power – Other Reasons
PL-UNK	Loss of Engine Power – Unknown Reasons
RAMP	Ground Handling
RE or RUNEXC	Runway Excursion
RI-VAP	Runway Incursion – Vehicle, Aircraft or Person
SEC	Security Related
SCF-NP	System/Component Failure or Malfunction – Non-powerplant
SCF-PP	System/Component Failure or Malfunction – Powerplant
SCF-SLE	System/Component Failure or Malfunction (Stress Limits Exceeded)
TURB	Turbulence Encounter
UIMC	Unintended Flight in Instrument Meteorological Conditions
USOS	Undershoot/Overshoot
WSTRW	Windshear or Thunderstorm

## Data Sources

The National Transportation Safety Board (NTSB) is an independent federal agency that investigates every civil aviation accident in the United States and significant accidents in the other modes of transportation, conducts special investigations and safety studies, and issues safety recommendations to prevent future accidents. The information the NTSB investigators collect during their investigations of these aviation events resides in the NTSB Aviation Accident and Incident Data System. A copy of this database in Microsoft Access format was obtained from the Aviation Safety Information Analysis and Sharing (ASIAS) department of the Federal Aviation Administration's Office of Aviation Safety<sup>1</sup> in June 2012. At that point in time, the NTSB investigation was not complete for a substantial number of 2011 accidents, particularly those which occurred toward the end of the year. For this reason, all work on the database was restricted to 1987-2010, which was primarily an update of two years beyond the previous working version of the data. The update process requires several months of cross-checking various data elements and attempting to fill in any missing data, followed by the assignment of occurrence categories to each accident.

The NTSB database includes events involving a wide variety of aircraft (airplanes, helicopters, hot air balloons, gliders, ultralight, etc.) with operations conducted under various Federal Aviation Regulations (Part 91: General Aviation, Part 121: Commercial Air Carriers, Part 129: Foreign Air Carriers, Part 135: Commuters and On-Demand Air Taxis, Part 137: Agricultural Operations, etc.). In March 1997 a change was made in the Federal Aviation Regulations defining the requirements for Part 121 versus Part 135

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<sup>1</sup> [http://www.asias.faa.gov/portal/page/portal/asias\\_pages/asias\\_home/](http://www.asias.faa.gov/portal/page/portal/asias_pages/asias_home/)

operations. As a result, Part 121 regulations were applied to commuter operations with 10 or more passengers<sup>2</sup>.

The NTSB considers each event to be either an accident or an incident, under the following definitions:<sup>3</sup>

- Accident - an occurrence associated with the operation of an aircraft, which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage
- Incident - an occurrence other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations

Any injury or aircraft damage which occurs when there was no intent for flight (high speed taxi tests, movement of the aircraft around the airfield, maintenance run-ups, etc) is, by definition, an incident.

The NTSB does not investigate all incidents, but incidents as well as accidents are reported to the Federal Aviation Administration (an agency within the Department of Transportation) by pilots, airport personnel and private citizens. The FAA maintains a database with the information that they receive in these reports and collect in their investigations. A copy of the FAA's Accident/Incident Data System (AIDS) in Microsoft Access format was obtained from ASIAs in July of 2011, which was late enough in the year that nearly all incidents from 2010 had been investigated. The current working copy of the AIDS database includes incidents from 1985-2010.

Among the incidents in this dataset were some mid-air collisions and ground collisions between multiple aircraft. The AIDS database includes a record for each aircraft involved, unless the aircraft was parked and unoccupied. In order to reduce the analysis data set to one record for each incident, each of the incidents involving multiple aircraft was reviewed, and the report for the passive aircraft (i.e., the aircraft that was hit during the collision) was eliminated. This procedure was not followed for the accident data for two reasons. First, in an accident the level of aircraft damage and injury can vary substantially between the two aircraft involved. Secondly, in an incident, the blame most often lies with the moving aircraft, whereas in an accident more parties may be at fault.

All recorded accidents and incidents involving commercially built fixed-wing airplanes operating under FAR Part 121, Part 135 or Part 91 were included in these working datasets, regardless of whether the investigation is in a preliminary stage or finalized, and whether or not the event occurred within the United States. Amateur built or experimental aircraft were excluded, as were helicopters, ultra light aircraft, gliders and balloons. Also

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<sup>2</sup> National Transportation Safety Board. *Annual Review of Aircraft Accident Data US Air Carrier Operations, Calendar Year 1999, NTSB/ARC-02/03, PB2002-109241*, November 13, 2002, page 1.

<sup>3</sup> National Transportation Safety Board, "Government Information Locator Service (GILS): Aviation Accident Synopses" <http://ntsb.gov/Info/gils/gilssyn.htm>

excluded were sky diving incidents in which the main issue involved the parachute or the parachutist, rather than the aircraft carrying the sky divers or the pilot of that aircraft.

All of the accidents included in this report have been assigned occurrence categories based on the taxonomy developed by the Commercial Aviation Safety Team/International Civil Aviation Organization (CAST/ICAO) Common Taxonomy Team (CICTT)<sup>4</sup>. The author added a few categories to this taxonomy for non-transport accidents, and details on all categories can be found in Appendix A. The assignment of categories was performed by means of a computer program, based on the occurrence codes and causal factor codes in the NTSB database. During the assignment process, many of the more complicated accidents were reviewed by the author, and all of the fatal accidents for Part 121 and Scheduled Part 135 were reviewed by other NASA aviation safety systems analysis personnel. A particular accident might have been assigned multiple occurrence categories.

One CICTT specification was not followed; this was with regard to loss of control when a system/component failure/malfunction rendered the aircraft uncontrollable. The CICTT taxonomy states that the loss of control should not be considered as a separate category in these cases. However, this analysis retained the loss of control category in all circumstances, regardless of malfunctions, in order to capture all of the loss of control including those that followed system/component failure/malfunction or other circumstances (incapacitation, weather) that might have rendered the aircraft uncontrollable.

The incident data were not categorized using the occurrence taxonomy. A single incident category was assigned to each incident to describe the primary occurrence. For example, if a system/component failure or malfunction occurred, the incident was classified according to the system of the malfunction, regardless of any consequences (e.g., loss of control, gear up landing, runway excursion, etc.). Details regarding the incident classifications are available in another paper<sup>5</sup>. For the purposes of this analysis, the CICTT categories were mapped to the incident categories without additional review of the specific incident.

In 2008, the FAA revised the amount of data recorded for each incident, making the database even less informative. Some of the data fields are now blank for the most recent incidents. One of those fields was previously used to determine which of the Part 135 flights were scheduled and which were non-scheduled. As a result, it is not possible to present incident data separately for scheduled versus non-scheduled Part 135 among incidents later than 2007. For most of this report, the incident data are presented for all Part 135 combined, whereas the Part 135 accident data are separated for scheduled versus non-scheduled. The lone exception is Table 2, in which the incident data were restricted to 2001-2007 in order to present those results separately.

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<sup>4</sup> CAST/ICAO Common Taxonomy Team, "Aviation Occurrence Categories Definitions and Usage Notes, April 2011 (4.1.5)

<http://www.intlaviationstandards.org/Documents/CICTTOccurrenceCategoryDefinitions.pdf>.

<sup>5</sup> Evans, JK, "A Description of Aviation Incidents During the Years 1985-2006"; March 2009.



## Results and Discussion

Figure 1 shows the accident rate (per 1 million flight hours) over time for each of the three flight operation categories. Data for total flight hours per year were obtained from tables published by the NTSB, which they based on data from the FAA<sup>6</sup>. The lowest accident rates continue to be in Part 121 (large transports), while the highest rates are in Part 91 (general aviation). The greatest rate of decline during this ten-year time period was in Non-Scheduled Part 135 (On-Demand Air Taxis) while the greatest variation was in Scheduled Part 135 (Commuter Airlines). In general, these statements are also true of the fatal accident rate (see Figure 2) and the incident rate (see Figure 3).

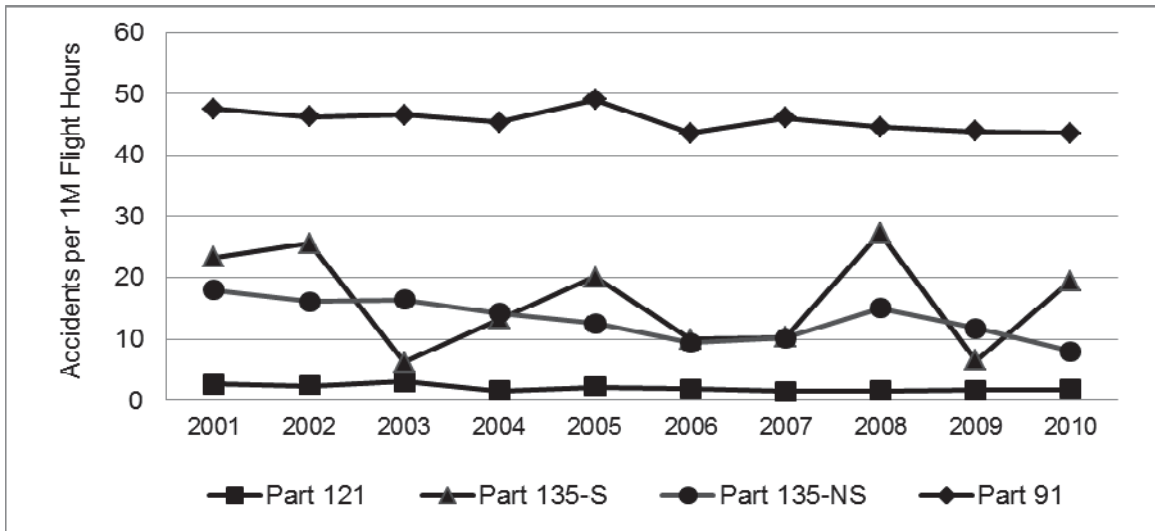


Figure 1. Accident Rate in Three Categories of Flight Operations (2001-2010).

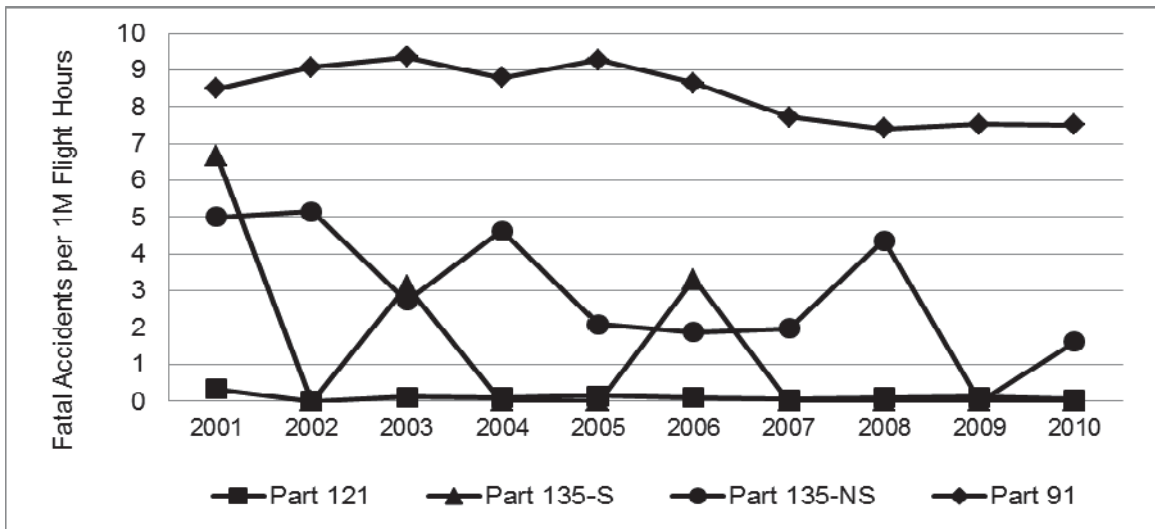


Figure 2. Fatal Accident Rate in Three Categories of Flight Operations (2001-2010).

<sup>6</sup> Tables 5, 8 and 9. [http://www.nts.gov/data/aviation\\_stats.html](http://www.nts.gov/data/aviation_stats.html)

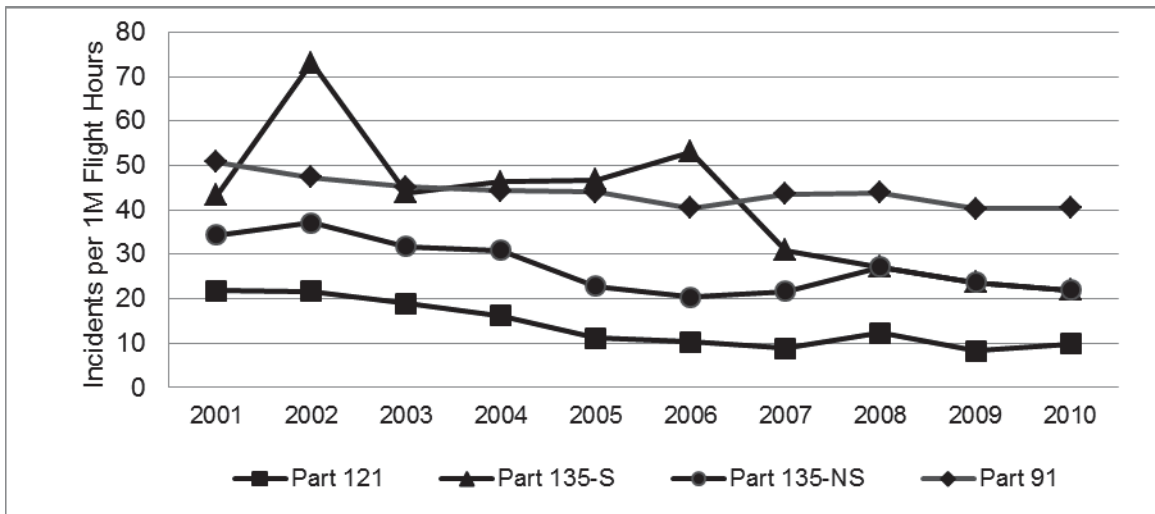


Figure 3. Incident Rate in Three Categories of Flight Operations (2001-2010).

The reader is reminded that the incident data were combined for scheduled and non-scheduled Part 135 in 2008-2010.

Although there is some indication of decline in both the total accident rate and fatal accident rate in every flight operations category, it is disturbing that the rates have remained so much higher in Part 135 and Part 91 relative to Part 121.

The frequencies for each CICTT occurrence category within each flight operations category are shown in a series of five large tables in Appendix B. The specifics of these tables are as follows:

- Table B-1 – Total accidents
- Table B-2 – Total injuries (fatal, serious or minor)
- Table B-3 – Fatal accidents
- Table B-4 – Total fatalities
- Table B-5 – Total incidents

The total number of accidents, incidents or injuries in a particular flight operations category also is provided in the tables. All of the percentages are based on these totals within the same category of flight operations. The reader is reminded that a particular accident might be assigned multiple occurrence categories. The additional categories that are not part of the official CICTT taxonomy are denoted with an asterisk (\*) and these are provided for informational purposes only. Although the tables are organized by outcome (accident, incident or injury) the discussion below is organized by flight operation. The top few occurrence categories within each flight operation were selected from each table. The actual number of categories selected varies among tables and flight operation, but in each case a clear demarcation in percentages exists to distinguish those selected from those not selected. Charts showing the frequency of total accidents and fatal accidents for each category of flight operations are in Appendix C.

## **Part 121**

Among Part 121 accidents, the only occurrence categories assigned to more than ten percent of the accidents were turbulence encounters (27%), ground handling (24%) and ground collisions (12%). In terms of total injuries, the largest percentages were claimed by post-impact fires (35%), in-flight loss of control (28%), abrupt maneuvering (22%), security (20%) and turbulence encounters (19%). The occurrence categories responsible for the largest percentage of fatal accidents were ground handling (29%), post-impact fires (24%), in-flight loss of control (24%) and security (19%). The largest percentages of total fatalities were claimed by post-impact fires (57%), in-flight loss of control (51%), the terrorist attacks of 9/11 (38%) and abrupt maneuvering (38%). Among Part 121 incidents, the only categories assigned to more than five percent of incidents were non-powerplant system/component failures (41%), powerplant system/component failures (13%) and ground handling (13%).

In summary, the following occurrence categories contributed the most to the overall safety risk in Part 121: abrupt maneuver, post-impact fires, ground collisions, ground handling, in-flight loss of control, non-powerplant system/component failures, powerplant system/component failures, security and turbulence encounters.

## **Scheduled Part 135**

The categories assigned to at least fifteen percent of the Scheduled Part 135 accidents were runway excursion (19%), in-flight loss of control (15%) and abnormal runway contact (15%). The occurrence categories with more than fifteen percent of the injuries were in-flight loss of control (33%), powerplant system/component failures (25%), CFIT (19%) and icing (17%). The only category with more than one fatal event was in-flight loss of control (3 events), and the categories with the highest levels of fatalities were in-flight loss of control (88%), icing (59%) and ground handling (18%). Among Part 135 incidents, the only categories assigned to more than ten percent of incidents were non-powerplant system/component failures (41%) and powerplant system/component failures (12%).

In summary, the following occurrence categories made the largest contribution to the overall safety risk in Scheduled Part 135: abnormal runway contact, CFIT, ground handling, icing, in-flight loss of control, runway excursion, powerplant system/component failures and non-powerplant system/component failures.

## **Non-Scheduled Part 135**

The top five categories in Non-Scheduled Part 135 accidents were in-flight loss of control (17%), runway excursion (16%), non-powerplant system/component failures (15%), post-impact fires (12%) and abnormal runway contact (12%). The occurrence categories responsible for more than fifteen percent of the injuries were in-flight loss of control

(31%), post-impact fires (27%) and CFIT (22%). Similarly, the top three categories in terms of both fatal events and fatalities were in-flight loss of control (41% of fatal events and 39% of fatalities), post-impact fires (37% of fatal events and 32% of fatalities) and CFIT (31% of fatal events and 32% of fatalities). The only categories responsible for more than ten percent of Part 135 incidents were non-powerplant system/component failures (41%) and powerplant system/component failures (12%).

In summary, the following occurrence categories made the largest contribution to the overall safety risk in Non-Scheduled Part 135: abnormal runway contact, CFIT, post-impact fires, in-flight loss of control, runway excursion, powerplant system/component failures and non-powerplant system/component failures.

## **Part 91**

The top five categories in Part 91 accidents were runway excursion (21%), in-flight loss of control (20%), on-ground loss of control (16%), abnormal runway contact (14%) and fuel related loss of engine power (11%). The categories with more than twelve percent of total injuries were in-flight loss of control (41%), post-impact fires (24%) and fuel related loss of engine power (14%). In terms of both fatal events and fatalities, the top five categories were in-flight loss of control (57% of fatal events and 58% of fatalities), post-impact fires (37% and 38%), low altitude operations (15% and 14%), CFIT (13% of both fatal events and fatalities) and unintended flight in IMC (11% of both fatal events and fatalities). The top four categories in Part 91 incidents were abnormal runway contact (27%), non-powerplant system/component failures (26%), runway excursion (10%) and powerplant system/component failures (9%).

In summary, the following occurrence categories made the largest contribution to the overall safety risk in Part 91: abnormal runway contact, CFIT, post-impact fires, low altitude operations, in-flight loss of control, on-ground loss of control, fuel related loss of engine power, runway excursion, powerplant system/component failures, non-powerplant system/component failures and unintended flight in IMC.

Table 1 summarizes the impact of each of the occurrence categories that were found to be top contributors to the safety risk within each flight operations category. The absence of summary statistics for a particular occurrence category within a particular flight operations category should not lead the reader to conclude that there were no events within that operation category that were assigned to that occurrence category. Rather, the number of events assigned to that occurrence category was not large enough for it to be considered a major contributor to the safety risk. The following abbreviations were used:

- TA - Total Accidents
- TAI - Total Accident Injuries
- FA - Fatal Accidents
- TF - Total Fatalities
- TI - Total Incidents

Table 1. Most Frequently Cited CICTT Occurrence Categories (2001-2010)

CICTT Occurrence Category	Part 121	Scheduled Part 135	Non-Scheduled Part 135	Part 91
Abrupt Maneuver	22% of TAI 38% of TF			
Abnormal Runway Contact		15% of TA	12% of TA	14% of TA 27% of TI
Controlled Flight Into Terrain		19% of TAI	22% of TAI 31% of FA 32% of TF	13% of FA 13% of TF
Fire – Post Impact	35% of TAI 24% of FA 57% of TF		12% of TA 27% of TAI 37% of FA 32% of TF	24% of TAI 37% of FA 38% of TF
Ground Collision	12% of TA			
Ground Handling	24% of TA 29% of FA 13% of TI	18% of TF		
Icing		17% of TAI 59% of TF		
Low Altitude Maneuvering				15% of FA 14% of TF
Loss of Control – On Ground/Water				16% of TA
Loss of Control – In Flight	28% of TAI 24% of FA 51% of TF	15% of TA 33% of TAI 75% of FA 88% of TF	17% of TA 31% of TAI 41% of FA 39% of TF	20% of TA 41% of TAI 57% of FA 58% of TF
Fuel Related Loss of Engine Power				11% of TA 14% of TAI
Runway Excursion		19% of TA	16% of TA	21% of TA 10% of TI
SCF – Powerplant	13% of TI	25% of TAI 12% of TI	12% of TI	9% of TI
SCF – Non Powerplant	41% of TI	41% of TI	15% of TA 41% of TI	26% of TI
Security Related	20% of TAI 19% of FA 38% of TF			
Turbulence Encounter	27% of TA 19% of TAI			
Unintended Flight in IMC				11% of FA 11% of TF

One accident (AA587 on 12NOV01) with abrupt maneuvering (which led to the failure of the vertical stabilizer and a total loss of control) was responsible for 38% of the Part 121 fatalities in this time period. This was the same number of people killed earlier that month in four aircraft on 9/11. It was only one accident, but it highlights the need for stringent and comprehensive flight training.

Abnormal runway contact is a major contributor to the safety risk in Part 135 and Part 91 based mostly on the percentage of total accidents (12% and 15%), but it is also a minor contributor for Part 121 (10% of total accidents).

Controlled flight into terrain (CFIT) is a major contributor to the safety risk for all operations except Part 121. Safety enhancements such as EGPWS (Enhanced Ground Proximity Warning System) have been invaluable. Compared with a similar analysis for 1997-2006 data<sup>7</sup>, it appears the risk may be shrinking among Scheduled Part 135, but rising among Non-Scheduled Part 135.

Post-impact fire is a major contributor for all operations except Scheduled Part 135. 24-37% of fatal accidents and 32-57% of all fatalities occur in accidents with post-impact fires.

Ground collision accidents accounted for twelve percent of Part 121 accidents and ten percent of Scheduled Part 135 accidents, but outside of Part 91 operations did not result in a fatality during this time period.

Ground handling accidents are most common in Part 121. Five of the six Part 121 ground handling fatal accidents resulted in only one fatality.

Icing affects mostly Scheduled Part 135 flights. It is interesting to note that, based on a review of the accident database, 85 percent of the Scheduled Part 135 accidents occurred in Alaska (41 of 48), compared with 8 percent of the other flight operation categories (941/11680). Similarly, two of the four fatal accidents in Scheduled Part 135 occurred in Alaska, compared with 4 percent of the other flight operations (81/2121).

In-flight loss of control is an important part of the safety risk due more to the number of injuries, especially fatal injuries, than to the number of accidents. This category is one of three to have a major impact on all four flight operations in this time period. In-flight loss of control is so likely to result in injury or substantial aircraft damage that it is rarely seen among incidents. When an incident does include in-flight loss of control, the loss of control is nearly always preceded by system/component failure/malfunction or severe weather, and control is regained prior to a collision.

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<sup>7</sup> Jones SM, Reveley, MS, Withrow C, Evans, JK, Barr LC, Leone, K. "Systems Analysis of NASA Aviation Safety Program: Final Report"; October 2013

Runway excursion accounts for 16-21 percent of accidents outside Part 121. However, runway excursion in Part 121 results in higher percentages of injuries (12%), fatal accidents (10%) and fatalities (7%) than are seen in Part 135 or Part 91.

The major contribution of both powerplant and non-powerplant system/component failures/malfunctions to the safety risk is in terms of incidents. However, 25% of all injuries in Scheduled Part 135 accidents are attributed to powerplant SCFM and 15% of Non-Scheduled Part 135 accidents are attributed to non-powerplant SCFM.

The security occurrence category is a major contributor to the safety risk only in Part 121 operations.

Similarly, encounters with turbulence account for less than seven percent of any kind of accidents or injuries in flight operations other than Part 121. However, in Part 121 flights, turbulence is responsible for 27% of accidents and 19% of injuries, making it the single largest cause of accidents in this operations category.

Unintended flight in IMC conditions was added to the CAST/ICAO taxonomy in May of 2011. This type of accident is primarily an issue for Part 91 flights, accounting for 11% of fatal accidents and 11% of fatalities.

These seventeen accident categories collectively were assigned to 88% of the accidents during 2001-2010 (Part 121: 89%; Scheduled Part 135: 83%; Non-Scheduled Part 135: 84%; Part 91:88%); 93% of the fatal accidents (Part 121: 90%; Scheduled Part 135: 100%; Non-Scheduled Part 135: 88%; Part 91:93%) and 88% of incidents (Part 121: 81%; Part 135: 86%; Part 91: 89%).

Since several occurrence categories are major contributors to the safety risk for only one flight operations category, Table 2 shows the percentage of accidents or incidents that have been assigned to the set of occurrence categories specific to that category of flight operations. For the incidents only, Part 135 operations were restricted to 2001-2007, in order to maintain the separation between Scheduled and Non-Scheduled flights.

Table 2. Number of Events Assigned to At Least One of the Most Frequent CICTT Occurrence Categories Within Each Category of Flight Operations (2001-2010)

Type of Outcome	Part 121	Scheduled Part 135	Non-Scheduled Part 135	Part 91
Total Accidents	289 (77.5%)	31 (64.6%)	282 (66.2%)	9222 (84.8%)
Total Injuries	1151 (87.7%)	50 (78.1%)	332 (74.8%)	7183 (86.0%)
Fatal Accidents	17 (81.0%)	4 (100.%)	76 (80.0%)	1833 (91.4%)
Fatal Injuries	692 (99.3%)	17 (100.%)	178 (77.1%)	3522 (89.2%)
Incidents *	1920 (75.7%)	79 (79.0%)	442 (67.6%)	8455 (80.5%)

\*For this table only, Part 135 incident data was restricted to 2001-2007.

## **Conclusions**

This analysis has determined four groups of occurrence categories (with between seven and eleven categories per group) that contribute greatly to the safety risk within each of the flight operations categories. Collectively, the occurrence categories in these groups represent 88% of accidents and 88% of incidents. Individually, these groups represent 65-85% of accidents and 68-81% of incidents. In general, the occurrence categories that are most important to the safety risk across all categories of flight operations are in-flight loss of control and system/component failure/malfunction.



## Appendix A

### Aviation Occurrence Categories

The CAST/ICAO Common Taxonomy Team (CICTT) was jointly chartered by the International Civil Aviation Organization (ICAO) and the Commercial Aviation Safety Team (CAST), and was charged with developing common taxonomies and definitions for aviation accident and incident reporting systems (for additional information see <http://www.intlaviationstandards.org/>). The occurrence categories are listed below, with brief descriptions of each. The information is taken from a document dated October 2008.

### **CICTT Categories**

**Abnormal Runway Contact (ARC):** Any takeoff or landing involving abnormal contact with the runway or landing surface. Included are hard/heavy landings, long/fast landings, crabbed landings, nose wheel first touchdowns, tail strikes, wing/nacelle strikes and gear up landings.

**Abrupt Maneuver (AMAN):** The intentional abrupt maneuvering of the aircraft (in-flight or on-ground) by the flight crew to avoid a collision with terrain, objects, weather or other aircraft.

**Aerodrome (ADRM):** Occurrences involved aerodrome design, service or functionality issues. The aerodrome includes runways, taxiways, ramp areas, parking areas, buildings and structures, lighting, signage Crash/Fire/Rescue (CFR) services.

**ATM/CNS (ATM):** Occurrences involving air traffic management (ATM) or communication, navigation or surveillance (CNS) service issues.

**Bird Strike (BIRD):** Occurrences involving collisions or near collisions with bird(s) or wildlife.

**Cabin Safety Events (CABIN):** Includes significant events in the passenger cabin, related to carry-on baggage, supplemental oxygen, missing/non-operational emergency equipment, the inadvertent deployment of emergency equipment, and the medical emergency (not caused by turbulence encounters) of persons other than the flight crew or medical evacuation patients.

**Collision with Obstacle(s) during Takeoff and Landing (CTOL):** A collision with an object or obstacle during airborne phases of take-off or landing.

**Controlled Flight Into or toward Terrain (CFIT):** In-flight collision or near collision with terrain, water or obstacle without indication of loss of control. Excludes intentional low altitude operations, intentional flight into terrain and runway undershoot/overshoot.

**Evacuation (EVAC):** Occurrences including one or more of the following: an unnecessary evacuation was performed, person(s) were injured during the evacuation, evacuation equipment failed to perform as required, or the evacuation was a factor in the outcome.

External Load Related Occurrences (EXTL): Occurrences during or as a result of external load or external cargo operations. Includes cases where external load or the load lifting equipment contacts terrain, water surface or objects.

Fire/Smoke Non-Impact (FI-NI): Fire or smoke in the aircraft (in-flight or on-ground) which was not the result of an impact.

Fire/Smoke Impact (FI-POST): Fire or smoke resulting from impact.

Fuel Related (FUEL): One or more powerplants experienced reduced or no power output due to fuel exhaustion (no usable fuel on board), fuel starvation (usable fuel is not available to the engine), fuel contamination (by water, sand, dirt, bugs) or wrong fuel, or carburetor and/or induction icing.

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.

Ground Handling (RAMP): Occurrences during (or as a result of) ground operations, including preflight configuration errors that lead to subsequent events (such as improperly latched doors, pitot tube contamination, or weight/balance issues).

Ground Collision (GCOL): Collision with an aircraft, person, animal, ground vehicle, building, etc., while taxiing to or from the runway in use.

Icing (ICE): The accumulation of snow, ice, freezing rain or frost on aircraft surfaces to the extent that aircraft control or performance is adversely affected.

Loss of Control – Ground (LOC-G): Loss of aircraft control while the aircraft is on the ground, which may result from a contaminated runway, evasive action due to a runway incursion, or the failure or malfunction of a system or component.

Loss of Control – In flight (LOC-I): Loss of aircraft control while in flight; may occur in Instrument Meteorological Conditions (IMC) or Visual Meteorological Conditions (VMC).

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 attitude, namely sailplanes, gliders, hang gliders, and paragliders, balloons and airships.

Low Altitude Operations (LALT): Collision or near collision with terrain/objects/obstacles while intentionally operating near the surface (excludes landing and takeoff phases). Includes aerobatics, sight-seeing, aerial photography, aerial application, scud running, and flying in close proximity to mountains or box canyons where the aircraft aerodynamic capability is not sufficient to avoid impact.

Airprox/TCAS Alert/Loss of Separation/Near Mid-Air Collision/Mid-Air Collision (MAC): Airprox, TCAS alerts and loss of separation, as well as near collisions or collisions between aircraft in flight.

Other (OTHER): Any occurrence not covered under another category.

Runway Excursion (RE): A veer off the side or overrun off the end of the runway.

Runway Incursion – Animal (RI-A): Collision with, risk of collision with, or evasive action taken by an aircraft to avoid an animal (other than birds) on the runway in use.

Runway Incursion – Vehicle, Aircraft or Person (RI-VAP): The incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for takeoffs or landings.

Security Related (SEC): Criminal or security related acts such as hijacking, aircraft theft, flight control interference, sabotage or suicide.

System/Component Failure or Malfunction – Non-powerplant (SCF-NP): Failure or malfunction of an aircraft system or component other than the powerplant.

System/Component Failure or Malfunction – Powerplant (SCF-PP): Failure or malfunction of an aircraft system or component related to the powerplant.

Turbulence Encounter (TURB): In flight encounter with turbulence; includes clear-air or cloud turbulence, mountain wave and wake vortex.

Unintended Flight in Instrument Meteorological Conditions (UIMC): Applicable if the pilot was flying according to Visual Flight Rules (VFR), and by any reason found oneself inadvertently in IMC. Only to be used if pilot not qualified to fly in IMC and/or aircraft not equipped to fly in IMC, and only in the case of a loss of visual references.

Undershoot/Overshoot (USOS): A touchdown off the runway surface but in close proximity to the runway. Excludes off-airport emergency landings.

Unknown or Undetermined (UNK): Insufficient information exists to categorize the accident; includes missing aircraft.

Windshear or Thunderstorm (WSTRW): Flight into windshear or thunderstorm; includes hail and heavy rain.

### **Additional Categories**

Many of the following categories were added in order to completely capture the event sequence. An emergency landing is required in most cases of System/Component

Failure/Malfunction and Loss of Engine Power, and may be performed after an encounter with adverse weather; this landing often is not without further incident. Control of the aircraft may be lost, hard or bounced landings may occur, terrain unsuitable for a proper landing may be encountered, the aircraft may collide with power lines, fences or ground vehicles during an off-airport landing, the aircraft may be unable to avoid rising terrain due to degraded performance. The single category of “Loss of Engine Power” is not sufficient to explain why the aircraft was destroyed.

Several categories (collisions with terrain or objects and loss of control) were further subdivided by general phase of flight (ground, takeoff, in flight, approach/landing) because either the root cause or the consequences of the occurrence differ by phase of flight.

Collision with Object – Precautionary Landing (CWO-PL): A collision with an object or obstacle occurred during a precautionary landing approach. CFIT is not an appropriate category in these cases because a system/component failure/malfunction or non-mechanical loss of engine power necessitated the landing.

Collision with Terrain – Precautionary Landing (CWT-PL): A collision with terrain occurred during a precautionary landing approach. CFIT is not an appropriate category in these cases because a system/component failure/malfunction or non-mechanical loss of engine power necessitated the landing. This code was also used in cases where the pilot “ditched” the aircraft in water.

Encounter with Terrain – Precautionary Landing (EWT-PL): An encounter with terrain occurred on the ground away from an airport environment during a precautionary landing, causing damage to the aircraft. The difference between this category and CWT-PL is primarily the force with which the aircraft strikes the ground at touchdown. An encounter with terrain involves a normal touchdown, with rough terrain encountered during the landing roll. Included here are intentional gear-up off-airport landings.

Pilot Incapacitation or Severe Impairment (INCAP): Pilot became incapacitated (due to illness or fatigue) or severely impaired (due to illness, alcohol or illegal drugs). Does not include minor impairment caused by fatigue or the use of unapproved prescription medications.

Loss of Engine Power – Fuel Related (PL-FUEL): Loss of engine power due to fuel exhaustion (no usable fuel on board), fuel starvation (usable fuel is not available to the engine), fuel contamination (by water, sand, dirt, bugs) or wrong fuel, or carburetor and/or induction icing (see FUEL above).

Loss of Engine Power – Other Reasons (PL-OTHER): Loss of engine power due to other non-mechanical reasons. Reasons include foreign object damage (e.g. bird strikes), ice ingestion, improper simulated engine out procedures, other improper procedures.

Loss of Engine Power – Unknown Reasons (PL-UNK): Loss of engine power occurred but the exact cause was undetermined.

SCF-SLE: Structural failure due to exceeding the designed stress limits of the aircraft, most often resulting from loss of control, from forces associated with severe weather or from pilot actions such as excessive airspeed or abrupt maneuvering.

## Appendix B

Tables of the Frequencies of Total Accidents, Total Injuries,  
Fatal Accidents, Fatal Injuries and Incidents  
by Aviation Occurrence Categories

Table B-1. Number of Accidents by CICTT Occurrence Category (2001-2010)

CICTT Occurrence Category	Part 121	Scheduled Part 135	Non-Scheduled Part 135	Part 91
Total Accidents	373	48	426	10881
Abrupt Maneuver	12 ( 3.2%)	0 ( 0.0%)	2 ( 0.5%)	53 ( 0.5%)
Abnormal Runway Contact	36 ( 9.7%)	7 (14.6%)	49 (11.5%)	1549 (14.2%)
Aerodrome	3 ( 0.8%)	2 ( 4.2%)	15 ( 3.5%)	122 ( 1.1%)
Air Traffic Management	9 ( 2.4%)	2 ( 4.2%)	6 ( 1.4%)	64 ( 0.6%)
Bird Strikes	15 ( 4.0%)	2 ( 4.2%)	6 ( 1.4%)	42 ( 0.4%)
Cabin Safety or Pilot Incapacitation	4 ( 1.1%)	0 ( 0.0%)	4 ( 0.9%)	134 ( 1.2%)
Controlled Flight Into Terrain	2 ( 0.5%)	3 ( 6.3%)	42 ( 9.8%)	346 ( 3.2%)
Collision with Object – Takeoff or Landing	1 ( 0.3%)	2 ( 4.2%)	14 ( 3.3%)	384 ( 3.5%)
Collision with Object – Precautionary Landing *			16 ( 3.7%)	1019 ( 9.4%)
Collision with Terrain – Precautionary Landing *	2 ( 0.5%)	1 ( 2.1%)	18 ( 4.2%)	449 ( 4.1%)
Encounter with Terrain – Precautionary Landing *	1 ( 0.3%)	2 ( 4.2%)	12 ( 2.8%)	658 ( 6.0%)
Evacuation	17 ( 4.6%)	1 ( 2.1%)	1 ( 0.3%)	
Fire – Non-Impact	11 ( 2.9%)	2 ( 4.2%)	8 ( 1.9%)	113 ( 1.0%)
Fire – Post Impact	12 ( 3.2%)	2 ( 4.2%)	51 (12.0%)	990 ( 9.1%)
Ground Collision	46 (12.3%)	5 (10.4%)	26 ( 6.1%)	244 ( 2.2%)
Ground Handling or PreFlight	88 (23.6%)	3 ( 6.3%)	24 ( 5.6%)	259 ( 2.4%)
Icing	3 ( 0.8%)	3 ( 6.3%)	23 ( 5.4%)	117 ( 1.1%)
Low Altitude Operations			11 ( 2.6%)	520 ( 4.8%)
Loss of Control – In Flight	8 ( 2.1%)	7 (14.6%)	73 (17.1%)	2129 (19.6%)
Loss of Control – On Ground		4 ( 8.3%)	35 ( 8.5%)	1711 (15.7%)
Mid Air Collision	1 ( 0.3%)		5 ( 1.2%)	114 ( 1.0%)
Power Loss – Fuel	1 ( 0.3%)	1 ( 2.1%)	23 ( 5.4%)	1235 (11.4%)
Power Loss – Other Reason *				71 ( 0.7%)
Power Loss – Unknown Reason *			18 ( 4.2%)	702 ( 6.5%)
Runway Excursion	27 ( 7.2%)	9 (18.8%)	69 (16.2%)	2327 (21.4%)
Runway Incursion (Animal, Vehicle, Aircraft or Person)	3 ( 0.8%)		5 ( 1.2%)	107 ( 1.0%)
SCF – Powerplant	9 ( 2.4%)	4 ( 8.3%)	22 ( 5.2%)	643 ( 5.9%)
SCF – Non Powerplant	29 ( 7.8%)	4 ( 8.3%)	63 (14.8%)	784 ( 7.2%)
SCF – Stress Limits Exceeded*			3 ( 0.7%)	81 ( 0.7%)
Security Related	4 ( 1.1%)			27 ( 0.2%)
Turbulence Encounter	101 (27.1%)	2 ( 4.2%)	3 ( 0.7%)	68 ( 0.6%)
Thunderstorm or Windshear	2 ( 0.5%)		6 ( 1.4%)	130 ( 1.2%)
Undershoot or Overshoot	1 ( 0.3%)	1 ( 2.1%)	9 ( 2.1%)	210 ( 1.9%)
Unintended Flight in IMC		2 ( 4.2%)	11 ( 2.6%)	259 ( 2.4%)
Other	3 ( 0.8%)		9 ( 2.1%)	53 ( 0.5%)
Unknown or Undetermined	2 ( 0.5%)		10 ( 2.3%)	72 ( 0.7%)



Table B-2. Number of Injuries in Accidents by CICTT Occurrence Category (2001-2010)

CICTT Occurrence Category	Part 121	Scheduled Part 135	Non-Scheduled Part 135	Part 91
Total Injuries	1312	64	444	8349
Abrupt Maneuver	288 (22.0%)		1 ( 0.2%)	67 ( 0.8%)
Abnormal Runway Contact	54 ( 4.1%)	0 ( 0.0%)	19 ( 4.3%)	322 ( 3.9%)
Aerodrome	0 ( 0.0%)	2 ( 3.1%)	1 ( 0.2%)	19 ( 0.2%)
Air Traffic Management	5 ( 0.4%)	1 ( 1.6%)	6 ( 1.4%)	74 ( 0.9%)
Bird Strikes	6 ( 0.5%)	0 ( 0.0%)	3 ( 0.7%)	14 ( 0.2%)
Cabin Safety or Pilot Incapacitation	4 ( 0.3%)		5 ( 1.1%)	202 ( 2.4%)
Controlled Flight Into Terrain	18 ( 1.4%)	12 (18.8%)	98 (22.1%)	665 ( 8.0%)
Collision with Object – Takeoff or Landing	0 ( 0.0%)	9 (14.1%)	12 ( 2.7%)	360 ( 4.3%)
Collision with Object – Precautionary Landing *			24 ( 5.4%)	1026 (12.2%)
Collision with Terrain – Precautionary Landing *	13 ( 1.0%)	8 (12.5%)	25 ( 5.6%)	519 ( 6.2%)
Encounter with Terrain – Precautionary Landing *	5 ( 0.4%)	6 ( 9.4%)	8 ( 1.8%)	378 ( 4.5%)
Evacuation	106 ( 8.1%)	8 (12.5%)	6 ( 1.4%)	
Fire – Non-Impact	34 ( 2.6%)	0 ( 0.0%)	4 ( 0.9%)	73 ( 0.9%)
Fire – Post Impact	461 (35.1%)	3 ( 4.7%)	118 (26.6%)	1985 (23.8%)
Ground Collision	19 ( 1.4%)	1 ( 1.6%)	1 ( 0.2%)	28 ( 0.3%)
Ground Handling or PreFlight	66 ( 5.0%)	3 ( 4.7%)	39 ( 8.8%)	338 ( 4.0%)
Icing	52 ( 4.0%)	11 (17.2%)	27 ( 6.1%)	172 ( 2.1%)
Low Altitude Operations			25 ( 5.6%)	816 ( 9.8%)
Loss of Control – In Flight	361 (27.5%)	21 (32.8%)	139 (31.3%)	3459 (41.4%)
Loss of Control – On Ground		0 ( 0.0%)	21 ( 4.7%)	413 ( 4.9%)
Mid Air Collision	0 ( 0.0%)		2 ( 0.5%)	286 ( 3.4%)
Power Loss – Fuel	2 ( 0.2%)	0 ( 0.0%)	39 ( 8.8%)	1174 (14.1%)
Power Loss – Other Reason *				73 ( 0.9%)
Power Loss – Unknown Reason *			18 ( 4.1%)	703 ( 8.4%)
Runway Excursion	162 (12.3%)	3 ( 4.7%)	42 ( 9.5%)	560 ( 6.7%)
Runway Incursion (Animal, Vehicle, Aircraft or Person)	0 ( 0.0%)		2 ( 0.5%)	16 ( 0.2%)
SCF – Powerplant	28 ( 2.1%)	16 (25.0%)	23 ( 5.2%)	575 ( 6.9%)
SCF – Non Powerplant	94 ( 7.2%)	0 ( 0.0%)	43 ( 9.7%)	284 ( 3.4%)
SCF – Stress Limit Exceeded *			3 ( 0.7%)	196 ( 2.3%)
Security Related	265 (20.2%)			29 ( 0.3%)
Turbulence Encounter	251 (19.1%)	4 ( 6.3%)	8 ( 1.8%)	83 ( 1.0%)
Thunderstorm or Windshear	0 ( 0.0%)		9 ( 2.0%)	188 ( 2.3%)
Undershoot or Overshoot	0 ( 0.0%)	0 ( 0.0%)	7 ( 1.6%)	82 ( 1.0%)
Unintended Flight in IMC		4 ( 6.3%)	19 ( 4.3%)	515 ( 6.2%)
Other	0 ( 0.0%)		3 ( 0.7%)	23 ( 0.3%)
Unknown or Undetermined	4 ( 0.3%)		26 ( 5.9%)	130 ( 1.6%)

Table B-3. Number of Fatal Accidents by CICTT Occurrence Category (2001-2010)

CICTT Occurrence Category	Part 121	Scheduled Part 135	Non-Scheduled Part 135	Part 91
Total Fatal Accidents	21	4	95	2005
Abrupt Maneuver	1 ( 4.8%)			27 ( 1.3%)
Abnormal Runway Contact			1 ( 1.1%)	26 ( 1.3%)
Aerodrome				1 ( 0.1%)
Air Traffic Management			2 ( 2.1%)	33 ( 1.6%)
Bird Strikes				2 ( 0.1%)
Cabin Safety or Pilot Incapacitation			4 ( 4.2%)	101 ( 5.0%)
Controlled Flight Into Terrain	1 ( 4.8%)		29 (30.5%)	265 (13.2%)
Collision with Object – Takeoff or Landing			1 ( 4.1%)	69 ( 3.4%)
Collision with Object – Precautionary Landing *			2 ( 2.1%)	121 ( 6.0%)
Collision with Terrain – Precautionary Landing *	2 ( 9.5%)	1 (25.0%)	3 ( 3.2%)	75 ( 3.7%)
Encounter with Terrain – Precautionary Landing *				7 ( 0.3%)
Evacuation		1 (25.0%)		
Fire – Non-Impact	2 ( 9.5%)			14 ( 0.7%)
Fire – Post Impact	5 (23.8%)		35 (36.8%)	739 (36.9%)
Ground Collision				3 ( 0.1%)
Ground Handling or PreFlight	6 (28.6%)	1 (25.0%)	5 ( 5.3%)	66 ( 3.3%)
Icing	1 ( 4.8%)	1 (25.0%)	9 ( 9.5%)	58 ( 2.9%)
Low Altitude Operations			7 ( 7.4%)	309 (15.4%)
Loss of Control – In Flight	5 (23.8%)	3 (75.0%)	39 (41.1%)	1149 (57.3%)
Loss of Control – On Ground			1 ( 1.1%)	15 ( 0.7%)
Mid Air Collision			1 ( 1.1%)	66 ( 3.3%)
Power Loss – Fuel	1 ( 4.8%)		1 ( 1.1%)	145 ( 7.2%)
Power Loss – Other Reason *				8 ( 0.4%)
Power Loss – Unknown Reason *			4 ( 4.2%)	104 ( 5.2%)
Runway Excursion	2 ( 9.5%)		2 ( 2.1%)	33 (1.6%)
Runway Incursion (Animal, Vehicle, Aircraft or Person)				2 ( 0.1%)
SCF – Powerplant	1 ( 4.8%)	1 (25.0%)	2 ( 2.1%)	92 ( 4.6%)
SCF – Non Powerplant	2 ( 9.5%)		6 ( 6.3%)	70 ( 3.5%)
SCF – Stress Limit Exceeded*			3 ( 3.2%)	79 ( 3.9%)
Security Related	4 (19.0%)			16 ( 0.8%)
Turbulence Encounter			2 ( 1.6%)	25 ( 1.2%)
Thunderstorm or Windshear			2 ( 1.6%)	66 ( 3.3%)
Undershoot or Overshoot				5 ( 0.2%)
Unintended Flight in IMC			7 ( 7.4%)	212 (10.6%)
Other				6 ( 0.3%)
Unknown or Undetermined	2 ( 9.5%)		9 ( 9.5%)	61 ( 3.0%)

Table B-4. Number of Fatalities by CICTT Occurrence Category (2001-2010)

CICTT Occurrence Category	Part 121	Scheduled Part 135	Non-Scheduled Part 135	Part 91
Total Fatalities	697	17	231	3948
Abrupt Maneuver	265 (38.0%)			54 ( 1.4%)
Abnormal Runway Contact			2 ( 0.9%)	38 ( 1.0%)
Aerodrome				1 ( 0.1%)
Air Traffic Management			3 ( 1.3%)	67 ( 1.7%)
Bird Strikes				7 ( 0.2%)
Cabin Safety or Pilot Incapacitation			5 ( 2.2%)	160 ( 4.1%)
Controlled Flight Into Terrain	13 ( 1.9%)		73 (31.6%)	517 (13.1%)
Collision with Object – Takeoff or Landing			8 ( 3.5%)	132 ( 3.3%)
Collision with Object – Precautionary Landing *			2 ( 0.9%)	193 ( 4.9%)
Collision with Terrain – Precautionary Landing *	3 ( 0.4%)	2 (11.8%)	3 ( 1.3%)	124 ( 3.1%)
Encounter with Terrain – Precautionary Landing *				12 ( 0.3%)
Evacuation		2 (11.8%)		
Fire – Non-Impact	22 ( 3.2%)			26 ( 0.7%)
Fire – Post Impact	398 (57.1%)		74 (32.0%)	1509 (38.2%)
Ground Collision				4 ( 0.1%)
Ground Handling or PreFlight	26 ( 3.7%)	3 (17.6%)	15 ( 6.5%)	147 ( 3.7%)
Icing	50 ( 7.2%)	10 (58.8%)	12 ( 5.2%)	123 ( 3.1%)
Low Altitude Operations			22 ( 9.5%)	555 (14.1%)
Loss of Control – In Flight	358 (51.4%)	15 (88.2%)	89 (38.5%)	2281 (57.8%)
Loss of Control – On Ground			2 ( 0.9%)	18 ( 0.5%)
Mid Air Collision			2 ( 0.9%)	248 ( 6.3%)
Power Loss – Fuel	1 ( 0.1%)		1 ( 0.4%)	233 ( 5.9%)
Power Loss – Other Reason *				11 ( 0.3%)
Power Loss – Unknown Reason *			5 ( 2.2%)	187 ( 4.7%)
Runway Excursion	50 ( 7.2%)		5 ( 2.2%)	55 ( 1.4%)
Runway Incursion (Animal, Vehicle, Aircraft or Person)				2 ( 0.1%)
SCF – Powerplant	2 ( 0.3%)	2 (11.8%)	8 ( 3.5%)	185 ( 4.7%)
SCF – Non Powerplant	41 ( 5.9%)		19 ( 8.2%)	123 ( 3.1%)
SCF – Stress Limits Exceeded			3 ( 1.3%)	195 ( 4.9%)
Security Related	265 (38.0%)			20 ( 0.5%)
Turbulence			3 ( 1.3%)	55 ( 1.4%)
Thunderstorm or Windshear			2 ( 0.9%)	152 ( 3.9%)
Undershoot or Overshoot				9 ( 0.2%)
Unintended Flight in IMC			14 ( 6.1%)	438 (11.1%)
Other				10 ( 0.3%)
Unknown or Undetermined	3 ( 0.4%)		24 (10.4%)	152 ( 3.9%)

Table B-5. Number of Incidents by CICTT Occurrence Category (2001-2010)

CICTT Occurrence Category	Part 121	Scheduled and Non-Scheduled Part 135	Part 91
Total Incidents	2537	1000	10508
Abnormal Runway Contact	44 ( 1.7%)	77 ( 7.7%)	2796 (26.6%)
Aerodrome	27 ( 1.1%)	15 ( 1.5%)	121 ( 1.2%)
Bird Strikes	111 ( 4.4%)	27 ( 2.7%)	77 ( 0.7%)
Cabin Safety or Pilot Incapacitation	45 ( 1.8%)	3 ( 0.3%)	16 ( 0.2%)
Collision with Object – Takeoff or Landing	5 ( 0.2%)	15 ( 1.5%)	152 ( 1.4%)
Evacuation	32 ( 1.3%)		
Fire – Non-Impact	91 ( 3.6%)	32 ( 3.2%)	112 ( 1.1%)
Ground Collision	46 ( 1.8%)	70 ( 7.0%)	433 ( 4.1%)
Ground Handling or Inadequate Pre-Flight	337 (13.3%)	78 ( 7.8%)	448 ( 4.3%)
Icing	2 ( 0.1%)	4 ( 0.4%)	18 ( 0.2%)
Low Altitude Operations		2 ( 0.2%)	19 ( 0.2%)
Loss of Control – On Ground	26 ( 1.0%)	16 ( 1.6%)	497 ( 4.7%)
Mid Air Collision	9 ( 0.4%)	2 ( 0.2%)	72 ( 0.7%)
Power Loss – Fuel	15 ( 0.6%)	15 ( 1.5%)	479 ( 4.6%)
Power Loss – Other or Unknown Reason *		9 ( 0.9%)	173 ( 1.6%)
Runway Excursion	54 ( 2.1%)	60 ( 6.0%)	1002 ( 9.5%)
Runway Incursion (Animal, Vehicle, Aircraft or Person)	9 ( 0.4%)	1 ( 0.1%)	21 ( 0.2%)
SCF – Powerplant	339 (13.4%)	118 (11.8%)	920 ( 8.8%)
SCF – Non Powerplant	1048 (41.3%)	412 (41.2%)	2742 (26.1%)
Security Related	91 ( 3.6%)	3 ( 0.3%)	10 ( 0.1%)
Turbulence Encounter	59 ( 2.3%)	3 ( 0.3%)	13 ( 0.1%)
Thunderstorm or Windshear	18 ( 0.7%)	2 ( 0.2%)	10 ( 0.1%)
Undershoot or Overshoot	3 ( 0.1%)	5 ( 0.5%)	56 ( 0.5%)
Other	103 ( 4.1%)	25 ( 2.5%)	252 ( 2.4%)
Unknown or Undetermined	23 ( 0.9%)	6 ( 0.6%)	52 ( 0.5%)

## Appendix C

### Charts of the Frequencies of Total Accidents and Fatal Accidents by Aviation Occurrence Categories

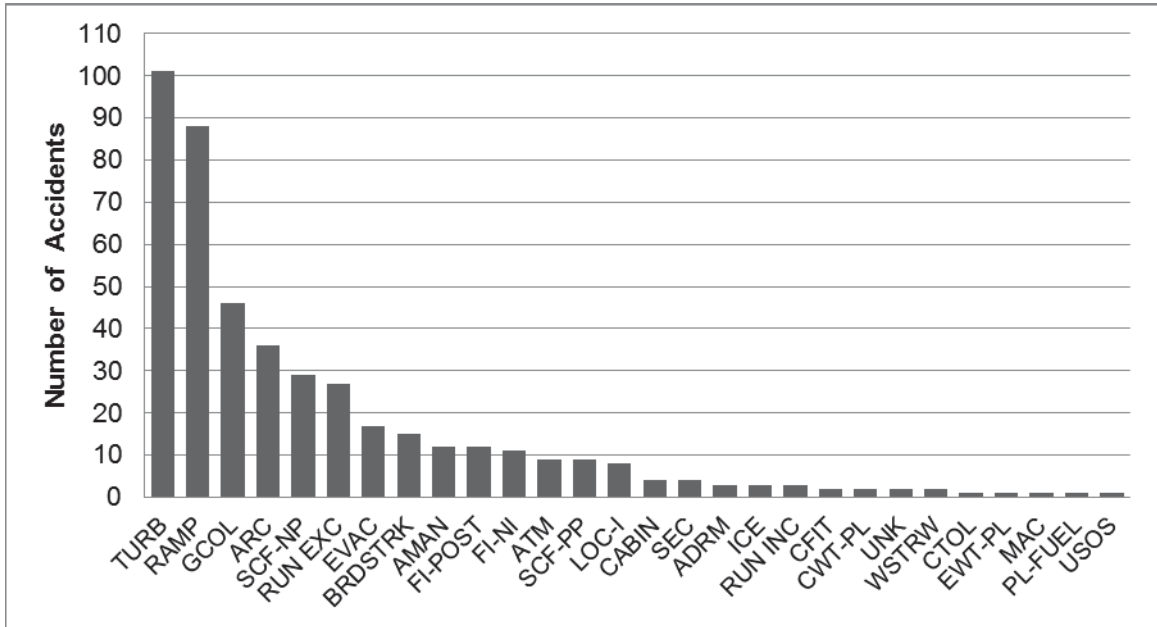


Figure 4. Number of Accidents by CICTT Occurrence Category in Part 121 (2001-2010).

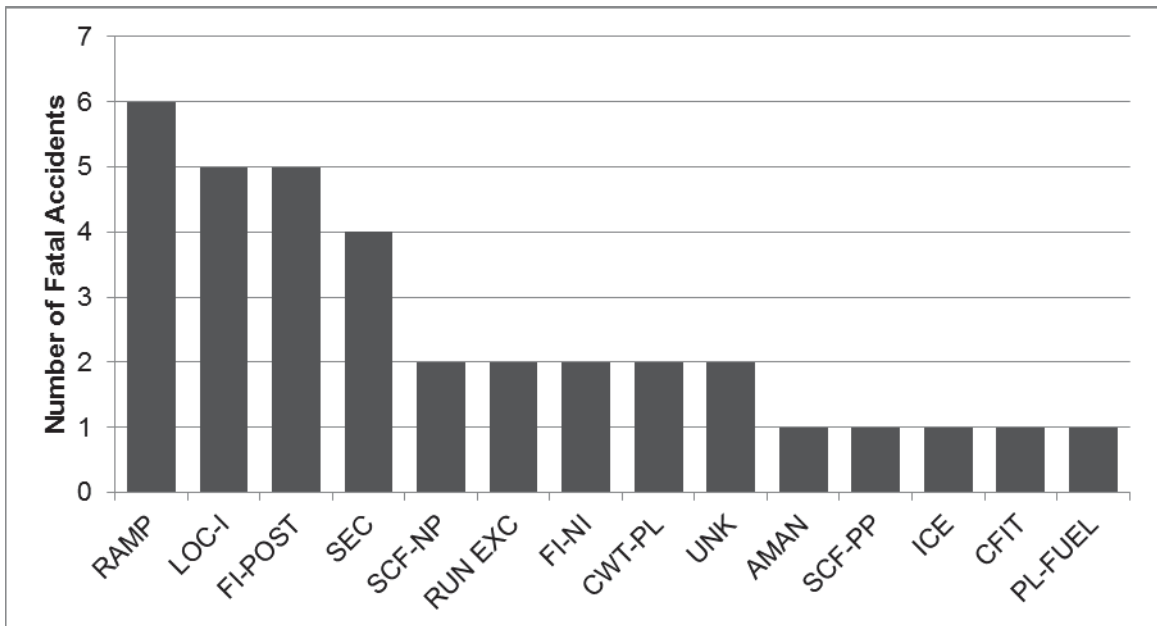


Figure 5. Number of Fatal Accidents by CICTT Occurrence Category in Part 121 (2001-2010).

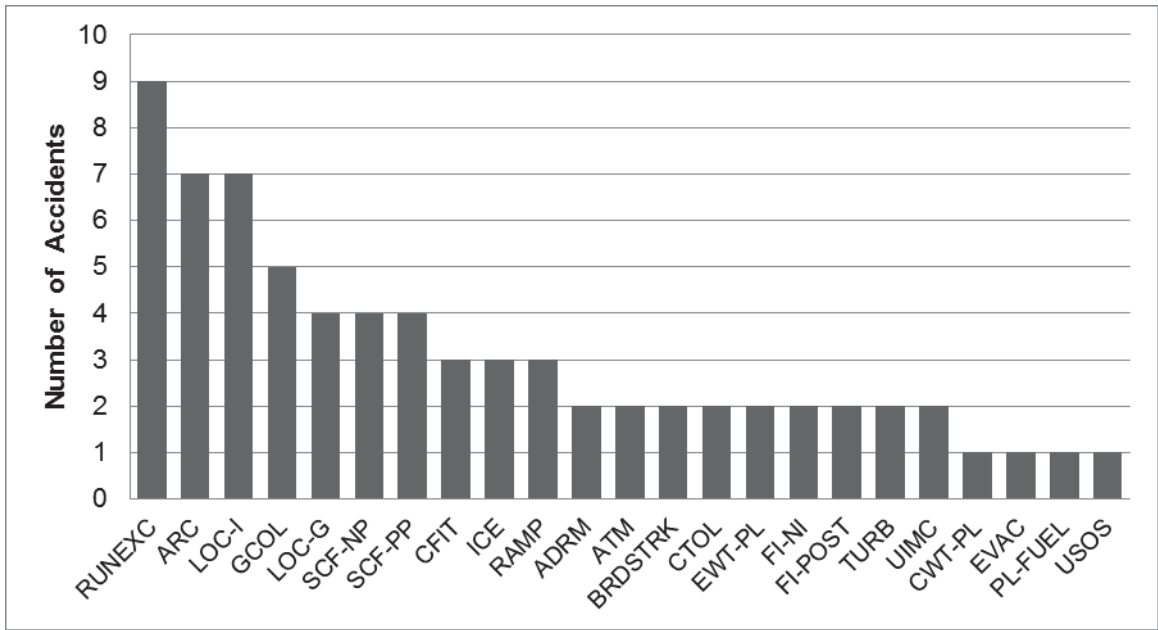


Figure 6. Number of Accidents by CICTT Occurrence Category in Scheduled Part 135 (2001-2010).

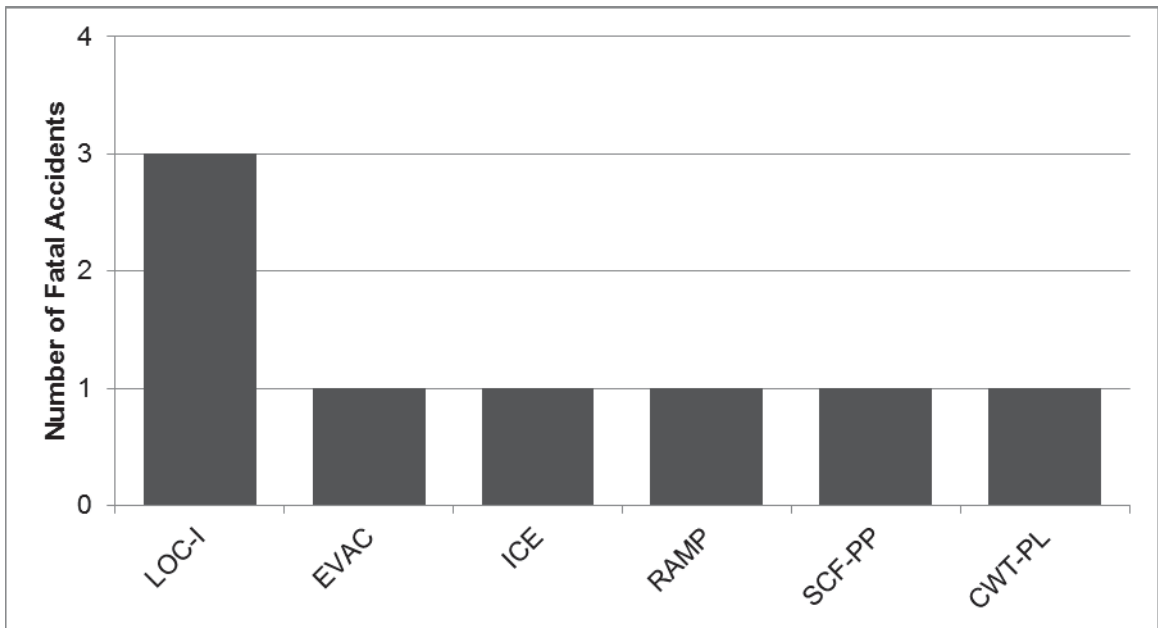


Figure 7. Number of Fatal Accidents by CICTT Occurrence Category in Scheduled Part 135 (2001-2010).

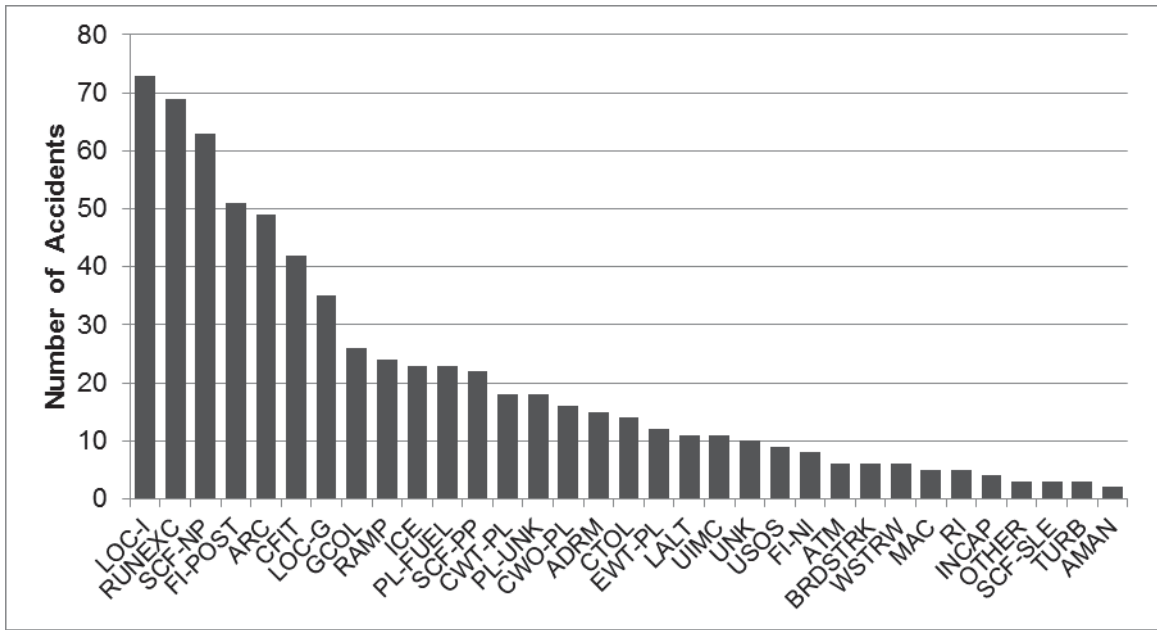


Figure 8. Number of Accidents by CICTT Occurrence Category in Non-Scheduled Part 135 (2001-2010).

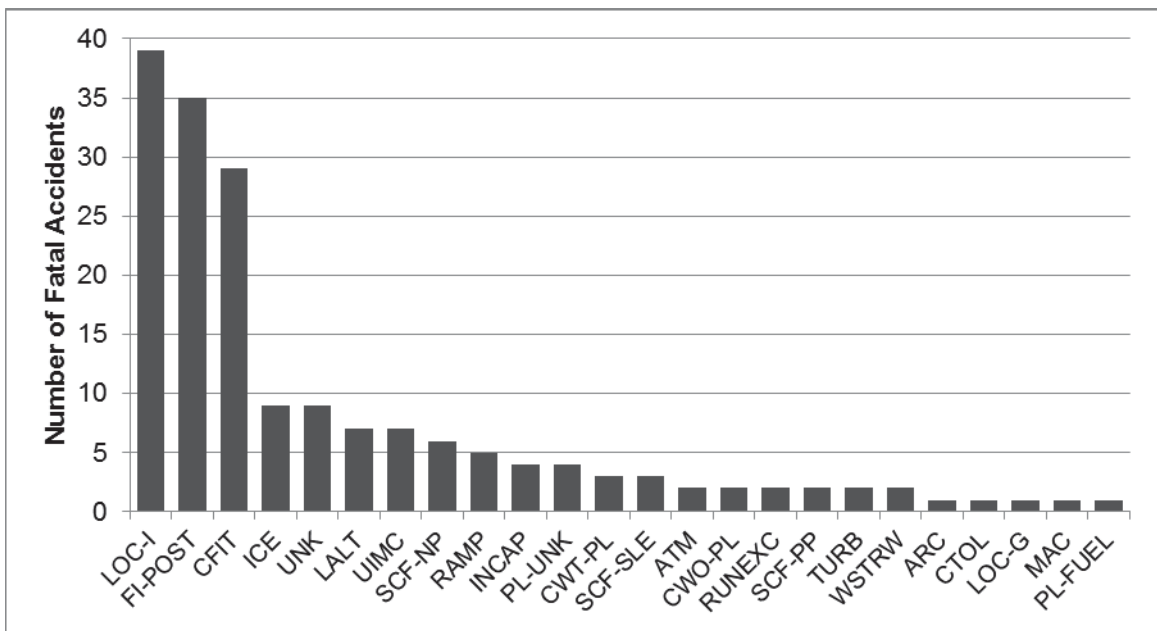


Figure 9. Number of Fatal Accidents by CICTT Occurrence Category in Non-Scheduled Part 135 (2001-2010).



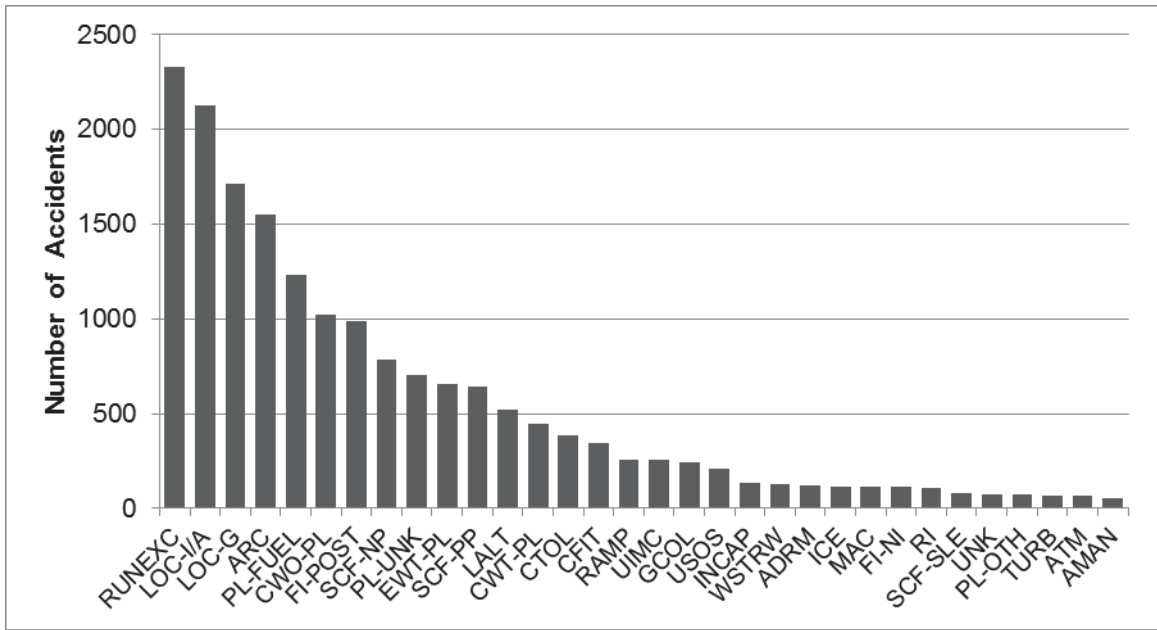


Figure 10. Number of Accidents by CICTT Occurrence Category in Part 91 (2001-2010).

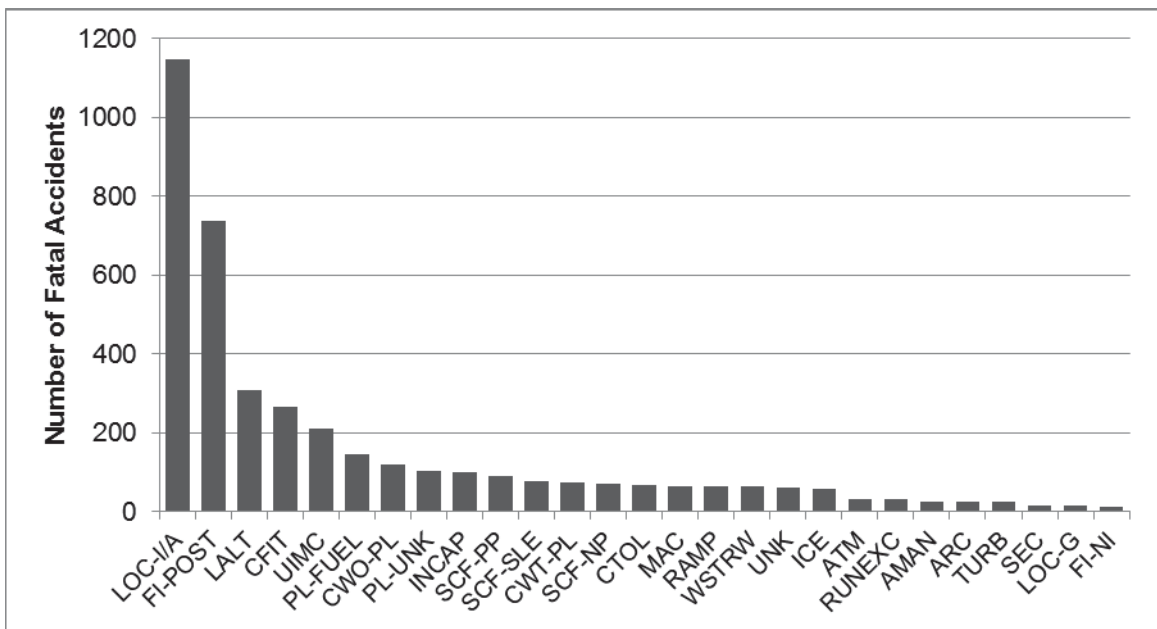


Figure 11. Number of Fatal Accidents by CICTT Occurrence Category in Part 91 (2001-2010).

**REPORT DOCUMENTATION PAGE**

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<b>4. TITLE AND SUBTITLE</b>  Frequency of Specific Categories of Aviation Accidents and Incidents During 2001-2010				<b>5a. CONTRACT NUMBER</b> NNL12AA09C	
				<b>5b. GRANT NUMBER</b>	
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<b>14. ABSTRACT</b>  The purpose of this study was to determine the types of accidents or incidents that are most important to the aviation safety risk. All accidents and incidents from 2001-2010 were assigned occurrence categories based on the taxonomy developed by the Commercial Aviation Safety Team/International Civil Aviation Organization (CAST/ICAO) Common Taxonomy Team (CICTT). The most frequently recorded categories were selected within each of five metrics: total accidents, fatal accidents, total injuries, fatal injuries and total incidents. This analysis was done separately for events within Part 121, Scheduled Part 135, Non-Scheduled Part 135 and Part 91. Combining those five sets of categories resulted in groups of between seven and eleven occurrence categories, depending on the flight operation. These groups represent 65-85% of all accidents and 68-81% of incidents.					
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