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William J. Hughes Technical Center
Aviation Research Division
Atlantic City International Airport
New Jersey 08405

Comprehensive Analysis of General Aviation Accidents Volume 1: Trends, Distributions, and Causes

May 2012

Final Report

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16. Abstract

Embry-Riddle Aeronautical University (ERAU) conducted a series of analyses to find patterns and associations among general aviation (GA) accidents. This research is intended to provide the Federal Aviation Administration (FAA) with analyses of Fatal, Serious, and Minor/None GA accidents by examining the National Transportation Safety Board (NTSB) database for each FAA region.

The analyses shown in this report focused on examining GA accidents that occurred between 1982 and 2009 for each FAA region.

According to the NTSB coding manual, more than 320 codes are used to identify the sequence of events leading to an aviation accident. However, a major portion of Fatal, Serious, and Minor/None GA accidents can be attributed to the ten most frequent initiating causes. The research team provided comprehensive analyses of these initiating causes for all nine FAA regions. This report provides exploratory statistics based on month, time of day, phase, and purpose of flight. The report also explores the role of the top ten initiating causes for Fatal, Serious, and Minor/None GA accidents and examines associations between GA accidents and pilot experience. Furthermore, the report explores the role of aircraft complexity (based on engine horsepower) in Fatal, Serious, and Minor/None GA accidents.

This report is Volume 1 of a two-volume report:

- Volume 1: Trends, Distributions, and Causes
- Volume 2: Pilot Experience and Aircraft Complexity

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LIST OF ACRONYMS

ASIAS	Aviation Safety Information Analysis and Sharing
CFR	Code of Federal Regulations
ERAU	Embry-Riddle Aeronautical University
FAA	Federal Aviation Administration
GA	General aviation
hp	Horsepower
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
NTSB	National Transportation Safety Board
VFR	Visual Flight Rules
V_S	Stalling speed, the minimum speed in flight at which the aircraft can develop a lift equal to the weight of the aircraft

EXECUTIVE SUMMARY

This research was conducted at Embry-Riddle Aeronautical University (ERAU) and funded by the Federal Aviation Administration (FAA) Center of Excellence for General Aviation Research (CGAR).

The research team at ERAU conducted a series of analyses to find patterns and associations with general aviation (GA) accidents. This research focused on GA accidents that occurred in each FAA region. The nine FAA regions are Alaskan, Central, Eastern, Great Lakes Region, New England, Northwest Mountain, Southern, Southwest, and Western-Pacific.

This research provided the FAA with analyses of Fatal, Serious, and Minor/None GA accidents using the National Transportation Safety Board (NTSB) accident database for each FAA region. This research analyzed data for GA accidents that occurred between 1982 and 2009.

Approximately 228,000 GA aircraft contributed over 80% of the total aviation accidents in the United States. This research analyzes the initiating causes of GA accidents under Title 14 Code of Federal Regulations Part 91.

According to the NTSB coding manual, more than 320 codes are used to identify the sequence of events leading to an aviation accident. However, a major portion of Fatal, Serious, and Minor/None GA accidents can be attributed to the ten most frequent initiating causes. The ERAU research team performed comprehensive analyses of these initiating causes for all nine FAA regions. This report provides exploratory statistics based on month, time of day, phase, and purpose of flight. This report also explores the role of the top ten initiating causes for Fatal, Serious, and Minor/None GA accidents and examines associations between GA accidents and pilot experience. Furthermore, the report explores the role of aircraft complexity (based on engine horsepower) in Fatal, Serious, and Minor/None GA accidents.

This document is Volume 1 of a two-volume report:

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1. INTRODUCTION.

According to the General Aviation Manufacturer Association, of approximately 320,000 general aviation (GA) aircraft worldwide, 228,000 aircraft are based in the United States. In addition, the National Transportation Safety Board (NTSB) reports that GA aircraft contributes to more than 80% of all aviation accidents nationwide. The Embry-Riddle Aeronautical University (ERAU) research team conducted a study to identify the initiating causes of GA accidents under Title 14 Code of Federal Regulations (CFR) Part 91 [1].

The final report for this study consists of two volumes:

- Volume 1: Trends, Distributions, and Causes
- Volume 2: Pilot Experience and Aircraft Complexity

This document is Volume 1, which describes the analyses of Fatal, Serious, and Minor/None GA accidents for each Federal Aviation Administration (FAA) region. According to the FAA, pilot error is the main cause of aircraft accidents followed by faulty maintenance and operational errors.

1.1 SCOPE.

This report provides exploratory statistics based on month, time of day, phase, and purpose of flight. The report also explores the role of the top ten initiating causes for Fatal, Serious, and Minor/None GA accidents and examines associations between GA accidents and pilot experience. Furthermore, the report explores the role of aircraft complexity (based on engine horsepower) in Fatal, Serious, and Minor/None GA accidents.

This report classifies GA accidents based on severity. This classification enables the FAA to achieve the objective of reducing the Fatal GA accident rate per 100,000 flight hours by 10% over a 10-year period (2009-2018). The GA accidents were classified as Fatal, Serious, and Minor/None based on the intensity of the injuries incurred. According to the NTSB Form 6120.1 [2], a Fatal accident involves any injury that results in death within 30 days of the accident. A Serious injury involves any injury that

- requires hospitalization for more than 48 hours, commencing within 7 days from the date of injury.
- results in a fracture of any bone (except simple fracture of fingers, toes or nose).
- causes severe hemorrhages, nerve, muscle, or tendon damage.
- involves injury to any internal organ.
- involves second- or third-degree burns, or any burns affecting more than 5% of the body surface.

Minor/None accidents are accidents that do not result in Serious injury or death.

The analysis for finding the initiating causes of GA accidents was divided into three major categories:

1. Time—The study was performed for four 7-year, nonoverlapping periods between 1982 and 2009 (1982-1988, 1989-1995, 1996-2002, and 2003-2009) to find the rate of change in accidents over time.

2. Pilot Experience—Pilot experience is described as the amount of total flight hours for the pilot in all aircraft (based on the data in the NTSB database). For this analysis, the team divided the number of flight hours into the following ranges: <100, 100-299, 300-1999, 2000-4999, and more than 5000 hours.

3. Aircraft Complexity—Aircraft complexity is based on the presence of retractable gears, flaps, and controllable pitch propeller. However, since there were insufficient data available from the NTSB database regarding these attributes, the team used aircraft engine horsepower (hp) as an indicator for aircraft complexity.

1.2 THE NTSB DATABASE.

Federal regulations require a pilot/operator of an aircraft who has been involved in an accident to immediately notify the nearest NTSB regional office. An accident is defined as an occurrence during an aircraft operation that takes place between the time any person boards the aircraft with the intention of flight and all such persons disembark and, in which, any person suffers death or serious injury, or the aircraft receives substantial damage. The database allows for input of up to five occurrences (major events) for each accident and up to ten sequences of events for each occurrence. The occurrences explain the chain of events that led to the accident. The initiating cause of GA accidents, which is defined as the event that triggers the chain of all other events, is addressed in this report. The study on the initiating causes is expressed in terms of frequency and percentage. Contributing factors were excluded from the analysis because they are not causal in nature.

The FAA provided the ERAU team with the database from the Aviation Safety Information Analysis and Sharing (ASIAS) system in Microsoft® Access®. In August 2010, the team received an updated database from the ASIAS. The previous database, which was used for a previous report [3], had 65,698 unique events; however, ASIAS provided this study with 66,633 unique events from 1982-2009.

1.3 ANALYSES OF GA ACCIDENTS BASED ON REGIONS.

GA accident data were analyzed for each of the FAA's nine regions in the United States. The following lists the states that comprise the nine regions.

- Alaskan Region: Alaska
- Central Region: Iowa, Kansas, Missouri, and Nebraska
- Eastern Region: Delaware, Maryland, New Jersey, New York, Pennsylvania, Virginia, West Virginia, and Washington, DC.
- Great Lakes Region: Illinois, Indiana, Michigan, Minnesota, North Dakota, Ohio, South Dakota, and Wisconsin
- New England Region: Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, and Vermont
- Northwest Mountain Region: Colorado, Idaho, Montana, Oregon, Utah, Washington, and Wyoming
- Southern Region: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, Puerto Rico, South Carolina, and Tennessee
- Southwest Region: Arkansas, Louisiana, New Mexico, Oklahoma, and Texas
- Western-Pacific Region: Arizona, California, Hawaii, and Nevada

All accident data used in this report was extracted from the NTSB database for flights under 14 CFR Part 91.

2. THE ALASKAN REGION.

This section discusses the Alaskan Region, which includes Alaska.

2.1 FREQUENCY OF GA ACCIDENTS IN THE ALASKAN REGION.

Generally, the frequency of GA accidents in the Alaskan Region is the second lowest among the frequency of GA accidents in the other regions. It has also decreased from 153 GA accidents in 1982 to 79 in 2009, which is almost a 50% decrease. However, there are two differences between 1993 and 1995 and between 2004 and 2006. The number of accidents in 1994 decreased 27.7% from the previous year, but increased 25% in 1996. In 2005, the number of accidents increased by 20.6%, but decreased 25.6% in 2006. In fact, the 2006 figure was the lowest since 1982, as shown in figure 1.

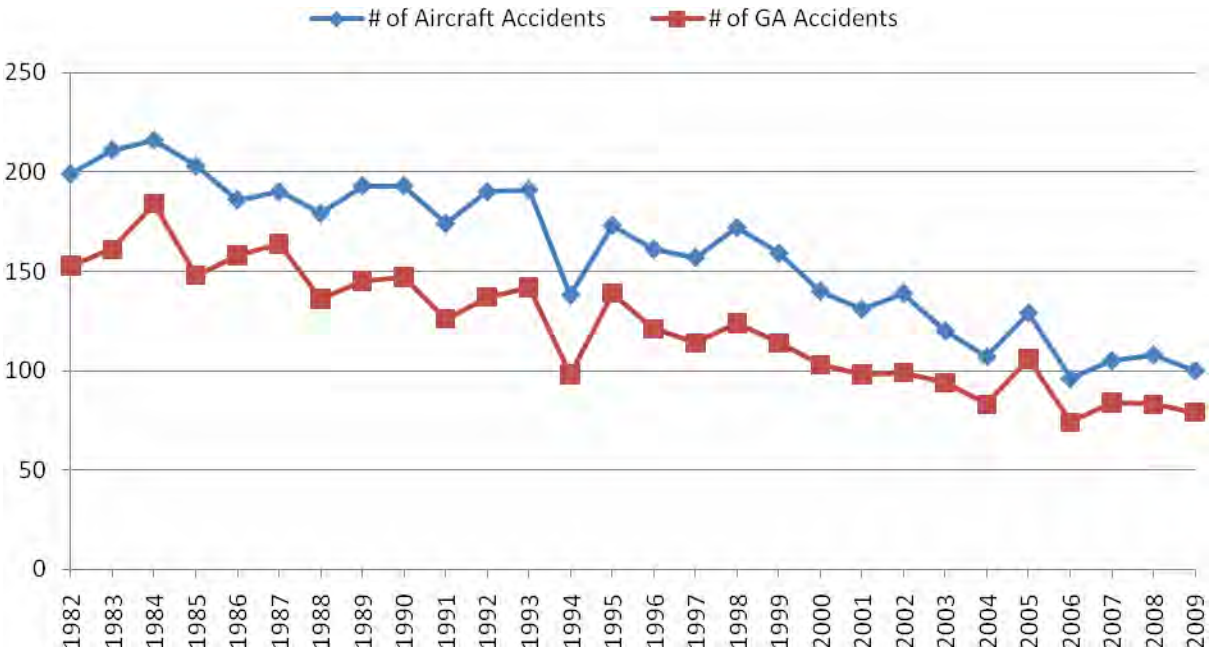

Figure 1. Number of Aircraft Accidents and GA Accidents in the Alaskan Region (1982-2009)

Figure 1 also shows the gap between the number of aircraft accidents and GA accidents is getting smaller. Figure 2 shows the percentage of GA accidents in the Alaskan Region out of all aviation accidents in the same region. It confirms that the decline in the number of GA accidents is slower than the aviation accidents, especially for the last 6 years. Along with the Southwest Region, the Alaskan Region has a steady percentage rate of GA accidents.

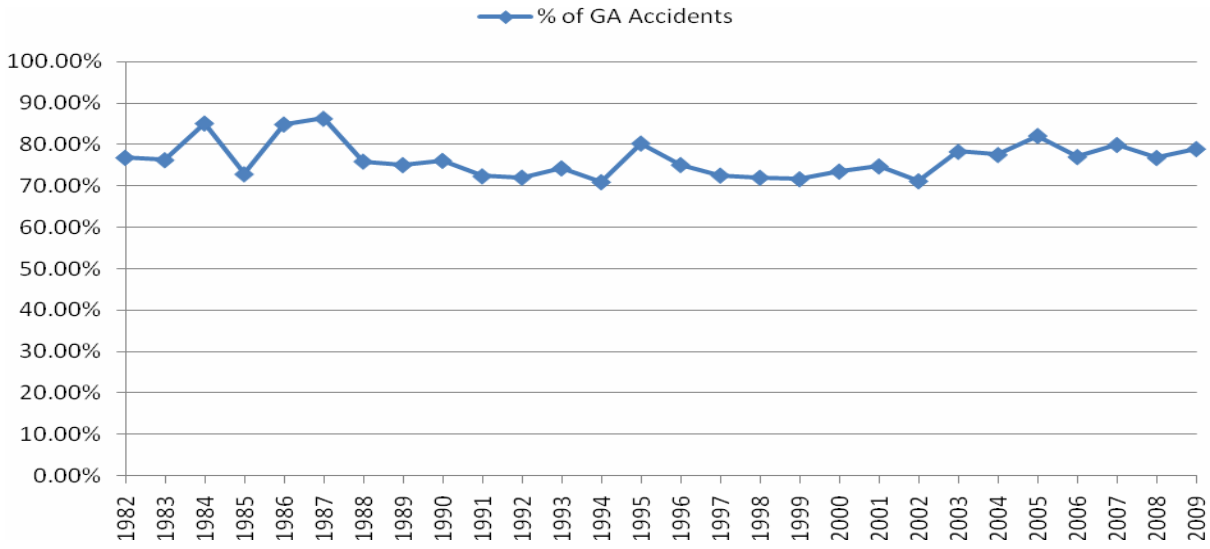

Figure 2. Percentage of GA Accidents of all Aviation Accidents in the Alaskan Region (1982-2009)

Figures 3 and 4 show the number of Fatal GA accidents and fatalities in the Alaskan Region over the same time period. Similar to the total number of GA accidents, the number of Fatal GA accidents decreased by more than half between 1982 and 1994, as shown in figure 3. Only three Fatal GA accidents occurred in 2001, which is the lowest number of Fatal GA accidents since 1982. In 2002, the number increased to ten Fatal GA accidents. However, only four Fatal GA accidents occurred in 2009. The number of fatalities appears low compared to the number of accidents; this is because, unlike commercial aircraft, most GA flights have fewer passengers.

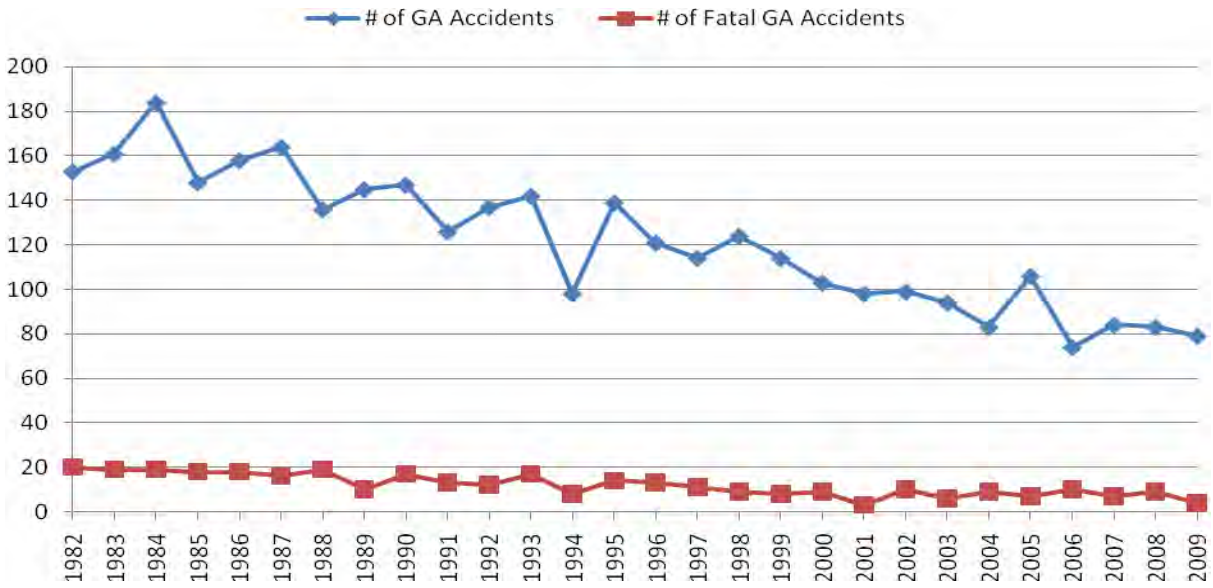

Figure 3. Number of GA Accidents and Fatal GA Accidents in the Alaskan Region

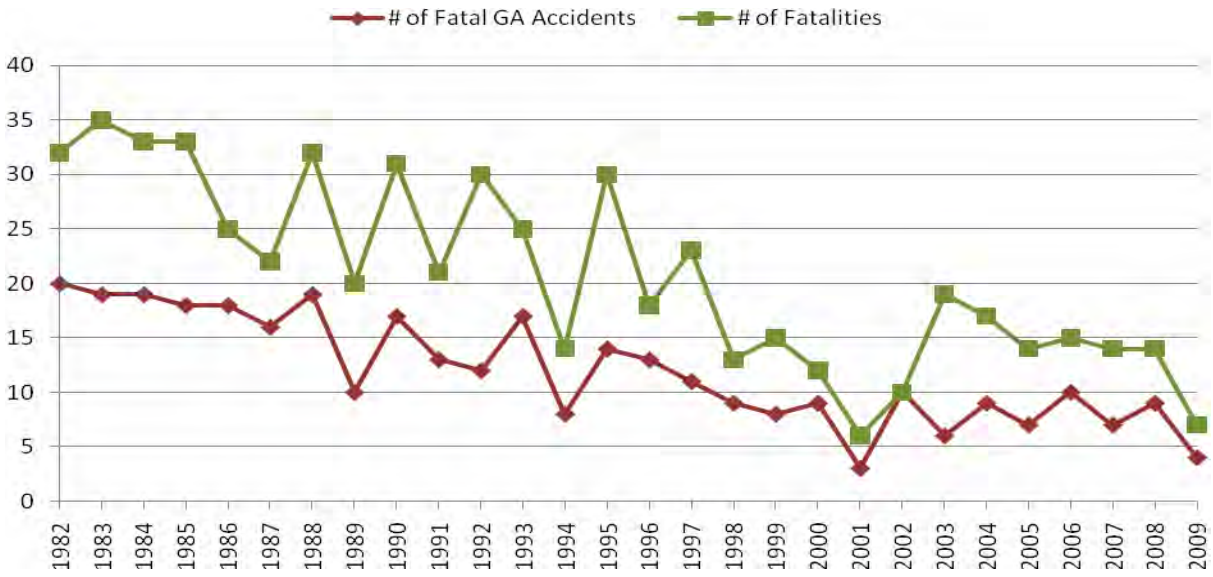

Figure 4. Number of Fatal GA Accidents and Fatalities in the Alaskan Region

2.2 PERCENTAGE OF GA ACCIDENTS BASED ON MONTH AND TIME OF DAY IN THE ALASKAN REGION.

Figure 5 shows that the total number of GA accidents in the Alaskan Region peaks between August and September when the early fall weather is more suitable for flying. However, the percentage of Fatal GA accidents is higher during April, May, June, July, and August. Notably, there is a significant difference between the rate of accidents in September and October.

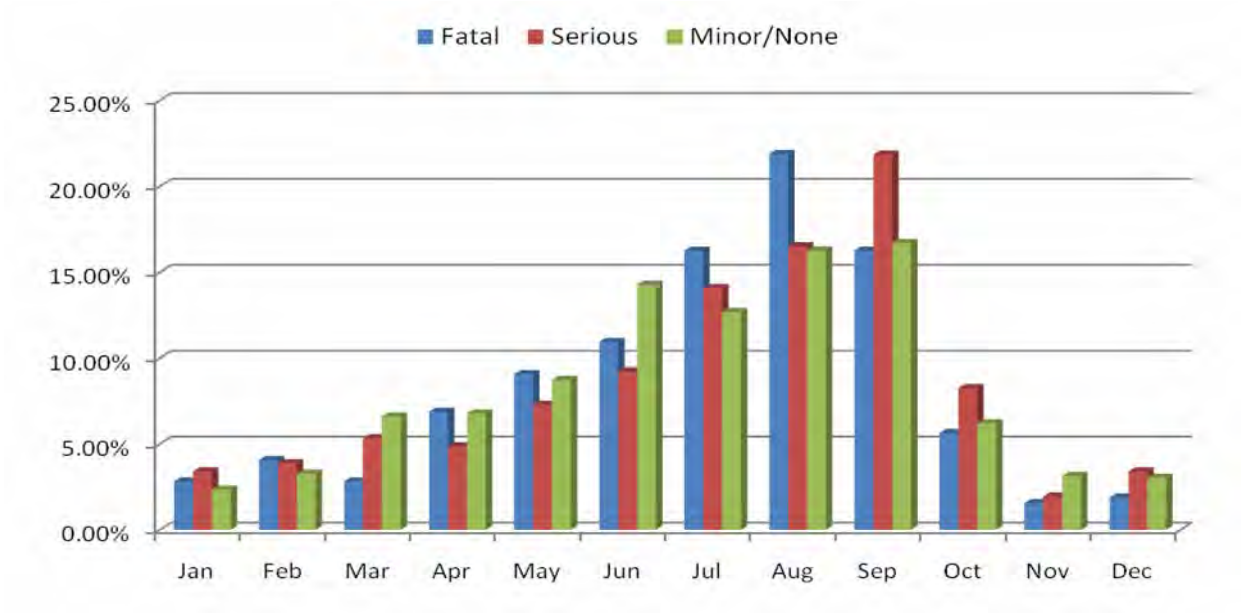

Figure 5. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Month in the Alaskan Region (1982 to 2009)

With regard to time of day, figure 6 shows that, between 1982 and 2009, the majority of GA accidents in the Alaskan Region occurred between 10:00 and 21:00 hours (10 a.m. and 9 p.m.). The highest number of total GA accidents, between 1982 and 2009, occurred between 13:00 and 16:00 hours (1 p.m. and 4 p.m.), with 318 accidents at 14:00 hours (2 p.m.), 315 at 13:00 hours (1 p.m.), 312 at 15:00 hours (3 p.m.), and 306 at 16:00 hours (4 p.m.). The percentage of Fatal GA accidents is higher between 18:00 and 7:00 hours (6 p.m. and 7 a.m.).

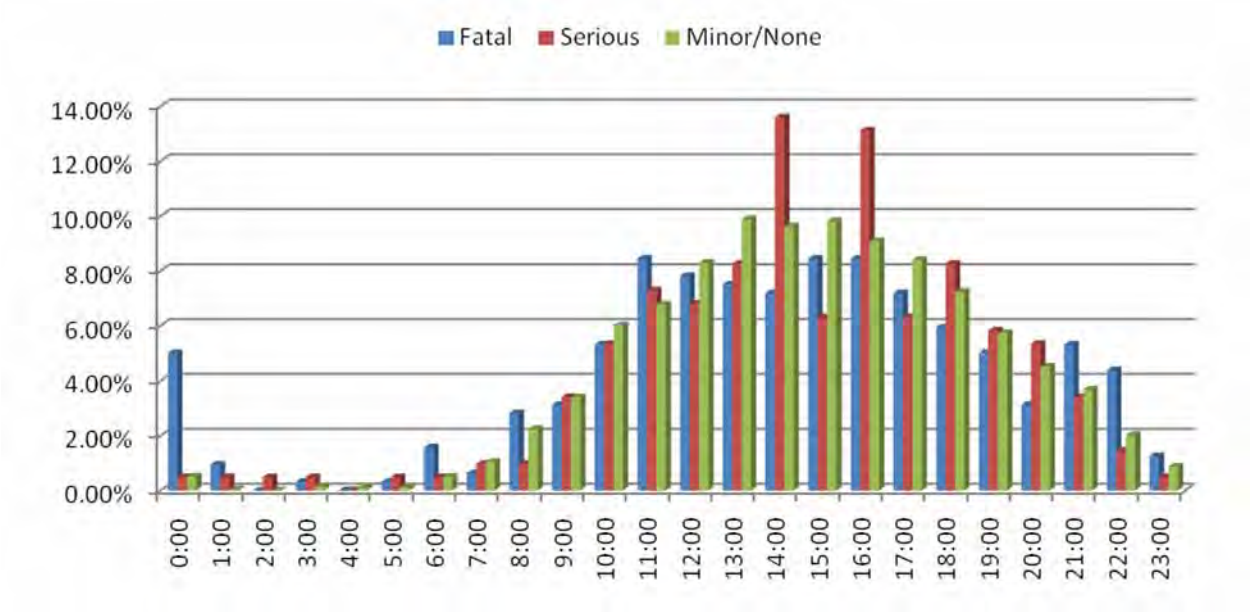

Figure 6. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Time of Day in the Alaskan Region (1982 to 2009)

2.3 PERCENTAGE OF GA ACCIDENTS BASED ON PHASE AND PURPOSE OF FLIGHT IN THE ALASKAN REGION.

Figure 7 shows the percentage of GA accidents based on phase of flight between 1982 and 2009. The percentage of Fatal GA accidents is higher during the cruise and maneuvering phases. Similar to nationwide data, the highest number of Minor/None GA accidents occurred during the landing phase. Serious accidents, however, were most likely to occur during the descent, landing, takeoff, and maneuvering phases.

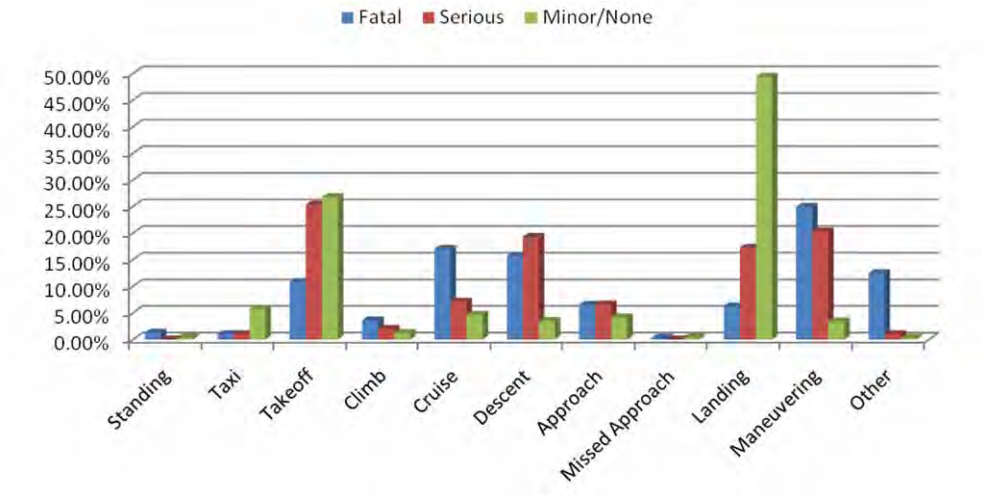

Figure 7. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Phase of Flight in the Alaskan Region (1982 to 2009)

Figure 8 shows the percentage of total GA accidents between 1982 and 2009 based on purpose of flight. Because of the large number of personal aircraft in operation, personal flights contribute the highest rate of GA accidents in the Alaskan Region, followed by instructional and business flights.

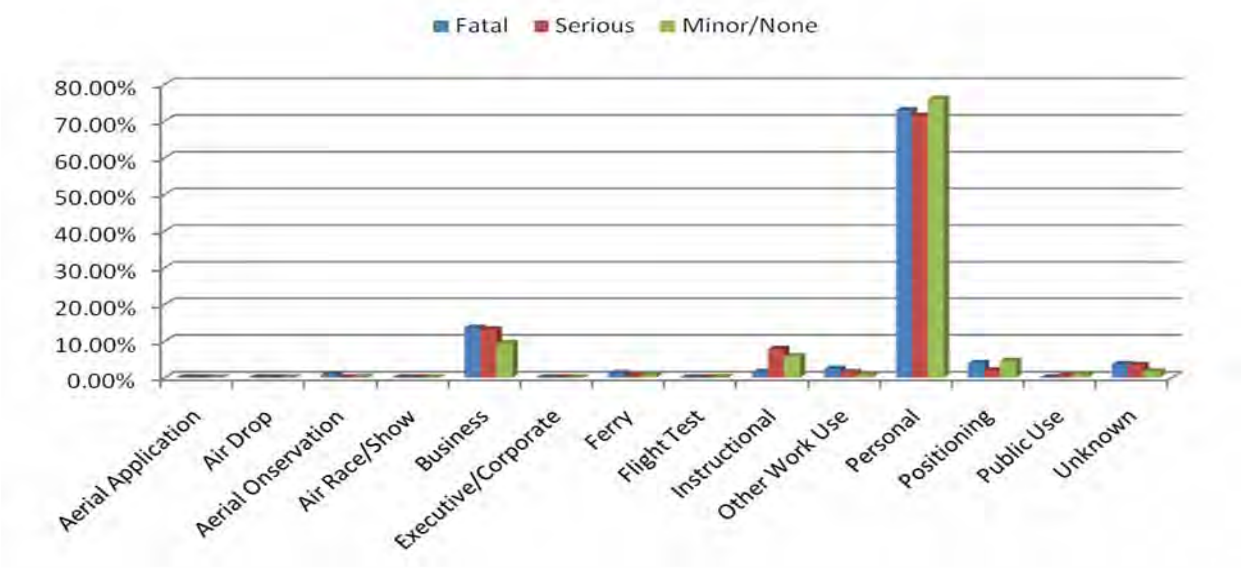

Figure 8. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Purpose of Flight in the Alaskan Region (1982 to 2009)

2.4 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS IN THE ALASKAN REGION.

This section discusses the frequency and percentage of the top ten initiating causes of GA accidents. The NTSB database allows for the input of up to five occurrences (major events) for each accident and up to ten sequences of events for each occurrence. The occurrences explain the chain of events that led to the accident. The initiating cause of every accident, which triggers the chain of all other events, is addressed in this report. The study on the initiating cause is expressed in terms of frequency and percentage. Contributing factors were excluded from the analysis because they are not causal in nature.

Figures 9 through 11 show the frequency and percentage of the top ten initiating causes of GA accidents that, when combined, contribute to almost 50% of all causes of GA accidents from 1982 to 2009. Visual Flight Rules (VFR) flight into Instrument Meteorological Conditions (IMC) is the number one initiating cause of Fatal GA accidents in the Alaskan Region, as shown in figure 9. This finding could be related to the unique demographic area and extreme weather conditions in this region. Moreover, the top ten initiating causes of Fatal GA accidents in the Alaska Region account for almost 60% of all causes of Fatal accidents in the region.

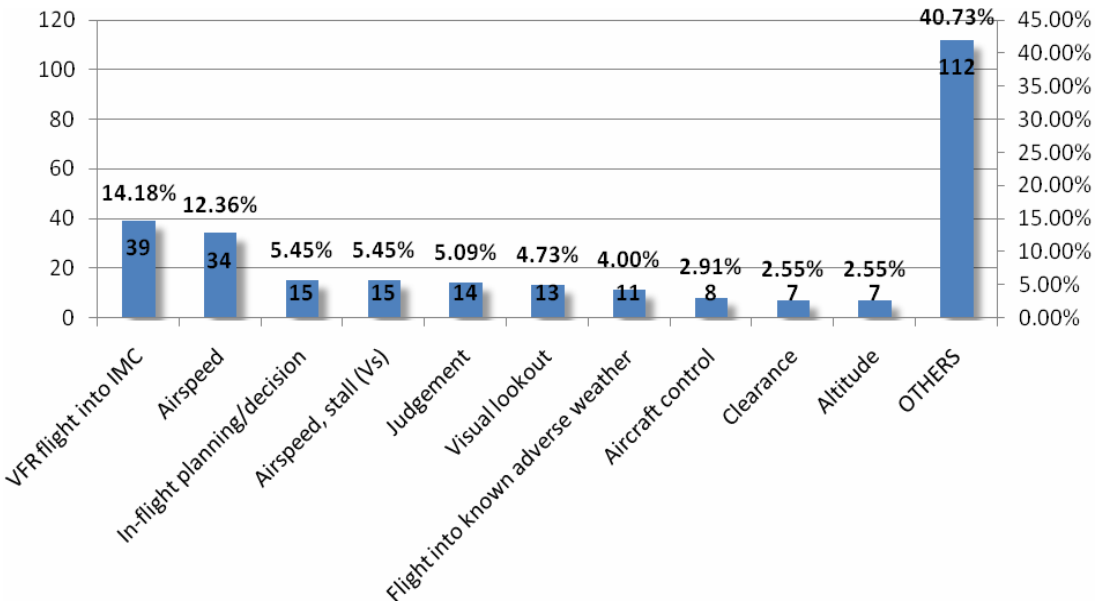

Figure 9. Frequency and Percentage of Initiating Causes of Fatal GA Accidents in the Alaskan Region (1982 to 2009)

Airspeed is the second highest initiating cause of Fatal GA accidents in the Alaskan Region. However, at 6.42%, it is the top initiating cause of Serious GA accidents. In-flight planning/decision and preflight planning/preparation have the same number of occurrences as stall, as shown in figure 10.

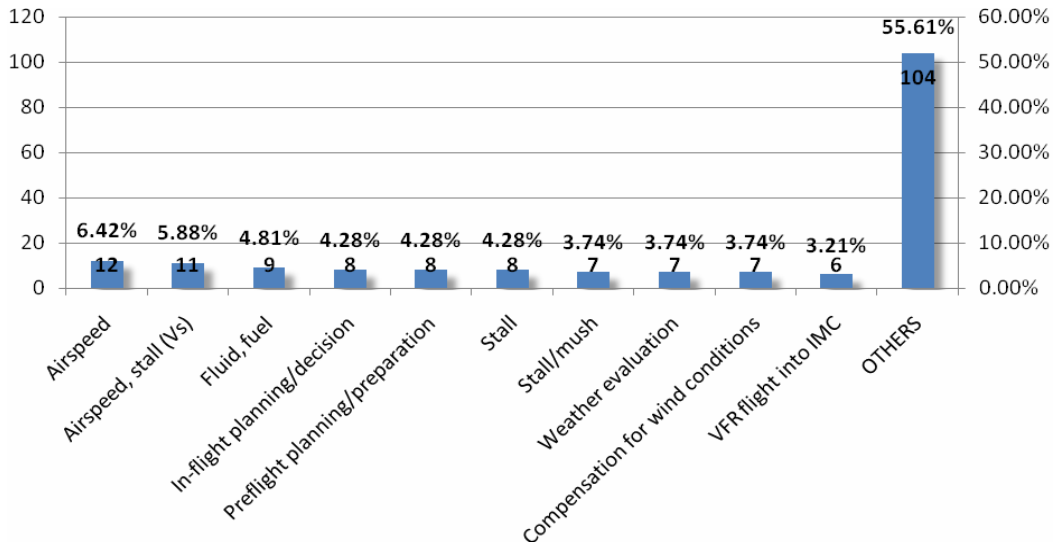

Figure 10. Frequency and Percentage of Initiating Causes of Serious GA Accidents in the Alaskan Region (1982 to 2009)

The Alaskan Region is the only region that has unsuitable terrain or takeoff/landing/taxi area as the number one initiating cause of Minor/None GA accidents, as shown in figure 11. Directional control (which is the number one initiating cause of Minor/None GA accidents nationwide and in every other region) is the second initiating cause in Alaska with a significant difference from the number one initiating cause. This confirms that Alaska has a unique demographic area and weather conditions. In addition, in the tenth position, two initiating causes, airspeed and planning/decision, have the same number of occurrences. However, because the ERAU team focused on the top ten initiating causes, planning/decision is not shown in the figure.

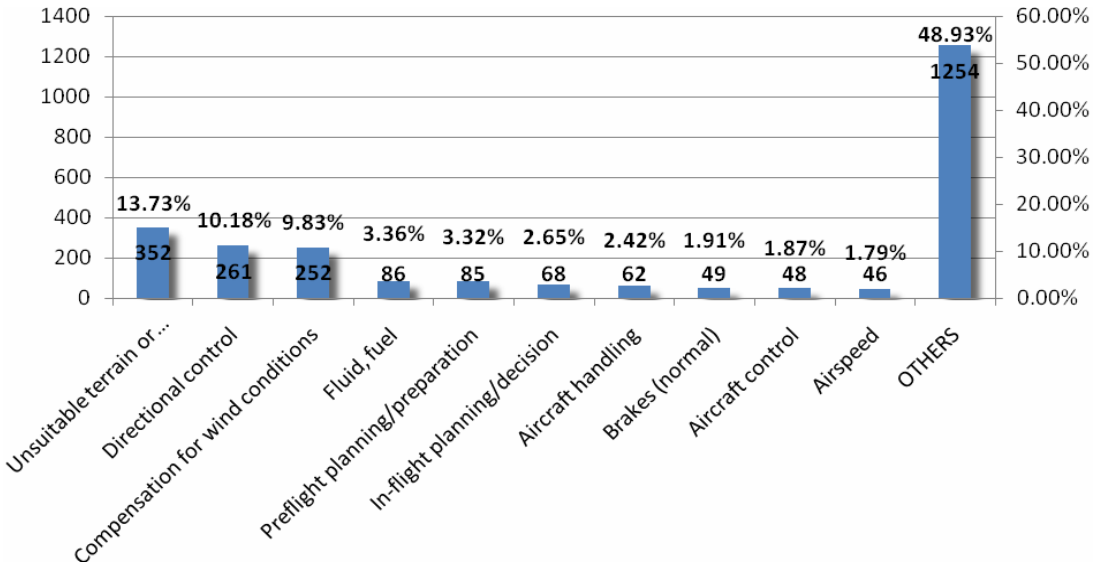

Figure 11. Frequency and Percentage of Initiating Causes of Minor/None GA Accidents in the Alaskan Region (1982 to 2009)

2.5 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS RELATED TO PILOT EXPERIENCE IN THE ALASKAN REGION.

According to the FAA, pilot error is the number one cause of aircraft accidents and incidents, followed by faulty maintenance and operational errors. The NTSB database confirms that approximately 80.5% of GA accidents in the Alaskan Region are caused by pilot error. The following sections provide statistical analyses of GA accident causes in the Alaskan Region related to pilot error. In particular, pilot experience in hours is used in this report to examine the top ten initiating causes of GA accidents that lead to other events.

Figures 12 through 14 show the percentage of pilot experience based on total flight hours in relation to initiating causes of GA accidents.

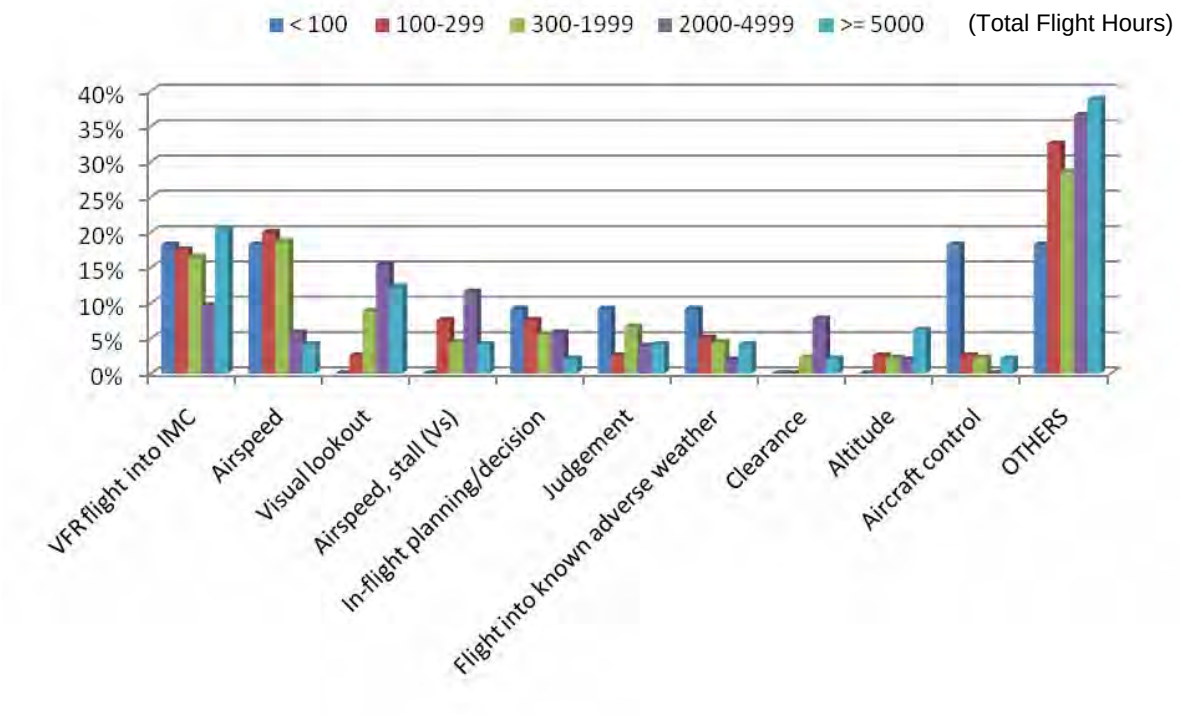

Figure 12. Percentage of Initiating Causes of Fatal GA Accidents Based on Pilot Experience in the Alaskan Region (1982 to 2009)

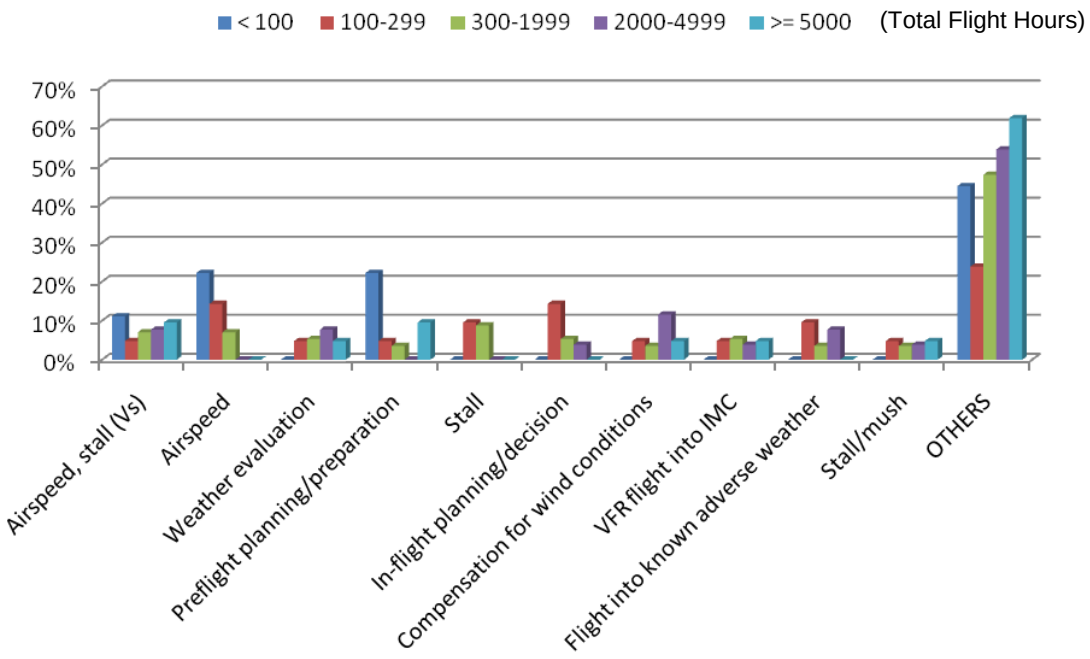

Figure 13. Percentage of Initiating Causes of Serious GA Accidents Based on Pilot Experience in the Alaskan Region (1982 to 2009)

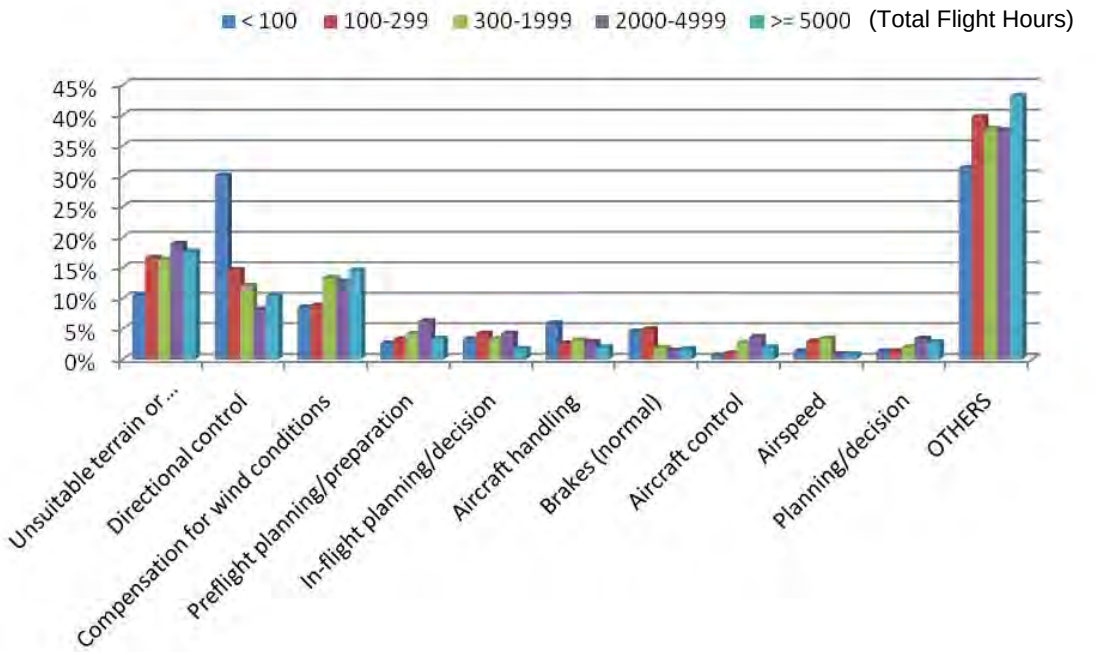

Figure 14. Percentage of Initiating Causes of Minor/None GA Accidents Based on Pilot Experience in the Alaskan Region (1982 to 2009)

2.6 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS RELATED TO AIRCRAFT COMPLEXITY IN THE ALASKAN REGION.

Figures 15 through 17 show the percentage of accidents involving aircraft with less than 200 engine hp and accidents involving aircraft with more than or equal to 200 engine hp. Figure 15 shows that VFR flight into IMC is the number one initiating cause of Fatal GA accidents for the two categories combined. Figure 16 also shows VFR flight into IMC as the number one initiating cause of Serious GA accidents. Finally, unsuitable terrain or takeoff/landing/taxi area is the number one initiating cause of Minor/None GA accidents, as shown in figure 17. Note that the Alaskan Region is the only region that does not show directional control as the number one initiating cause of Minor/None GA accidents in this category.

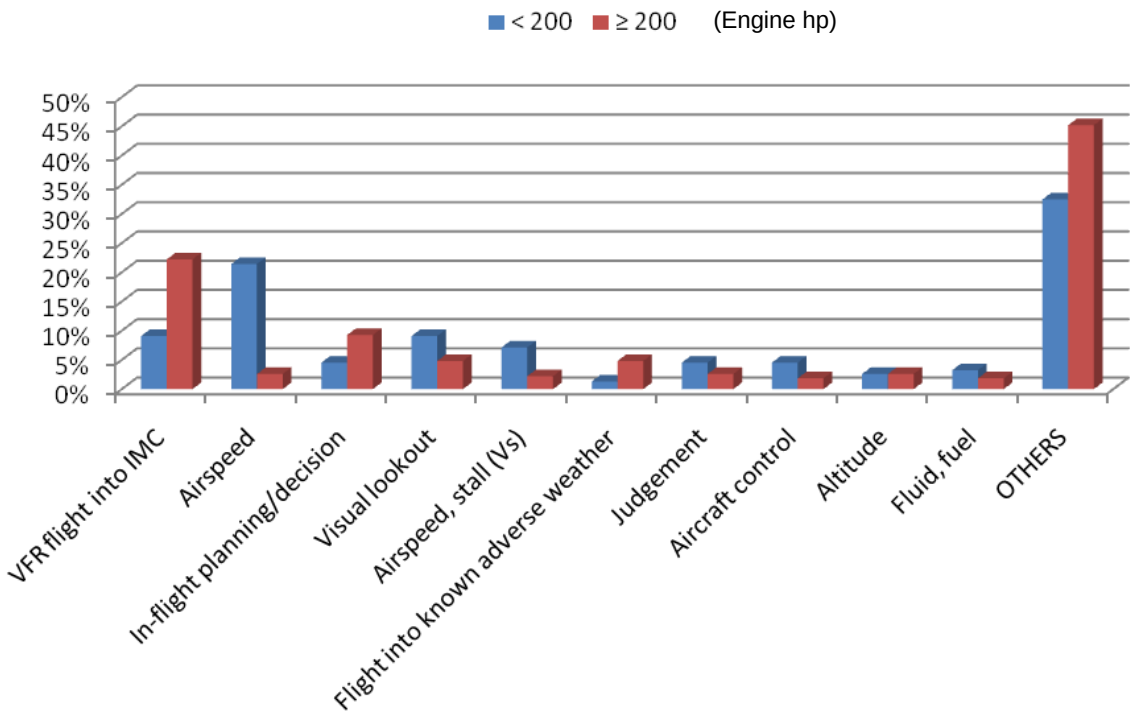

Figure 15. Percentage of Initiating Causes of Fatal GA Accidents Based on Aircraft Engine Power in the Alaskan Region (1982 to 2009)

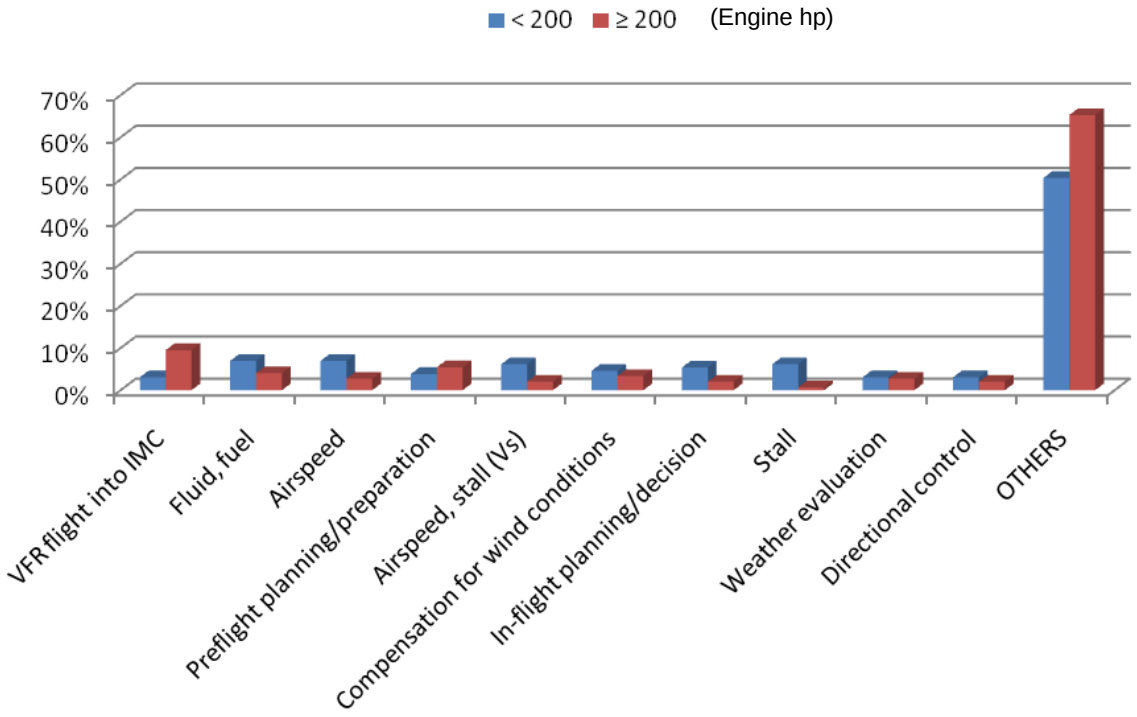

Figure 16. Percentage of Initiating Causes of Serious GA Accidents Based on Aircraft Engine Power in the Alaskan Region (1982 to 2009)

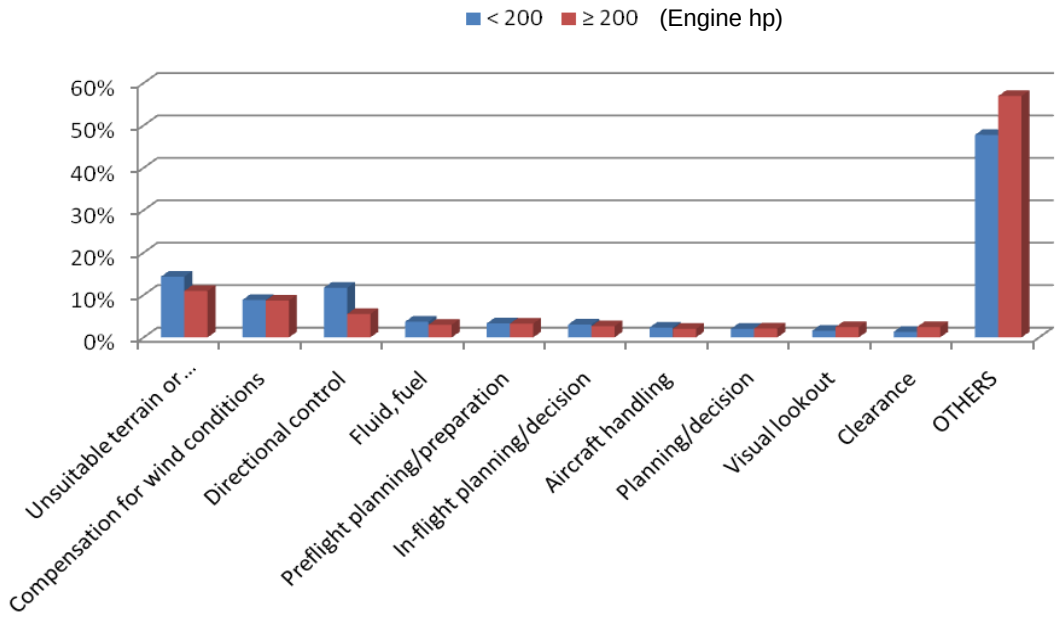

Figure 17. Percentage of Initiating Causes of Minor/None GA Accidents Based on Aircraft Engine Power in the Alaskan Region (1982 to 2009)

2.7 RESULTS FOR THE ALASKAN REGION.

This study examined the top ten initiating causes of GA accidents in the Alaskan Region between 1982 and 2009. The trends found are similar to the nationwide trend and the trends in other regions. Airspeed, for example, is most frequently the number one initiating cause of Fatal GA accidents. Directional control is the number two initiating cause of Minor/None GA accidents in the Alaskan region, unlike other regions, in which it is the number one cause.

The number of GA accidents decreased in the Alaskan Region from 153 in 1982 to 79 in 2009, which is almost a 50% decrease. The nationwide data show a similar trend in which the number of GA accidents is declining, most likely due to safety measures introduced by the FAA.

Analysis of GA accidents in the Alaskan Region based on month shows that the majority of GA accidents occurred during the months of June, July, August, and September; nationwide, the percentage of GA accidents is higher between May and August.

The majority of GA accidents in the Alaskan Region occurred between 10:00 and 21:00 hours (10 a.m. and 9 p.m.) with the highest number of accidents recorded at 14:00 hours (2 p.m.) and 13:00 hours (1 p.m.); nationwide, the highest number of accidents occurred at 14:00 hours (2 p.m.) and 15:00 hours (3 p.m.).

Analysis of GA accidents in the Alaskan Region based on phase of flight reveals that the highest number of GA accidents occurred during the landing phase. Fatal GA accidents were higher during the cruise and maneuvering phases. Serious GA accidents occurred most during the descent, landing, takeoff, and maneuvering phases. Nationwide, Serious GA accidents mainly occurred during the takeoff and landing phases.

Analysis of GA accidents in the Alaskan Region based on purpose of flight shows that the personal flight contributes the highest rate of GA accidents in the Alaskan Region, which is similar to the nationwide data.

The top initiating causes of Fatal GA accidents in the Alaskan Region are VFR flight into IMC followed by airspeed; nationwide, the top initiating causes of Fatal GA accidents are airspeed followed by VFR flight into IMC.

The top initiating causes for Serious GA accidents in the Alaskan Region are airspeed, followed by airspeed, stall (V_s) and fluid, fuel in the Alaskan Region; nationwide, the top initiating causes for Serious GA accidents are fluid, fuel followed by airspeed.

Unlike the nationwide trend, the Alaskan Region is the only region that has unsuitable terrain or takeoff/landing/taxi area as the number one initiating cause of Minor/None GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents nationwide, but it is in the second most frequent in the Alaskan Region.

Based on pilot experience in total flight hours, the following results were found.

- The top initiating causes of Fatal GA accidents, for pilots with
    - less than 100 hours, are airspeed and VFR flight into IMC in the Alaskan Region and airspeed nationwide.
    - between 100-299 hours, is airspeed in the Alaskan Region and nationwide.
    - between 300-1999 hours, is airspeed in the Alaskan Region and aircraft control nationwide.
    - between 2000-4999 hours, is visual lookout in the Alaskan Region and aircraft control nationwide.
    - of more than 5000 hours, is VFR flight into IMC in the Alaskan Region and airspeed nationwide.
- The top initiating causes of Serious GA accidents, for pilots with
    - less than 100 and between 100-299 hours, is airspeed in both the Alaskan Region and nationwide.
    - between 300-1999 hours, is compensation for wind conditions in the Alaskan Region and airspeed nationwide.
    - between 2000-4999 hours, is airspeed in both the Alaskan Region and nationwide.

- more than 5000 hours, are airspeed, stall (V_s) and preflight planning/preparation in the Alaskan Region and aircraft control nationwide.

- The top initiating causes of Minor/None GA accidents, for pilots with

  - less than 100 hours, is directional control in both the Alaskan Region and nationwide.

  - between 100-299, 300-1999, 2000-4999, and more than 5000 hours, is unsuitable terrain or takeoff/landing/taxi area in the Alaskan Region and directional control nationwide.

Based on aircraft engine power, the following results were found.

- The top initiating causes of Fatal GA accidents, for aircraft with

  - less than 200 hp, is airspeed in both the Alaskan Region and nationwide.

  - more than 200 hp, is VFR flight into IMC in both the Alaskan Region and nationwide.

- The top initiating causes of Serious GA accidents, for aircraft with

  - less than 200 hp, is fluid, fuel in the Alaskan Region and airspeed nationwide.

  - more than 200 hp, is VFR flight into IMC in the Alaskan Region and fluid, fuel nationwide.

- The top initiating cause of Serious GA accidents, for aircraft in both engine power categories, is directional control in the Alaskan Region and nationwide.

3. THE CENTRAL REGION.

This section discusses the Central Region, which includes Iowa, Kansas, Missouri, and Nebraska.

3.1 FREQUENCY OF GA ACCIDENTS IN THE CENTRAL REGION.

Generally, the frequency of GA accidents in the Central Region significantly decreased from 1982 to 1996, the first half of the period studied. As shown in figure 18, the number of GA accidents decreased from 207 in 1982 to 69 in 1996, which is more than a 50% decrease. However, the number increased from 82 in 1997 to 100 in 1999 before decreasing to 64 in 2000. The lowest number of accidents occurred in 2006 with 59 accidents. The number of GA accidents decreased to 60 in 2009.

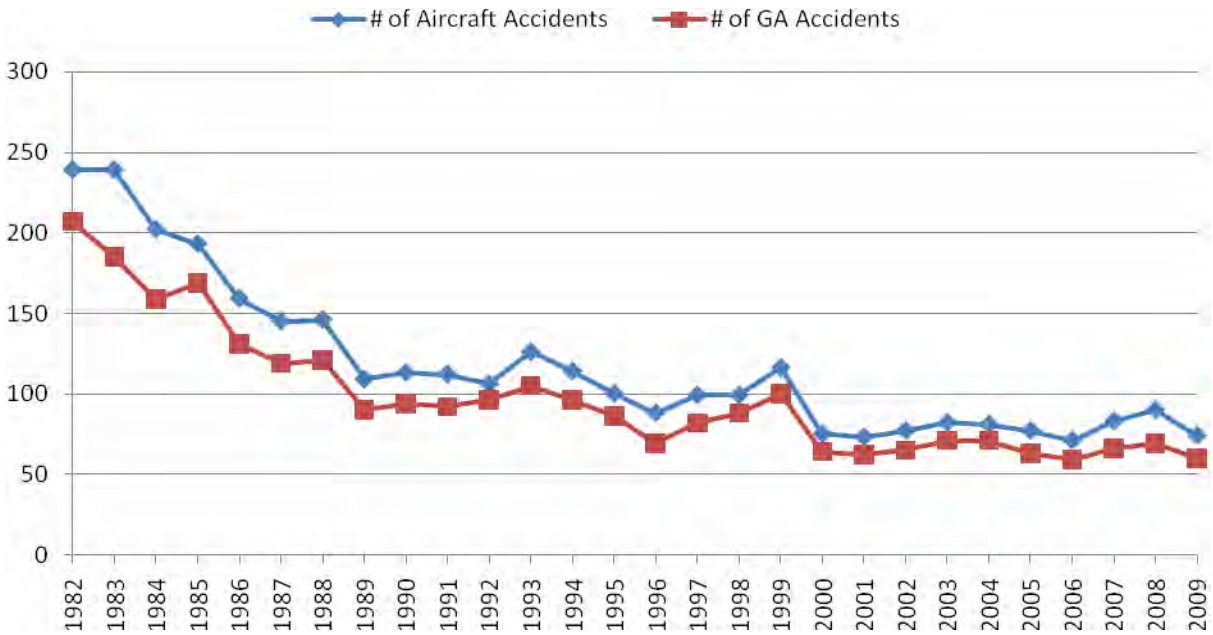

Figure 18. Number of Aircraft Accidents and GA Accidents in the Central Region

Figure 19 shows that the percentage of GA accidents in the Central Region of all aviation accidents fluctuates between 76% and 91%. The highest rate of GA accidents occurred in 1992 with 96 GA accidents out of a total of 106 aviation accidents, which is 90.57%. The lowest rate of GA accidents was in 2008 with 69 GA accidents out of a total of 90 aviation accidents, which is 76.7%.

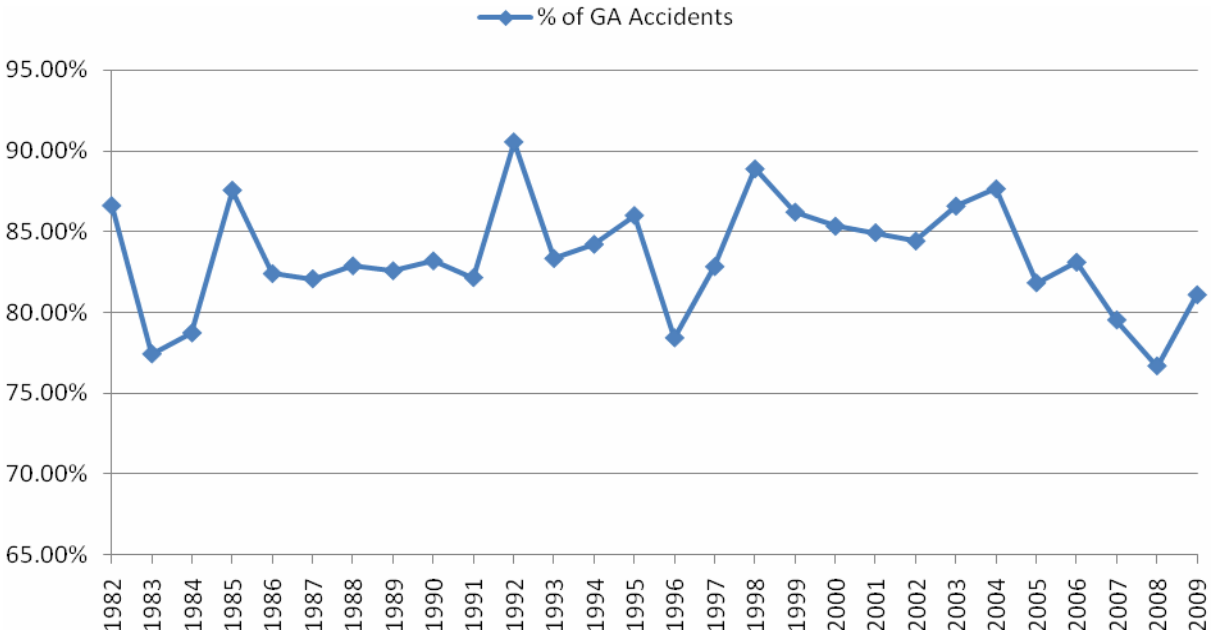

Figure 19. Percentage of GA Accidents of all Aviation Accidents in the Central Region

Figures 20 and 21 show the number of Fatal GA accidents and fatalities in the Central Region over the same period. Similar to the total number of GA accidents, the number of Fatal GA accidents decreased by more than half between 1982 and 1996, as shown in figure 20. The lowest number of Fatal GA accidents since 1982 occurred in 1996, 2003, and 2009 with nine Fatal GA accidents each. The number of fatalities, on the other hand, appears low compared to the number of accidents; this is because, unlike commercial aircraft, most GA flights have fewer passengers. Between 2005 and 2009, the number of fatalities became more stable. In fact, the number of fatalities in 2009, which is 11, is the lowest number since 1982.

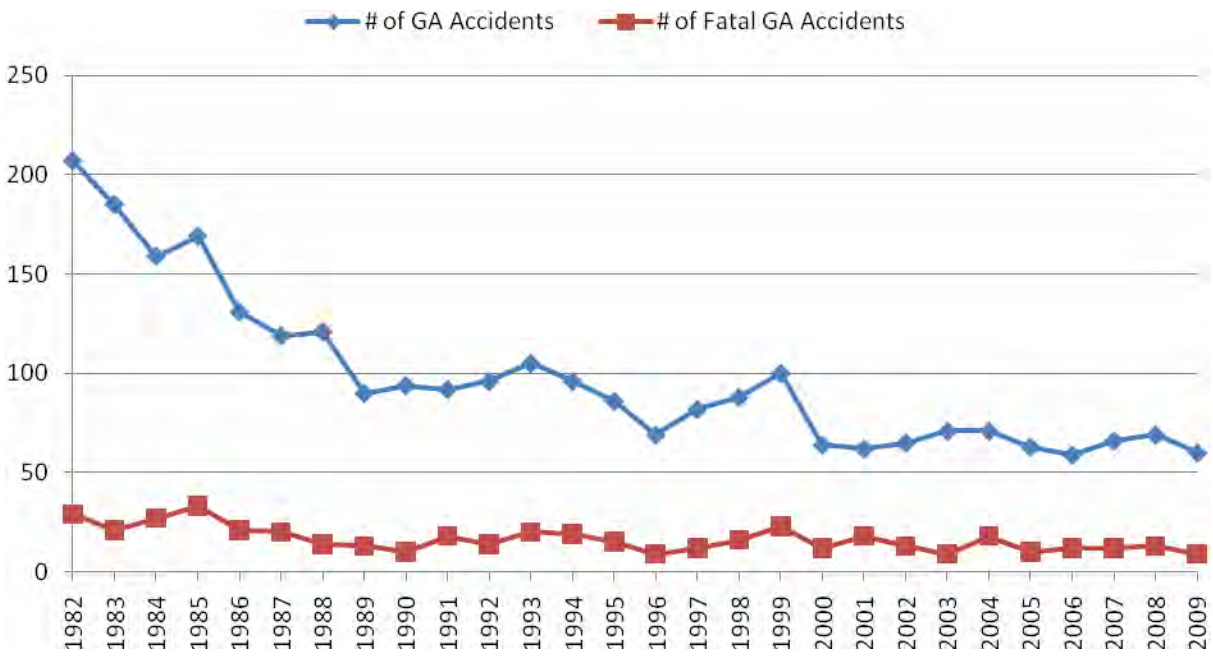

Figure 20. Number of GA Accidents and Fatal GA Accidents in the Central Region

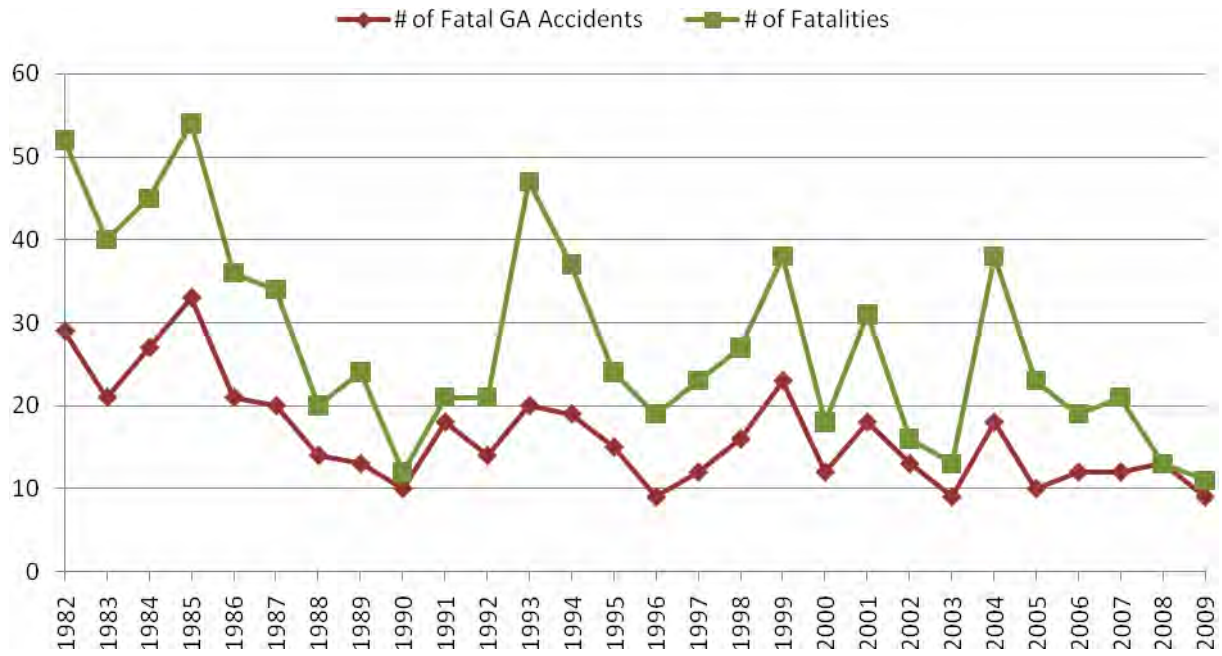

Figure 21. Number of Fatal GA Accidents and Fatalities in the Central Region

3.2 PERCENTAGE OF GA ACCIDENTS BASED ON MONTH AND TIME OF DAY IN THE CENTRAL REGION.

Figure 22 shows that the total number of GA accidents in the Central Region peaks between May and August when the summer weather is more suitable for flying. However, the percentage of Fatal GA accidents is quite high in November and April, which may require further investigation.

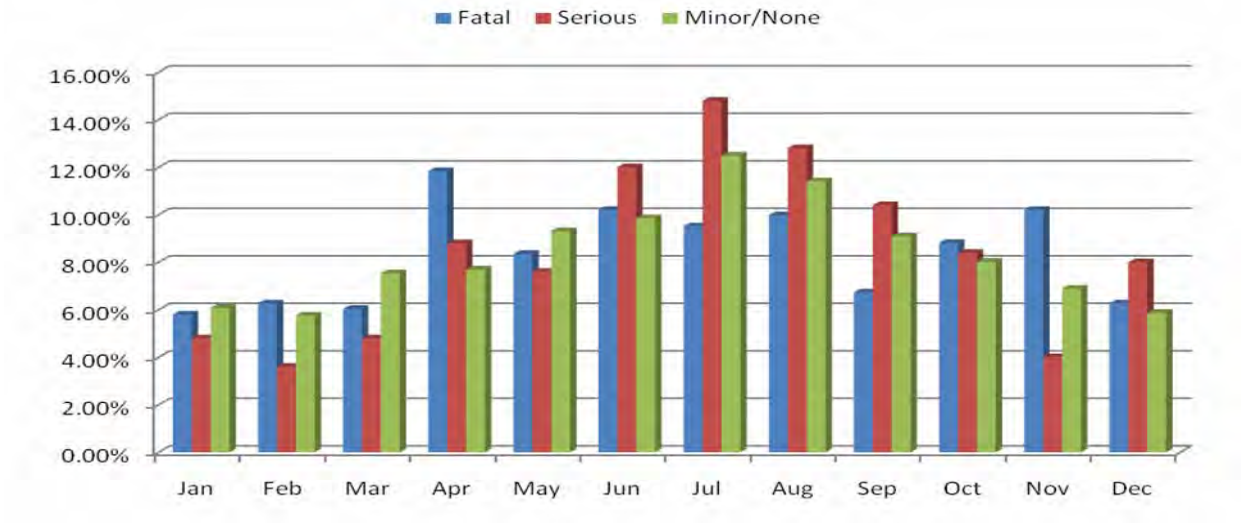

Figure 22. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Month in the Central Region (1982 to 2009)

With regard to time of day, the majority of GA accidents in the Central Region occurred between 7:00 and 22:00 hours (7 a.m. and 10 p.m.), as shown in figure 23. The highest number of accidents, in total between 1982 and 2009, occurred at 15:00 hours (3 p.m.) with 237 accidents and at 14:00 hours (2 p.m.) with 218 accidents, as shown in figure 23.

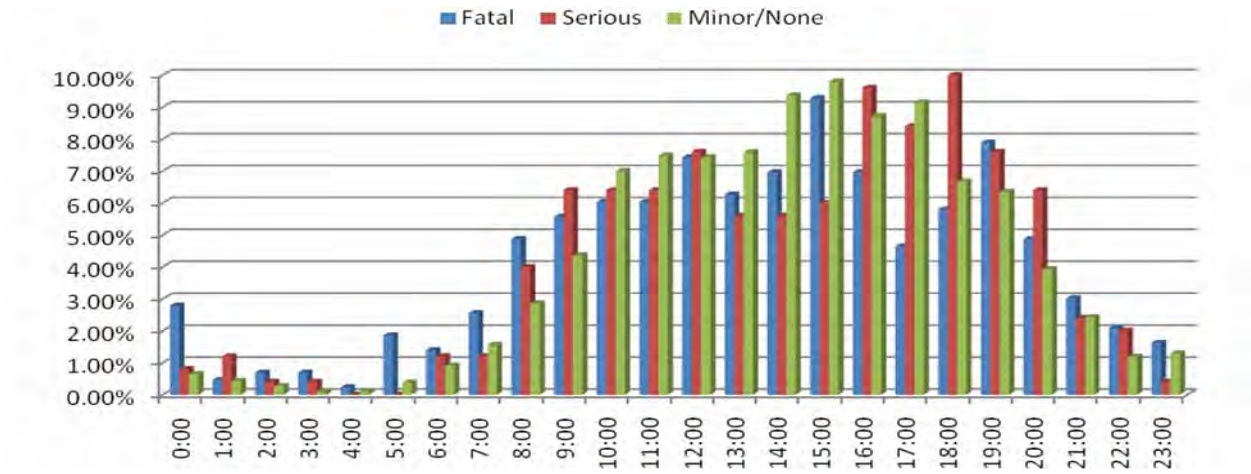

Figure 23. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Time of Day in the Central Region (1982 to 2009)

3.3 PERCENTAGE OF GA ACCIDENTS BASED ON PHASE AND PURPOSE OF FLIGHT IN THE CENTRAL REGION.

Figure 24 shows the percentage of GA accidents based on phase of flight between 1982 and 2009. The percentage of Fatal GA accidents is higher during the cruise, descent, and maneuvering phases. Serious GA accidents, however, were most likely to occur during the takeoff and approach phases. Similar to the nationwide data, the highest number of Minor/None GA accidents occurred during the landing phase.

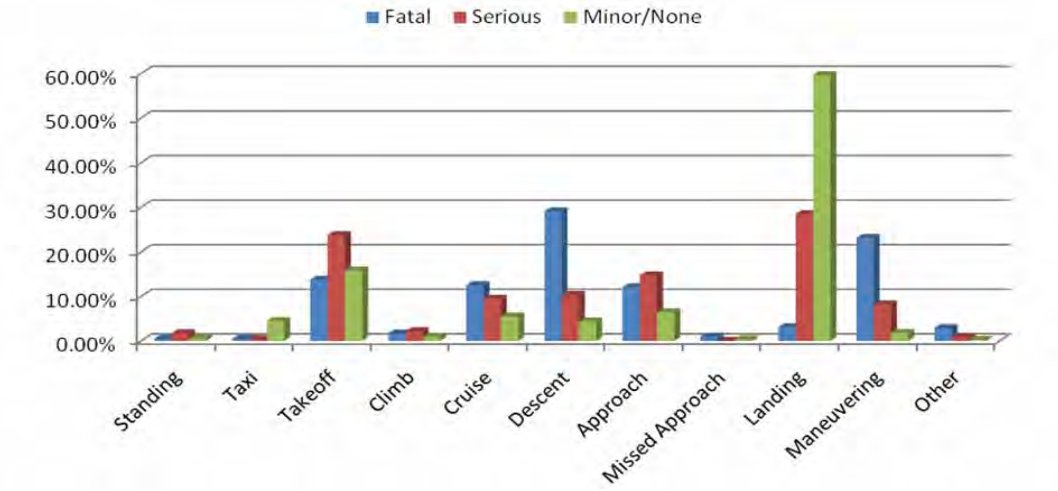

Figure 24. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Phase of Flight in the Central Region (1982 to 2009)

Figure 25 shows the percentage of GA accidents according to the purpose of flight. Because of the large number of personal aircraft in operation, personal flights contribute the highest rate of GA accidents in the Central Region like in all other regions, followed by instructional and business flights.

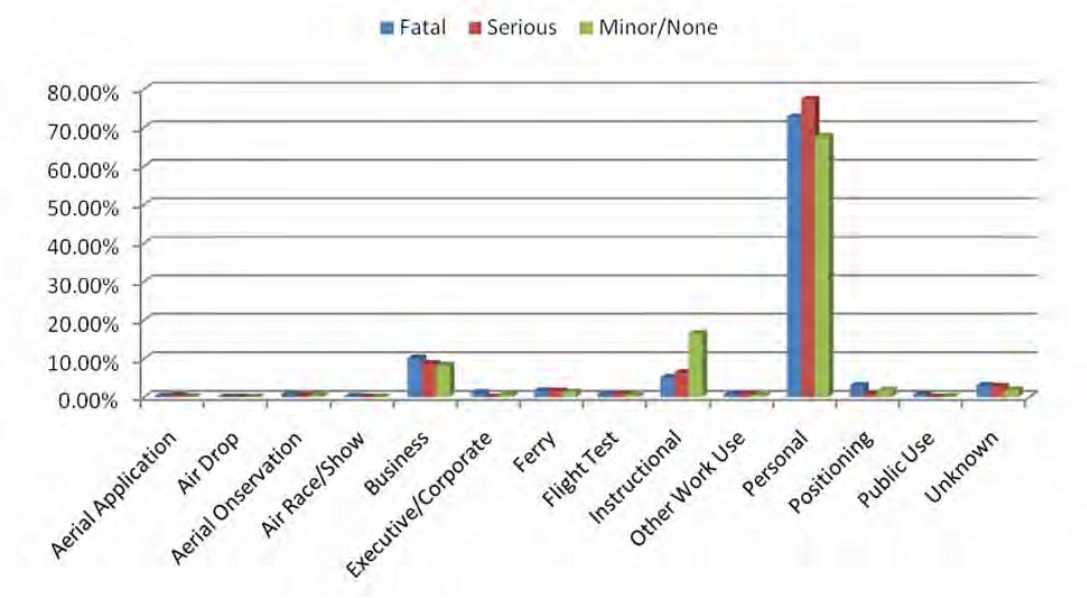

Figure 25. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Purpose of Flight in the Central Region (1982 to 2009)

3.4 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS IN THE CENTRAL REGION.

Figures 26 through 28 show the frequency and percentage of the top ten initiating causes of GA accidents for the Central Region. Aircraft control is the top initiating cause of Fatal GA accidents in the Central Region, as shown in figure 26. Fluid, fuel was the top initiating cause of Serious GA accidents in the Central Region, as shown in figure 27. Directional control is the top initiating cause of Minor/None GA accidents in the Central Region, as shown in figure 28. This is similar to the nationwide data.

Six initiating causes share the tenth position with seven occurrences each: (1) operation with known deficiencies in equipment, (2) proper altitude, (3) aircraft preflight, (4) stall, (5) visual lookout, and (6) judgment. Figure 26 shows only the first of these, operation with known deficiencies in equipment.

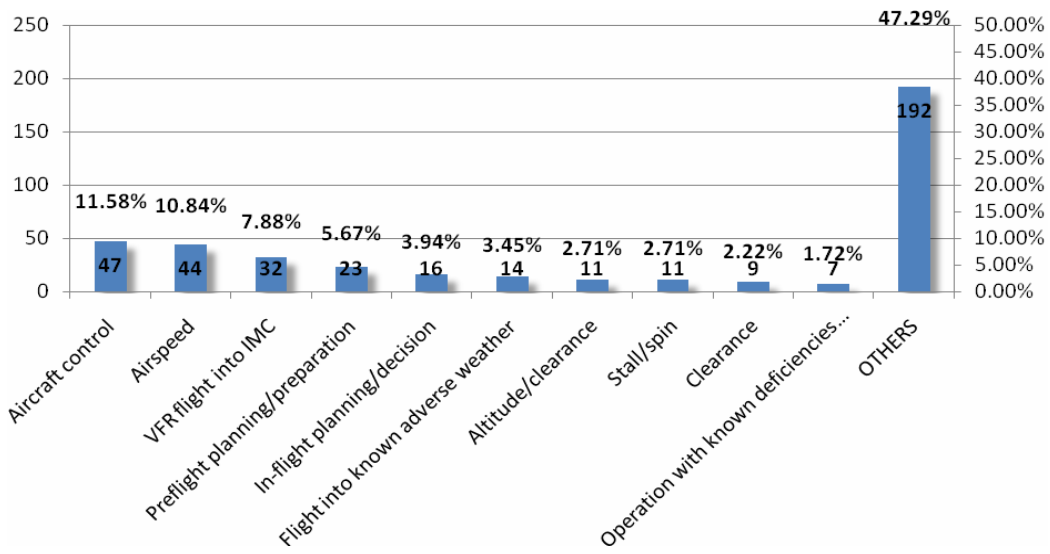

Figure 26. Frequency and Percentage of Initiating Causes of Fatal GA Accidents in the Central Region (1982 to 2009)

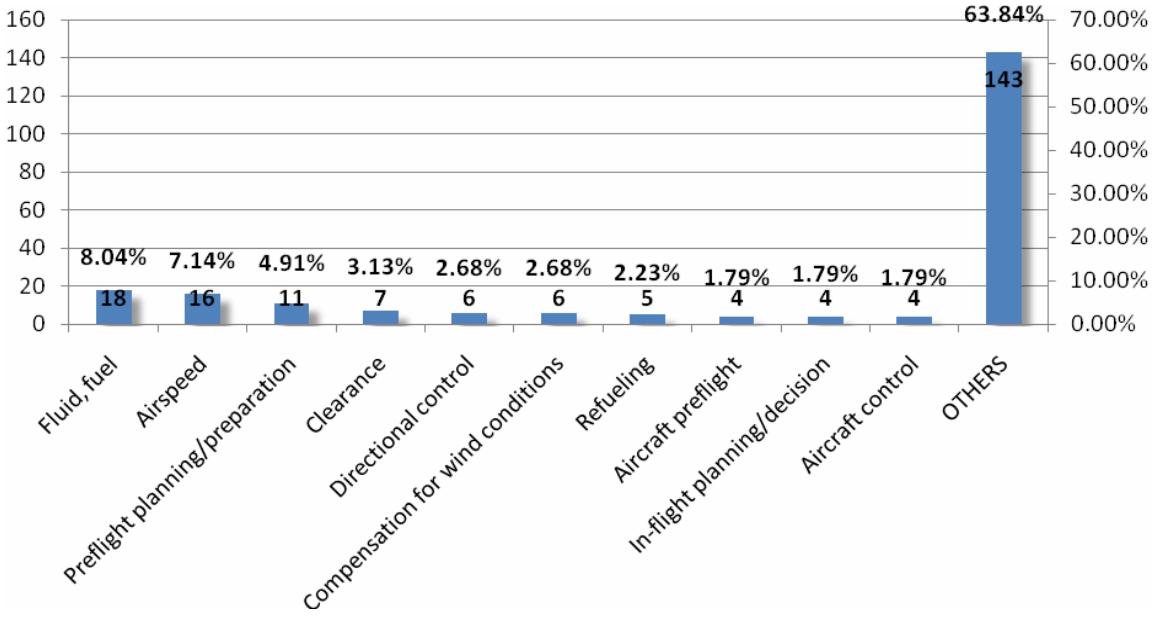

Figure 27. Frequency and Percentage of Initiating Causes of Serious GA Accidents in the Central Region (1982 to 2009)

Note that in addition to aircraft preflight, in-flight planning/decision, and aircraft control (shown in figure 27), six other initiating causes also have four occurrences, but are not shown. They are climb, judgment, stall, propeller system/accessories/blade, stalling speed, and weather evaluation.

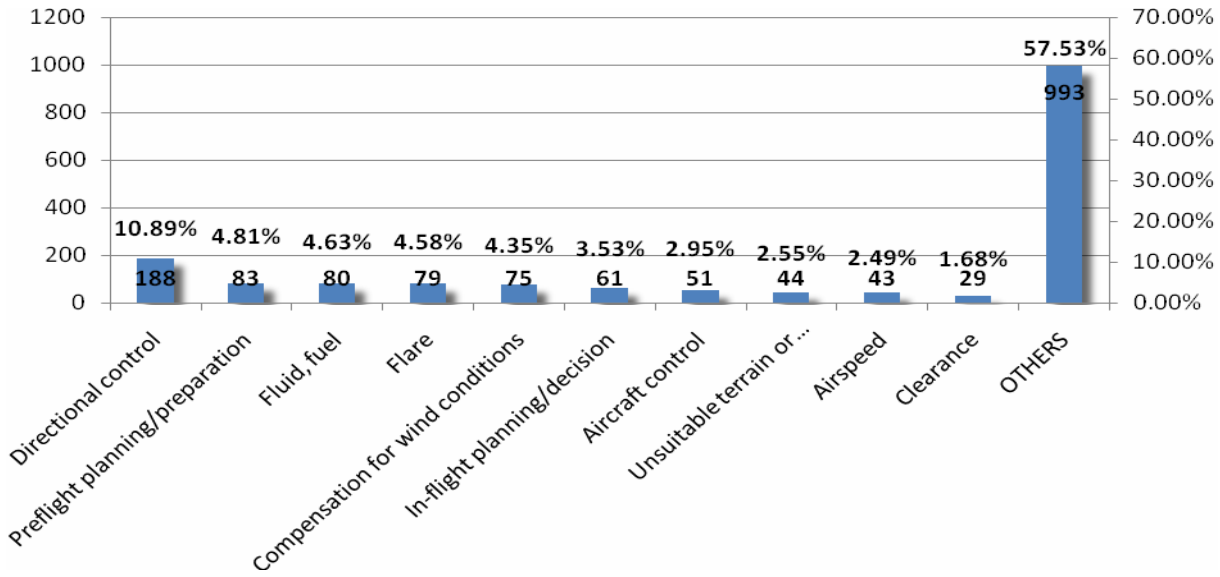

Figure 28. Frequency and Percentage of Initiating Causes of Minor/None GA Accidents in the Central Region (1982 to 2009)

3.5 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS RELATED TO PILOT EXPERIENCE IN THE CENTRAL REGION.

According to the FAA, pilot error is the number one cause of aircraft accidents and incidents followed by faulty maintenance and operational errors. The NTSB database confirms that approximately 85% of GA accidents in the Central Region are caused by pilot error. The following sections provide statistical analyses of GA accident causes in the Central Region related to pilot error. In particular, pilot experience in hours is used in this report to examine the top ten initiating causes of GA accidents that lead to other events.

Figures 29 through 31 show the percentage of pilot experience based on total flight hours in relation to initiating causes of GA accidents.

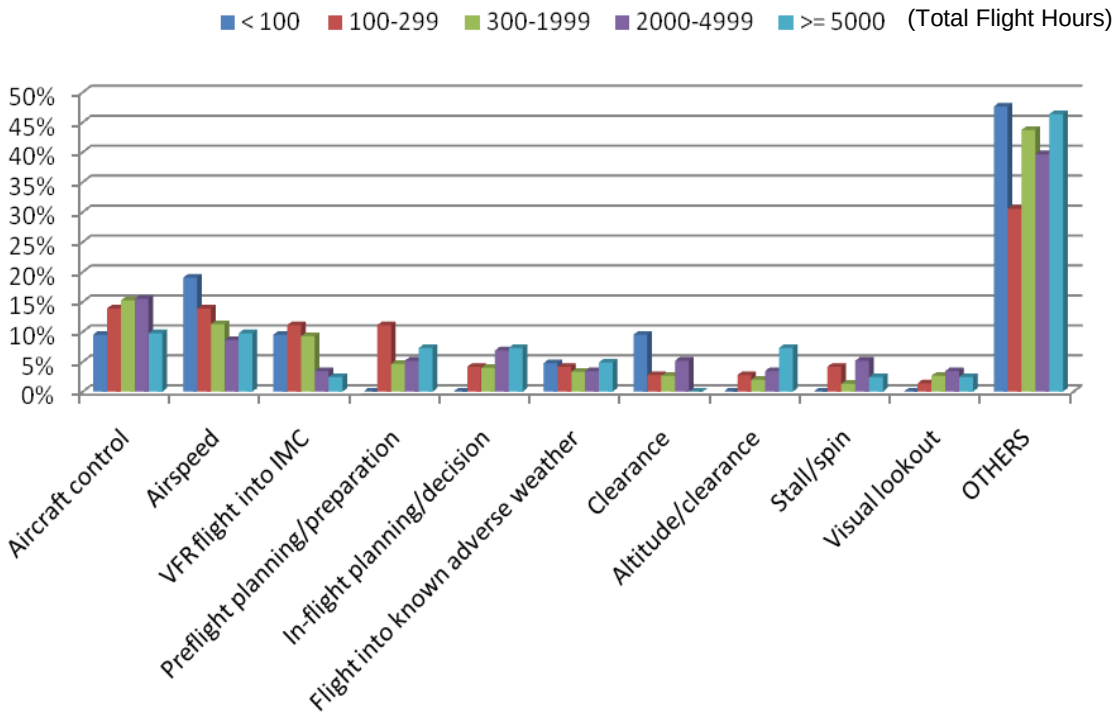

Figure 29. Percentage of Initiating Causes of Fatal GA Accidents Based on Pilot Experience in the Central Region (1982 to 2009)

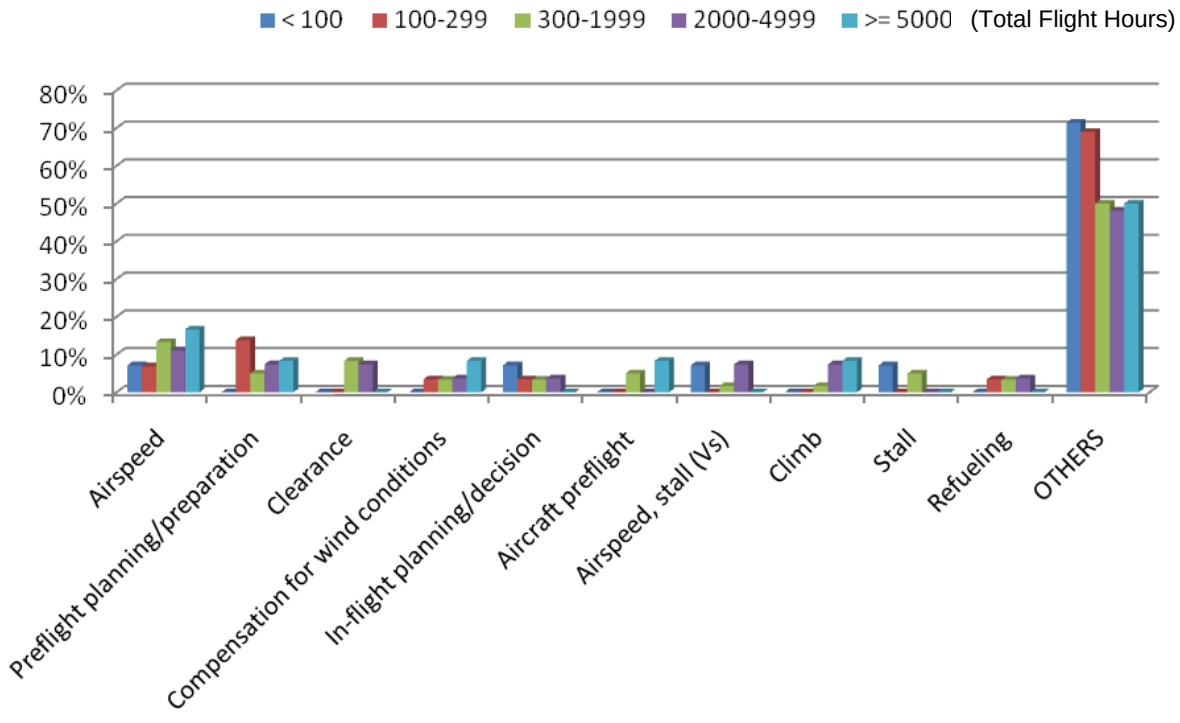

Figure 30. Percentage of Initiating Causes of Serious GA Accidents Based on Pilot Experience in the Central Region (1982 to 2009)

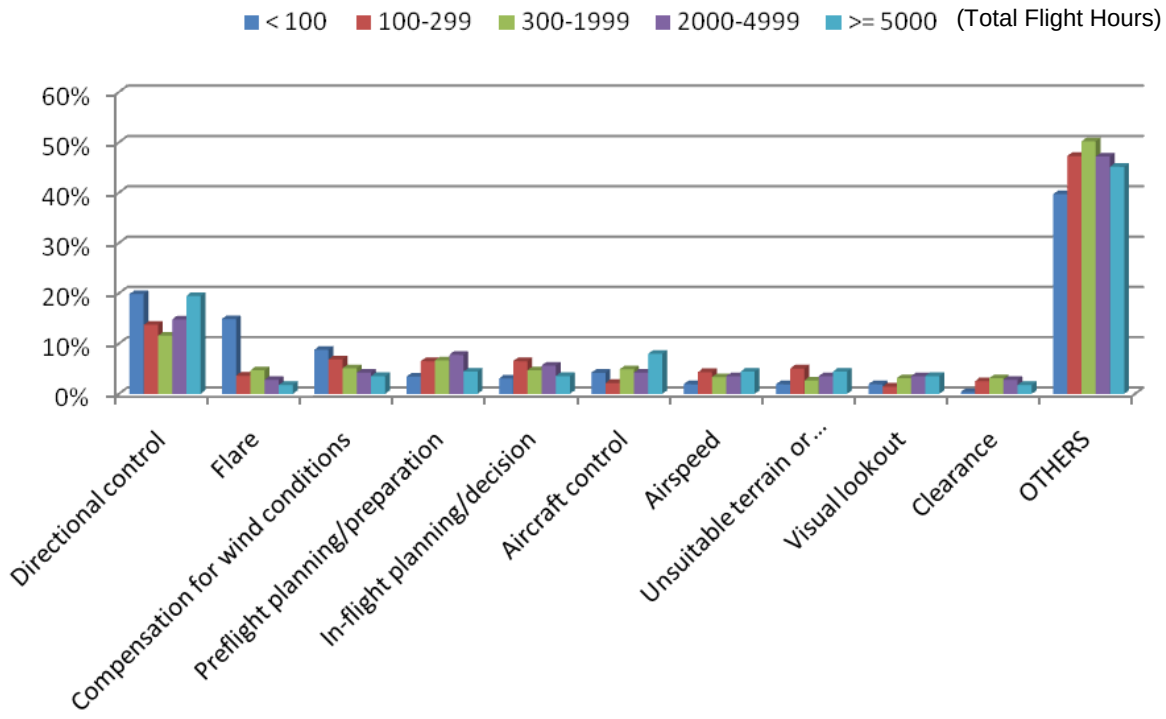

Figure 31. Percentage of Initiating Causes of Minor/None GA Accidents Based on Pilot Experience in the Central Region (1982 to 2009)

3.6 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS BASED ON AIRCRAFT COMPLEXITY IN THE CENTRAL REGION.

Figures 32 through 34 show the percentage of accidents involving aircraft with less than 200 engine hp and accidents involving aircraft with more than or equal to 200 engine hp. Figure 32 shows that aircraft control is the number one initiating cause of Fatal GA accidents for the two categories combined. Figure 33 shows airspeed as the number one initiating cause of Serious GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents for both categories, as shown in figure 34.

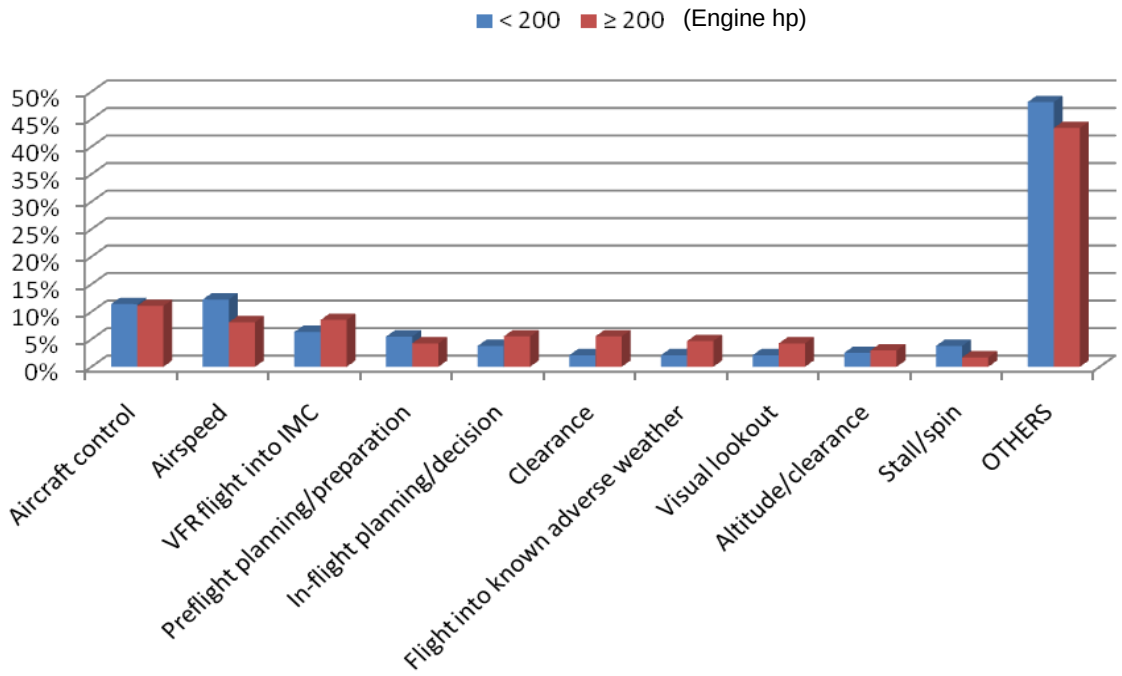

Figure 32. Percentage of Initiating Causes of Fatal GA Accidents Based on Aircraft Engine Power in the Central Region (1982 to 2009)

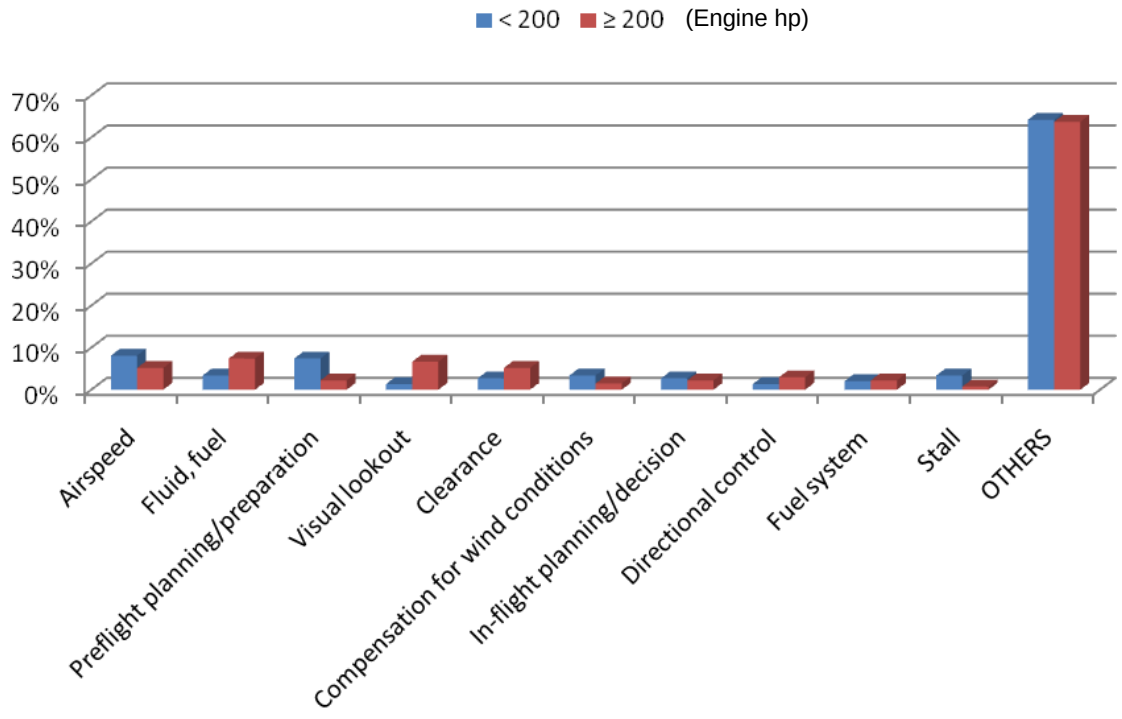

Figure 33. Percentage of Initiating Causes of Serious GA Accidents Based on Aircraft Engine Power in the Central Region (1982 to 2009)

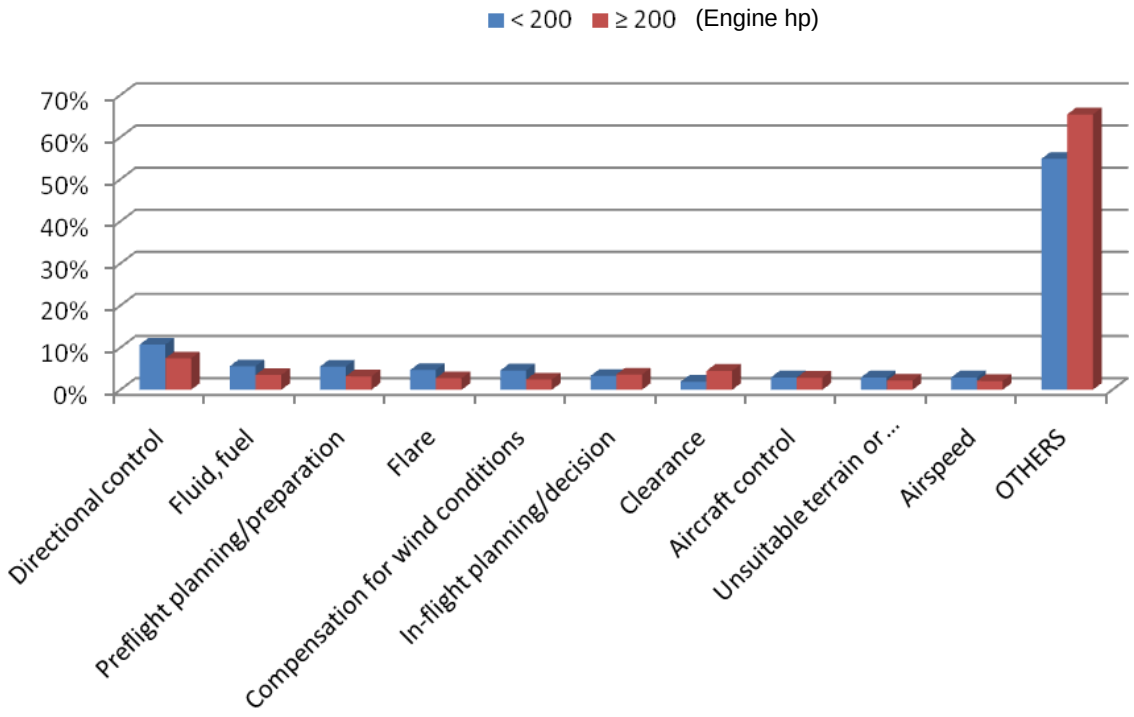

Figure 34. Percentage of Initiating Causes of Minor/None GA Accidents Based on Aircraft Engine Power in the Central Region (1982 to 2009)

3.7 RESULTS FOR THE CENTRAL REGION.

This study examined the top ten initiating causes of GA accidents in the Central Region between 1982 and 2009. The trends found are similar to the nationwide trend and the trends in other regions. Airspeed, for example, is most frequently the number one initiating cause of Fatal GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents.

The number of GA accidents in the Central Region has decreased from 207 in 1982 to 60 in 2009, which is almost a 25% decrease. The number of GA accidents in the Central Region decreased faster than the number of nationwide GA accidents.

Analysis of GA accidents in the Central Region based on month shows that the majority of GA accidents occurred between May and August, which is similar to the nationwide data.

The majority of GA accidents in the Central Region occurred between 07:00 and 22:00 hours (7 a.m. and 10 p.m.) with the highest number of GA accidents recorded at 15:00 hours (3 p.m.) and 14:00 hours (2 p.m.); nationwide, the highest number of GA accidents occurred at 14:00 hours (2 p.m.) and 15:00 hours (3 p.m.).

Analysis of GA accidents in the Central Region based on phase of flight shows that the highest number of accidents occurred during the landing phase. Fatal GA accidents were higher during the cruise, descent, and maneuvering phases. Serious GA accidents were most likely to occur

during the takeoff and approach phases; nationwide, Serious GA accidents mainly occur during the takeoff and landing phases.

Analysis of GA accidents in the Central Region based on purpose of flight shows that personal flight contributes the highest rate of GA accidents, which is similar to the nationwide data.

The top initiating causes of Fatal GA accidents in the Central Region are aircraft control followed by airspeed; nationwide, the top initiating causes of Fatal GA accidents are airspeed followed by VFR flight into IMC.

The top initiating causes for Serious GA accidents in the Central Region are fluid, fuel followed by airspeed, which is similar to the nationwide data.

The top initiating cause of Minor/None GA accidents in the Central Region is directional control. This trend is similar to the nationwide data.

Based on pilot experience in total flight hours, the following results were found.

- The top initiating cause of Fatal GA accidents, for pilots with
  - less than 100 hours, is airspeed in both the Central Region and nationwide.
  - between 100-299 hours, are aircraft control and airspeed in the Central Region and airspeed nationwide.
  - between 300-1999 and 2000-4999 hours, is aircraft control in both the Central Region and nationwide.
  - more than 5000 hours, are aircraft control and airspeed in the Central Region and airspeed nationwide.
- The top initiating cause of Serious GA accidents, for pilots with
  - less than 100 hours, is airspeed in both the Central Region and nationwide.
  - between 100-299 hours, is preflight planning/decision in the Central Region and airspeed nationwide.
  - between 300-1999 and 2000-4999 hours, is airspeed in both the Central Region and nationwide.
  - more than 5000 hours, is airspeed in the Central Region and aircraft control nationwide.
- The top initiating cause of Minor/None GA accidents for pilots at every experience level is directional control in the Central Region and nationwide.

Based on aircraft engine power, the following results were found.

- The top initiating cause of Fatal GA accidents, for aircraft with
  - less than 200 hp, is airspeed in both the Central Region and nationwide.
  - more than 200 hp, is aircraft control in the Central Region and VFR flight into IMC nationwide.
- The top initiating cause of Serious GA accidents, for aircraft with
  - less than 200 hp, is airspeed in the Central Region and fluid, fuel nationwide.
  - more than 200 hp, is fluid, fuel in both the Central Region and nationwide.
- The top initiating cause of Serious GA accidents for both engine power levels is directional control in both Central Region and nationwide.

4. THE EASTERN REGION.

This section discusses the Eastern Region, which includes Delaware, Maryland, New Jersey, New York, Pennsylvania, Virginia, West Virginia, and Washington, DC.

4.1 FREQUENCY OF GA ACCIDENTS IN THE EASTERN REGION.

Generally, the frequency of GA accidents in the Eastern Region has decreased significantly between 1982 and 1995. The number of GA accidents has decreased from 300 in 1982 to 120 in 2004, which is more than a 50% decrease. However, the trend from 2005 onward shows a slight increase for 2 to 3 years followed by a slight drop.

Figure 35 shows the number of all aviation and GA accidents. Figure 36 shows the percentage of GA accidents in the Eastern Region out of all aviation accidents in the same region. It confirms that the decline in the number of GA accidents is slower than that of aircraft accidents. Both figures verify that GA has a significant role in the safety of aviation industry and needs attention.

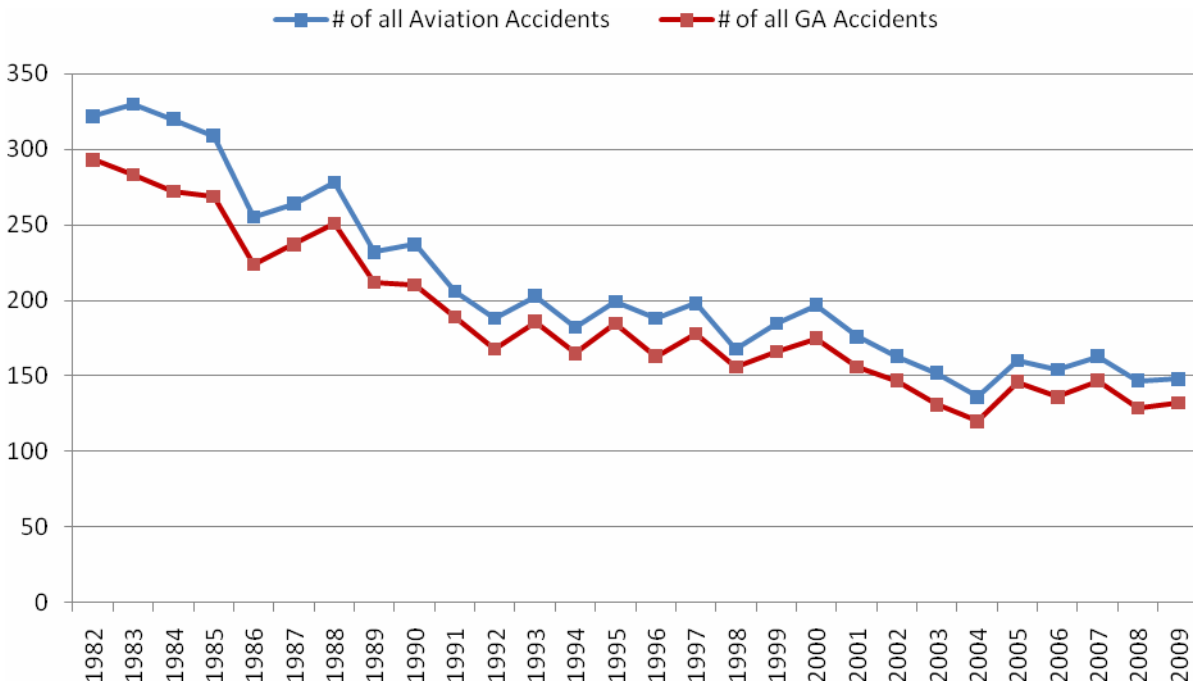

Figure 35. Number of all Aviation Accidents and all GA Accidents in the Eastern Region

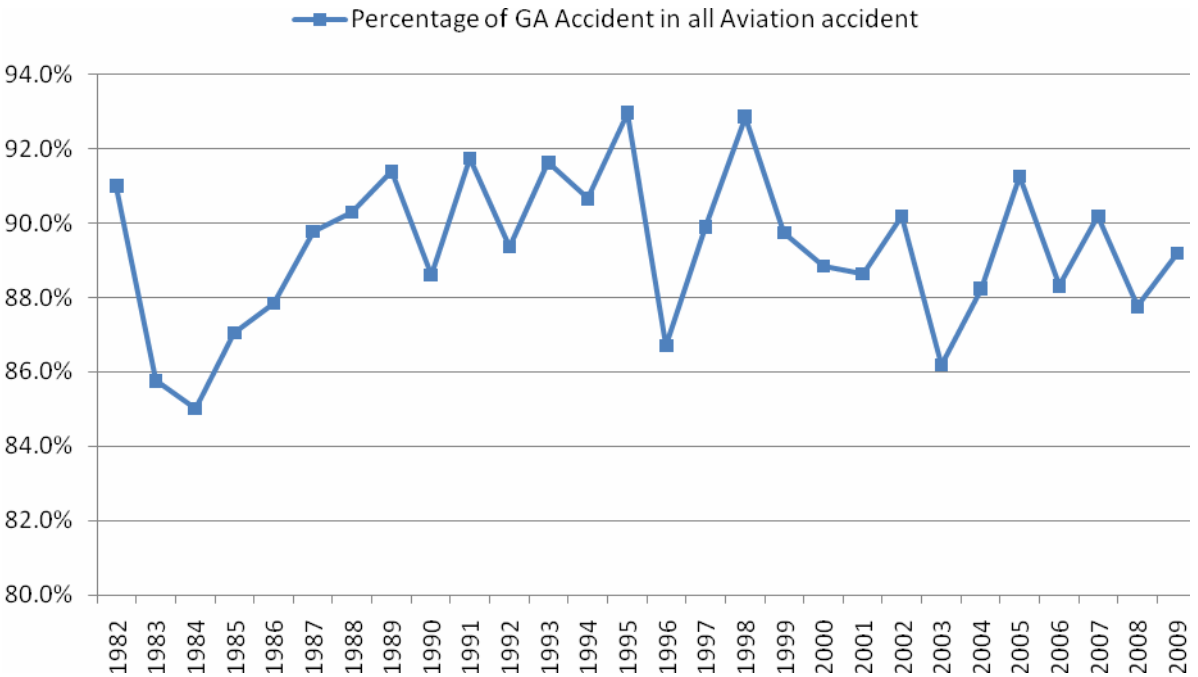

Figure 36. Percentage of GA Accidents of all Aviation Accidents in the Eastern Region

Figures 37 and 38 show the number of Fatal GA accidents and fatalities in the Eastern Region. Similar to the number of total GA accidents, the number of Fatal GA accidents decreased by more than half between 1982 and 1997, as shown in figure 37.

The number of fatalities appears low compared to the number of accidents. This is because, unlike commercial aircraft, most GA flights have fewer passengers. In the 1990s, the number of fatalities also decreased by more than half the number in 1982, as shown in figure 38.

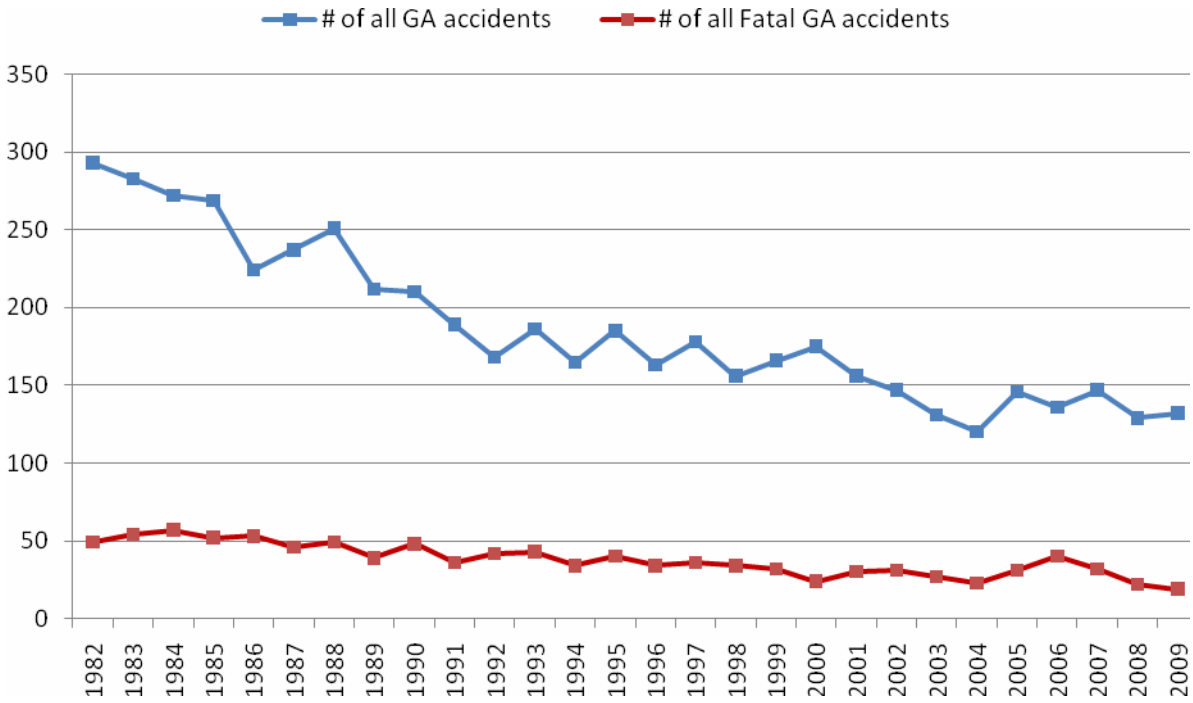

Figure 37. Number of all GA Accidents and all Fatal GA Accidents in the Eastern Region

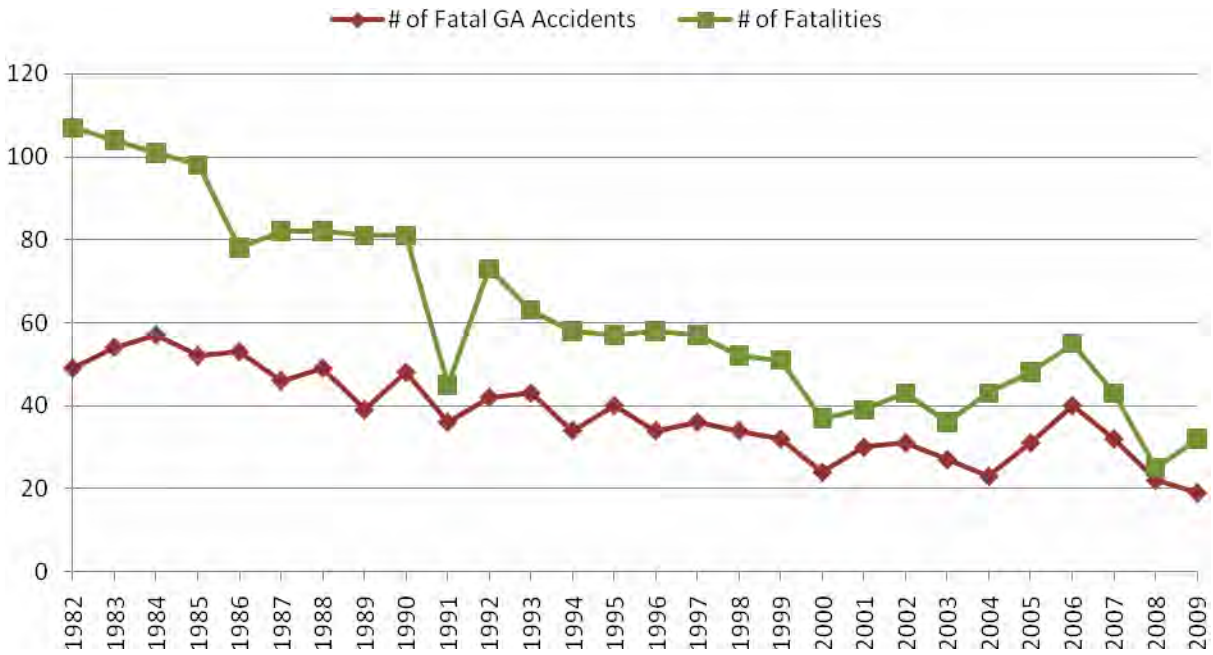

Figure 38. Number of Fatal GA Accidents and Fatalities in the Eastern Region

4.2 PERCENTAGE OF GA ACCIDENTS BASED ON MONTH AND TIME OF DAY IN THE EASTERN REGION.

Figure 39 shows that the total number of GA accidents in the Eastern Region peaks between May and August when the summer weather is more suitable for flying. Fatal GA accidents are significantly higher during March, April, November, and December. Serious GA accidents are most likely to occur in May, July, and August.

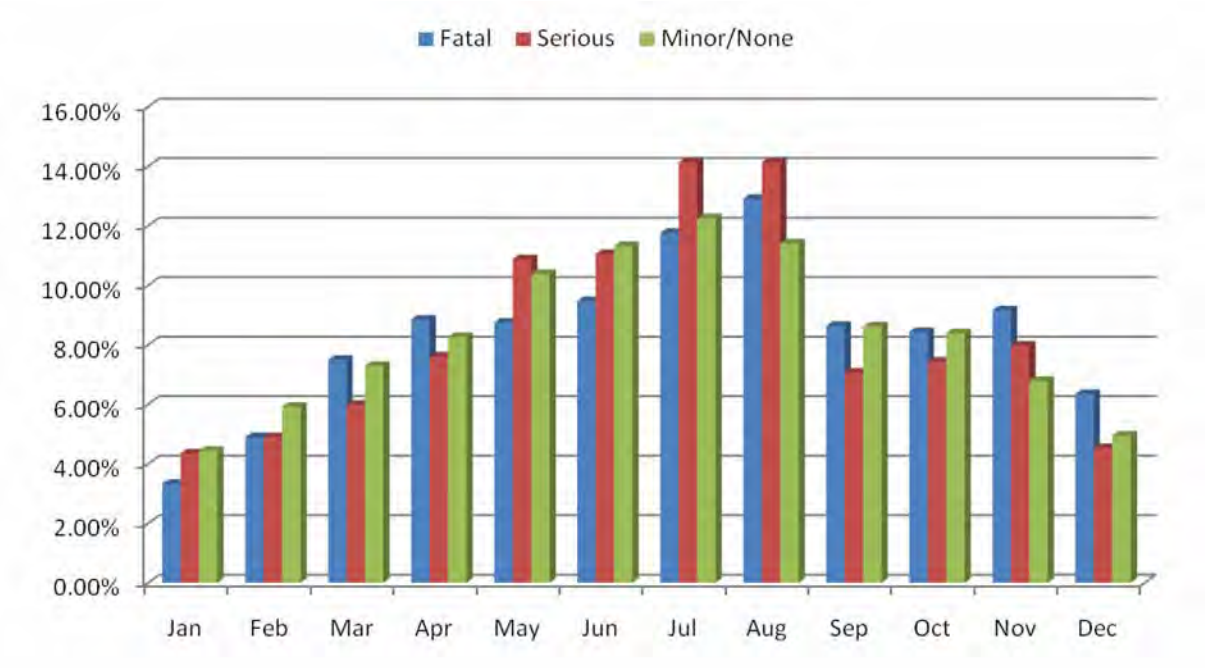

Figure 39. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Month in the Eastern Region (1982 to 2009)

With regard to time of day, figure 40 shows the majority of GA accidents in the Eastern Region occurred between 07:00 and 22:00 hours (7 a.m. and 10 p.m.). The highest number of GA accidents, in total between 1982 and 2009, occurred at 14:00 hours (2 p.m.) with 445 accidents and at 15:00 hours (3 p.m.) with 432 accidents.

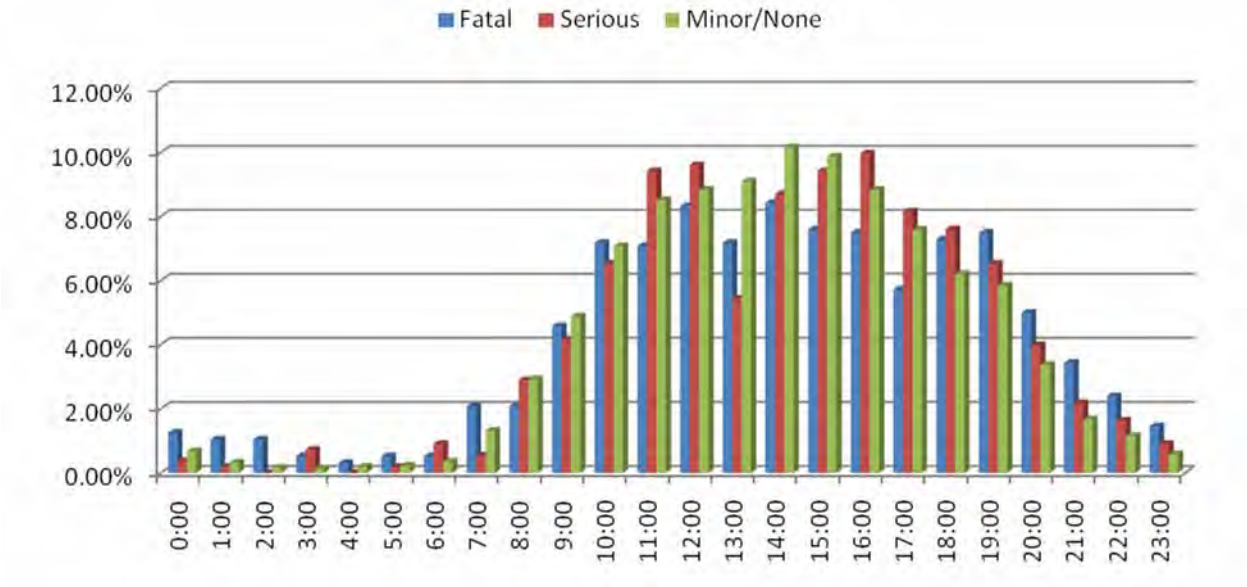

Figure 40. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Time of Day in the Eastern Region (1982 to 2009)

4.3 PERCENTAGE OF GA ACCIDENTS BASED ON PHASE AND PURPOSE OF FLIGHT IN THE EASTERN REGION.

Figure 41 shows that the highest number of GA accidents occurred during the landing phase. Fatal GA accidents are significantly higher during the cruise, descent, approach, and maneuvering phases. Serious GA accidents, however, are most likely to occur during the takeoff and landing phases. Similar to the nationwide data, the highest number of Minor/None GA accidents occurred during the landing phase.

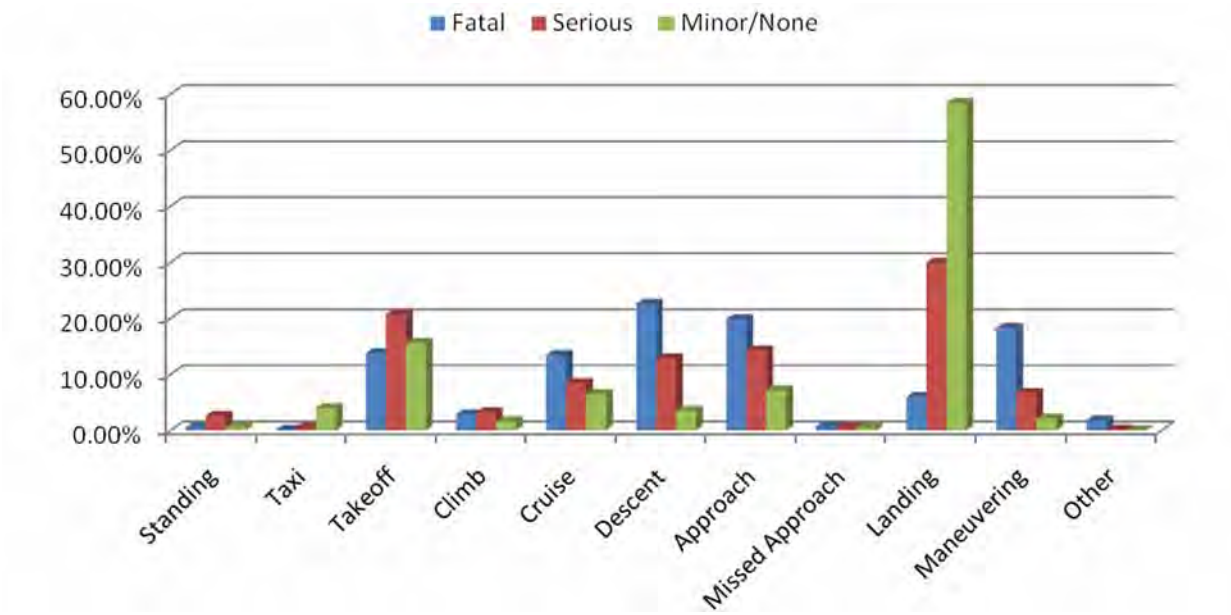

Figure 41. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Phase of Flight in the Eastern Region (1982 to 2009)

Figure 42 shows the percentage of GA accidents based on purpose of flight. Personal flights contribute the highest rate of GA accidents in the Eastern Region, followed by instructional and business flights.

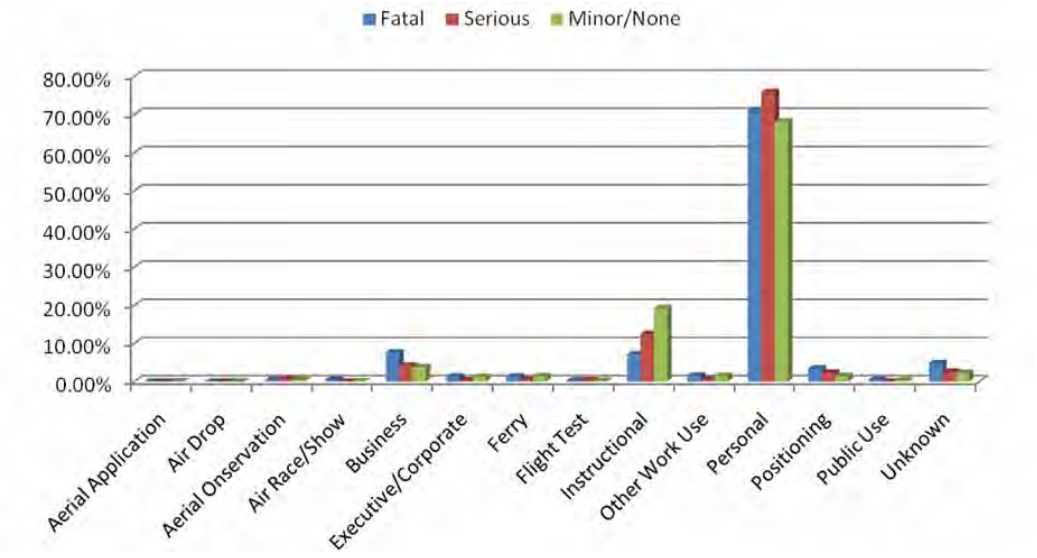

Figure 42. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Phase of Flight in the Eastern Region (1982 to 2009)

4.4 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS IN THE EASTERN REGION.

Figures 43 through 45 show the frequency and percentage of the top ten initiating causes of GA accidents for the Eastern Region. Airspeed is the top initiating cause of Fatal GA accidents in the Eastern Region, as shown in figure 43. Fluid, fuel was the top initiating cause of Serious GA accidents in the Eastern Region, as shown in figure 44. Directional control is the top initiating cause of Minor/None GA accidents in the Eastern Region, as shown in figure 45. This is similar to the nationwide data.

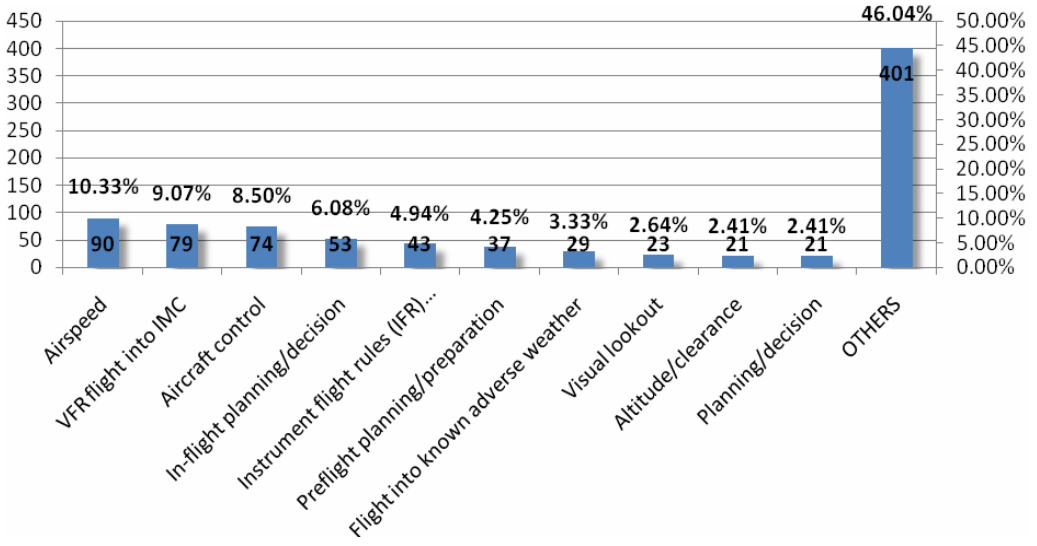

Figure 43. Frequency and Percentage of Initiating Causes of Fatal GA Accidents in the Eastern Region (1982 to 2009)

Note that carburetor heat, visual lookout, and planning/decision share the tenth position with nine occurrences each. Figure 44 shows only the first of these, carburetor heat.

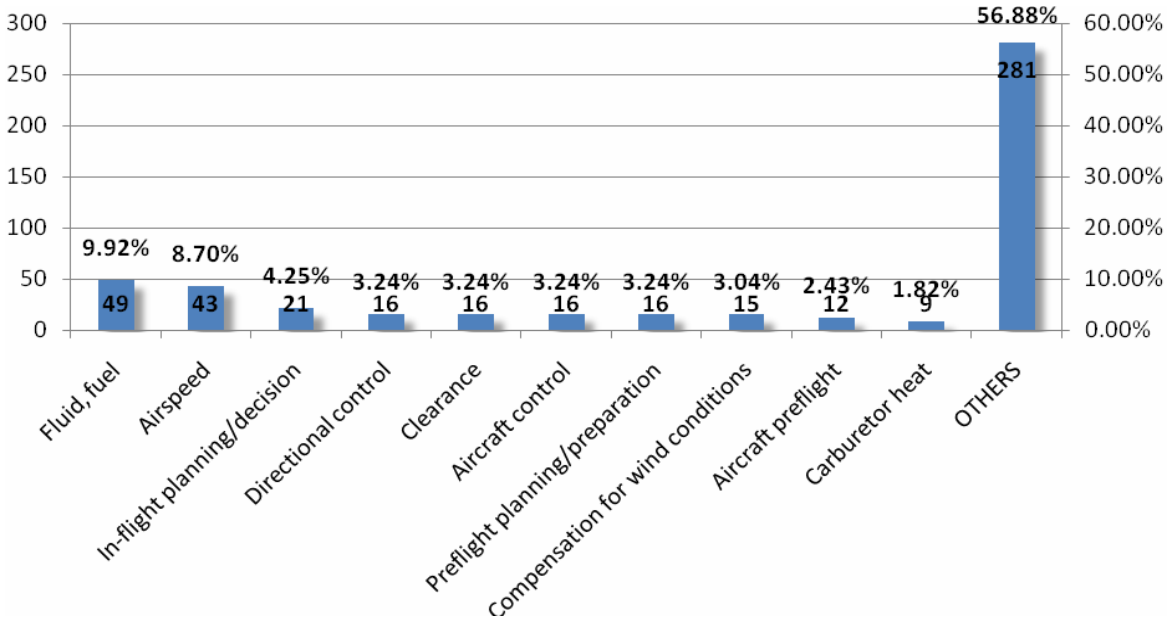

Figure 44. Frequency and Percentage of Initiating Causes of Serious GA Accidents in the Eastern Region (1982 to 2009)

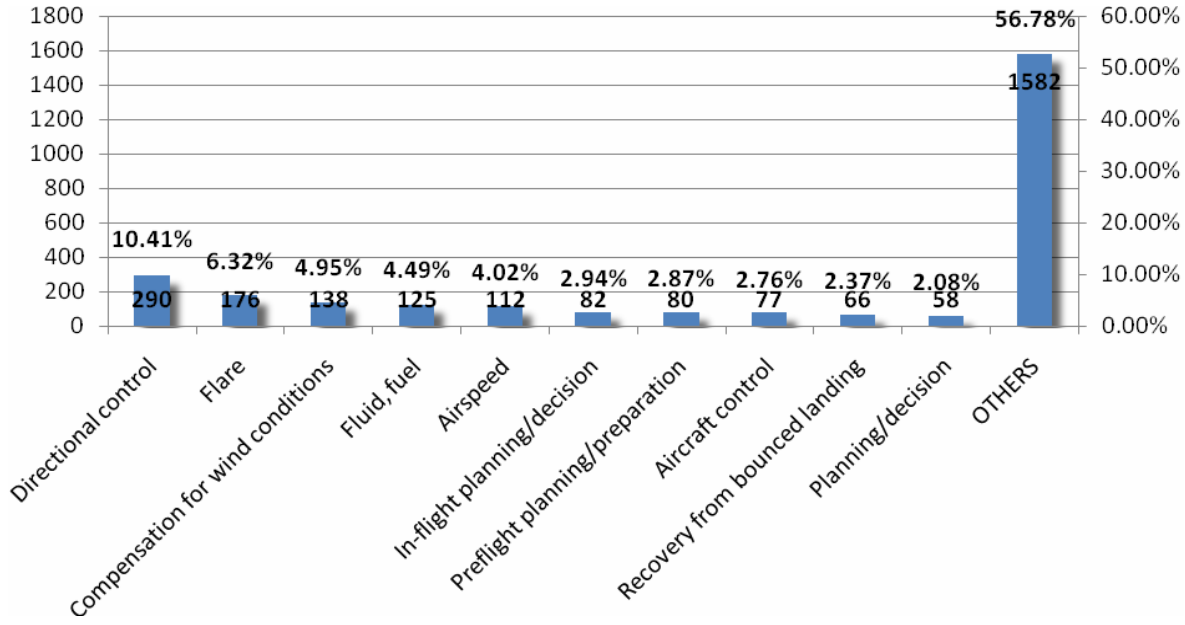

Figure 45. Frequency and Percentage of Initiating Causes of Minor/None GA Accidents in the Eastern Region (1982 to 2009)

4.5 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS RELATED TO PILOT EXPERIENCE IN THE EASTERN REGION.

According to the FAA, pilot error is the number one cause of aircraft accidents and incidents followed by faulty maintenance and operational errors. The NTSB database confirms that approximately 85% of GA accidents in the Eastern Region are caused by pilot error. The following sections provide statistical analyses of GA accident causes in the Eastern Region related to pilot error. In particular, pilot experience in hours is used in this report to examine the top ten initiating causes of GA accidents that lead to other events.

Figures 46 through 48 show the percentage of pilot experience based on total flight hours in relation to initiating causes of GA accidents.

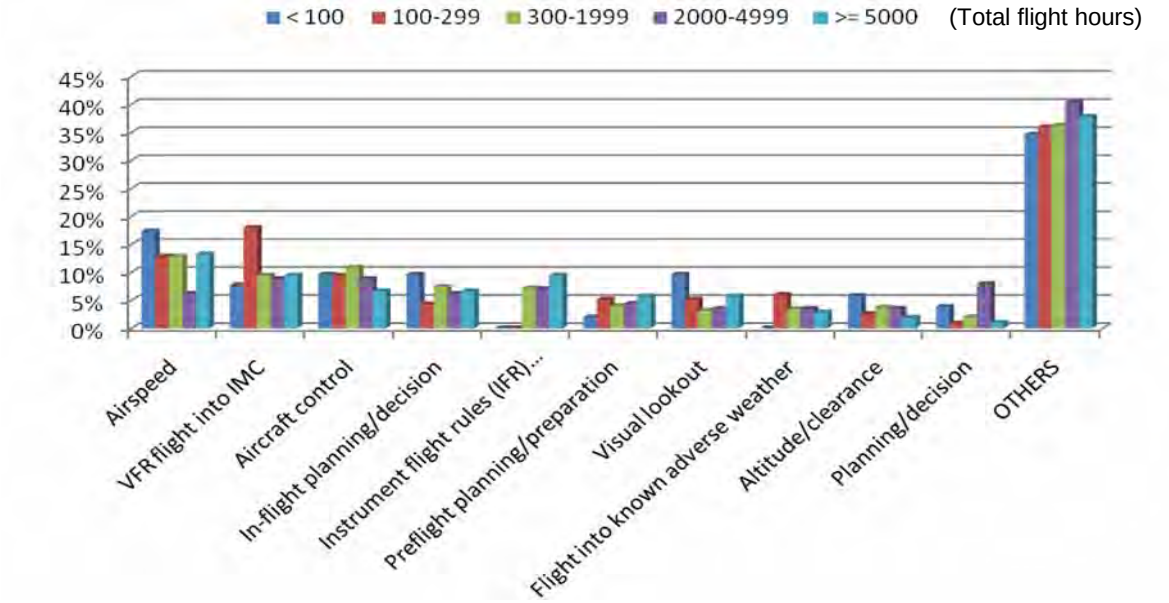

Figure 46. Percentage of Initiating Causes of Fatal GA Accidents Based on Pilot Experience in the Eastern Region (1982 to 2009)

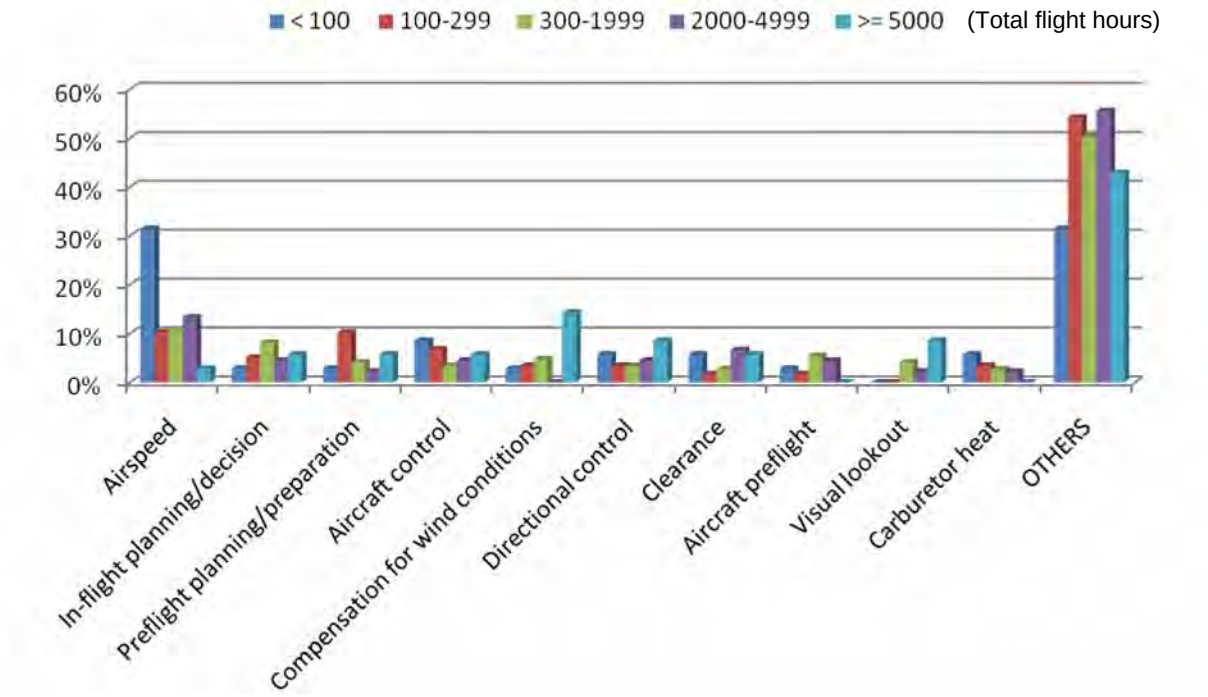

Figure 47. Percentage of Initiating Causes of Serious GA Accidents Based on Pilot Experience in the Eastern Region (1982 to 2009)

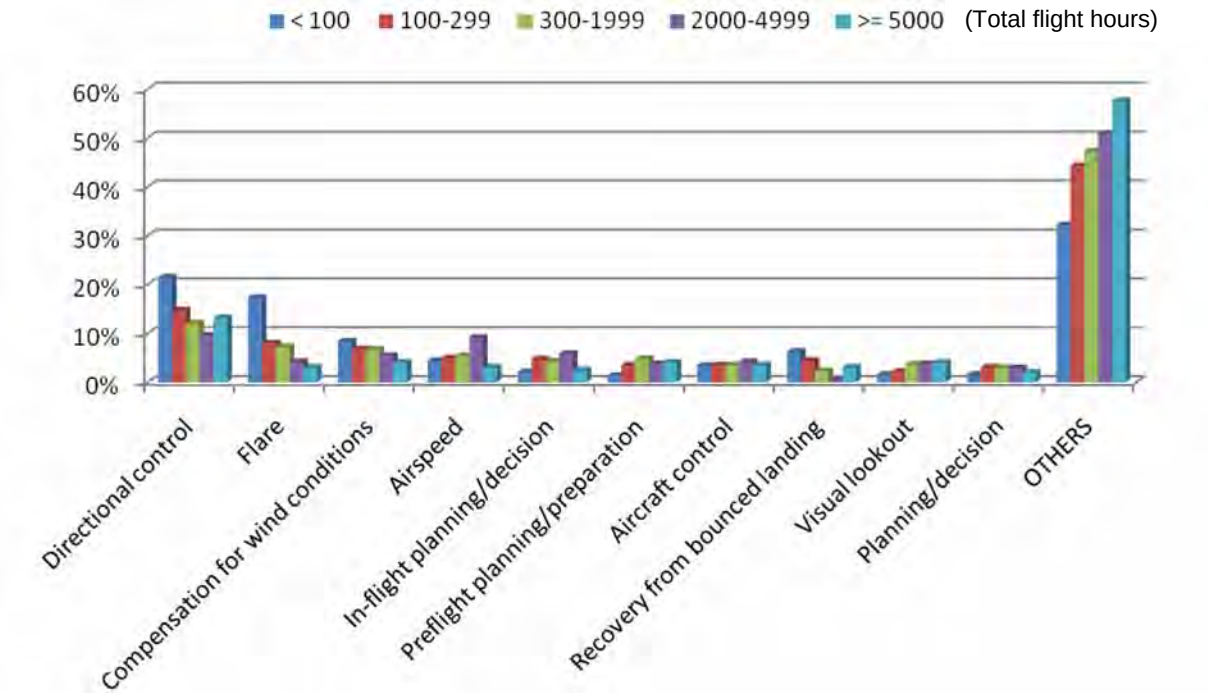

Figure 48. Percentage of Initiating Causes of Minor/None GA Accidents Based on Pilot Experience in the Eastern Region (1982 to 2009)

4.6 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS BASED ON AIRCRAFT COMPLEXITY IN THE EASTERN REGION.

Figures 49 through 51 show the percentages of accidents involving aircraft with less than 200 engine hp and accidents involving aircraft with more than or equal to 200 engine hp. Figure 49 shows that airspeed is the number one initiating cause of Fatal GA accidents for the two categories combined. Figure 50 shows fluid, fuel as the number one initiating cause of Serious GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents, as shown in figure 51.

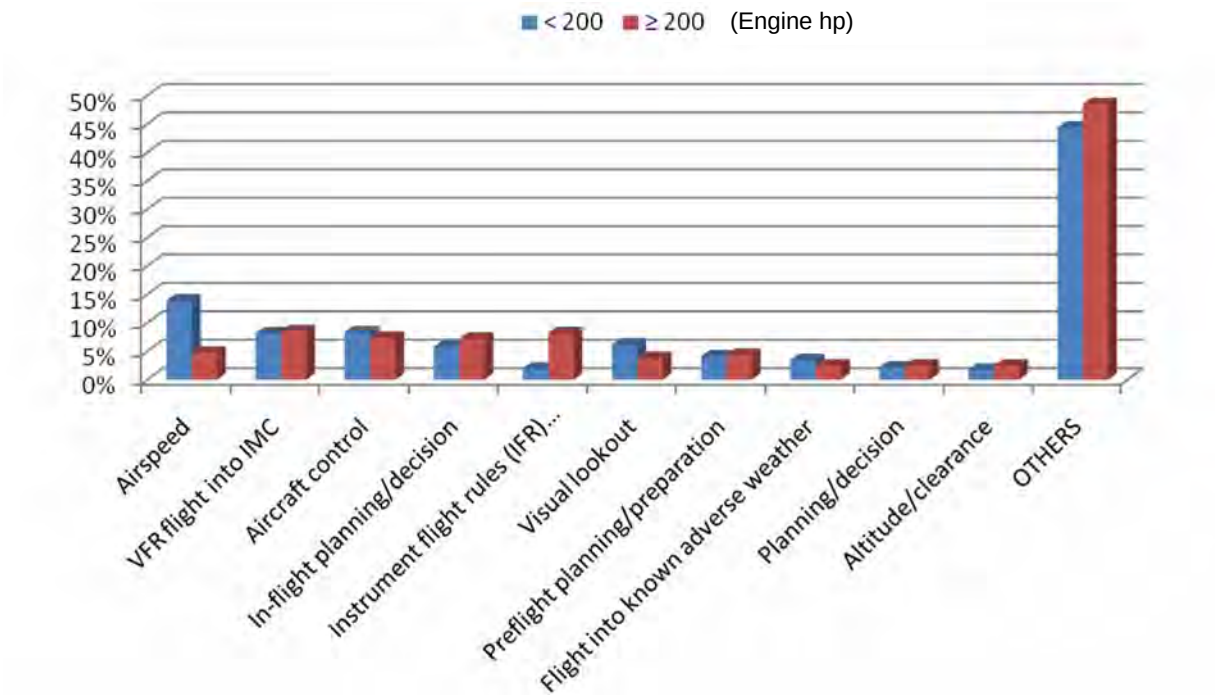

Figure 49. Percentage of Initiating Causes of Fatal GA Accidents Based on Aircraft Engine Power in the Eastern Region (1982 to 2009)

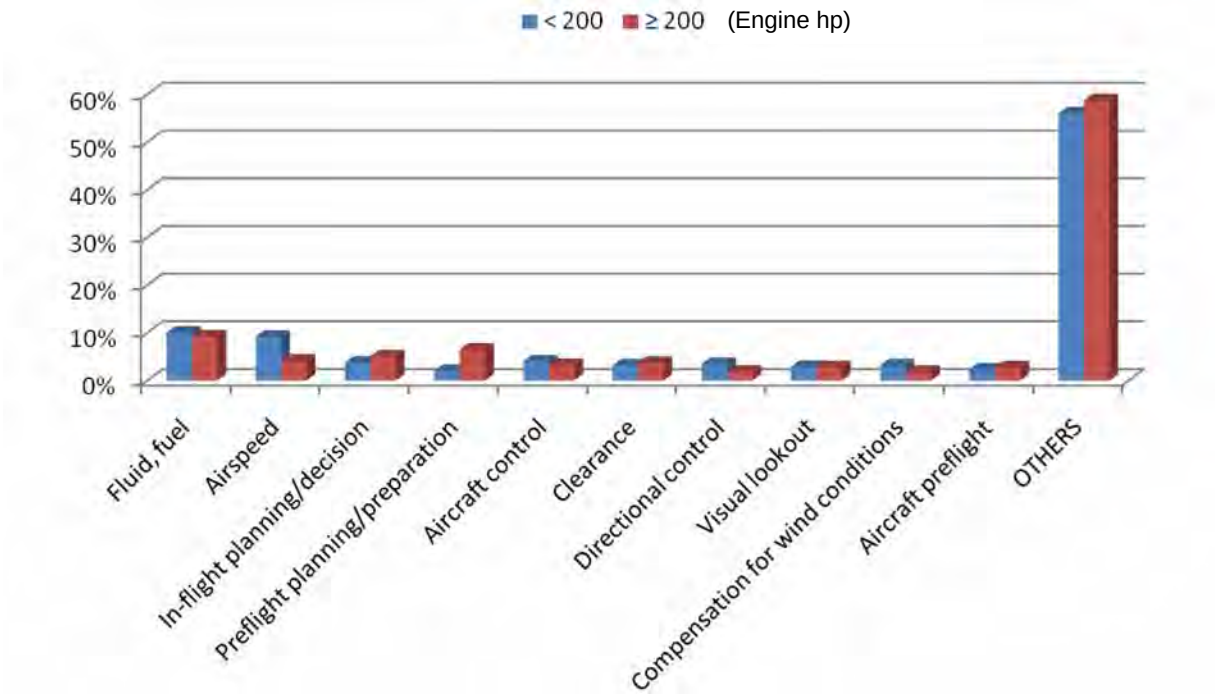

Figure 50. Percentage of Initiating Causes of Serious GA Accidents Based on Aircraft Engine Power in the Eastern Region (1982 to 2009)

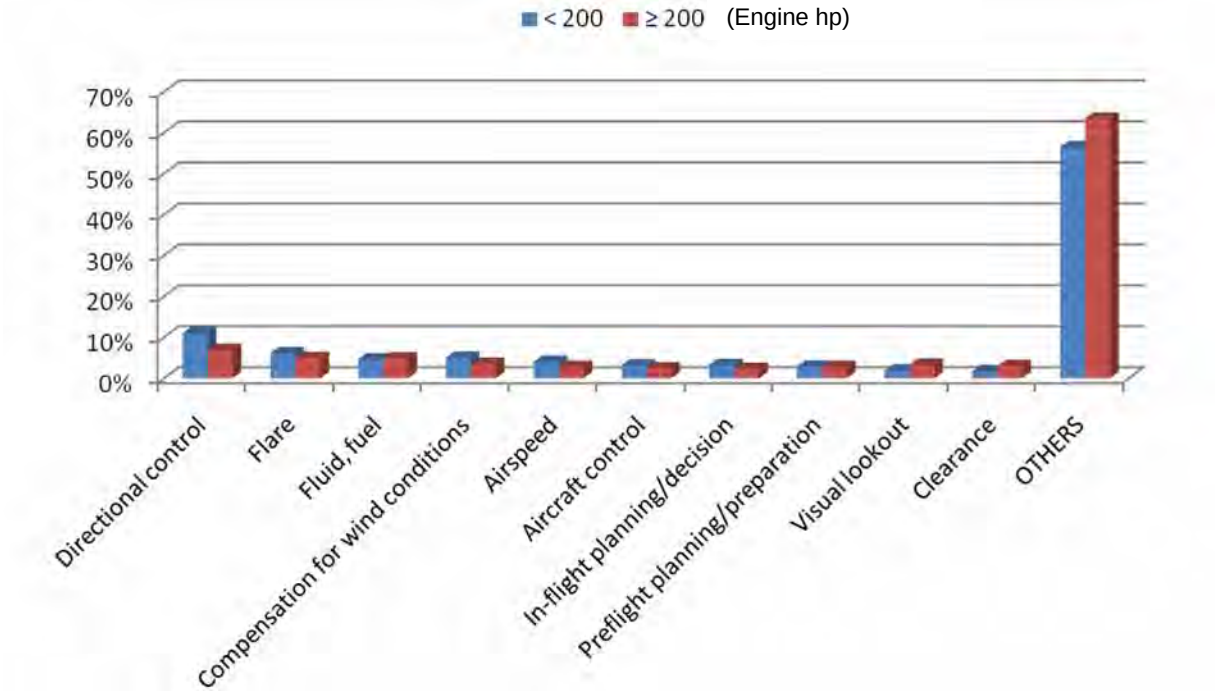

Figure 51. Percentage of Initiating Causes of Minor/None GA Accidents Based on Aircraft Engine Power in the Eastern Region (1982 to 2009)

4.7 RESULTS FOR THE EASTERN REGION.

This study examined the top ten initiating causes of GA accidents in the Eastern Region between 1982 and 2009. The trends found are similar to the nationwide trend and the trends in other regions. Airspeed, for example, is most frequently the number one initiating cause of Fatal GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents.

The number of GA accidents in the Eastern Region has decreased significantly from 322 in 1982 to 132 in 2009.

Analysis of GA accidents in the Eastern Region based on month shows that the majority of GA accidents occurred between May and August, which is similar to the nationwide data.

The majority of GA accidents in the Eastern Region occurred between 07:00 and 22:00 hours (7 a.m. and 10 p.m.) with the highest number of accidents recorded at 14:00 hours (2 p.m.) and 15:00 hours (3 p.m.); nationwide, the highest number of accidents occurred at 14:00 hours (2 p.m.) and at 15:00 hours (3 p.m.).

Analysis of GA accidents in the Eastern Region based on phase of flight shows that the highest number of accidents occurred during the landing phase. Fatal GA accidents are higher during the cruise, descent, approach, and maneuvering phases. Serious GA accidents are most likely to occur during the takeoff and landing phases, which is similar to the nationwide data.

Analysis of GA accidents in the Eastern Region based on purpose of flight shows that personal flight contributes the highest rate of GA accidents, which is similar to the nationwide data.

The top initiating causes of Fatal GA accidents in the Eastern Region are airspeed followed by VFR flight into IMC, which is the same as the nationwide data.

The top initiating cause of Serious GA accidents in the Eastern Region is fluid, fuel, which is similar to the nationwide data.

The top initiating cause of Minor/None GA accidents in the Eastern Region is directional control, which is similar to the nationwide data.

Based on pilot experience in total flight hours, the following results were found.

- The top initiating cause of Fatal GA accidents, for pilots with
    - less than 100 hours, is airspeed in both the Eastern Region and nationwide.
    - between 100-299 hours, is VFR flight into IMC in both the Eastern Region and nationwide.
    - between 300-1999 hours, is airspeed in both Eastern Region and nationwide.

- between 2000-4999 hours, is VFR flight into IMC in the Eastern Region and aircraft control nationwide.

- more than 5000 hours, is airspeed in the Eastern Region and aircraft control nationwide.

- The top initiating cause of Serious GA accidents, for pilots with

  - less than 100 hours, is airspeed in both the Eastern Region and nationwide.

  - between 100-299 hours, is preflight planning/preparation in the Eastern Region and airspeed nationwide.

  - between 300-1999 and between 2000-4999 hours, is airspeed in both the Eastern Region and airspeed nationwide.

  - more than 5000 hours, is compensation for wind conditions in the Eastern Region and airspeed nationwide.

- The top initiating cause of Minor/None GA accidents for pilots at every experience level is directional control for both the Eastern Region and nationwide.

Based on aircraft engine power, the following results were found.

- The top initiating cause of Fatal GA accidents, for aircraft with

  - less than 200 hp, is airspeed for both the Eastern Region and nationwide.

  - more than 200 hp, is VFR flight into IMC for both the Eastern Region and nationwide.

- The top initiating cause of Serious GA accidents, for aircraft with

  - less than 200 hp, is fluid, fuel for the Eastern Region and airspeed nationwide.
  - more than 200 hp, is fluid, fuel for both the Eastern Region and nationwide.

- The top initiating cause of Serious GA accidents for aircraft for both engine power categories is directional control for both the Eastern Region and nationwide.

5. THE GREAT LAKES REGION.

This section discusses the Great Lakes Region, which includes Illinois, Indiana, Michigan, Minnesota, North Dakota, Ohio, South Dakota, and Wisconsin.

5.1 FREQUENCY OF GA ACCIDENTS FOR THE GREAT LAKES REGION.

Generally, the frequency of GA accidents in the Great Lakes Region has decreased significantly between 1982 and 2009. The number of GA accidents decreased from 426 in 1982 to 174 in 2009, as shown in figure 52. In fact, the 2009 figure is the lowest number of GA accidents since 1982.

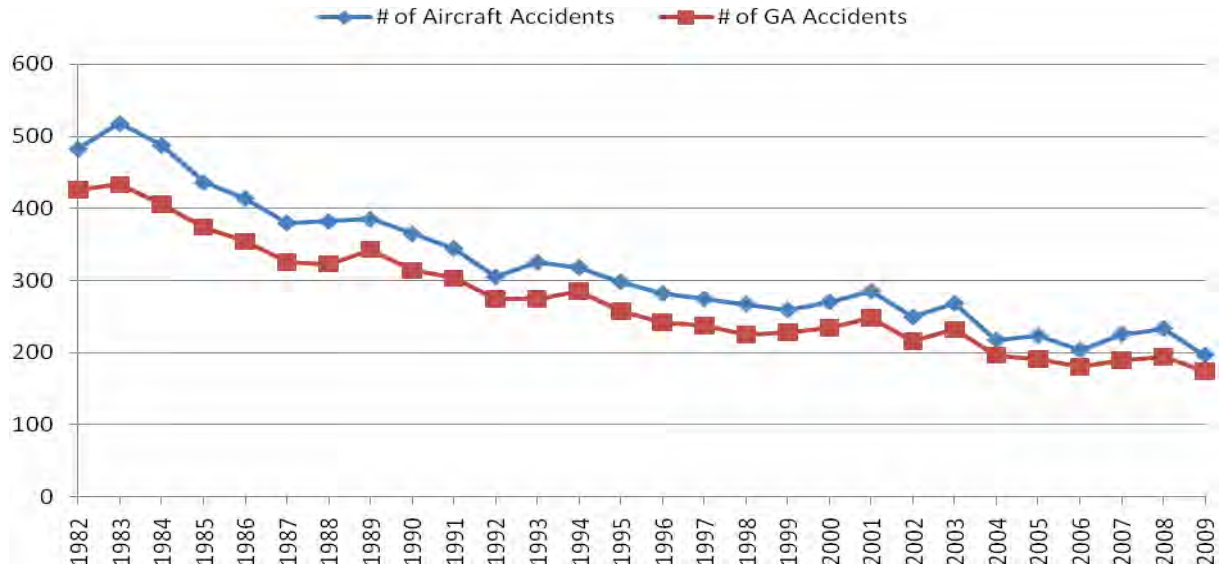

Figure 52. Number of Aircraft Accidents and GA Accidents in the Great Lakes Region (1982-2009)

Figure 53 shows that the percentage of GA accidents in the Great Lakes Region out of all aviation accidents fluctuates between 83% and 91%. The highest rate of GA accidents occurred in 2004 with 196 GA accidents out of a total of 217 aviation accidents, which is 90.3%. The lowest rate of GA accidents is 76.7% in 2008 with 69 GA accidents out of a total of 90 aviation accidents.

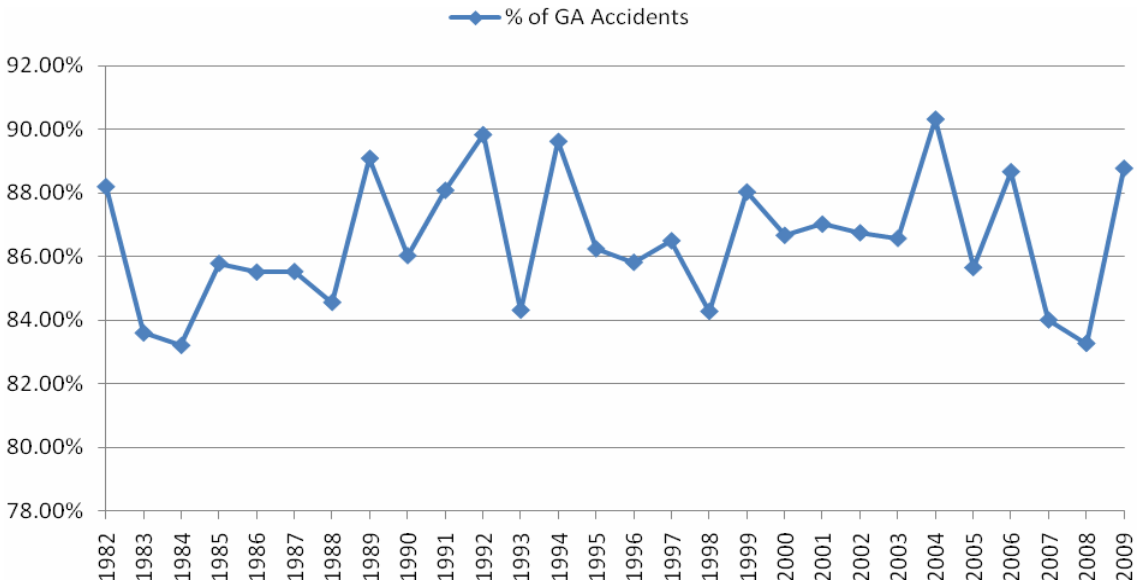

Figure 53. Percentage of GA Accidents of all Aviation Accidents in the Great Lakes Region (1982-2009)

Figures 54 and 55 respectively show the number of Fatal GA accidents and fatalities in the Great Lakes Region over the same period. The Great Lakes Region has the second slowest rate of decline for Fatal GA accidents after the Northwest Mountain Region. It took more than 20 years for the region to reduce the number of Fatal GA accidents in 1982 (61) by half. In 2005, the number of Fatal GA accidents was below 30 for the first time since 1982. The lowest number of Fatal GA accidents occurred in 2008 with 25 Fatal GA accidents, followed by 2005 with 27. The number of fatalities, on the other hand, appears low compared to the number of accidents. This is because, unlike commercial aircraft, most GA flights have fewer passengers. Since 2001, the number of fatalities has not increased above 60. The lowest number of fatalities (37) occurred in 2005.

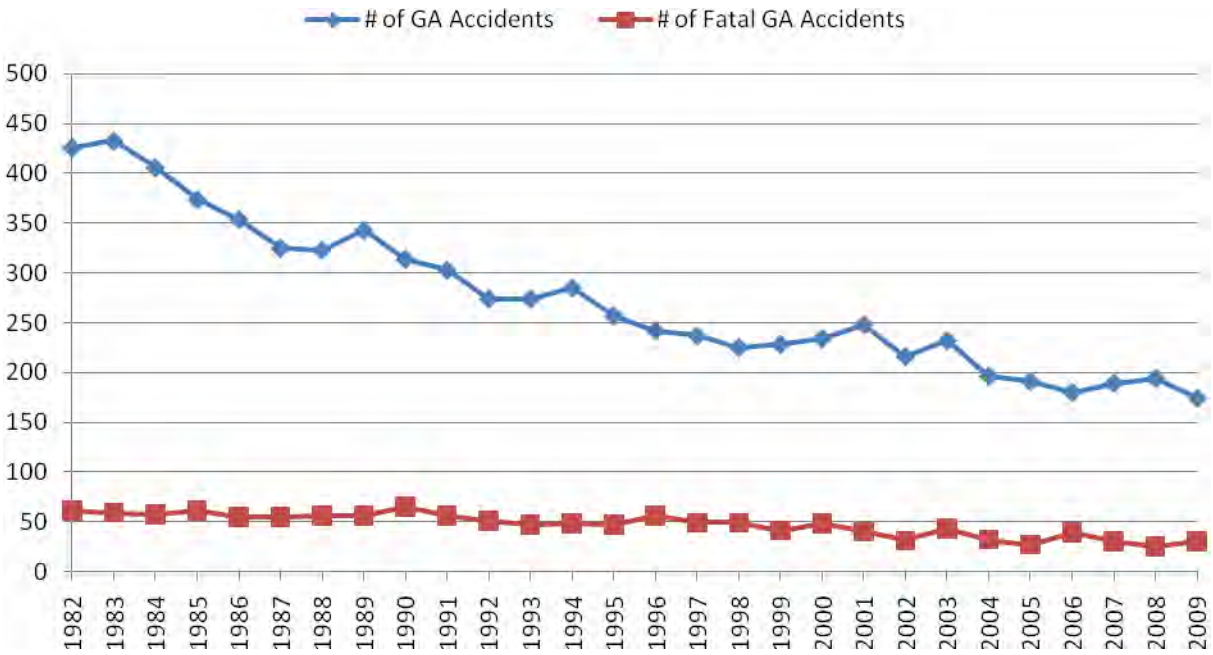

Figure 54. Number of GA Accidents and Fatal GA Accidents in the Great Lakes Region (1982-2009)

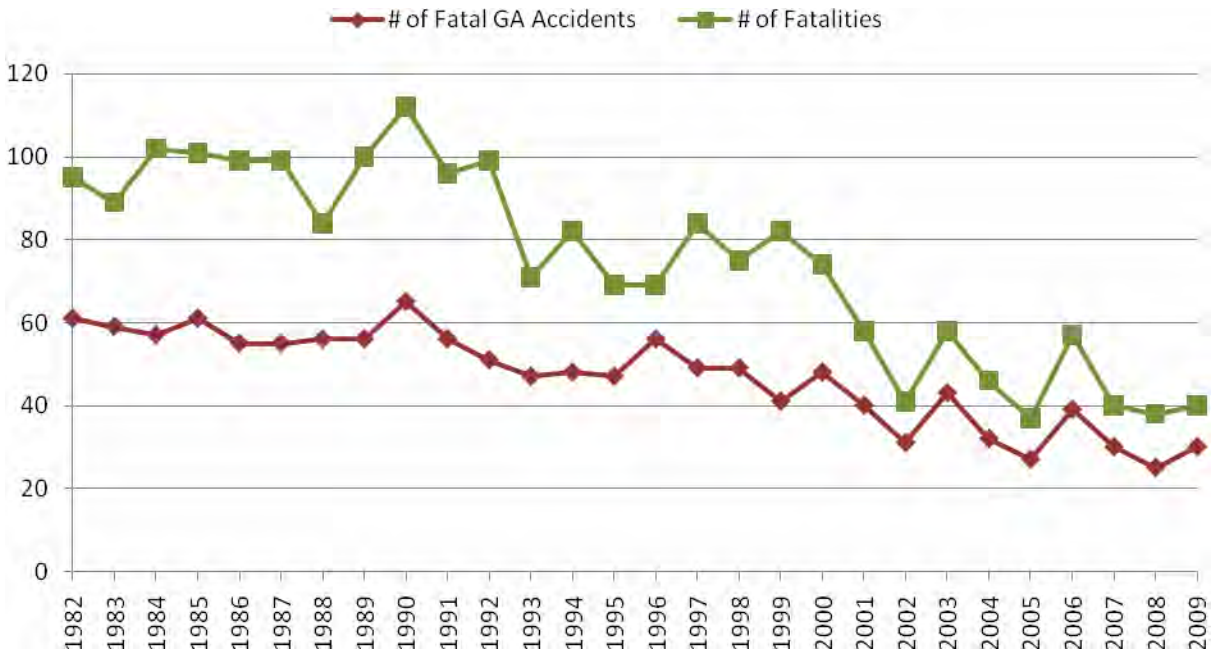

Figure 55. Number of Fatal GA Accidents and Fatalities in the Great Lakes Region (1982-2009)

5.2 PERCENTAGE OF GA ACCIDENTS BASED ON MONTH AND TIME OF DAY IN THE GREAT LAKES REGION.

Figure 56 shows that the total number of GA accidents in the Great Lakes Region peaks between May and August when the summer weather is more suitable for flying. Generally, Serious and Minor/None GA accidents outnumber Fatal GA accidents. However, the percentage of Fatal GA accidents outnumbers Serious and Minor/None GA accidents in September and December. The number of total GA accidents was highest in July followed by August and June.

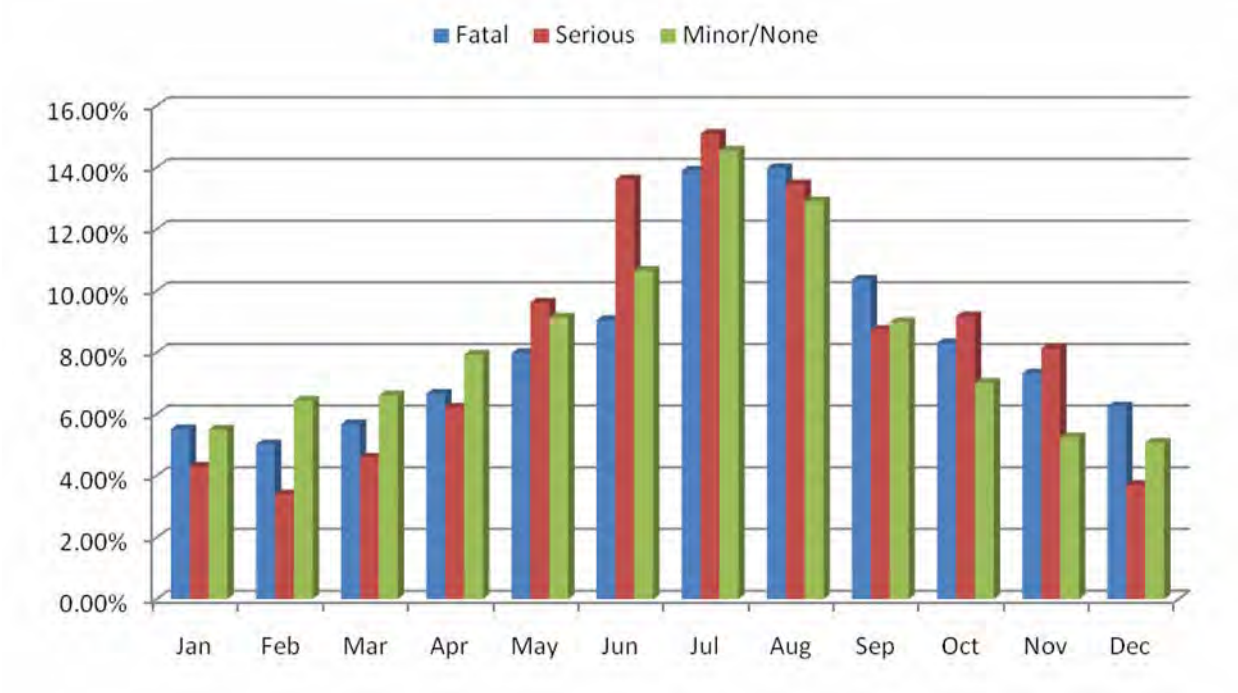

Figure 56. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Month in the Great Lakes Region (1982 to 2009)

With regard to time of day, the majority of GA accidents in the Great Lakes Region occurred between 07:00 and 22:00 hours (7 a.m. and 10 p.m.), as shown in figure 57. The highest number of accidents, in total between 1982 and 2009, occurred at 15:00 hours (3 p.m.) with 660 accidents and at 13:00 hours (1 p.m.) with 596 accidents. The percentage of Fatal GA accidents is higher after midnight from 00:00 to 08:00 hours (12 a.m. to 8 a.m.).

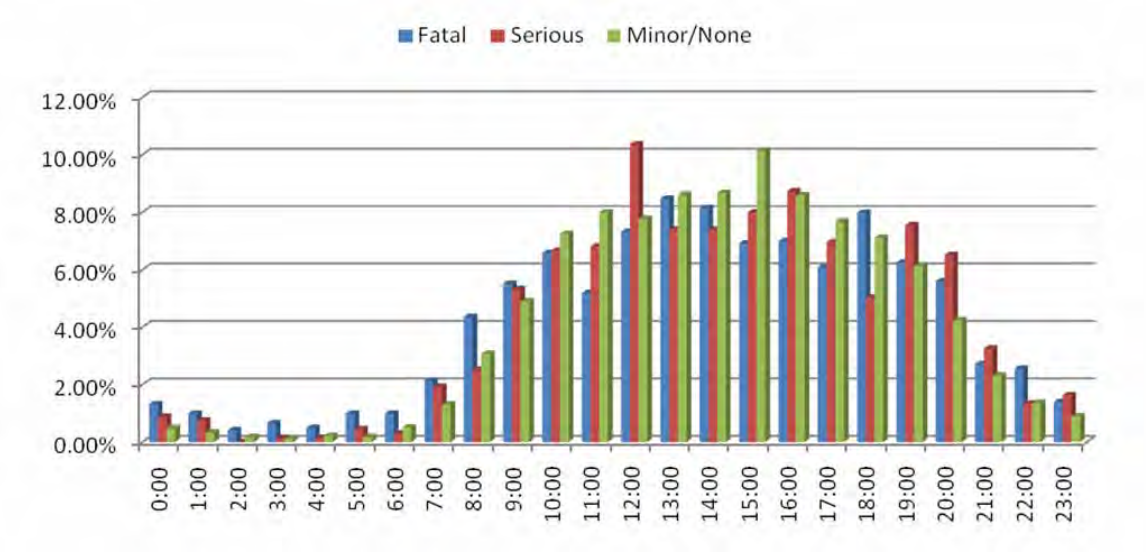

Figure 57. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Time of Day in the Great Lakes Region (1982 to 2009)

5.3 PERCENTAGE OF GA ACCIDENTS BASED ON PHASE AND PURPOSE OF FLIGHT IN THE GREAT LAKES REGION.

Figure 58 shows the percentage of GA accidents based on phase of flight. The percentage of Fatal GA accidents is higher during the cruise, descent, approach, and maneuvering phases. Serious GA accidents, however, were most likely to occur during the takeoff phase. Similar to the nationwide data, the highest number of Minor/None GA accidents occurs during the landing phase.

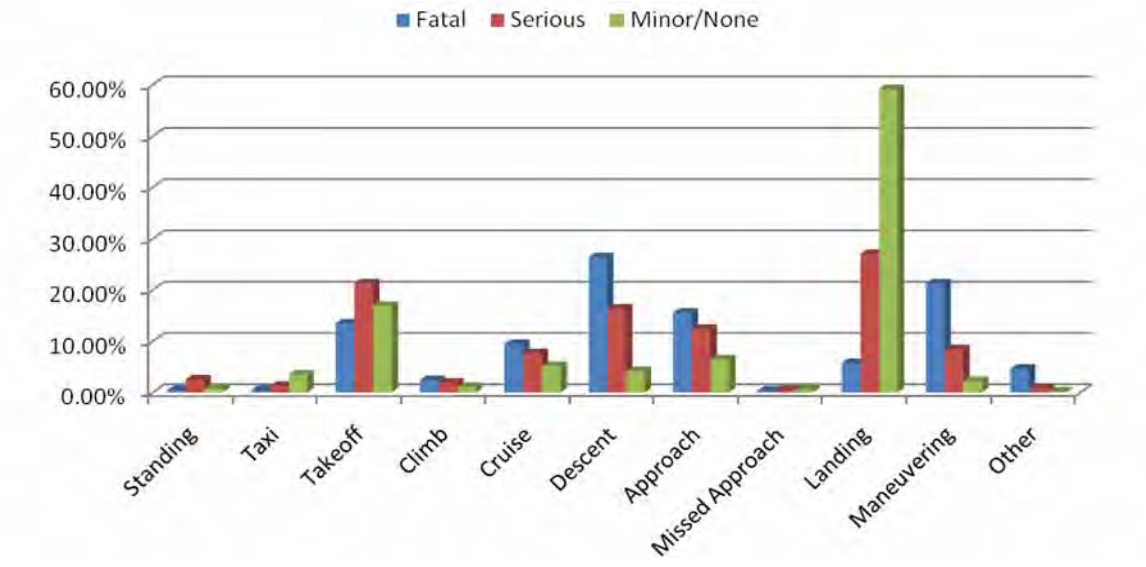

Figure 58. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Phase of Flight in the Great Lakes Region (1982 to 2009)

Figure 59 shows the percentage of GA accidents based on purpose of flight. Because of the large number of personal aircraft in operation, personal flights contribute the highest rate of GA accidents in the Great Lakes Region, followed by instructional and business flights.

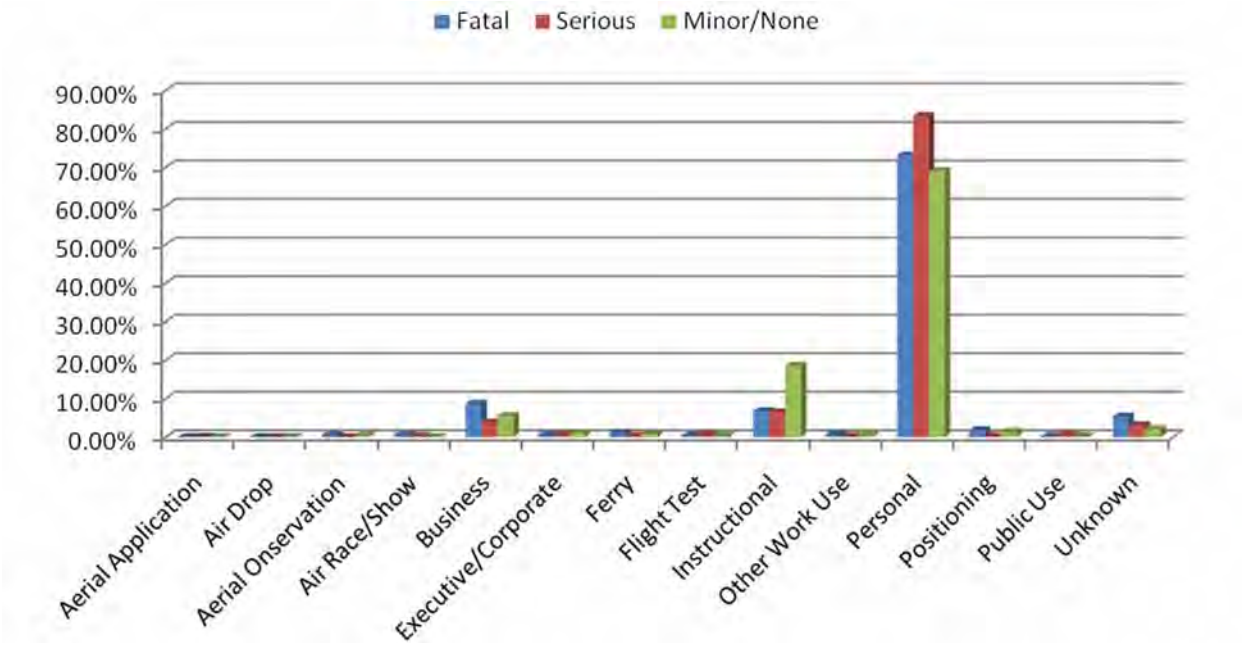

Figure 59. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Purpose of Flight in the Great Lakes Region (1982 to 2009)

5.4 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS IN THE GREAT LAKES REGION.

Figures 60 through 62 show the frequency and percentage of the top ten initiating causes of GA accidents. Aircraft control is the number one initiating cause of Fatal GA accidents in the Great Lakes Region, as shown in figure 60. Airspeed is the number one initiating cause of Serious GA accidents, as shown in figure 61. Although figure 61 shows only aircraft preflight in the tenth position of initiating causes, directional control also has 11 occurrences and, thus, shares that position. Directional control is the number one initiating cause of Minor/None GA accidents, as shown in figure 62. This is similar to the nationwide data.

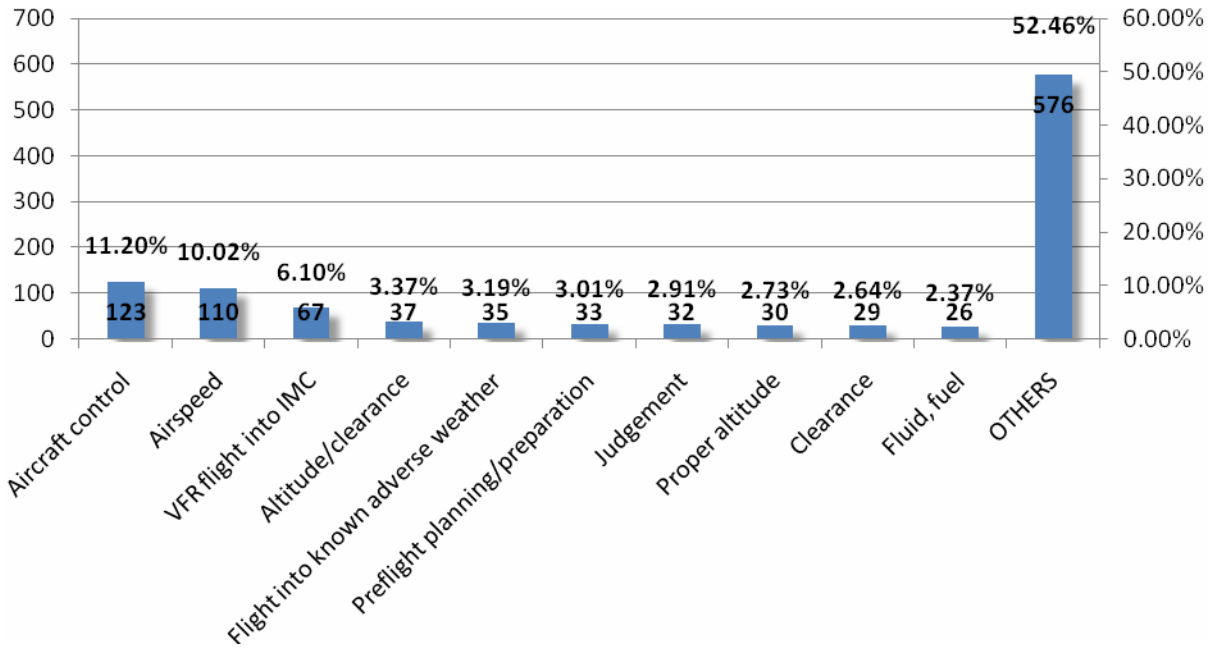

Figure 60. Frequency and Percentage of Initiating Causes of Fatal GA Accidents in the Great Lakes Region (1982 to 2009)

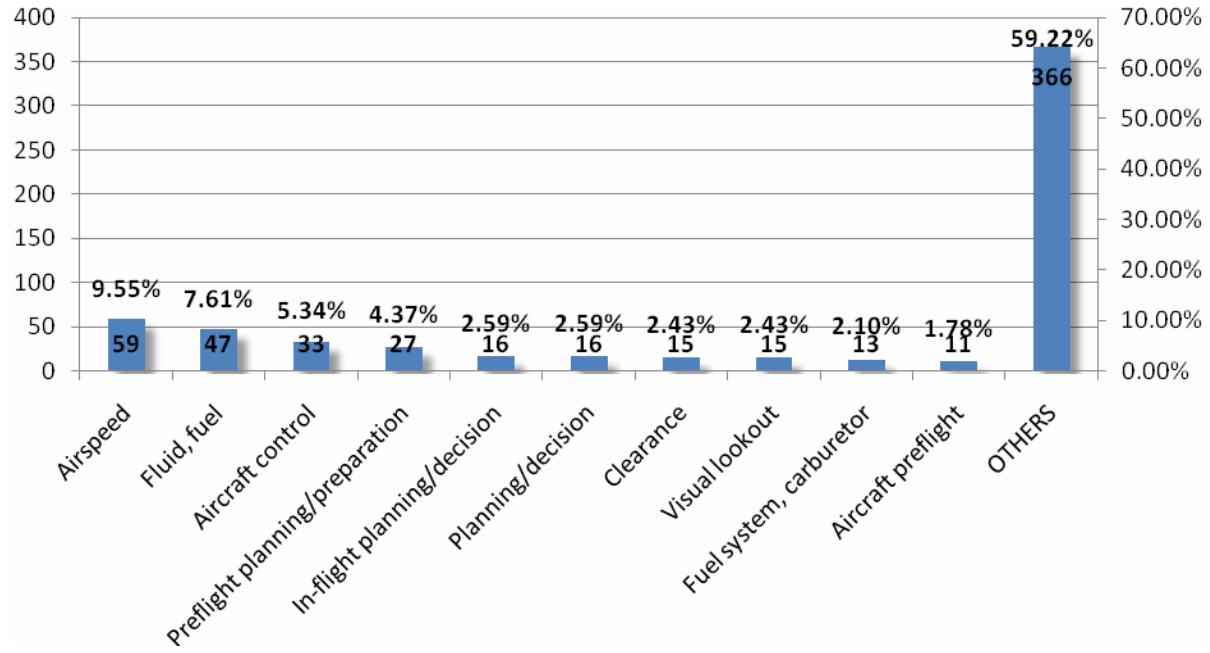

Figure 61. Frequency and Percentage of Initiating Causes of Serious GA Accidents in the Great Lakes Region (1982 to 2009)

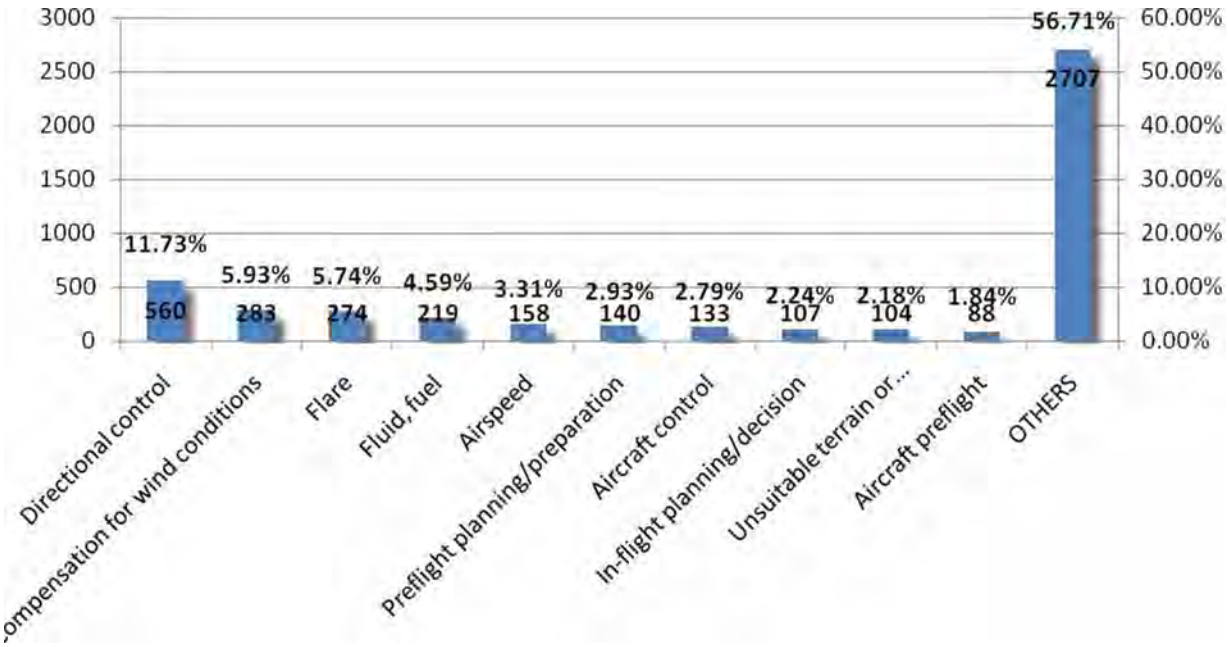

Figure 62. Frequency and Percentage of Initiating Causes of Minor/None GA Accidents in the Great Lakes Region (1982 to 2009)

5.5 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS RELATED TO PILOT EXPERIENCE IN THE GREAT LAKES REGION.

According to the FAA, pilot error is the number one cause of aircraft accidents and incidents followed by faulty maintenance and operational errors. The NTSB database confirms that approximately 85% of GA accidents in the Great Lakes Region are caused by pilot error. The following sections provide statistical analyses of GA accident causes in the Great Lakes Region related to pilot error. In particular, pilot experience in hours is used in this report to examine the top ten initiating causes of GA accidents that lead to other events.

Figures 63 through 65 show the percentage of pilot experience based on total flight hours in relation to initiating causes of GA accidents.

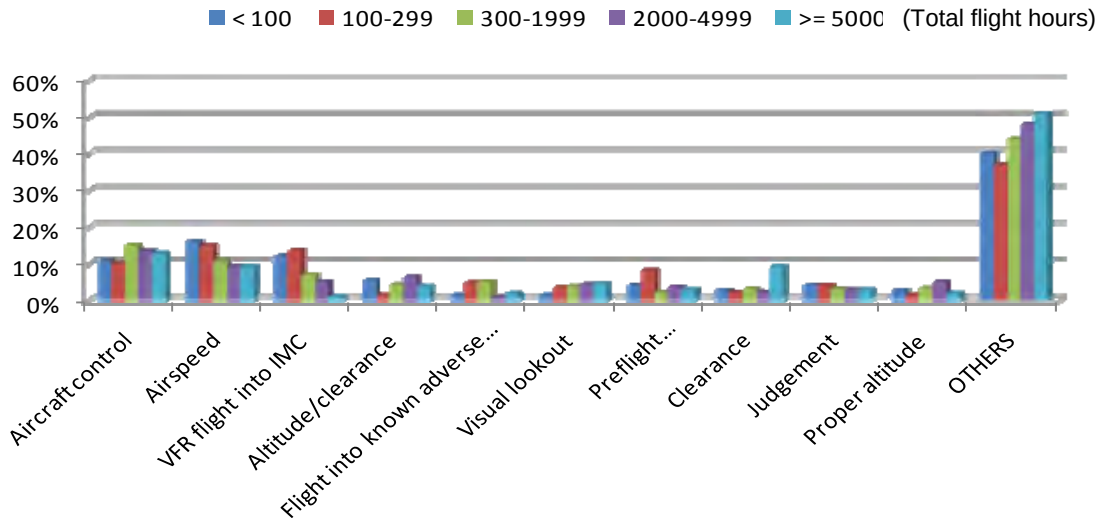

Figure 63. Percentage of Initiating Causes of Fatal GA Accidents Based on Pilot Experience in the Great Lakes Region (1982 to 2009)

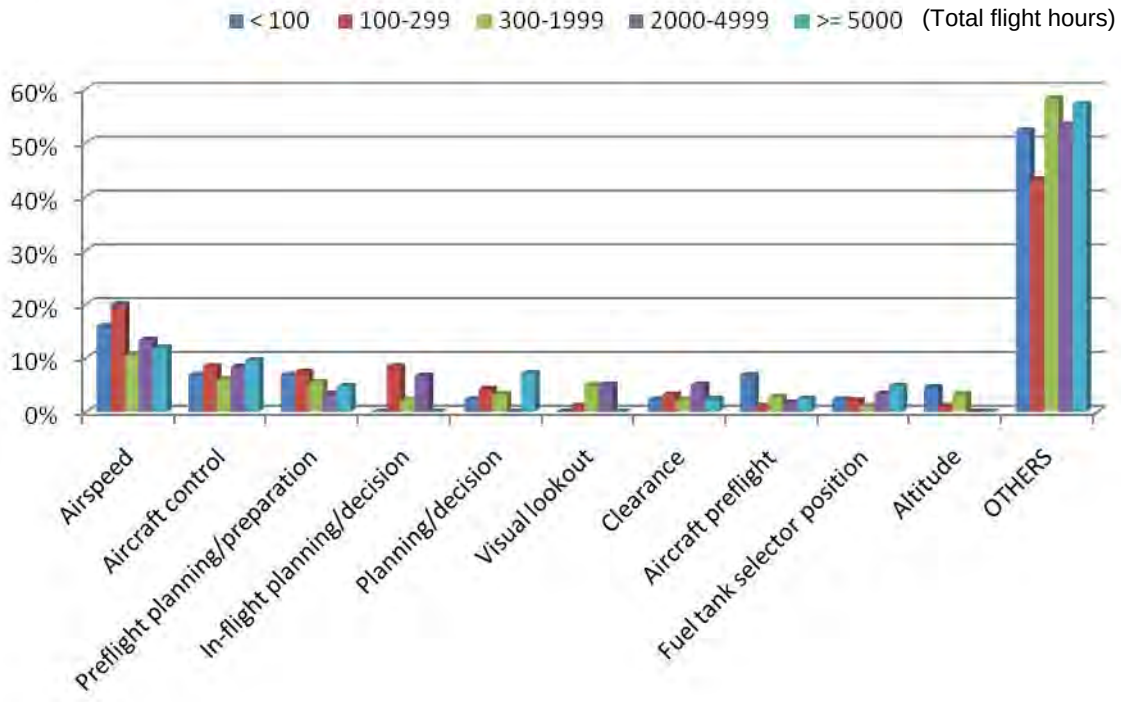

Figure 64. Percentage of Initiating Causes of Serious GA Accidents Based on Pilot Experience in the Great Lakes Region (1982 to 2009)

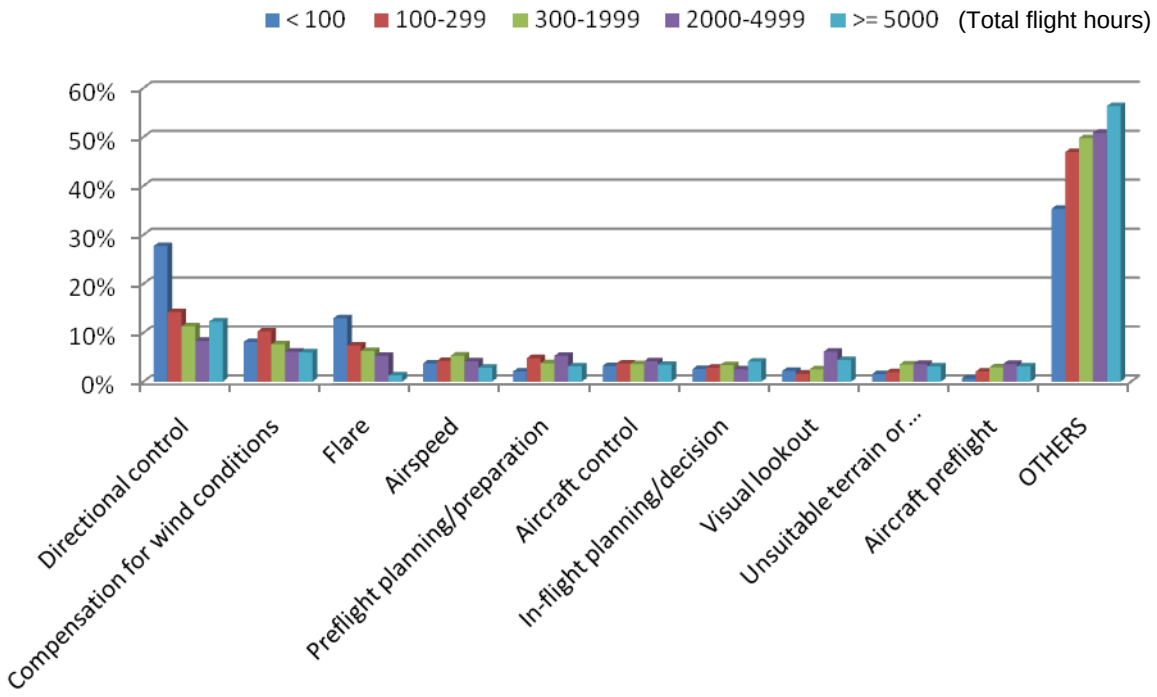

Figure 65. Percentage of Initiating Causes of Minor/None GA Accidents Based on Pilot Experience in the Great Lakes Region (1982 to 2009)

5.6 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS BASED ON AIRCRAFT COMPLEXITY IN THE GREAT LAKES REGION.

Figures 66 through 68 show the percentage of accidents involving aircraft with less than 200 engine hp and accidents involving aircraft with more than or equal to 200 engine hp. Figure 66 shows aircraft control is the number one initiating cause of Fatal GA accidents for both categories combined. Figure 67 shows airspeed is the number one initiating cause of Serious GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents, as shown in figure 68.

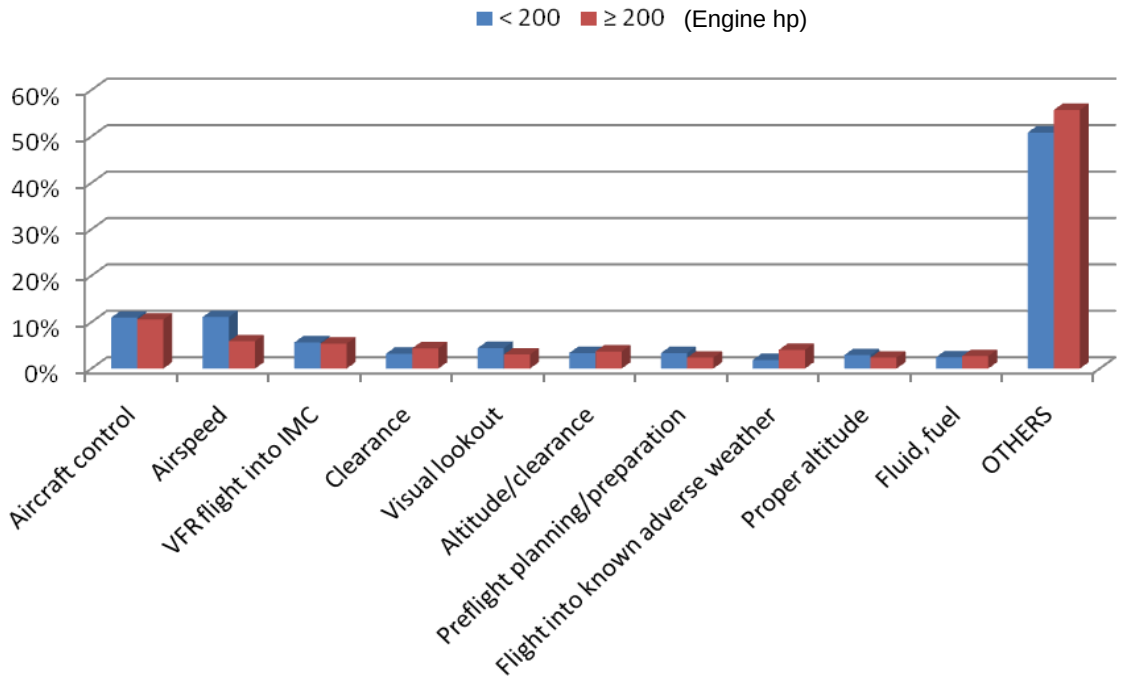

Figure 66. Percentage of Initiating Causes of Fatal GA Accidents Based on Aircraft Engine Power in the Great Lakes Region (1982 to 2009)

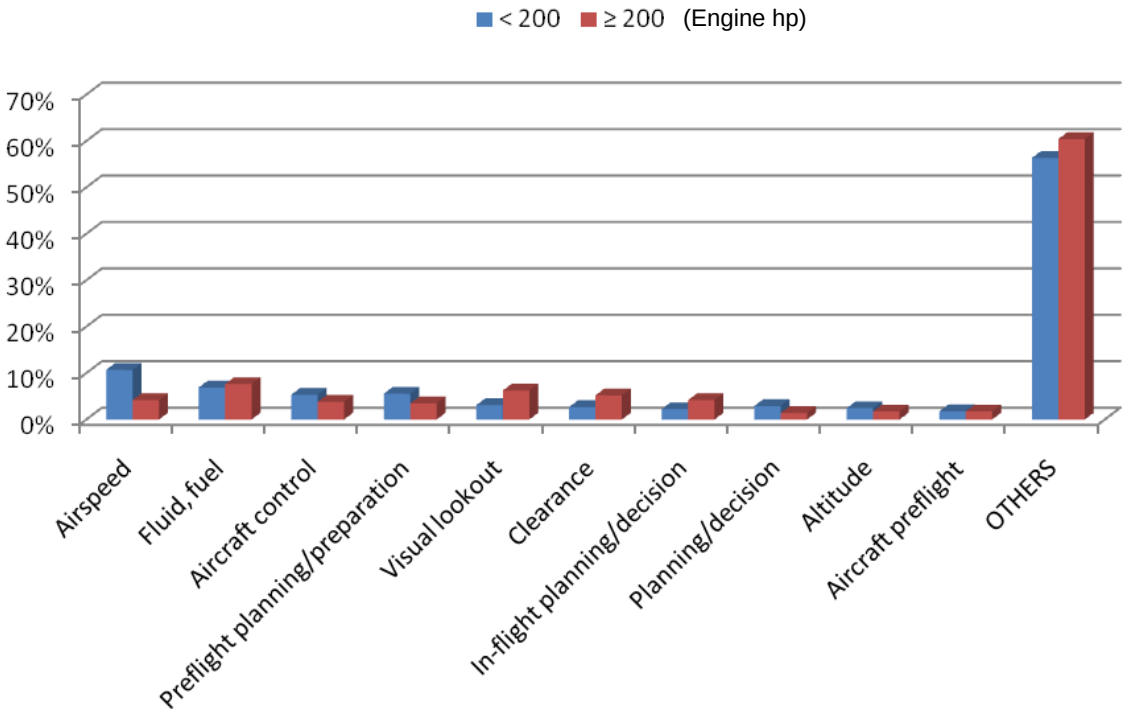

Figure 67. Percentage of Initiating Causes of Serious GA Accidents Based on Aircraft Engine Power in the Great Lakes Region (1982 to 2009)

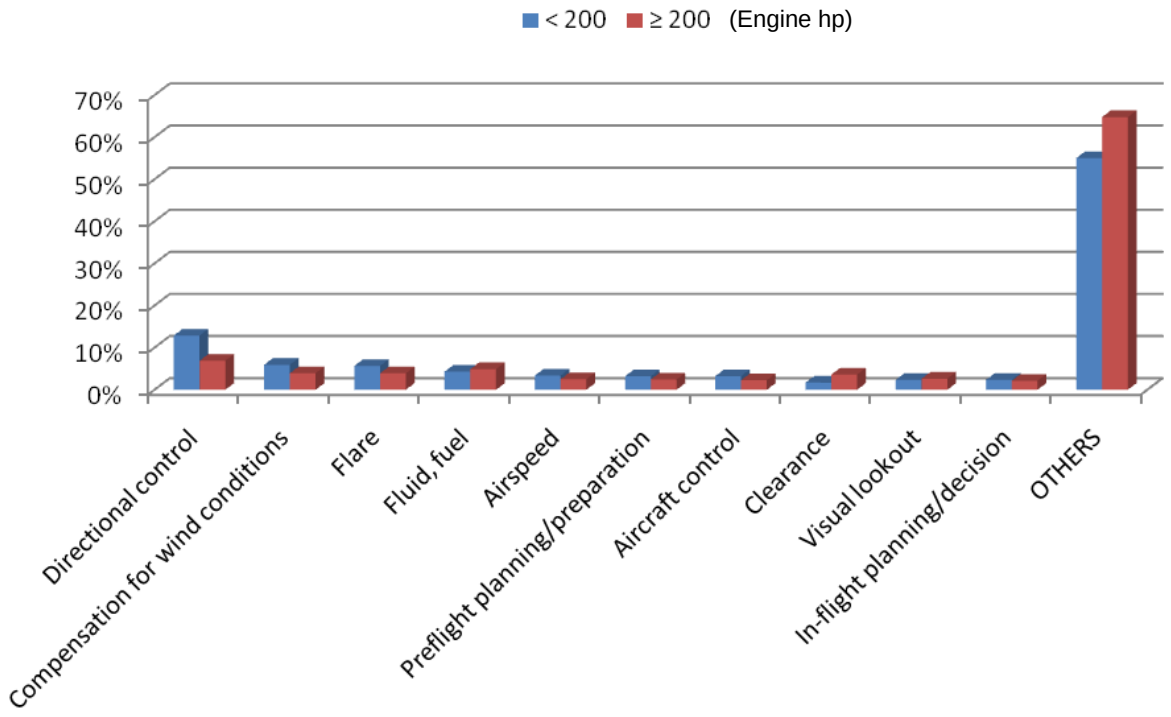

Figure 68. Percentage of Initiating Causes of Minor/None GA Accidents Based on Aircraft Engine Power in the Great Lakes Region (1982 to 2009)

5.7 RESULTS FOR THE GREAT LAKES REGION.

This study examined the top ten initiating causes of GA accidents in the Great Lakes Region between 1982 and 2009. The trends found are similar to the nationwide trend and the trends in other regions. Airspeed, for example, is most frequently the number one initiating cause of Fatal GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents.

Analysis of GA accidents based on month shows that the majority of GA accidents in the Great Lakes Region occurred between May and August, which is similar to the nationwide data.

The majority of GA accidents in the Great Lakes Region occurred between 07:00 and 22:00 hours (7 a.m. and 10 p.m.), with the highest number of GA accidents recorded at 15:00 hours (3 p.m.) and 13:00 hours (1 p.m.); nationwide, the highest number of GA accidents occurred at 14:00 hours (2 p.m.) and 15:00 hours (3 p.m.).

Analysis of GA accidents in the Great Lakes Region based on phase of flight shows that the highest number of GA accidents occurred during the landing phase. Fatal GA accidents were higher during the cruise, descent, approach, and maneuvering phases. Serious GA accidents were most likely to occur during the takeoff phase, which is similar to the nationwide data.

Analysis of GA accidents in the Great Lakes Region based on purpose of flight shows that personal flight contributes the highest rate of GA accidents, which is similar to the nationwide data.

The top initiating causes of Fatal GA accidents in the Great Lakes Region are aircraft control followed by airspeed; nationwide, the top initiating causes of Fatal GA accidents are airspeed followed by VFR flight into IMC.

The top initiating cause of Serious GA accidents in the Great Lakes Region is airspeed; nationwide, the top initiating cause of Serious GA accidents is fluid, fuel.

Directional control is the top initiating cause for Minor/None GA accidents in the Great Lakes Region. This trend is similar to the nationwide data.

Based on pilot experience in total flight hours, the following results were found.

- The top initiating cause of Fatal GA accidents, for pilots with
    - less than 100 hours, is airspeed in both the Great Lakes Region and nationwide.
    - between 100-299 hours, is airspeed in the Great Lakes Region and VFR flight into IMC nationwide.
    - between 300-1999 hours, is aircraft control in the Great Lakes Region and airspeed nationwide.
    - between 2000-4999 and more than 5000 hours, is aircraft control in both the Great Lakes Region and nationwide.
- The top initiating cause of Serious GA accidents for pilots of all experience levels is airspeed in both the Great Lakes Region and nationwide.
- The top initiating cause of Minor/None GA accidents for pilots of all experience levels is directional control in both the Great Lakes Region and nationwide.

Based on aircraft engine power, the following results were found.

- The top initiating causes of Fatal GA accidents, for aircraft with
    - less than 200 hp, are aircraft control and airspeed in the Great Lakes Region and airspeed nationwide.
    - more than 200 hp, is aircraft control in the Great Lakes Region and VFR flight into IMC nationwide.

- The top initiating cause of Serious GA accidents, for aircraft with:

  - less than 200 hp, is airspeed in the Great Lakes Region and fluid, fuel nationwide.
  - more than 200 hp, is fluid, fuel in both the Great Lakes Region and nationwide.

- The top initiating cause of Minor/None GA accidents, based on aircraft engine power less than 200 hp and more than 200 hp, is directional control in both the Great Lakes Region and nationwide.

6. THE NEW ENGLAND REGION.

This section discusses the New England Region, which includes Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, and Vermont.

6.1 FREQUENCY OF GA ACCIDENTS IN THE NEW ENGLAND REGION.

Generally, the frequency of GA accidents in the New England Region decreased significantly between 1982 and 1994. The number of GA accidents decreased from 105 in 1982 to 50 in 1997, which is more than a 50% decrease, as shown in figure 69. However, the numbers remain steady from 1998 to 2008. The number of GA accidents in 2009 (33 accidents) is the lowest since 1982.

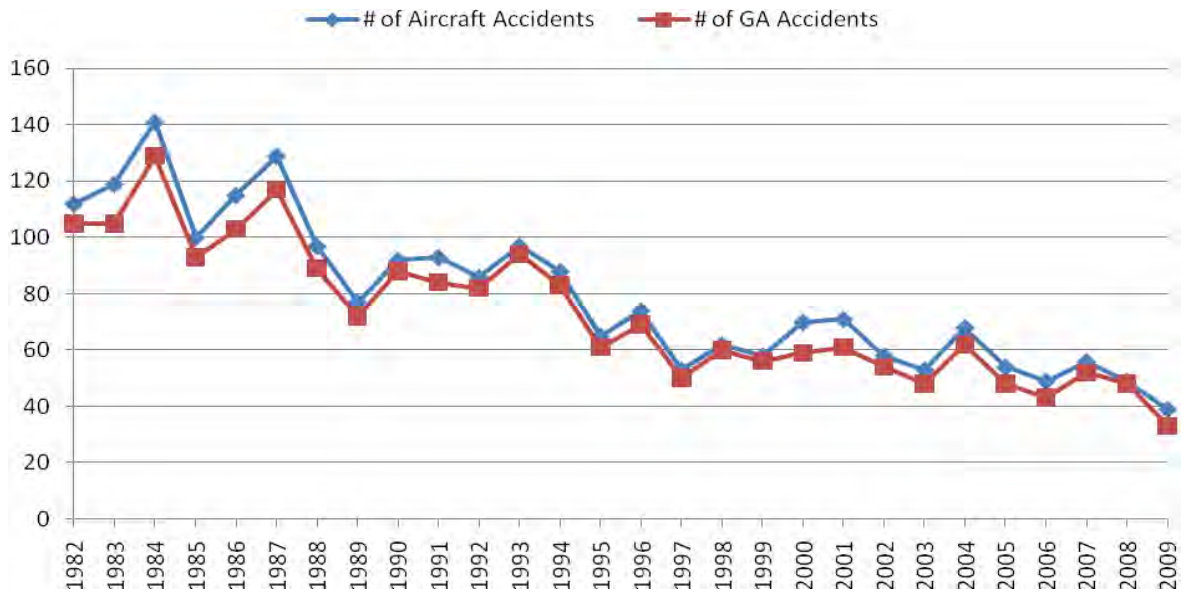

Figure 69. Number of Aircraft Accidents and GA Accidents in the New England Region

Figure 70 shows that the percentage of GA accidents in the New England Region of all aviation accidents significantly fluctuates between 84% and 98%. The highest rate of GA accidents occurred in 2008 with 48 GA accidents out of a total of 49 aviation accidents; that is almost 100%. The lowest rate is 84.3% in 2000 with 59 GA accidents out of a total of 70 aviation accidents.

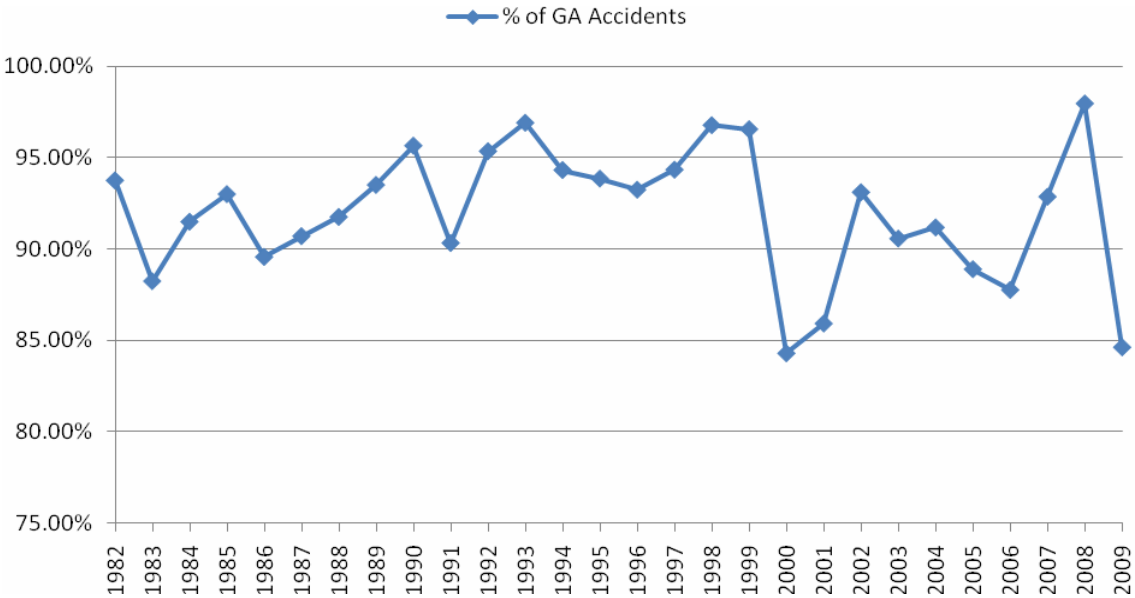

Figure 70. Percentage of GA Accidents in the New England Region

Figures 71 and 72 show the number of Fatal GA accidents and fatalities in the New England Region over the same period. Compared to other regions, the New England Region has the second lowest frequency of Fatal GA accidents. (Note: the Alaskan Region has the lowest frequency.) However, the New England Region significantly fluctuates. The highest number of Fatal GA accidents is 29 in 1984, while the lowest number is 3 in 2009. The number of fatalities, on the other hand, appears low compared to the number of accidents. This is because, unlike commercial aircraft, most GA flights have fewer passengers. Although the number of fatal GA accidents fluctuates, it has steadily decreased since 2004. Since 2004, the number of fatal GA accidents has not increased above the 1982 number. The lowest number of fatalities occurred in 2009.

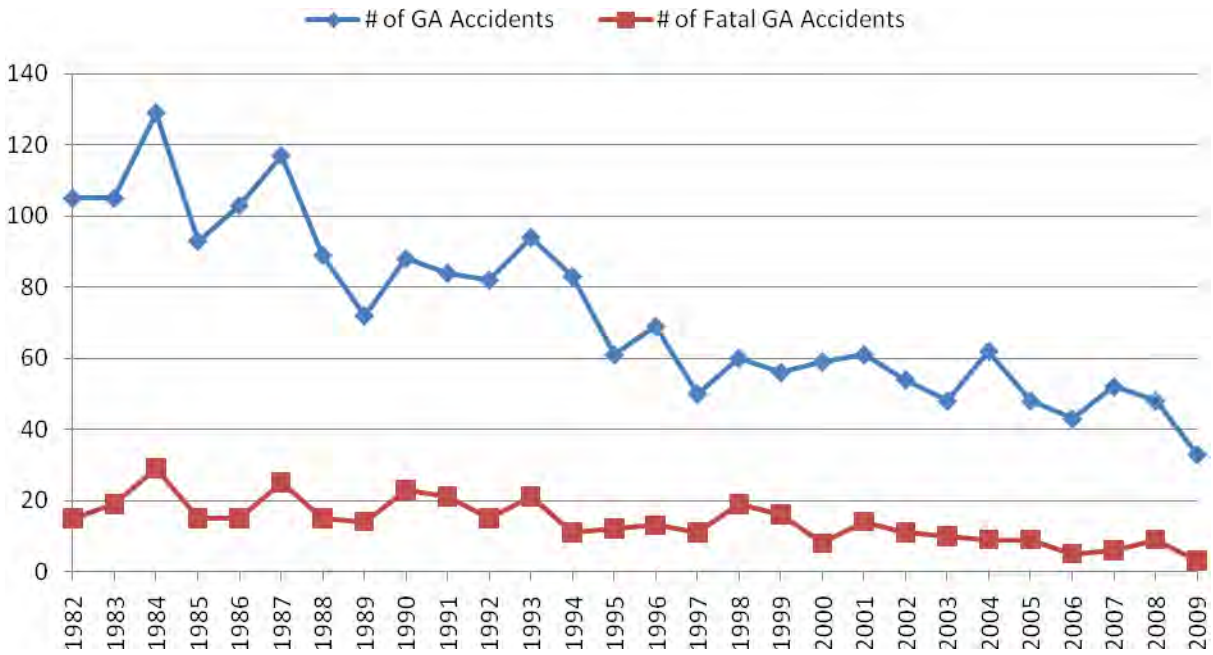

Figure 71. Number of GA Accidents and Fatal GA Accidents in the New England Region

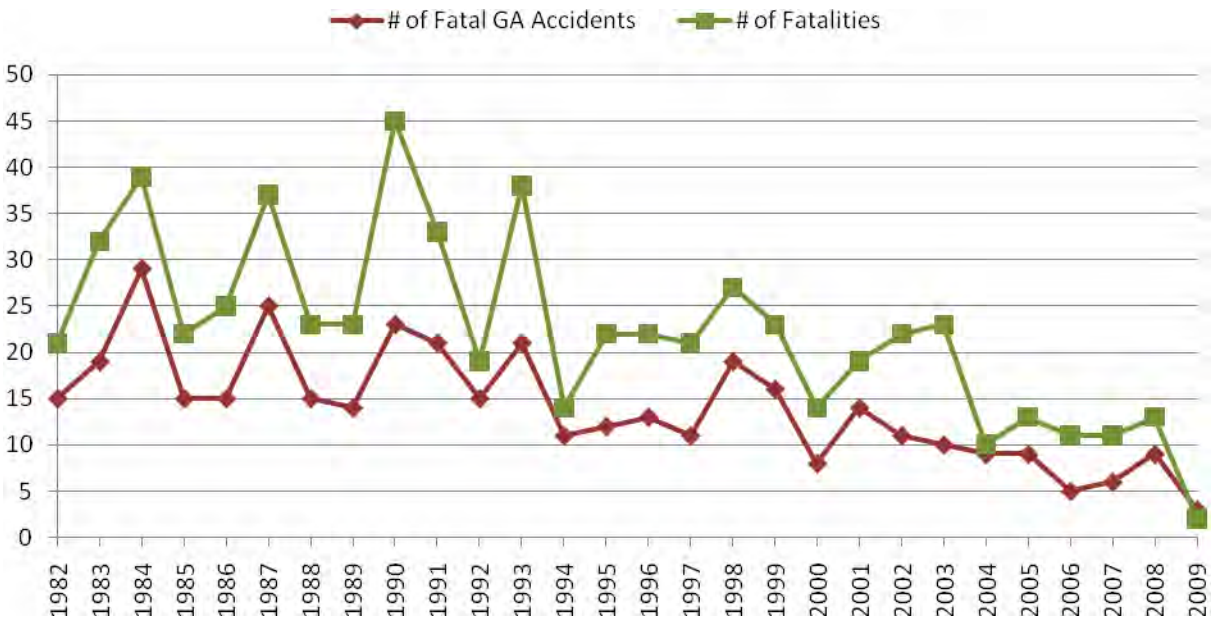

Figure 72. Number of Fatal GA Accidents and Fatalities in the New England Region

6.2 PERCENTAGE OF GA ACCIDENTS BASED ON MONTH AND TIME OF DAY IN THE NEW ENGLAND REGION.

Figure 73 shows that the total number of GA accidents in the New England Region peaks between May and August when the summer weather is more suitable for flying. Generally, Serious and Minor/None GA accidents outnumber Fatal GA accidents. However, the percentage of Fatal GA accidents is higher during April, August, and December. The highest number of total GA accidents was recorded in July followed by August and September.

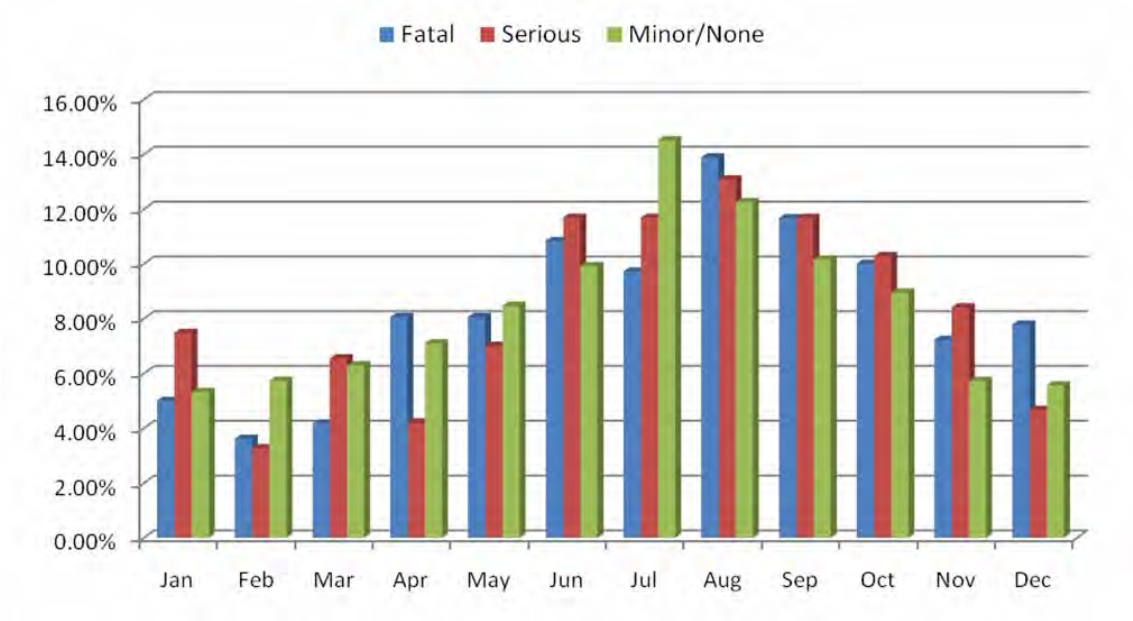

Figure 73. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Month in the New England Region (1982 to 2009)

With regard to time of day, the majority of GA accidents in the New England Region occurred between 07:00 and 22:00 hours (7 a.m. and 10 p.m.), as shown in figure 74. The highest number of GA accidents, in total between 1982 and 2009, occurred at 14:00 hours (2 p.m.) with 198 accidents and at 11:00 hours (11 a.m.) with 164 accidents. The percentage of Fatal GA accidents is higher between 19:00 and 00:00 hours (7 p.m. and 12 a.m.) and between 04:00 and 07:00 hours (4 a.m. and 7 a.m.).

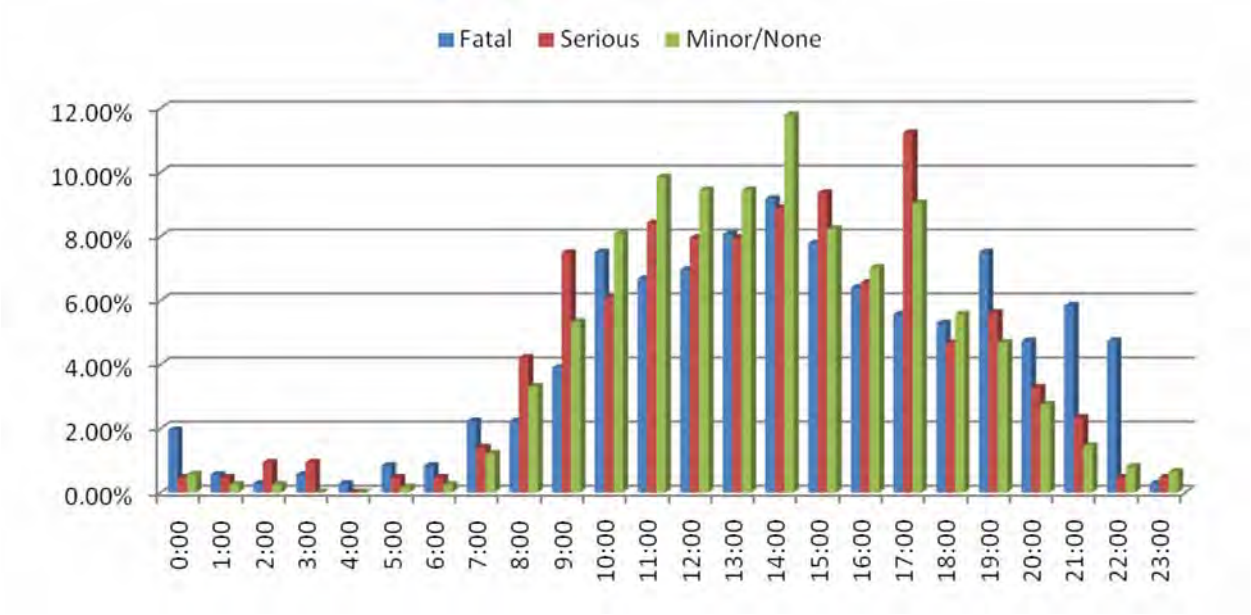

Figure 74. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Time of Day in the New England Region (1982 to 2009)

6.3 PERCENTAGE OF GA ACCIDENTS BASED ON PHASE AND PURPOSE OF FLIGHT IN THE NEW ENGLAND REGION.

Figure 75 shows the percentage of GA accidents in the New England Region based on phase of flight. The percentage of Fatal GA accidents is higher during the cruise, descent, approach, and maneuvering phases. Serious GA accidents, however, are most likely to occur during the takeoff phase. Similar to the nationwide data, the highest number of Minor/None GA accidents occurs during the landing phase.

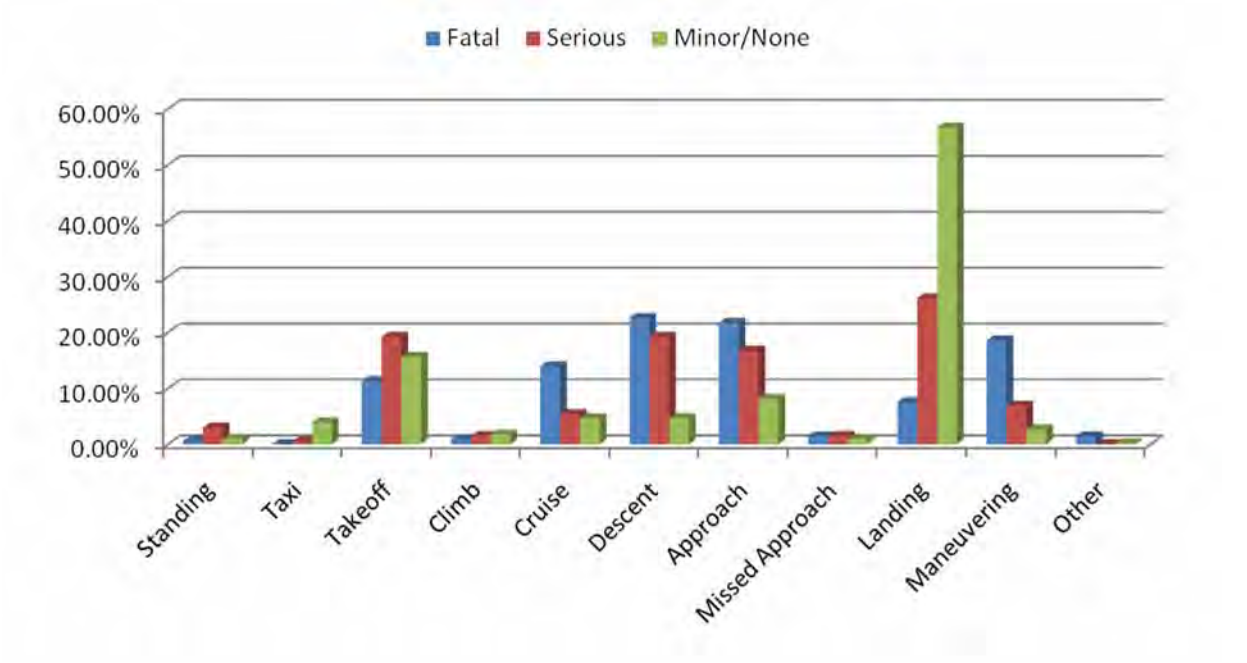

Figure 75. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Phase of Flight in the New England Region (1982 to 2009)

Figure 76 shows the percentage of GA accidents according to the purpose of flight. Because of the large number of personal aircraft in operation, personal flights contribute the highest rate of GA accidents in the New England Region, followed by instructional and business flights.

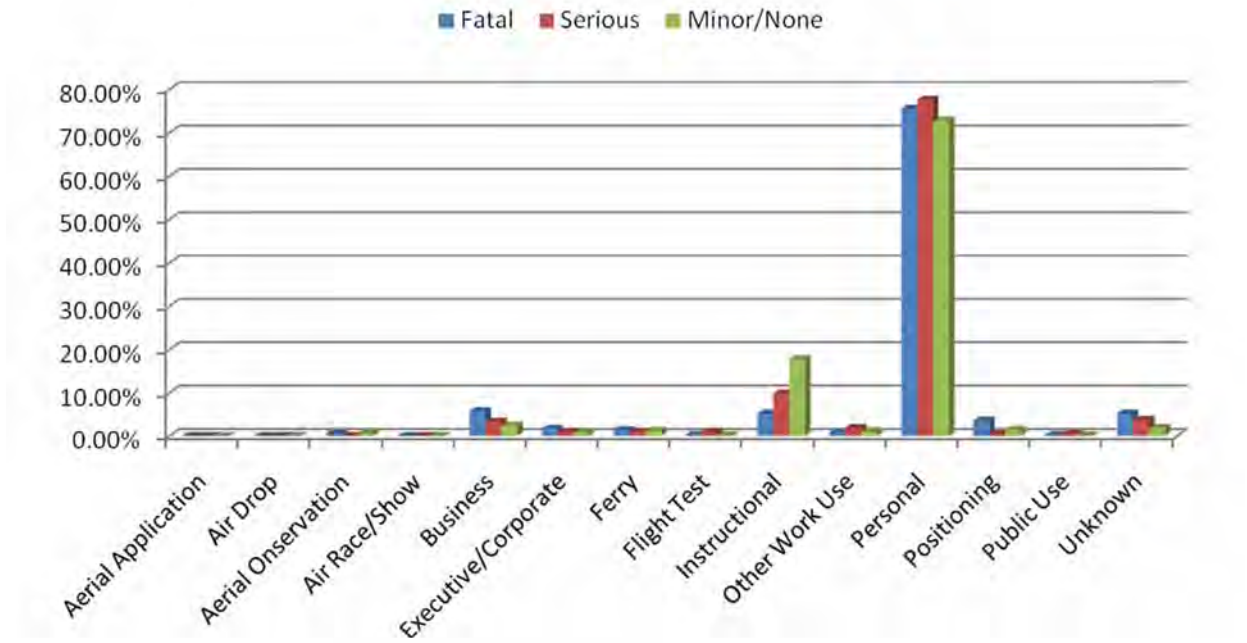

Figure 76. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Purpose of Flight in the New England Region (1982 to 2009)

6.4 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS IN THE NEW ENGLAND REGION.

Figures 77 through 79 show the frequency and percentage of the top ten initiating causes of GA accidents. Aircraft control is the number one initiating cause of Fatal GA accidents in the New England Region, as shown in figure 77. Airspeed is the number one initiating cause of Serious GA accidents, as shown in figure 78. Directional control is the number one initiating cause of Minor/None GA accidents, as shown in figure 79. This is similar to the nationwide data.

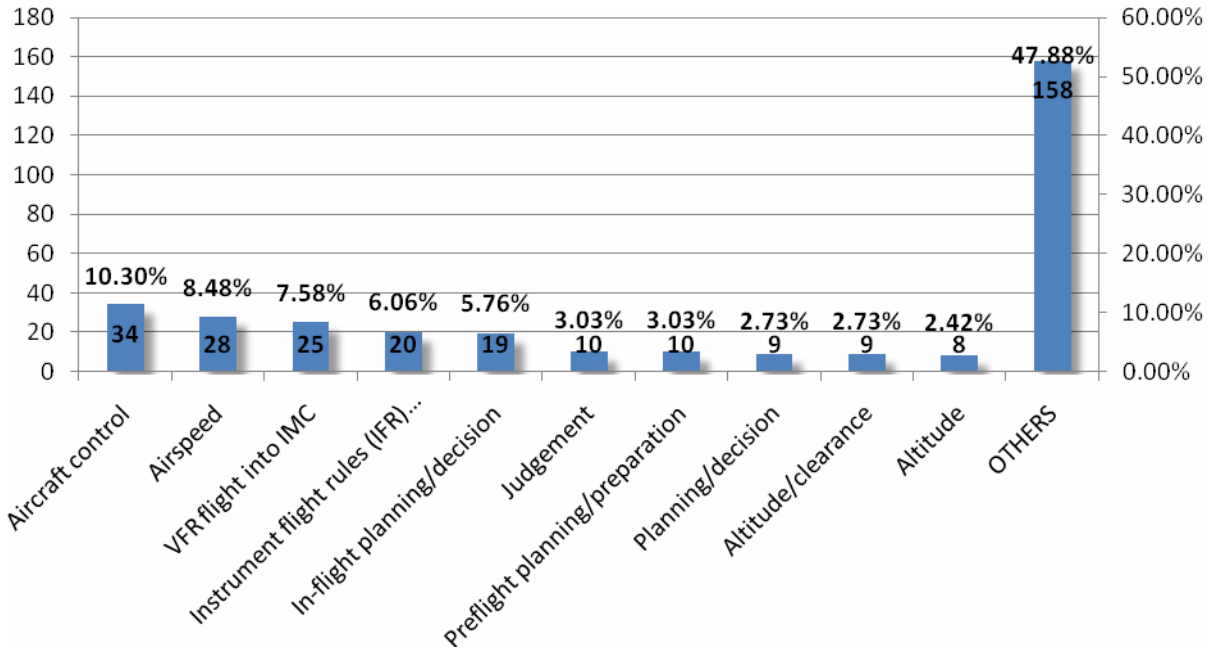

Figure 77. Frequency and Percentage of Initiating Causes of Fatal GA Accidents in the New England Region (1982 to 2009)

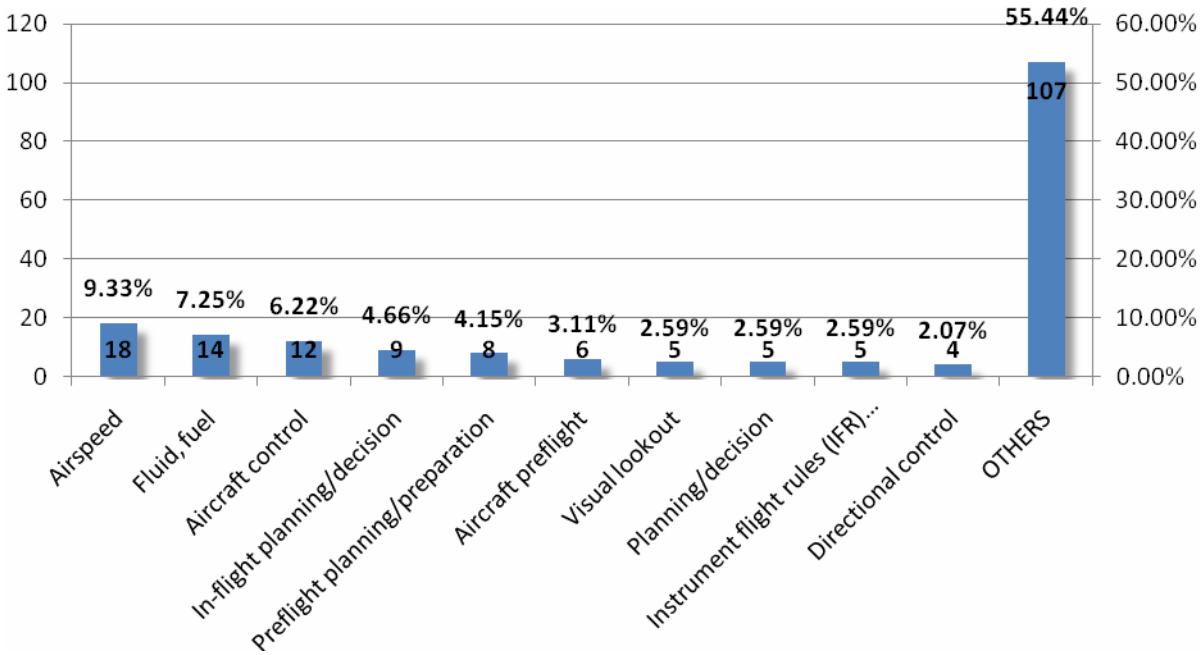

Figure 78. Frequency and Percentage of Initiating Causes of Serious GA Accidents in the New England Region (1982 to 2009)

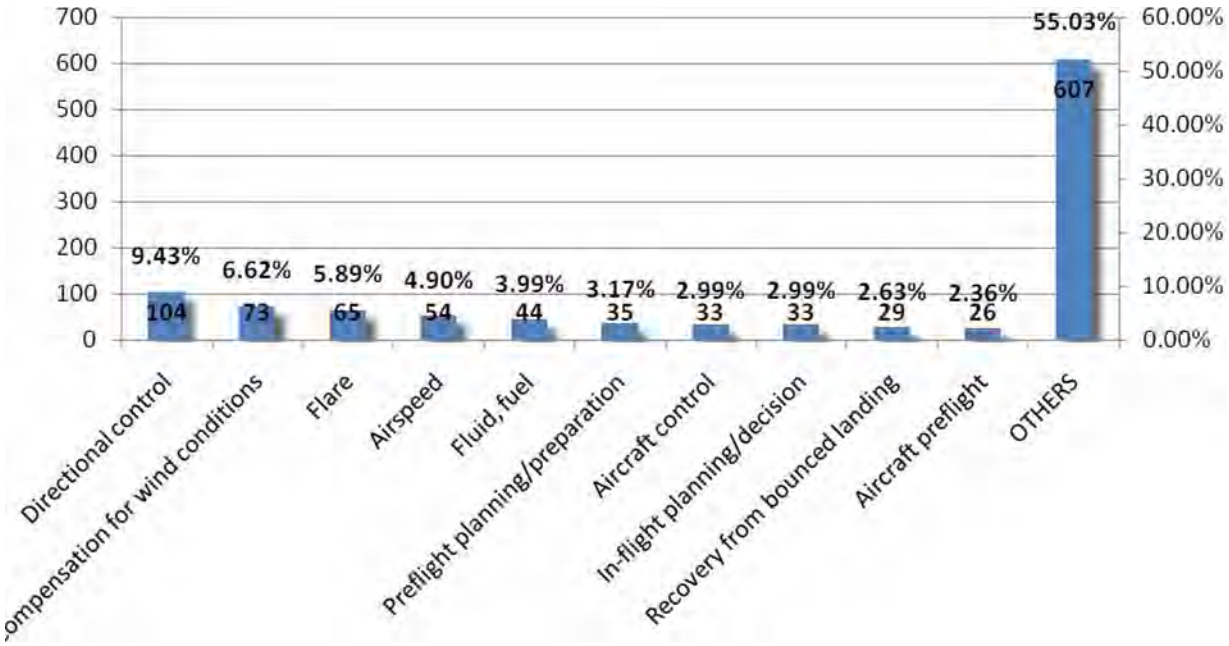

Figure 79. Frequency and Percentage of Initiating Causes of Minor/None GA Accidents in the New England Region (1982 to 2009)

6.5 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS RELATED TO PILOT EXPERIENCE IN THE NEW ENGLAND REGION.

According to the FAA, pilot error is the number one cause of aircraft accidents and incidents followed by faulty maintenance and operational errors. The NTSB database confirms that approximately 85% of GA accidents in the New England Region are caused by pilot error. This section provides statistical analyses of GA accident causes in the New England Region related to pilot error. In particular, pilot experience in hours is used in this report to examine the top ten initiating causes of GA accidents that lead to other events.

Figures 80 through 82 show the percentage of pilot experience based on total flight hours in relation to initiating causes of GA accidents.

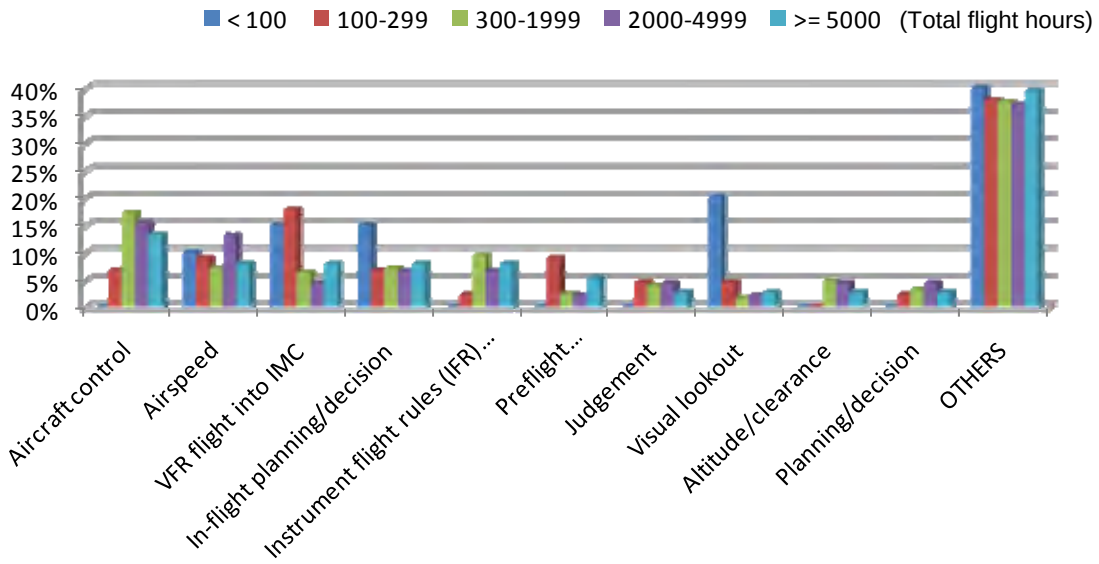

Figure 80. Percentage of Initiating Causes of Fatal GA Accidents Based on Pilot Experience in the New England Region (1982 to 2009)

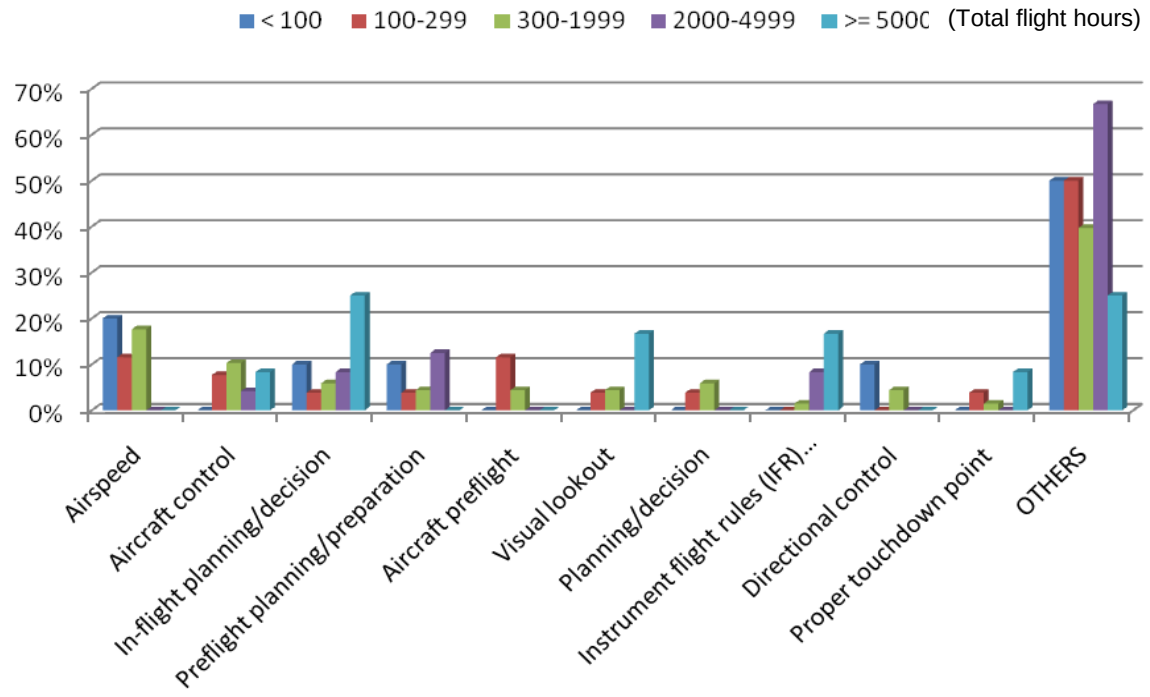

Figure 81. Percentage of Initiating Causes of Serious GA Accidents Based on Pilot Experience in the New England Region (1982 to 2009)

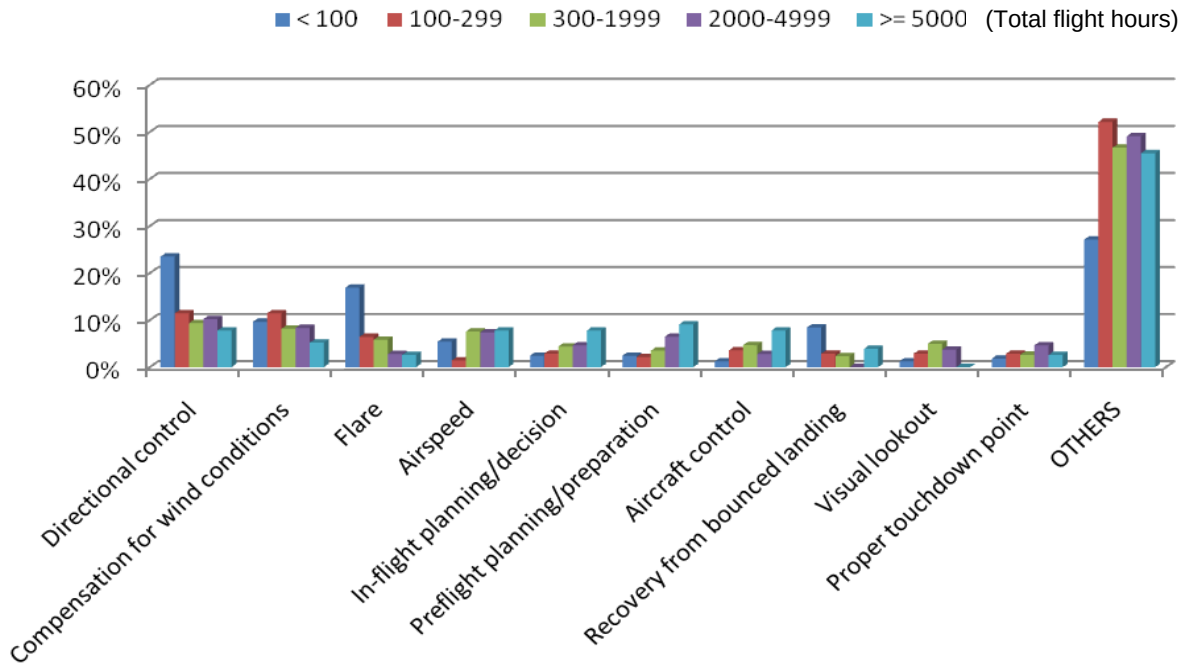

Figure 82. Percentage of Initiating Causes of Minor/None GA Accidents Based on Pilot Experience in the New England Region (1982 to 2009)

6.6 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS BASED ON AIRCRAFT COMPLEXITY IN THE NEW ENGLAND REGION.

Figures 83 through 85 show the percentage of accidents involving aircraft with less than 200 engine hp and accidents involving aircraft with more than or equal to 200 engine hp. Figure 83 shows that aircraft control is the number one initiating cause of Fatal GA accidents for the two categories combined. Figure 84 shows airspeed is the number one initiating cause of Serious GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents, as shown in figure 85.

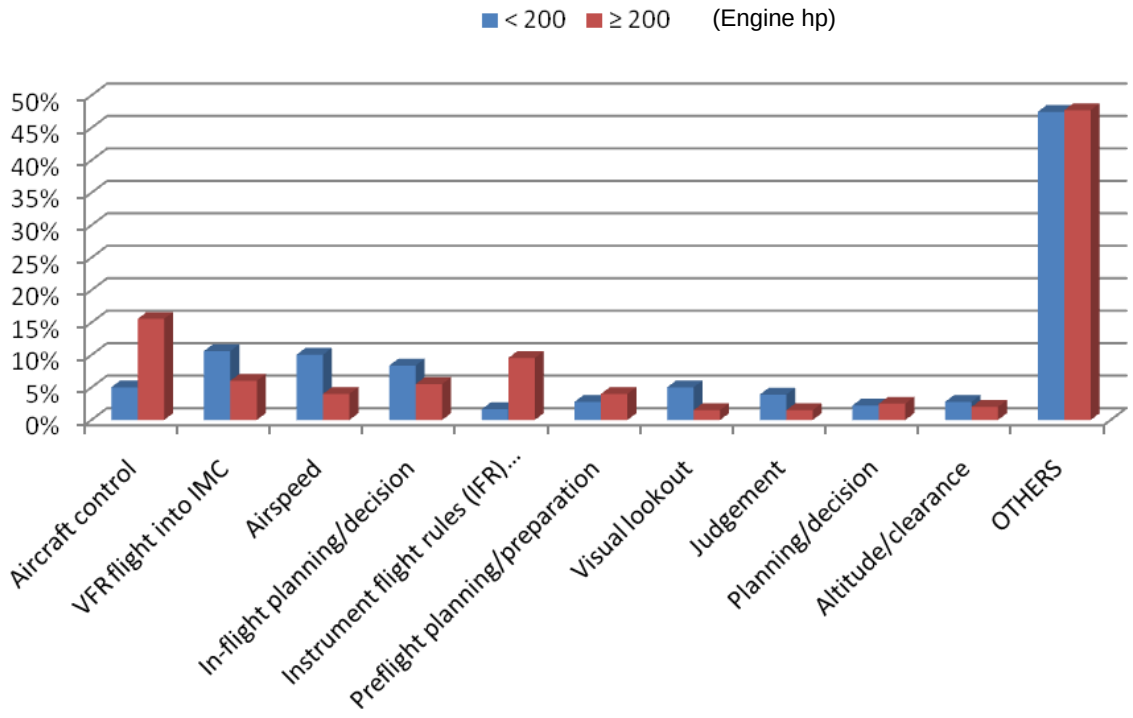

Figure 83. Percentage of Initiating Causes of Fatal GA Accidents Based on Aircraft Engine Power in the New England Region (1982 to 2009)

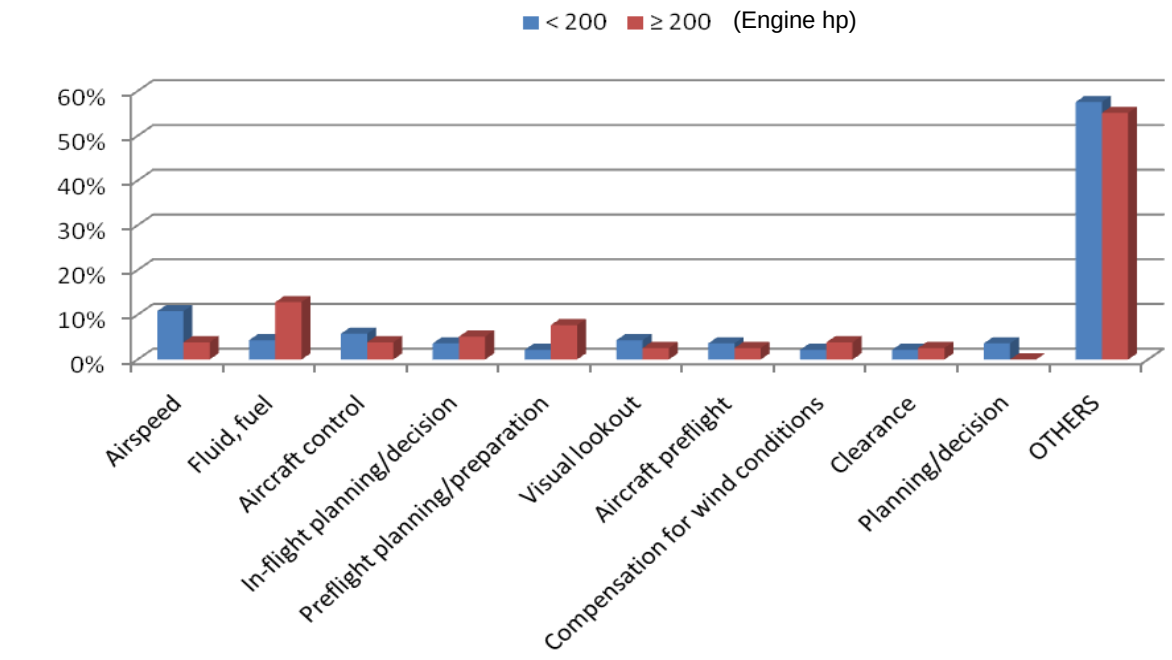

Figure 84. Percentage of Initiating Causes of Serious GA Accidents Based on Aircraft Engine Power in the New England Region (1982 to 2009)

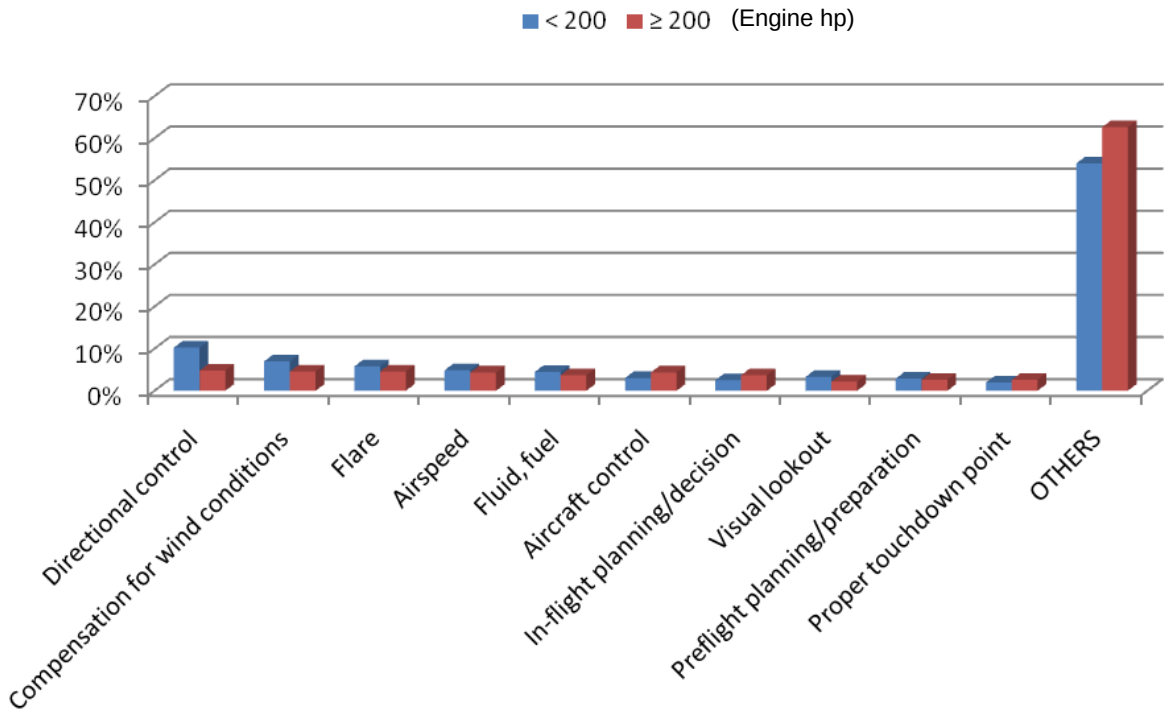

Figure 85. Percentage of Initiating Causes of Minor/None GA Accidents Based on Aircraft Engine Power in the New England Region (1982 to 2009)

6.7 RESULTS FOR THE NEW ENGLAND REGION.

This study examined the top ten initiating causes of GA accidents in the New England Region between 1982 and 2009. The trends found are similar to the nationwide trend and the trends in other regions. Airspeed, for example, is most frequently the number one initiating cause of Fatal GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents.

The number of GA accidents in the New England Region has decreased from 105 in 1982 to 33 in 2009, which is almost a 33% decrease in 1982 with 105 GA accidents. The number of GA accidents in the New England Region decreased faster than the nationwide number.

Analysis of GA accidents in the New England Region based on month shows that the majority of GA accidents occurred between May and August, which is similar to the nationwide data.

The majority of GA accidents in the New England Region occurred between 07:00 and 22:00 hours (7 a.m. and 10 p.m.), with the highest number of GA accidents recorded at 15:00 hours (3 p.m.) and 13:00 hours (1 p.m.); nationwide, the highest number of GA accidents occurred at 14:00 hours (2 p.m.) and 15:00 hours (3 p.m.).

Analysis of GA accidents in the New England Region based on phase of flight shows that the highest number of GA accidents occurred during the landing phase. Fatal GA accidents were higher during the cruise, descent, approach, and maneuvering phases. Serious GA accidents were most likely to occur during the takeoff phase, which is similar to the nationwide data.

Analysis of GA accidents in the New England Region based on purpose of flight shows that personal flight contributes the highest rate of GA accidents in the New England Region, which is similar to the nationwide data.

The top initiating causes of Fatal GA accidents in the New England Region are aircraft control followed by airspeed; nationwide, the top initiating causes of Fatal GA accidents are airspeed followed by VFR flight into IMC.

The top initiating cause of Serious GA accidents is airspeed in the New England Region; nationwide, the top initiating cause of Serious GA accidents is fluid, fuel.

Directional control is the top initiating cause of Minor/None GA accidents in the New England Region. This trend is similar to the nationwide data.

Based on pilot experience in total flight hours, the following results were found.

- The top initiating cause of Fatal GA accidents, for pilots with
    - less than 100 hours, is visual lookout in the New England Region and airspeed nationwide.

- between 100-299 hours, is VFR flight into IMC in both the New England Region and nationwide.

- between 300-1999 hours, is aircraft control in the New England Region and airspeed nationwide.

- between 2000-4999 and more than 5000 hours, is aircraft control in both the New England Region and nationwide.

- The top initiating cause of Serious GA accidents, for pilots with

  - less than 100, between 100-299, and between 300-1999 hours, is airspeed in both the New England Region and nationwide.

  - between 2000-4999 hours, is preflight planning/decision in the New England Region and airspeed nationwide.

  - more than 5000 hours, is in-flight planning/decision in the New England Region and airspeed nationwide.

- The top initiating cause of Minor/None GA accidents for pilots of every experience level is directional control in both the New England Region and nationwide.

Based on aircraft engine power, the following results were found.

- The top initiating cause of Fatal GA accidents, for aircraft with

  - less than 200 hp, is VFR flight into IMC in the New England Region and airspeed nationwide.

  - more than 200 hp, is aircraft control in the New England Region and VFR flight into IMC nationwide.

- The top initiating cause of Serious GA accidents, for aircraft with

  - less than 200 hp, is airspeed in the New England Region and fluid, fuel nationwide.

  - more than 200 hp, is fluid, fuel in both the New England Region and nationwide.

- The top initiating cause of Serious GA accidents for aircraft in both engine power categories is directional control in the New England Region and nationwide.

7. THE NORTHWEST MOUNTAIN REGION.

This section discusses the Northwest Mountain Region, which includes Colorado, Idaho, Montana, Oregon, Utah, Washington, and Wyoming.

7.1 FREQUENCY OF GA ACCIDENTS IN THE NORTHWEST MOUNTAIN REGION.

Generally, the frequency of GA accidents in the Northwest Mountain Region has decreased by almost half since 1982. There were 211 GA accidents in 2009 compared to 388 in 1982. However, compared to other regions, the Northwest Mountain Region has the steadiest trend. In 1991, the number of GA accidents increased 14.6% from the 1989 number. It decreased again until 1993, then it slowly increased until 2000. The trend from 2001 onward shows a significant increase in one year and followed by slight downturns for 3 to 4 years. The 2009 number of GA accidents is the lowest number since 1982.

Figure 86 shows the total number of aviation and GA accidents between 1982 and 2009 and shows the gap between the two lines is getting smaller. Figure 87 shows the percentage of GA accidents in the Northwest Mountain Region of all aviation accidents in the same region. It confirms that the decline in the number of GA accidents is slower than that of aviation accidents, especially between 1998 and 2009. The 2009 percentage of GA accidents (90.56%) is the highest since 1982. The lowest percentage of GA accidents is 77.75% in 1984.

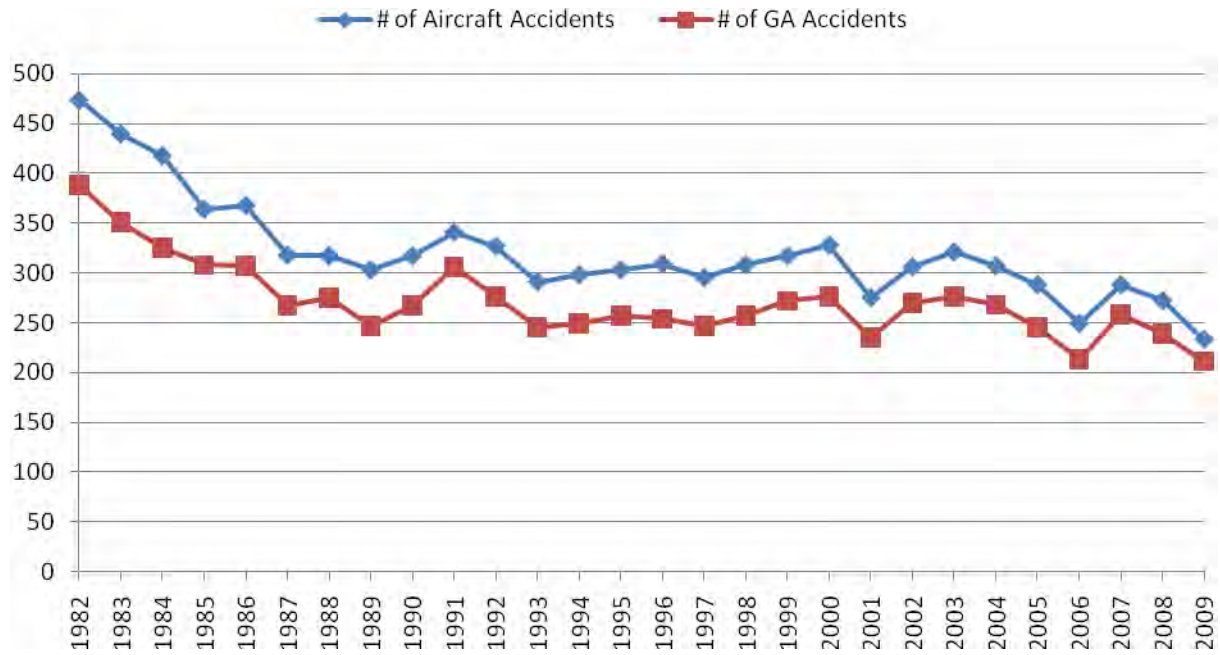

Figure 86. Number of Aircraft Accidents and GA Accidents in the Northwest Mountain Region

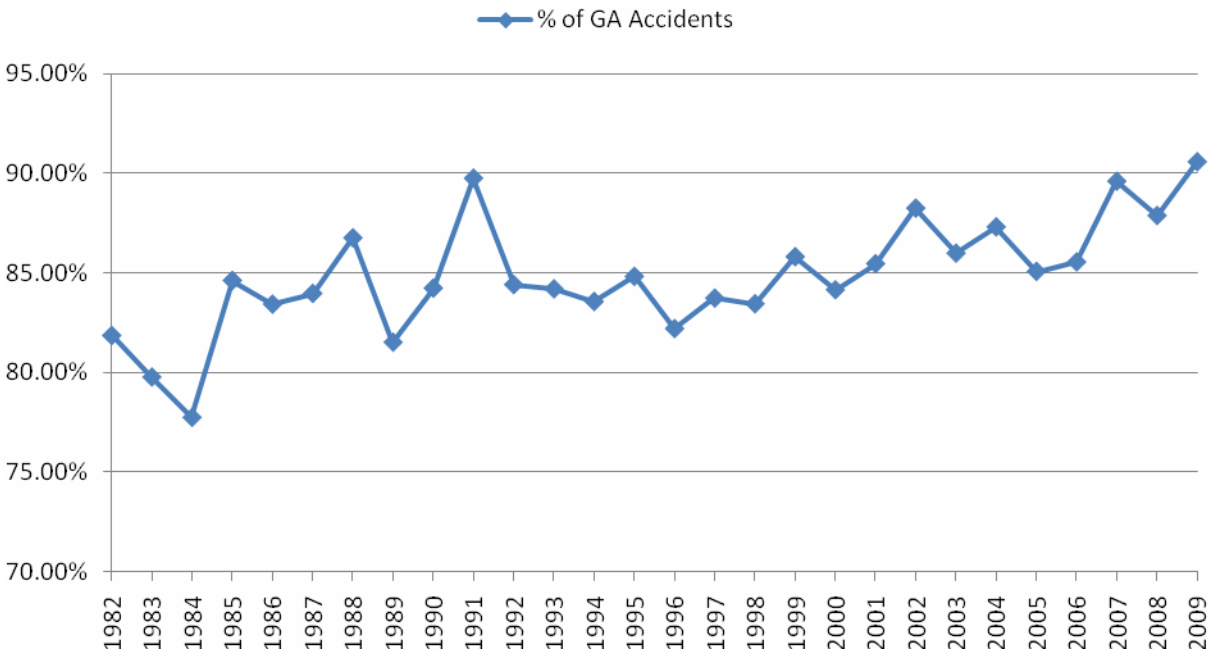

Figure 87. Percentage of GA Accidents of all Aviation Accidents in the Northwest Mountain Region

Figures 88 and 89 show the number of Fatal GA accidents and fatalities in the Northwest Mountain Region over the same period. Unlike other regions, this region has the slowest rate of decline for the frequency of Fatal GA accidents. It took more than 22 years for the region to reduce its 1982 number of Fatal GA accidents by half. Since 1982, there have been only two years when the number of Fatal GA accidents fell below 40. In 2006, the number of Fatal GA accidents is 30, which is the second lowest number after 2009 (29). The number of fatalities, on the other hand, appears low compared to the number of accidents. This is because, unlike commercial aircraft, most GA flights have fewer passengers. Overall, the lowest frequency of fatalities is in 2006 with 43 fatalities.

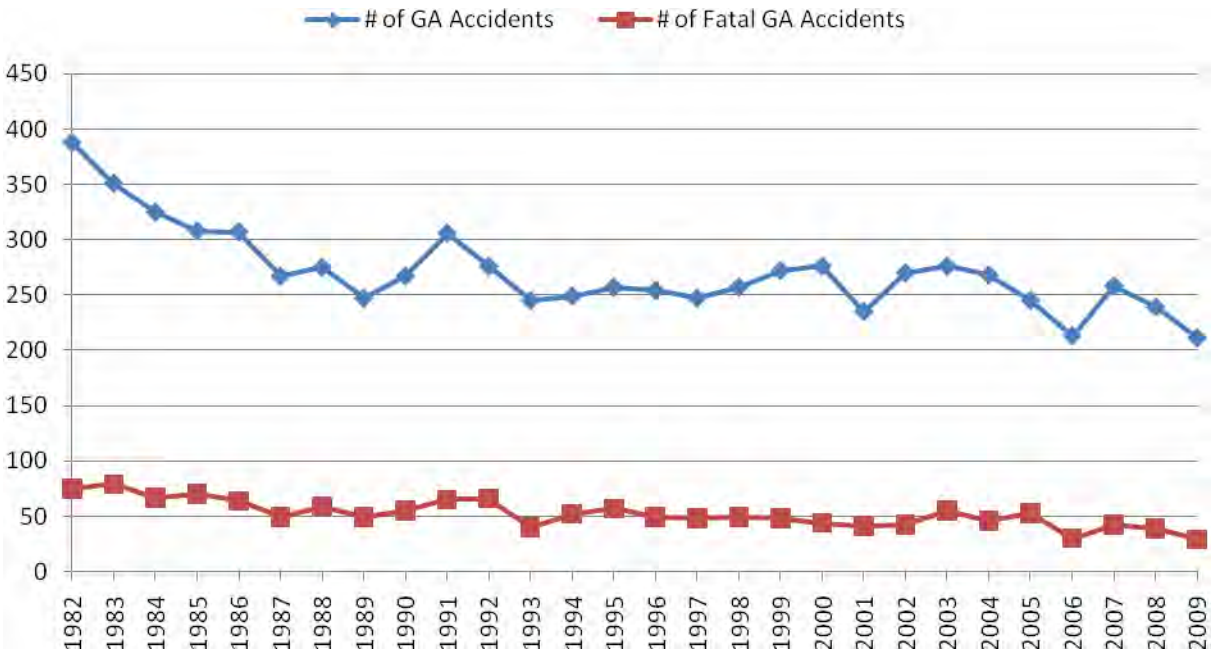

Figure 88. Number of GA Accidents and Fatal GA Accidents in the Northwest Mountain Region

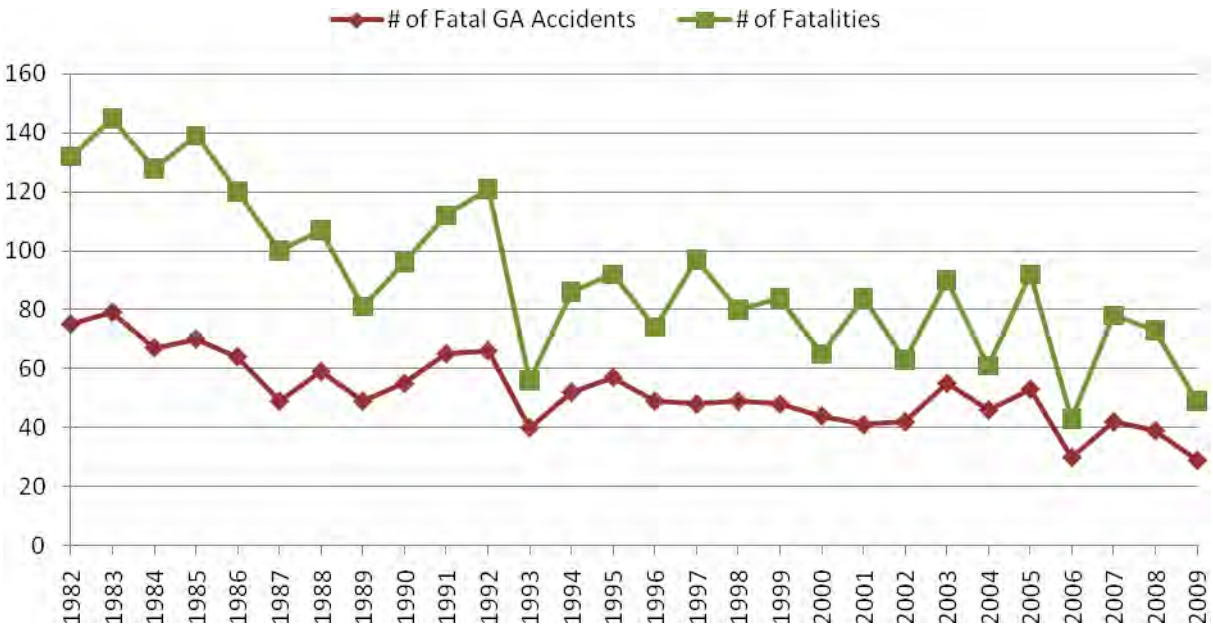

Figure 89. Number of Fatal GA Accidents and Fatalities in the Northwest Mountain Region

7.2 PERCENTAGE OF GA ACCIDENTS BASED ON MONTH AND TIME OF DAY IN THE NORTHWEST MOUNTAIN REGION.

Figure 90 shows that the total number of GA accidents in the Northwest Mountain Region peaks between May and August when the summer weather is more suitable for flying. Generally, Serious and Minor/None GA accidents outnumber Fatal GA accidents. However, the percentage of Fatal GA accidents is higher during October, November, and January. The highest number of GA accidents occurred in July followed by August and June.

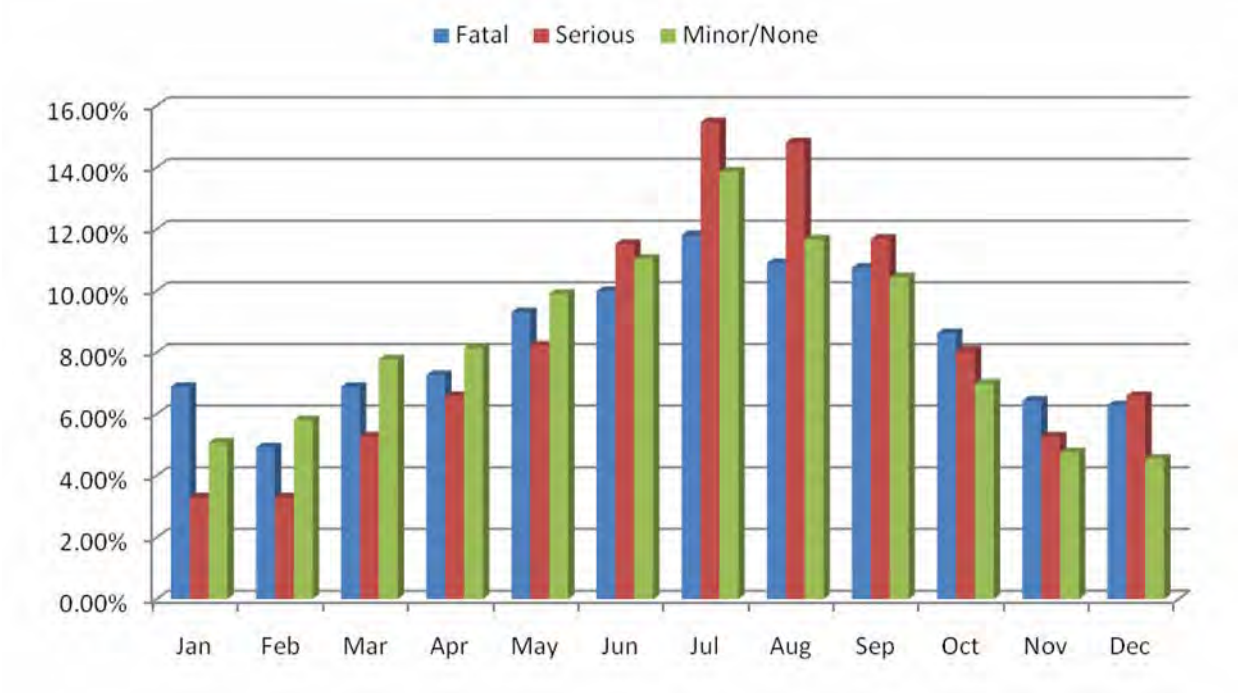

Figure 90. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Month in the Northwest Mountain Region (1982 to 2009)

With regard to time of day, figure 91 shows that between 1982 and 2009, the majority of GA accidents in the Northwest Mountain Region occurred between 07:00 and 22:00 hours (7 a.m. and 10 p.m.). The percentage of Fatal GA accidents is higher between 17:00 and 06:00 hours (5 p.m. and 6 a.m.). The highest number of GA accidents, in total between 1982 and 2009, occurred at 22:00 hours (2 p.m.) with 614 accidents and at 11:00 hours (11 a.m.) with 605 accidents.

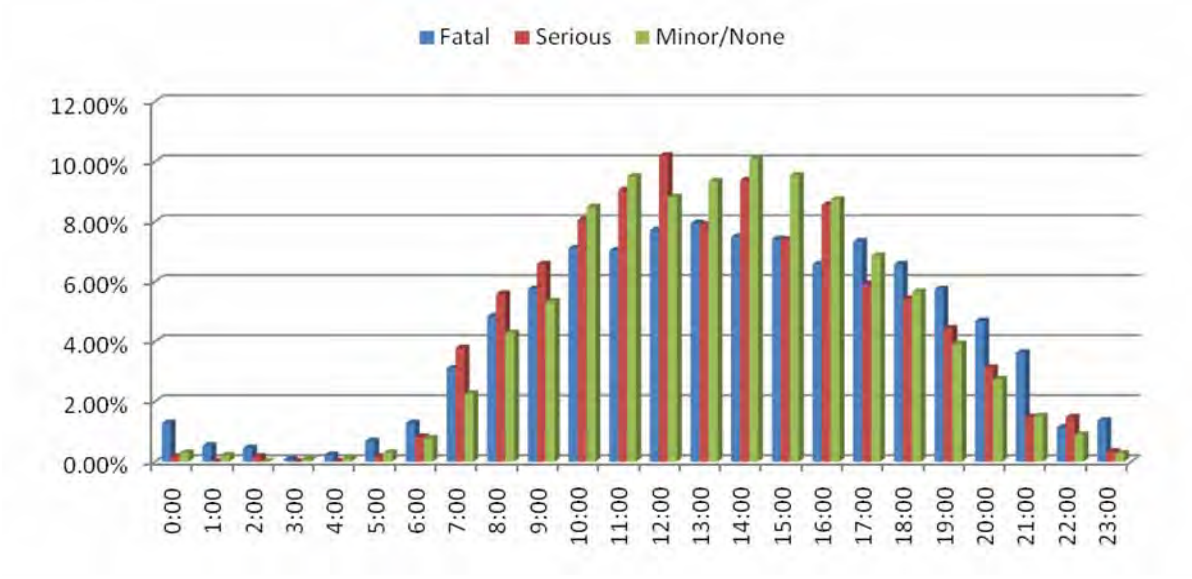

Figure 91. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Time of Day in the Northwest Mountain Region (1982 to 2009)

7.3 PERCENTAGE OF GA ACCIDENTS BASED ON PHASE AND PURPOSE OF FLIGHT IN THE NORTHWEST MOUNTAIN REGION.

Figure 92 shows the percentage of GA accidents in the Northwest Mountain Region from 1982 to 2009 based on phase of flight. The percentage of Fatal GA accidents is higher during the cruise, descent, and maneuvering phases. Similar to the nationwide data, the highest number of GA accidents occurred during the landing phase. Serious GA accidents, however, were most likely to occur during the takeoff phase.

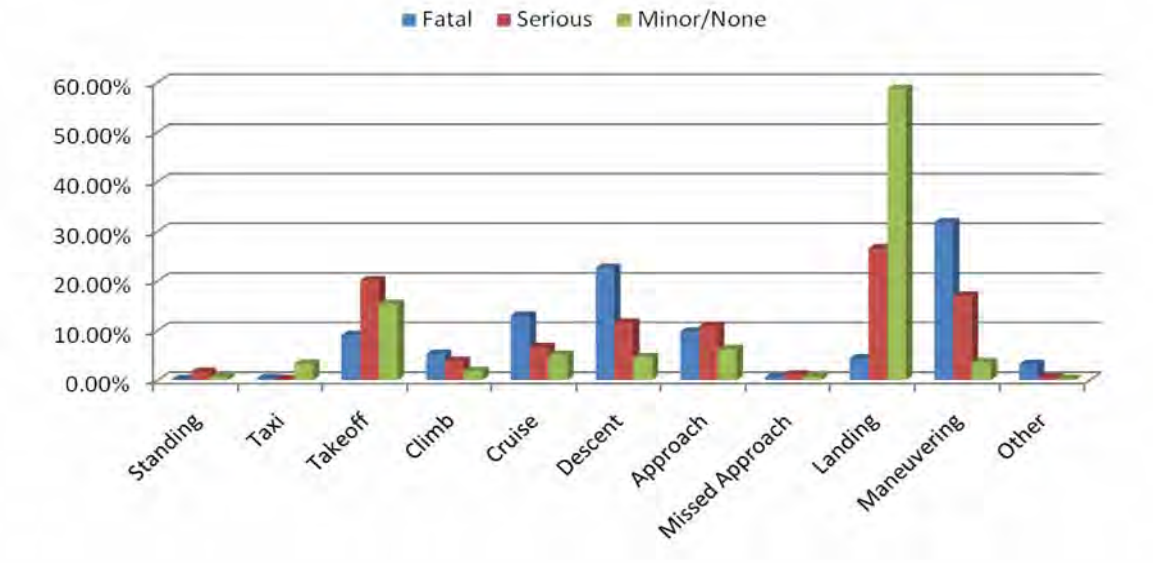

Figure 92. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Phase of Flight in the Northwest Mountain Region (1982 to 2009)

Figure 93 shows the percentage of GA accidents according to the purpose of flight. Because of the large number of personal aircraft in operation, personal flights contribute the highest rate of GA accidents in Northwest Mountain Region followed by instructional and business flights.

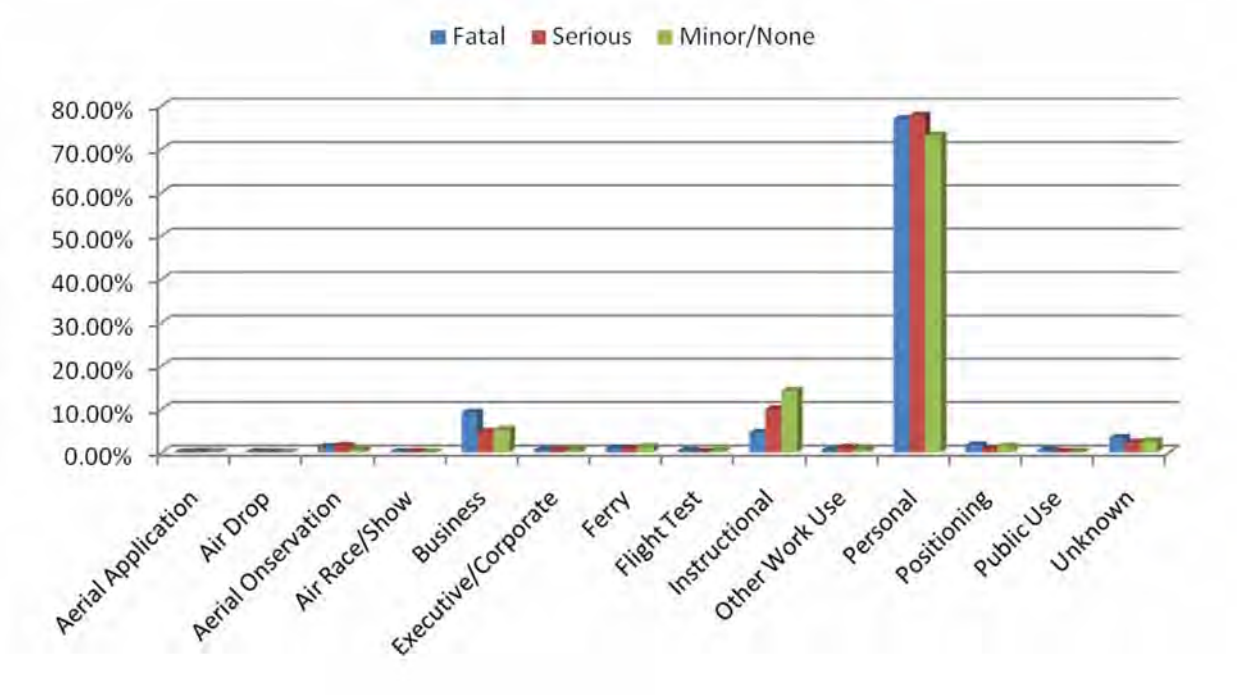

Figure 93. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Purpose of Flight in the Northwest Mountain Region (1982 to 2009)

7.4 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS IN THE NORTHWEST MOUNTAIN REGION.

Figures 94 through 96 show the frequency and percentage of the top ten initiating causes of GA accidents in the Northwest Mountain Region between 1982 and 2009. In-flight planning/decision is the number one initiating cause of Fatal GA accidents in the Northwest Mountain Region, as shown in figure 94. Fluid, fuel is the number one initiating cause of Serious GA accidents, as shown in figure 95. Directional control is the number one initiating cause of Minor/None GA accidents, as shown in figure 96. This is similar to the nationwide data.

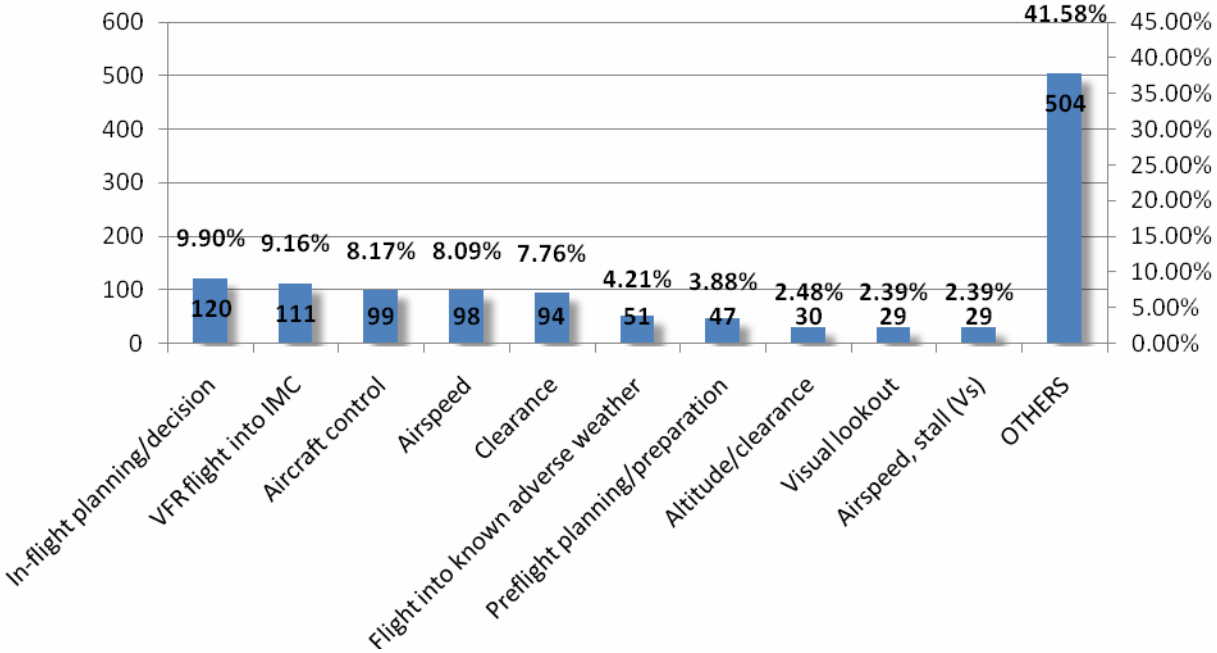

Figure 94. Frequency and Percentage of Initiating Causes of Fatal GA Accidents in the Northwest Mountain Region (1982 to 2009)

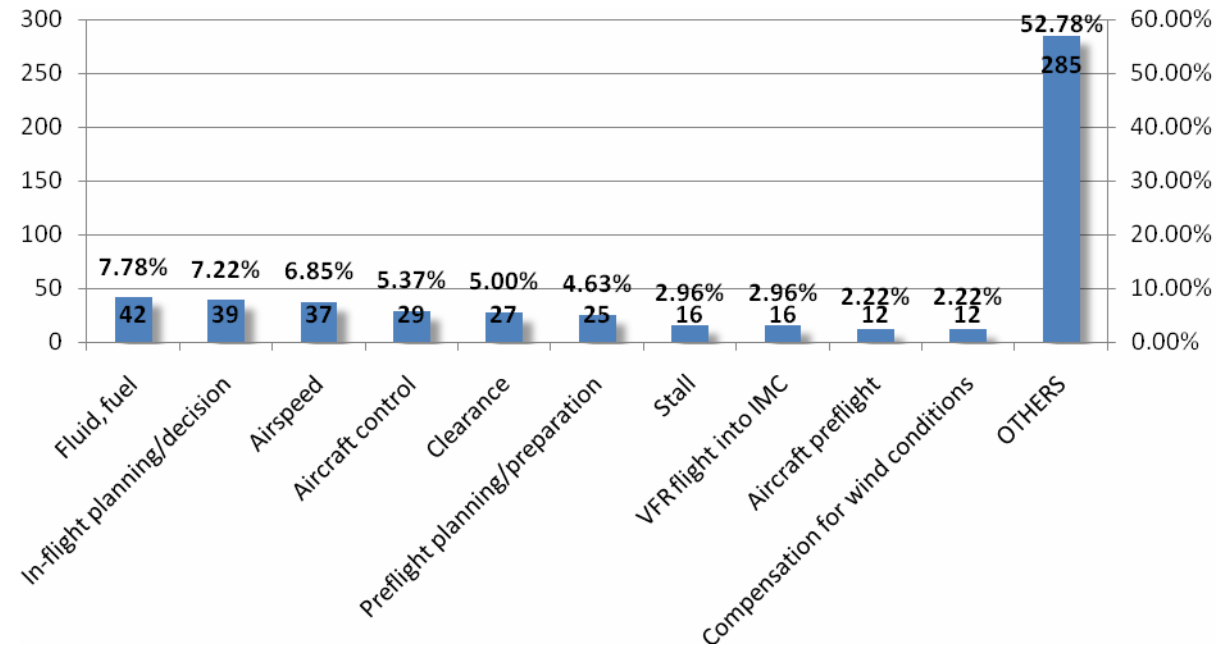

Figure 95. Frequency and Percentage of Initiating Causes of Serious GA Accidents in the Northwest Mountain Region (1982 to 2009)

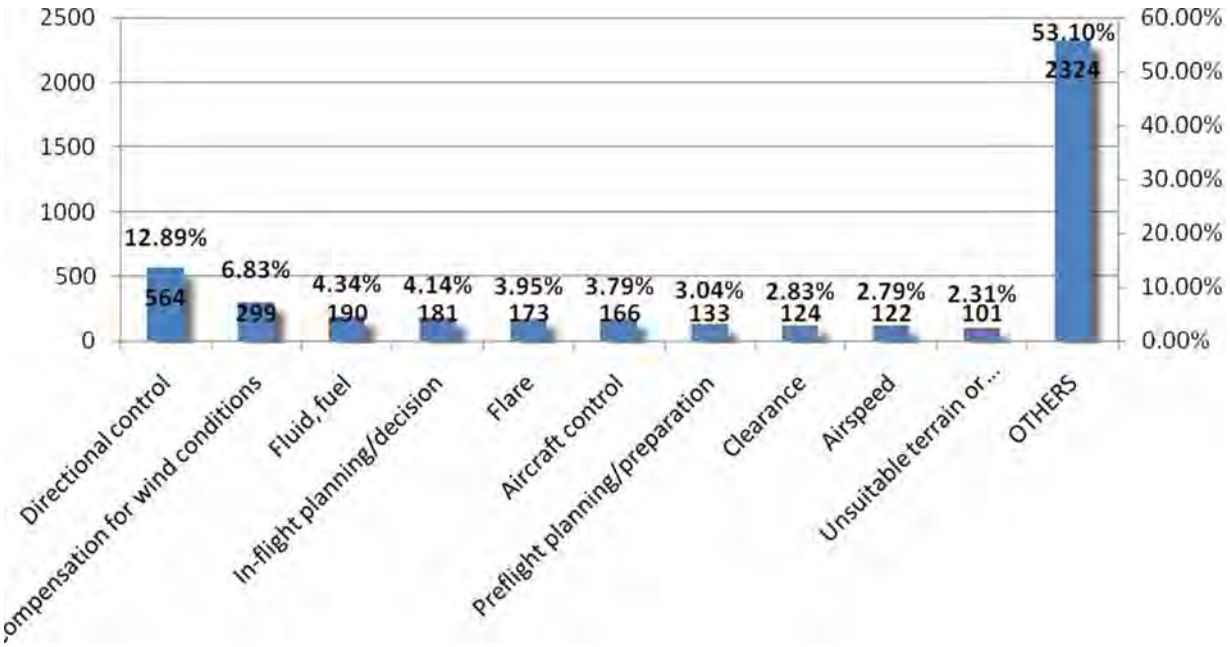

Figure 96. Frequency and Percentage of Initiating Causes of Minor/None GA Accidents in the Northwest Mountain Region (1982 to 2009)

7.5 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS RELATED TO PILOT EXPERIENCE IN THE NORTHWEST MOUNTAIN REGION.

According to the FAA, pilot error is the number one initiating cause of aircraft accidents and incidents followed by faulty maintenance and operational errors. The NTSB database confirms that approximately 85% of GA accidents in the Northwest Mountain Region are caused by pilot error. The following sections provide statistical analyses of GA accident causes in the Northwest Mountain Region related to pilot error. In particular, pilot experience in hours is used in this report to examine the top ten initiating causes of GA accidents that lead to other events.

Figures 97 through 99 show the percentage of pilot experience based on total flight hours in relation to initiating causes of GA accidents.

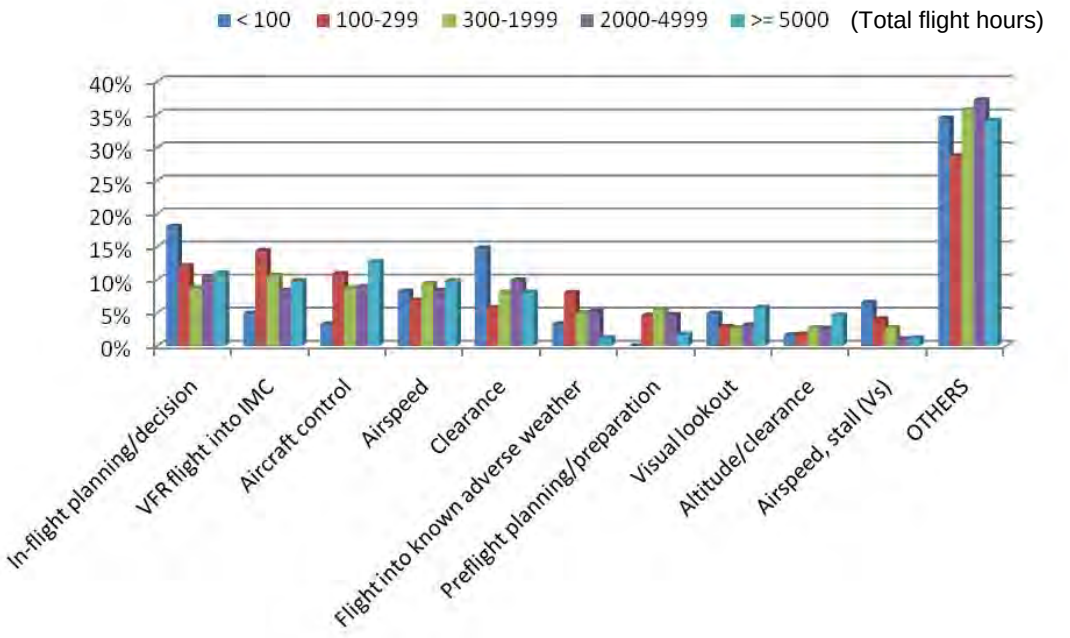

Figure 97. Percentage of Initiating Causes of Fatal GA Accidents Based on Pilot Experience in the Northwest Mountain Region (1982 to 2009)

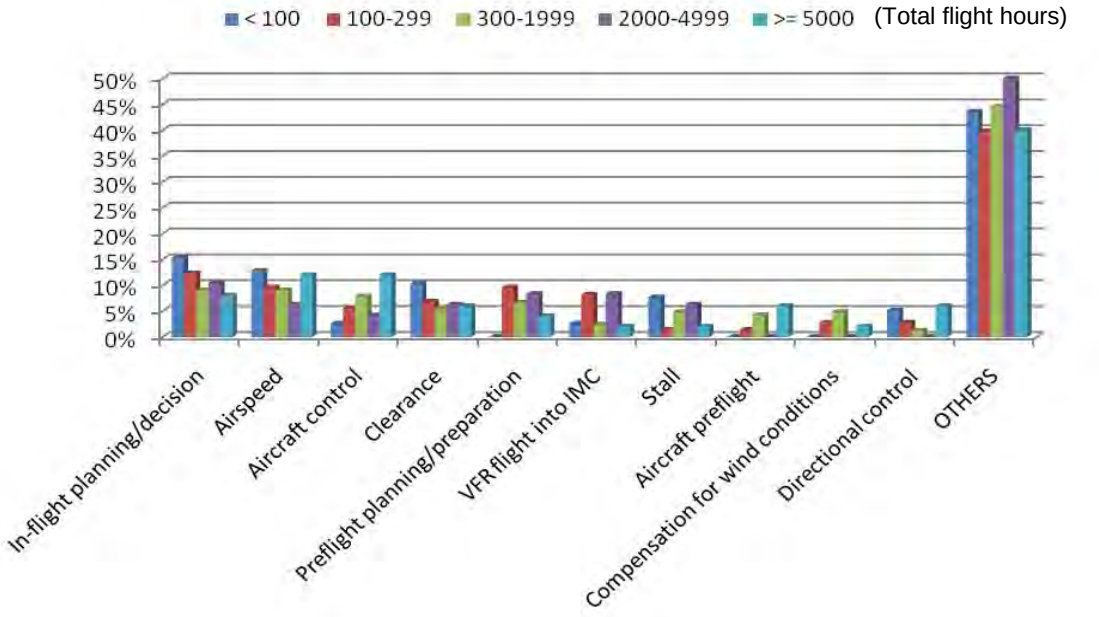

Figure 98. Percentage of Initiating Causes of Serious GA Accidents Based on Pilot Experience in the Northwest Mountain Region (1982 to 2009)

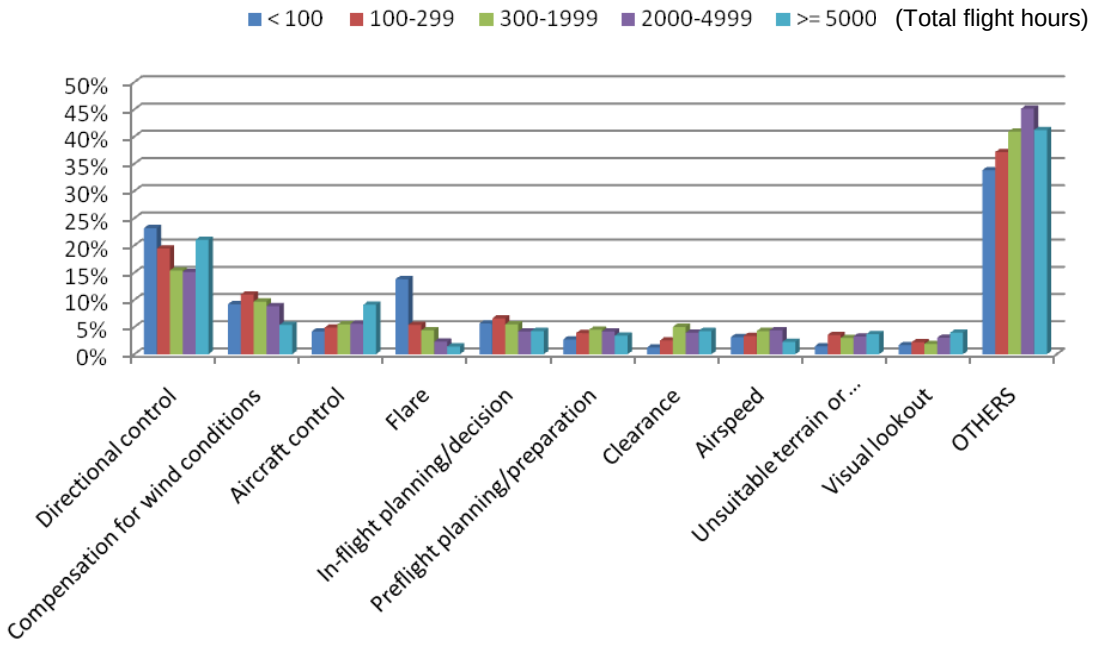

Figure 99. Percentage of Initiating Causes of Minor/None GA Accidents Based on Pilot Experience in the Northwest Mountain Region (1982 to 2009)

7.6 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS BASED ON AIRCRAFT COMPLEXITY IN THE NORTHWEST MOUNTAIN REGION.

Figures 100 through 102 show the percentage of accidents involving aircraft with less than 200 engine hp and accidents involving aircraft with more than or equal to 200 engine hp. Figure 100 shows that in-flight planning/decision is the number one initiating cause of Fatal GA accidents for the two categories combined. Figure 101 shows in-flight planning/decision as the number one initiating cause of Serious GA accidents for the combined categories. However, upon reviewing each individual category, fluid, fuel is the number one initiating cause of Serious GA accidents involving aircraft with more than 200 engine hp, while airspeed is the number one initiating cause for aircraft with less than 200 engine hp. Directional control is the number one initiating cause of Minor/None GA accidents for both categories, as shown in figure 102.

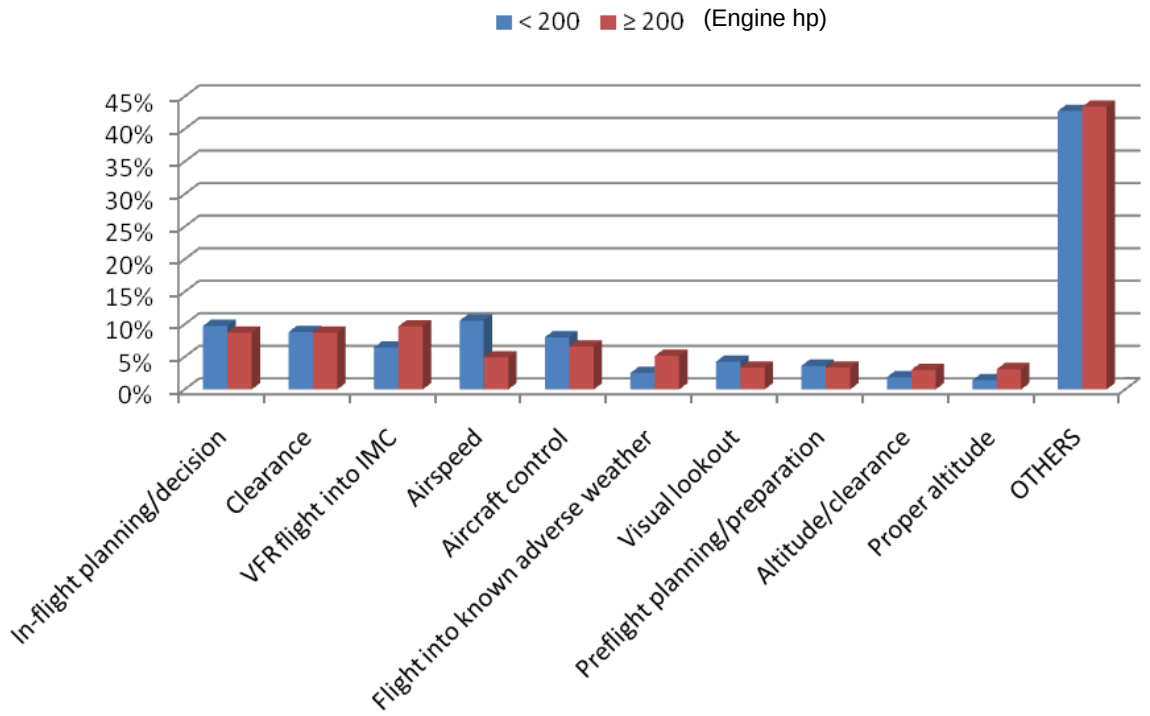

Figure 100. Percentage of Initiating Causes of Fatal GA Accidents Based on Aircraft Engine Power in the Northwest Mountain Region (1982 to 2009)

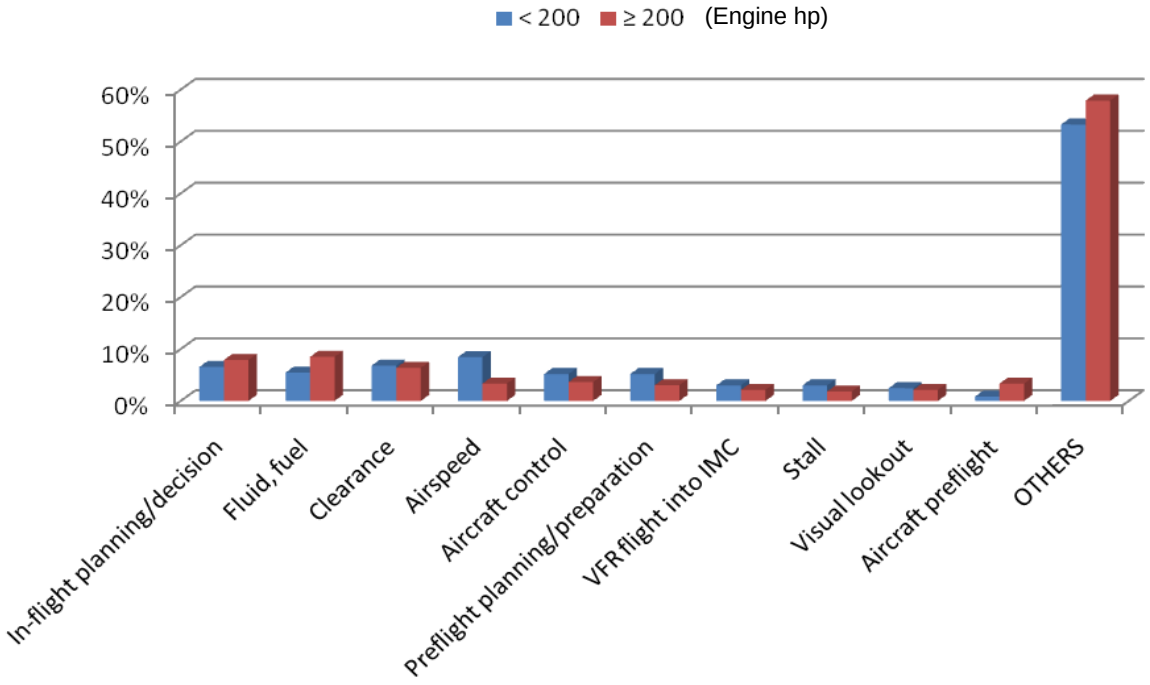

Figure 101. Percentage of Initiating Causes of Serious GA Accidents Based on Aircraft Engine Power in the Northwest Mountain Region (1982 to 2009)

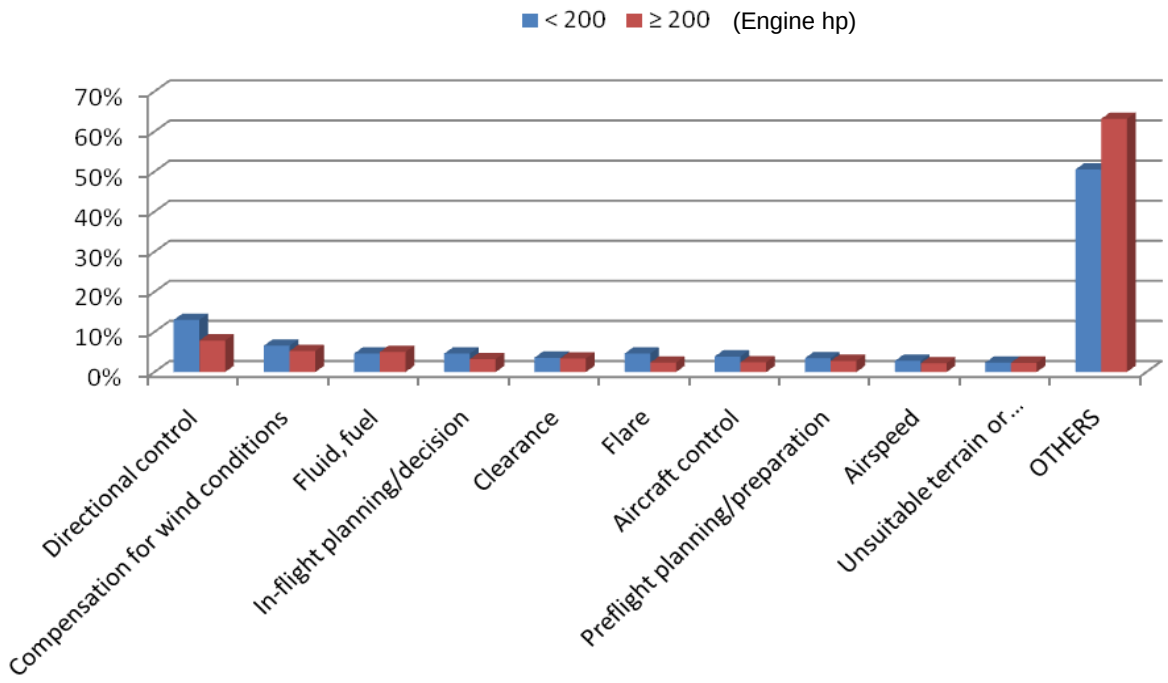

Figure 102. Percentage of Initiating Causes of Minor/None GA Accidents Based on Aircraft Engine Power in the Northwest Mountain Region (1982 to 2009)

7.7 RESULTS FOR THE NORTHWEST MOUNTAIN REGION.

This study examined the top ten initiating causes of GA accidents in the Northwest Mountain Region. The trends found are similar to the nationwide trend and the trends in other regions. Airspeed, for example, is most frequently the number one initiating cause of Fatal GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents.

The number of GA accidents has decreased from 388 in 1982 to 211 in 2009, which is almost a 33% decrease. However, compared to other regions, the Northwest Mountain Region has the steadiest trend; compared to the nationwide data, the region did not decrease significantly.

Analysis of GA accidents in the Northwest Mountain Region based on month shows that the majority of GA accidents occurred between May and August, which is similar to the nationwide data.

The majority of GA accidents in the Northwest Mountain Region occurred between 07:00 and 22:00 hours (7 a.m. and 10 p.m.) with the highest number of accidents recorded at 14:00 hours (2 p.m.) and 11:00 hours (11 a.m.); nationwide, the highest number of accidents occurred at 14:00 hours (2 p.m.) and 15:00 hours (3 p.m.).

Analysis of GA accidents in the Northwest Mountain Region based on phase of flight reveals that the highest number of GA accidents occurred during the landing phase. Fatal GA accidents

were higher during the cruise, descent, and maneuvering phases. Serious GA accidents were most likely to occur during the takeoff phase, which is similar to the nationwide data.

Analysis of GA accidents in the Northwest Mountain Region based on purpose of flight shows that personal flights contribute the highest rate of GA accidents in the Northwest Mountain Region, which is similar to the nationwide data.

The top initiating causes of Fatal GA accidents in the Northwest Mountain Region are in-flight planning/decision followed by VFR flight into IMC; nationwide, the top initiating causes of Fatal GA accidents are airspeed followed by VFR flight into IMC.

The top initiating cause of Serious GA accidents is fluid, fuel in the Northwest Mountain Region, which is similar to the nationwide data.

Directional control is the number one initiating cause of Minor/None GA accidents in the Northwest Mountain Region. This trend is similar to the nationwide data.

Based on pilot experience in total flight hours, the following results were found.

- The top initiating cause of Fatal GA accidents, for pilots with
    - less than 100 hours, is in-flight planning/decision in the Northwest Mountain Region and airspeed nationwide.
    - between 100-299 hours, is VFR flight into IMC in both the Northwest Mountain Region and nationwide.
    - between 300-1999 hours, is VFR flight into IMC in the Northwest Mountain Region and airspeed nationwide.
    - between 2000-4999 hours, is in-flight planning/decision in the Northwest Mountain Region and aircraft control nationwide.
    - more than 5000 hours, is aircraft control in both the Northwest Mountain Region and nationwide.
- The top initiating cause of Serious GA accidents, for pilots with
    - less than 100, between 100-299, between 300-1999, and between 2000-4999 hours, is in-flight planning/decision in the Northwest Mountain Region and airspeed nationwide.
    - more than 5000 hours, are airspeed and aircraft control in the Northwest Mountain Region and airspeed nationwide.

- The top initiating cause of Minor/None GA accidents, for pilots of all experience levels, is directional control in both the Northwest Mountain Region and nationwide.

Based on aircraft engine power, the following results were found.

- The top initiating cause of Fatal GA accidents, for aircraft with
  - less than 200 hp, is airspeed in both the Northwest Mountain Region and nationwide.
  - more than 200 hp, is VFR flight into IMC in both the Northwest Mountain Region and nationwide.
- The top initiating cause of Serious GA accidents, for aircraft with
  - less than 200 hp, is airspeed in the Northwest Mountain Region and fluid, fuel nationwide
  - more than 200 hp, are in-flight planning/decision and fluid, fuel in the Northwest Mountain Region and fluid, fuel nationwide.
- The top initiating cause of Serious GA accidents, for aircraft of both engine hp categories is directional control in both the Northwest Mountain Region and nationwide.

8. THE SOUTHERN REGION.

This section discusses the Southern Region, which includes Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, Puerto Rico, South Carolina, and Tennessee.

8.1 FREQUENCY OF GA ACCIDENTS IN THE SOUTHERN REGION.

Generally, the frequency of GA accidents in the Southern Region has significantly decreased between 1982 and 1997. The number of GA accidents has decreased from 500 in 1982 to 260 in 1997, which is almost a 50% decrease. However, the trend from 1997 onward shows slight increases in three- to four-year intervals followed by a drop. The number significantly declined in 2008 (from 289 GA accidents in 2007 to 231 in 2008), but rose again to 267 GA accidents in 2009.

Figure 103 shows the number of total aviation and GA accidents in the Southern Region between 1982 and 2009, and shows the gap between the two lines is getting smaller. Figure 104 shows the percentage of GA accidents in the Southern Region of all aviation accidents in the same region. It confirms that the decline in the number of GA accidents is slower than that of aviation accidents. Both figures verify that GA has a significant role in the safety of the aviation industry and needs attention.

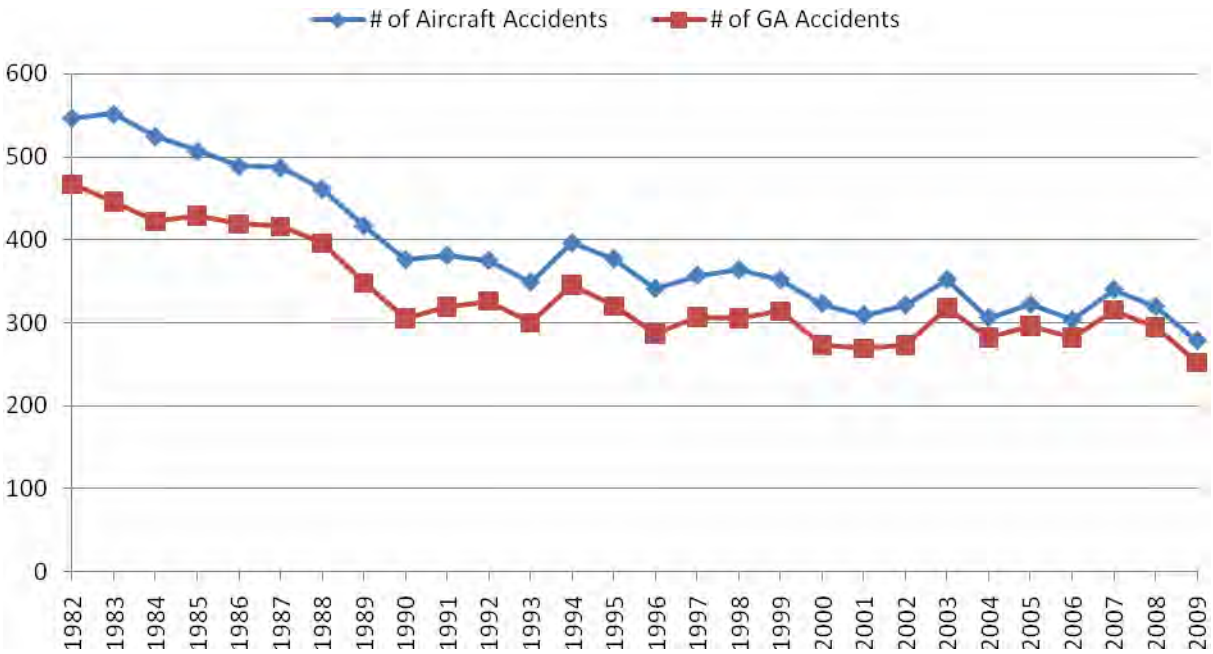

Figure 103. Number of Aircraft Accidents and GA Accidents in the Southern Region

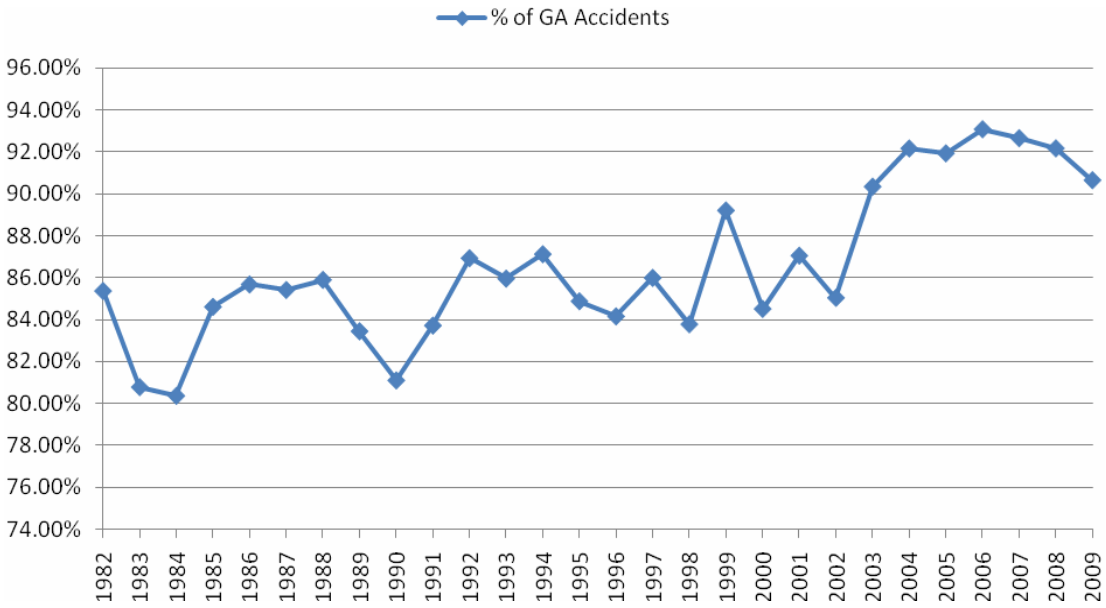

Figure 104. Percentage of GA Accidents of all Aviation Accidents in the Southern Region

Figures 105 and 106 show the number of Fatal GA accidents and fatalities in the Southern Region over the same period. The number of Fatal GA accidents and fatalities has decreased, which may be due to improved FAA safety regulations. In addition, the number of fatalities appears low compared to the number of accidents. This is because, unlike commercial aircraft, most GA flights have fewer passengers.

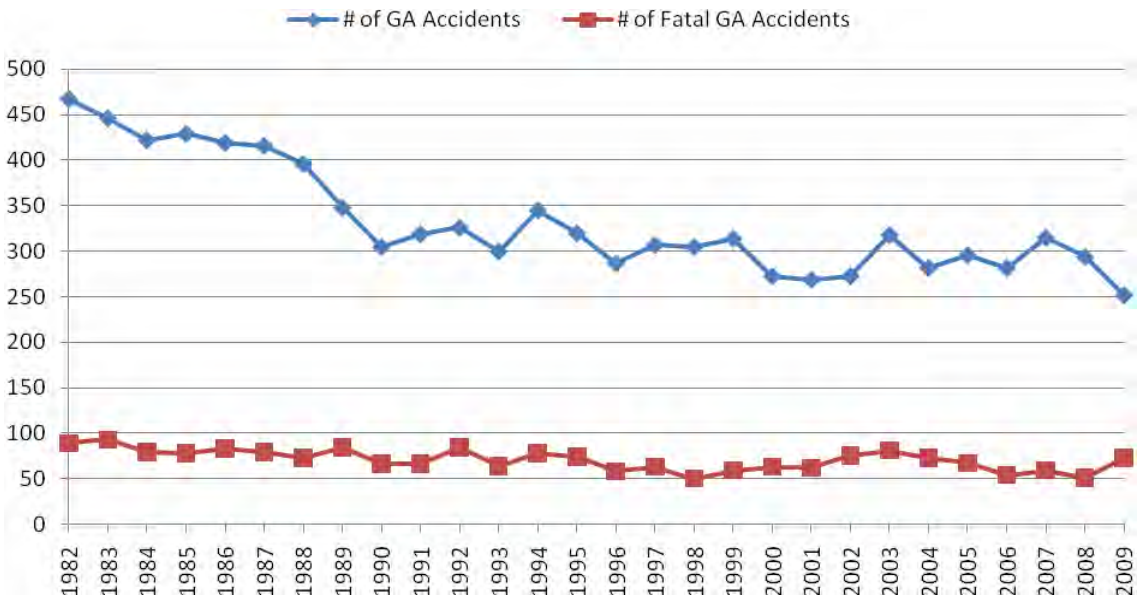

Figure 105. Number of GA Accidents and Fatal GA Accidents in the Southern Region

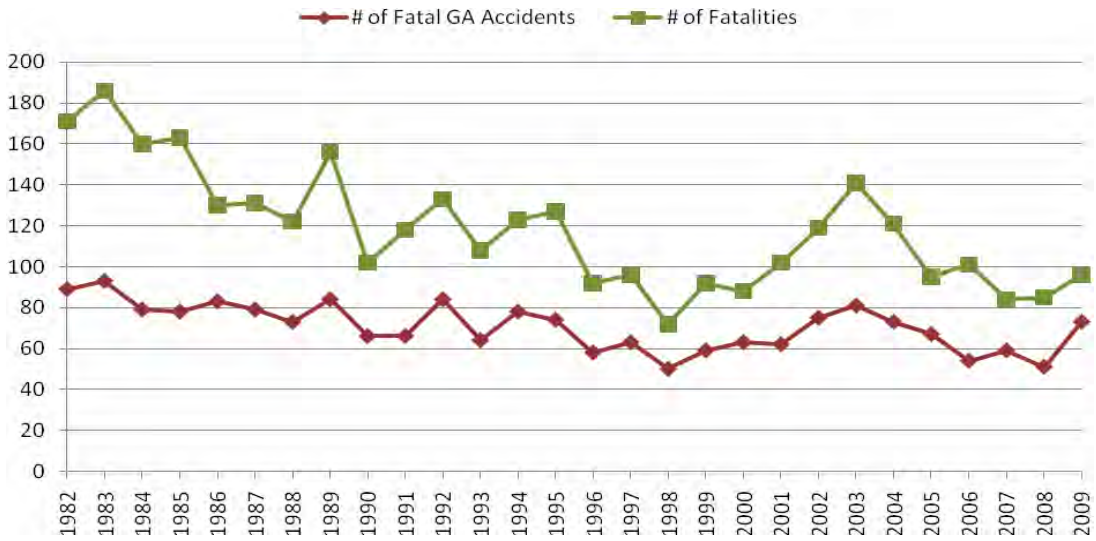

Figure 106. Number of Fatal GA Accidents and Fatalities in the Southern Region

8.2 PERCENTAGE OF GA ACCIDENTS BASED ON MONTH AND TIME OF DAY IN THE SOUTHERN REGION.

Figure 107 shows that the frequency of GA accidents in the Southern Region was dispersed evenly throughout the year with a slight increase in March and April. The percentage of Fatal GA accidents is higher in December and January. Between 1982 and 2009, the highest number of total GA accidents occurred in April followed by March.

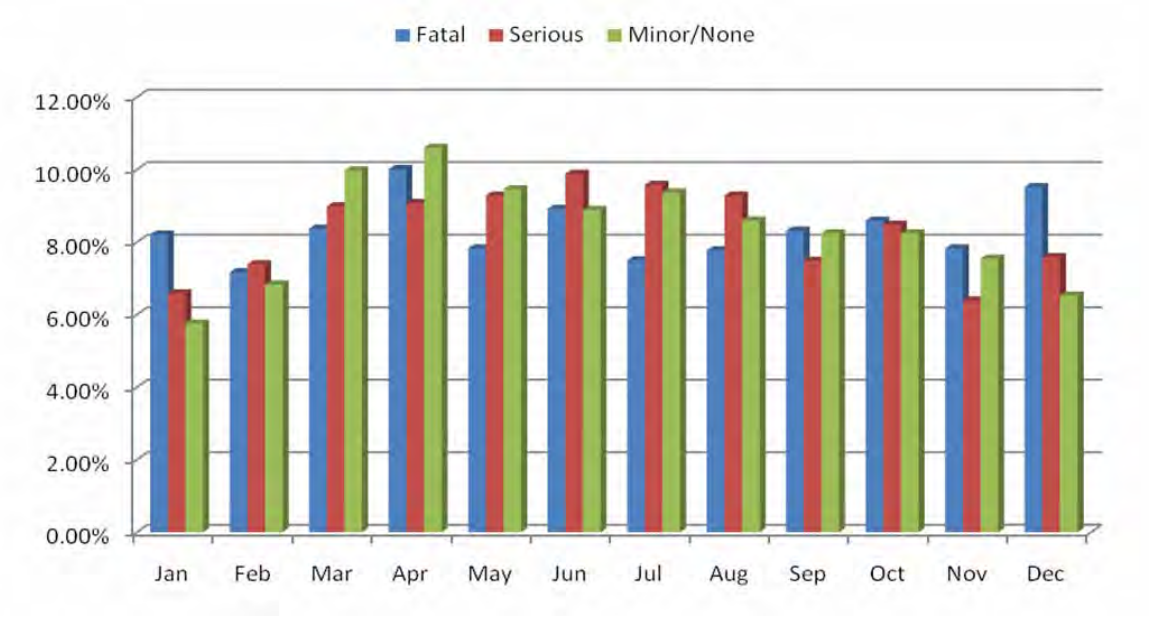

Figure 107. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Month in the Southern Region (1982 to 2009)

With regard to time of day, the majority of GA accidents in the Southern Region occurred between 07:00 and 22:00 hours (7 a.m. and 10 p.m.), as shown in figure 108. The percentage of Fatal GA accidents was higher between 20:00 and 08:00 hours (8 p.m. and 8 a.m.). The highest number of GA accidents, in total between 1982 and 2009, occurred at 15:00 hours (3 p.m.) with 758 accidents and at 14:00 hours (2 p.m.) with 733 accidents.

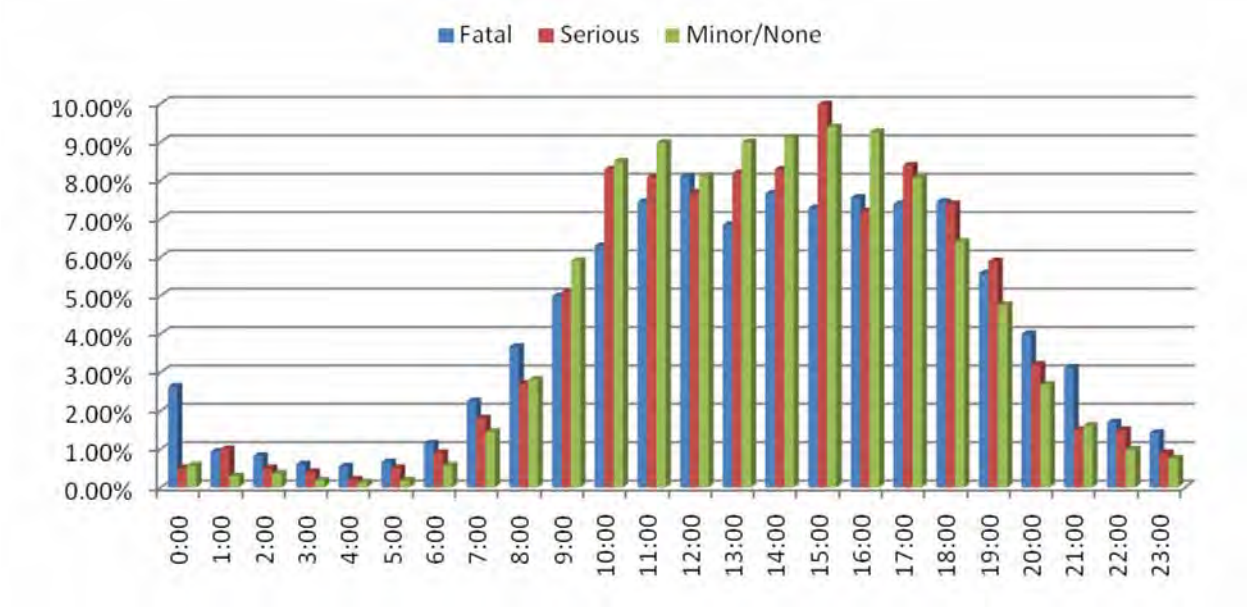

Figure 108. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Time of Day in the Southern Region (1982 to 2009)

8.3 PERCENTAGE OF GA ACCIDENTS BASED ON PHASE AND PURPOSE OF FLIGHT IN THE SOUTHERN REGION.

Figure 109 shows the percentage of GA accidents based on phase of flight. Generally, the percentage of Serious and Minor/None GA accidents outnumber the percentage of Fatal GA accidents. However, the percentage of Fatal GA accidents is higher during the cruise, descent, and maneuvering phases. Like the nationwide data, the highest number of GA accidents occurred during landing. Serious GA accidents, however, were most likely to occur during the takeoff phase.

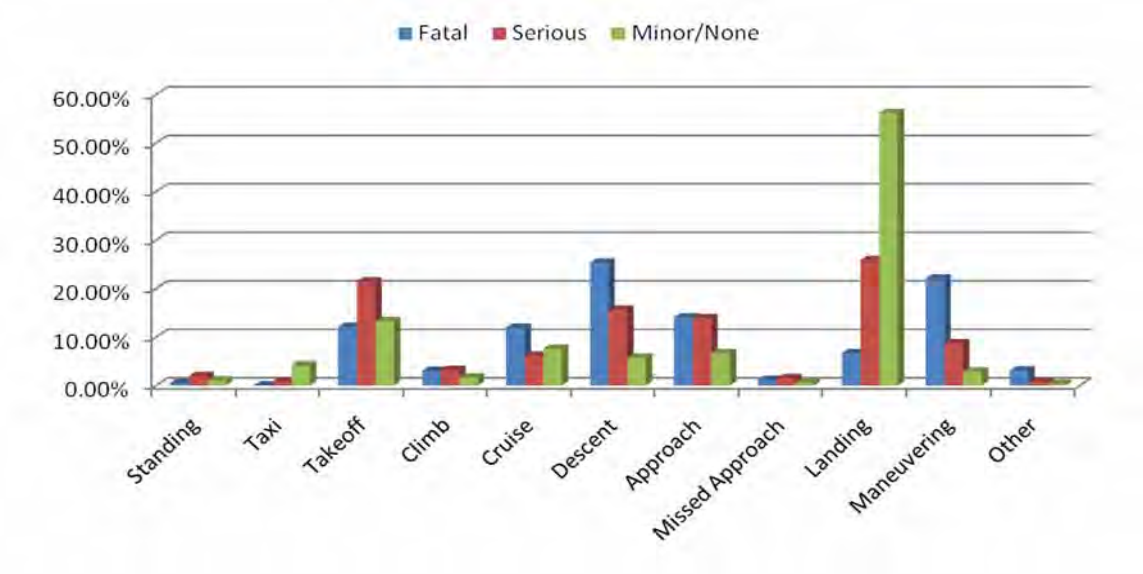

Figure 109. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Phase of Flight in the Southern Region (1982-2009)

Figure 110 shows the percentage of GA accidents according to the purpose of flight. Because of the large number of personal aircraft in operation, personal flights contribute the highest rate of GA accidents in the Southern Region followed by instructional and business flights.

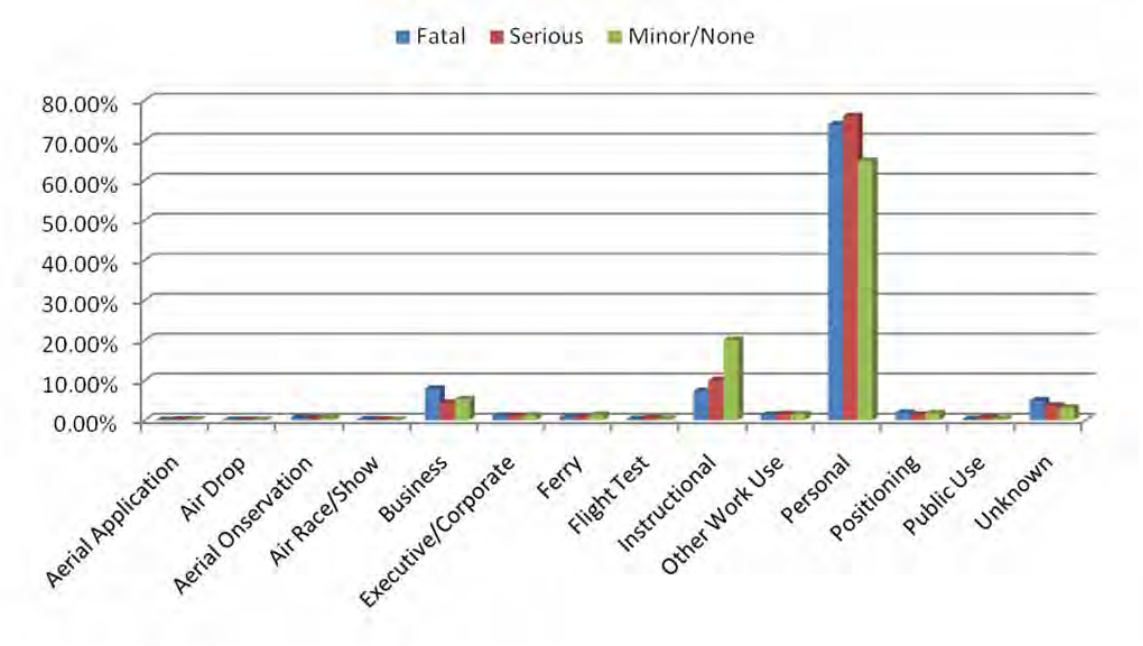

Figure 110. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Purpose of Flight in the Southern Region (1982 to 2009)

8.4 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS IN THE SOUTHERN REGION.

Figures 111 through 113 show the frequency and percentage of the top ten initiating causes of GA accidents in the Southern Region between 1982 and 2009. Airspeed is the number one initiating cause of Fatal GA accidents in the region, as shown in figure 111. Fluid, fuel is blamed the number one initiating cause of Serious GA accidents, as shown in figure 112. Directional control is the number one initiating cause of Minor/None GA accidents, as shown in figure 113. This is similar to the nationwide data.

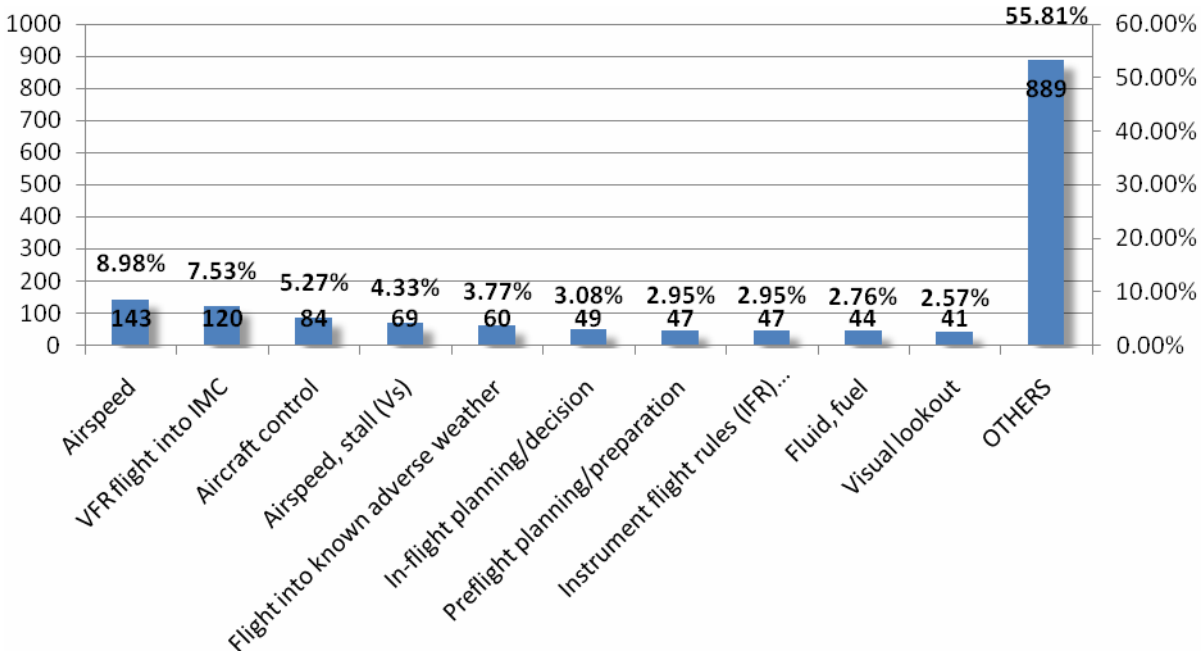

Figure 111. Percentage of Initiating Causes of Fatal GA Accidents in the Southern Region (1982 to 2009)

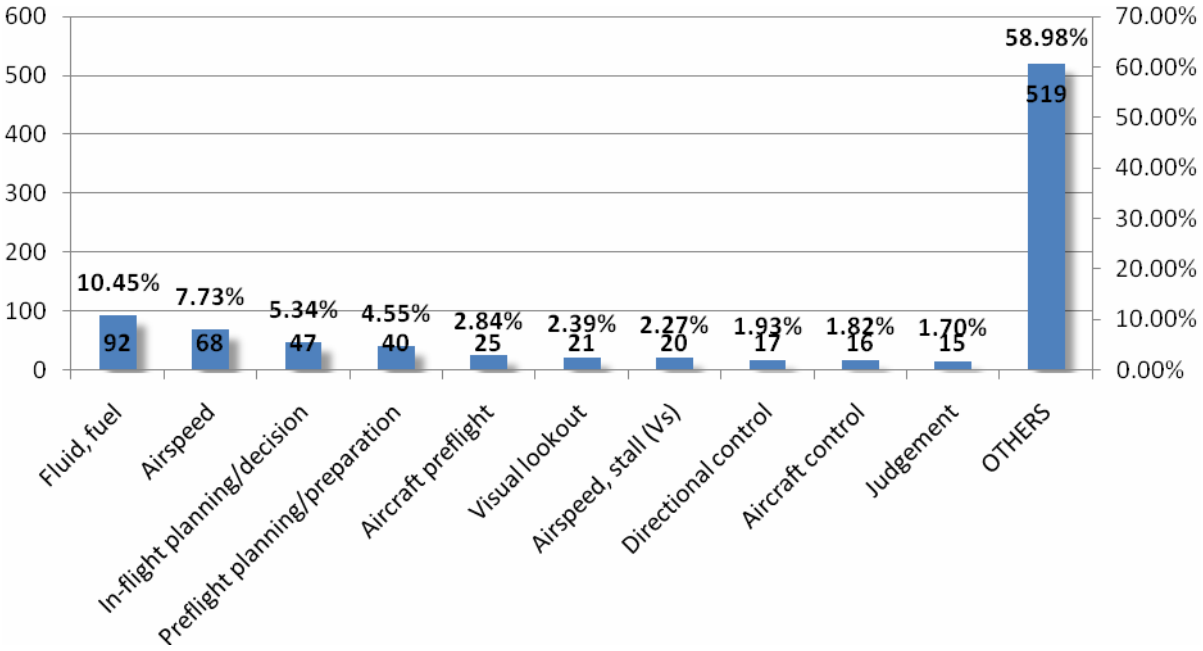

Figure 112. Percentage of Initiating Causes of Serious GA Accidents in the Southern Region (1982 to 2009)

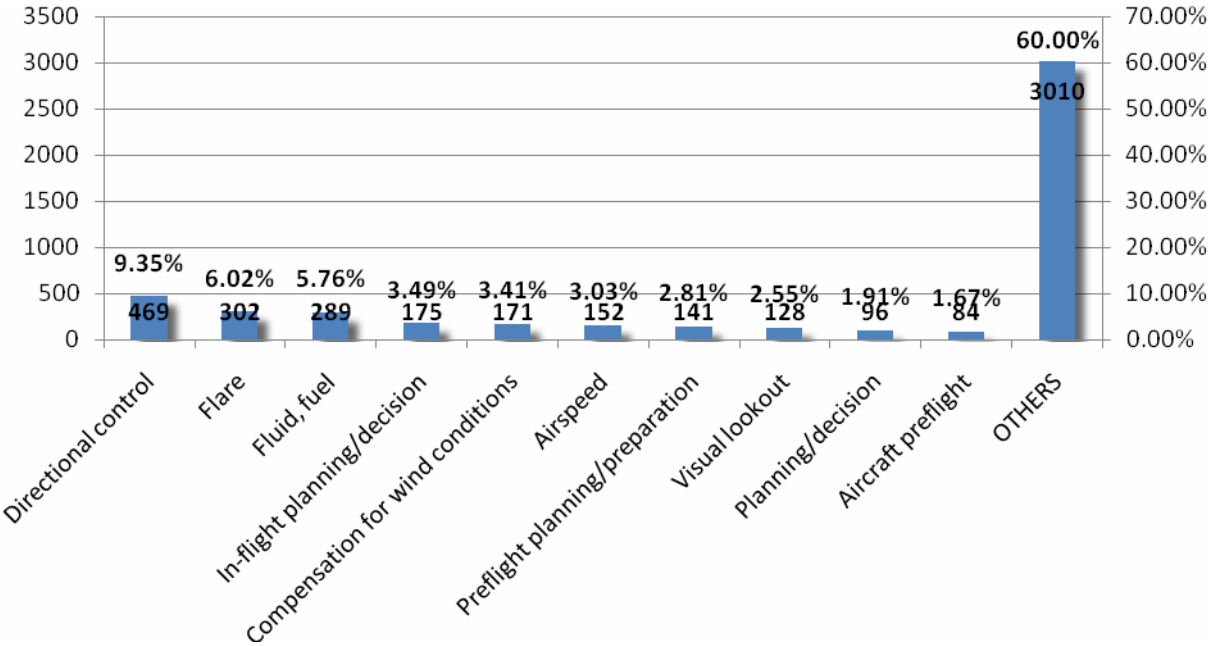

Figure 113. Percentage of Initiating Causes of Minor/None GA Accidents in the Southern Region (1982 to 2009)

8.5 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS RELATED TO PILOT EXPERIENCE IN THE SOUTHERN REGION.

According to the FAA, pilot error is the number one cause of aircraft accidents and incidents followed by faulty maintenance and operational errors. The NTSB database confirms that approximately 85% of GA accidents in the Southern Region are caused by pilot error. The following sections provide statistical analyses of GA accident causes in the Southern Region related to pilot error. In particular, pilot experience in hours is used in this report to examine the top ten initiating causes of GA accidents that lead to other events.

Figures 114 through 116 show the percentage of pilot experience based on total flight hours in relation to initiating causes of GA accidents.

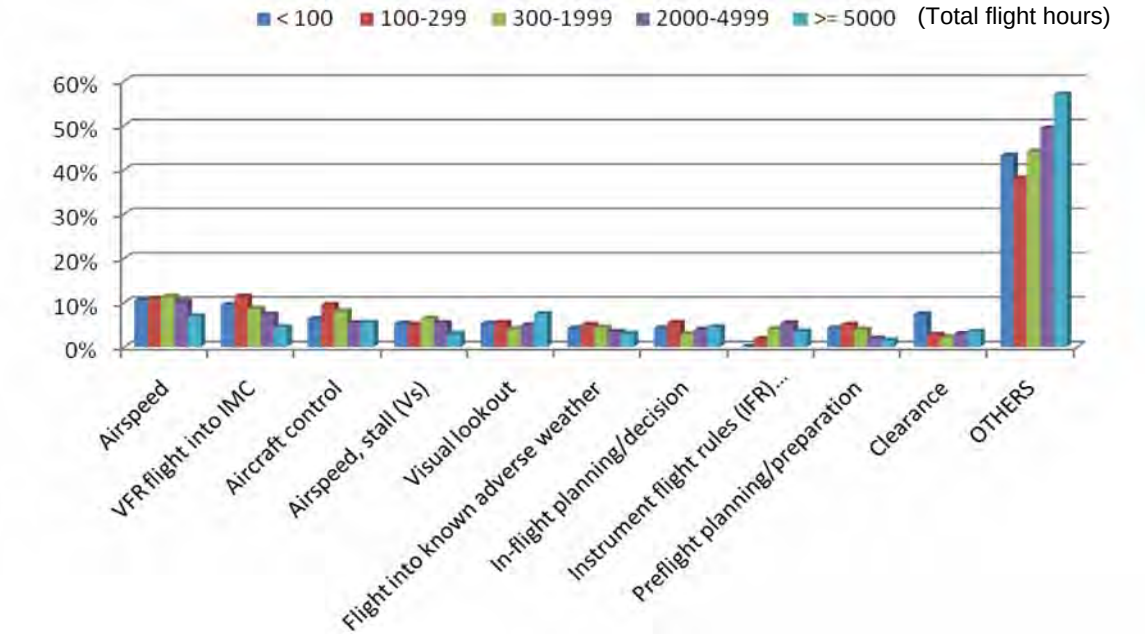

Figure 114. Percentage of Initiating Causes of Fatal GA Accidents Based on Pilot Experience in the Southern Region (1982 to 2009)

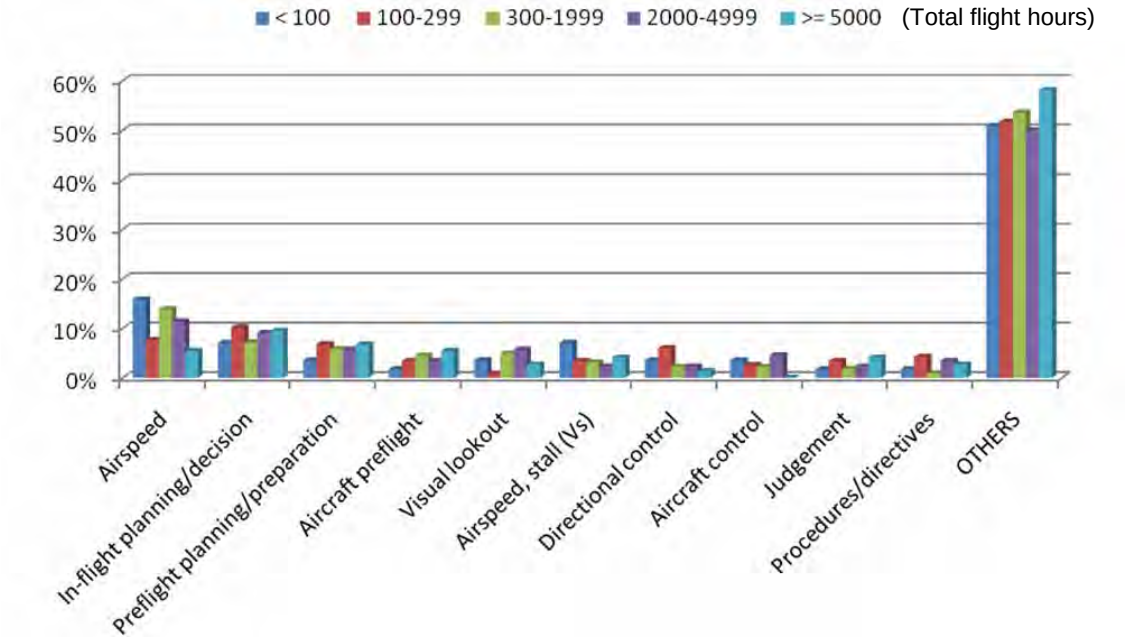

Figure 115. Percentage of Initiating Causes of Serious GA Accidents Based on Pilot Experience in the Southern Region (1982 to 2009)

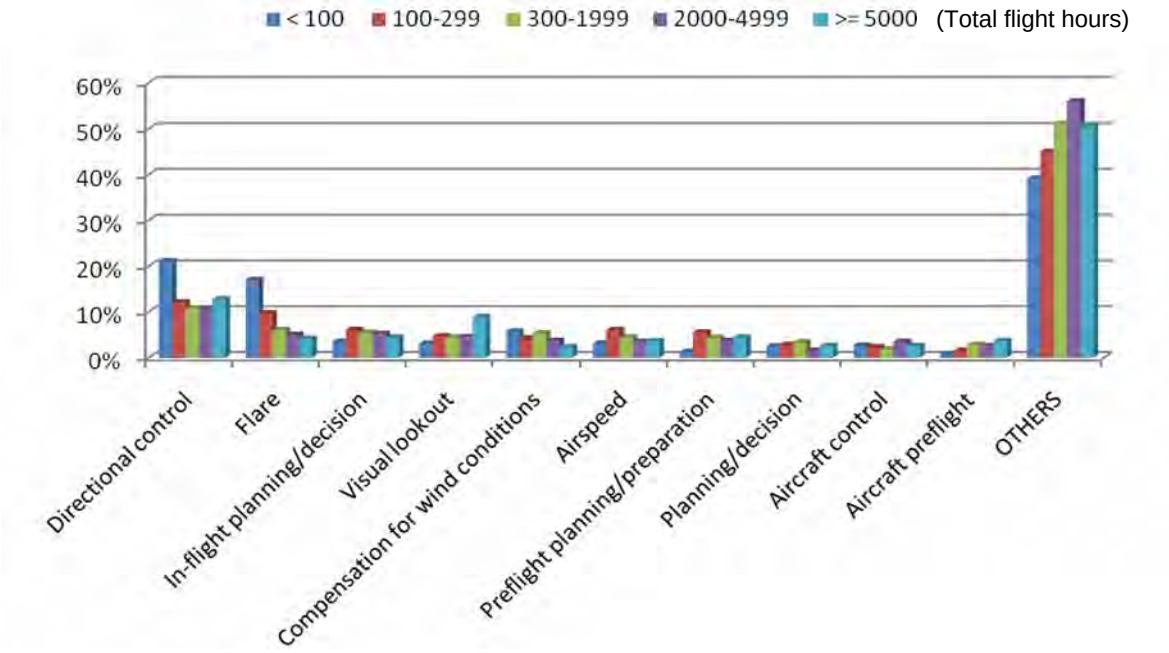

Figure 116. Percentage of Initiating Causes of Minor/None GA Accidents Based on Pilot Experience in the Southern Region (1982 to 2009)

8.6 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS BASED ON AIRCRAFT COMPLEXITY IN THE SOUTHERN REGION.

Figures 117 though 119 show the percentage of GA accidents involving aircraft with less than 200 engine hp and GA accidents involving aircraft with more than or equal to 200 engine hp. Figure 117 shows that airspeed is the number one initiating cause of Fatal GA accidents for the two categories combined. Aircraft control, however, is the number one initiating cause of Fatal GA accidents involving aircraft with more than 200 engine hp. Figure 118 shows fluid, fuel as the number one initiating cause of Serious GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents for aircraft in both engine power categories, as shown in figure 119.

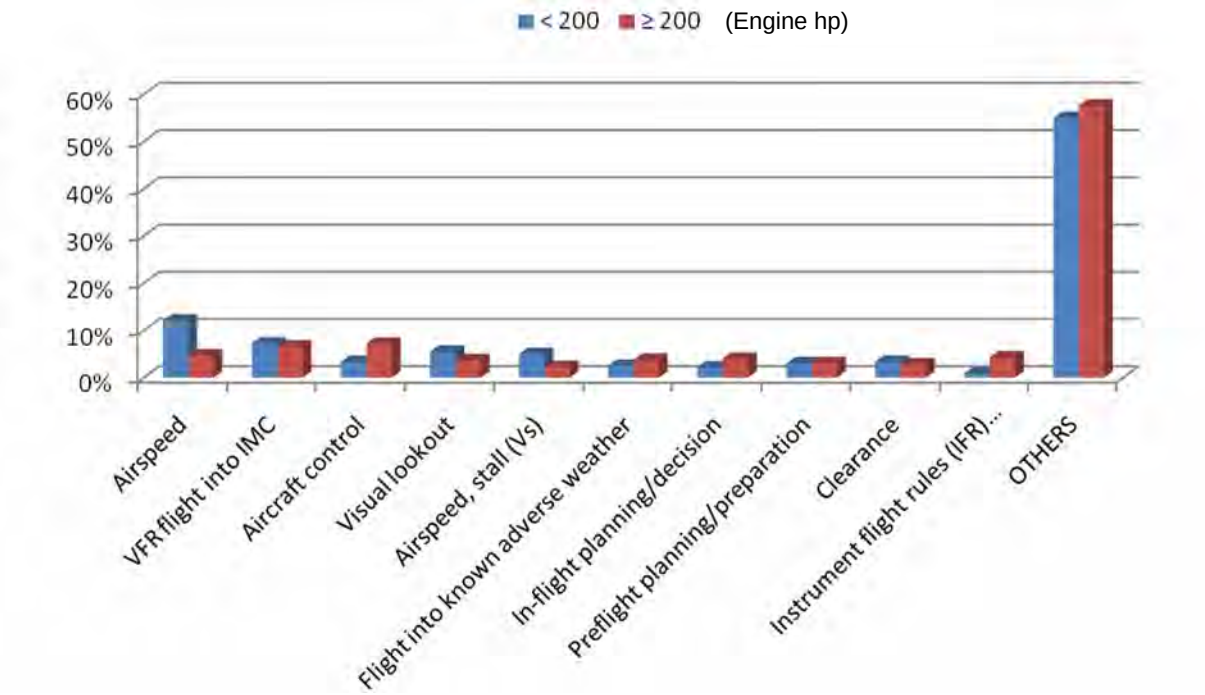

Figure 117. Percentage of Initiating Causes of Fatal GA Accidents Based on Aircraft Engine Power in the Southern Region (1982 to 2009)

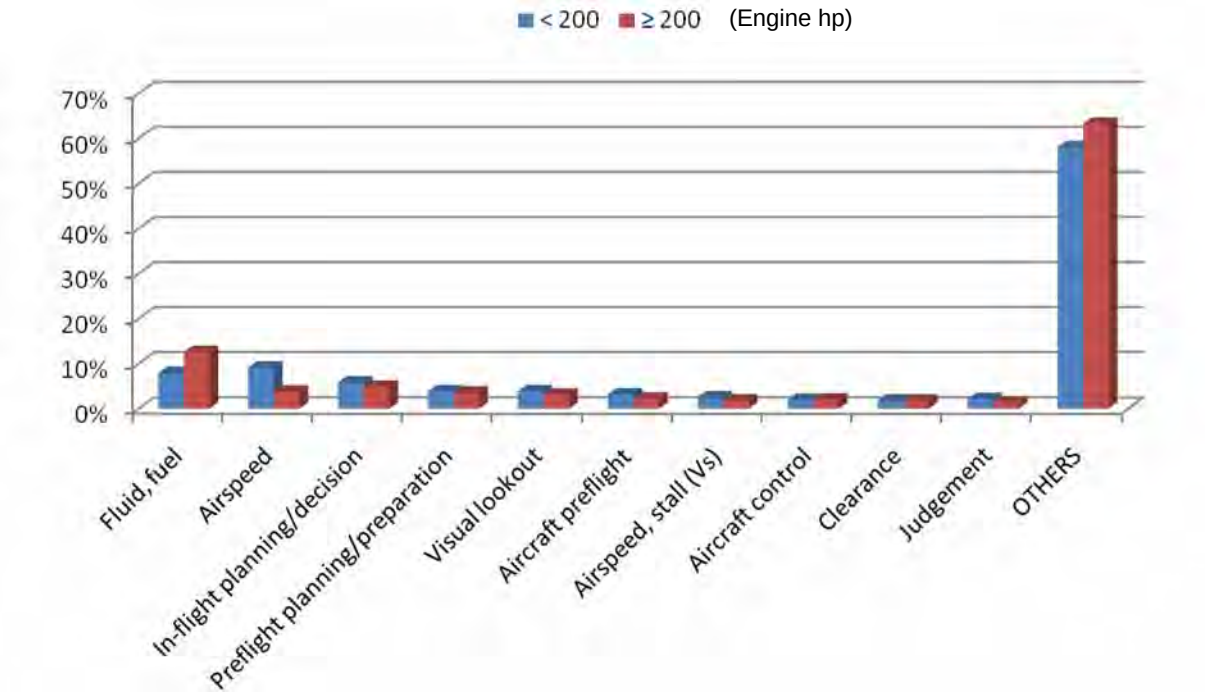

Figure 118. Percentage of Initiating Causes of Serious GA Accidents Based on Aircraft Engine Power in the Southern Region (1982 to 2009)

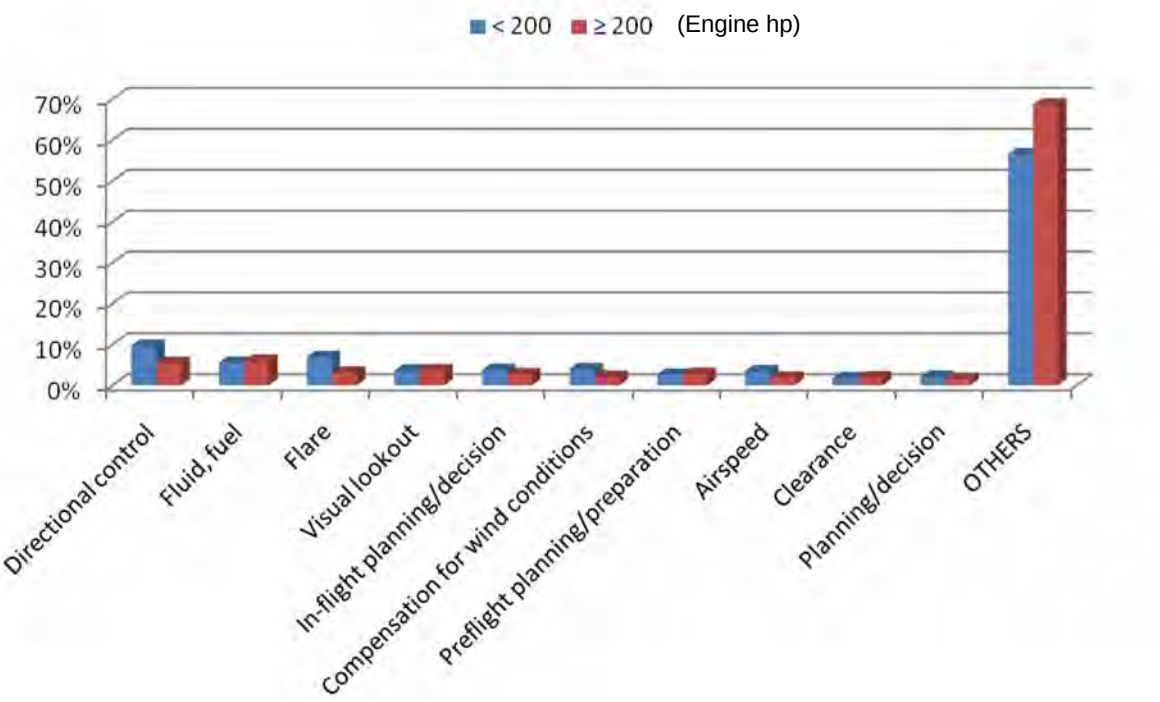

Figure 119. Percentage of Initiating Causes of Minor/None GA Accidents Based on Aircraft Engine Power in the Southern Region (1982 to 2009)

8.7 RESULTS FOR THE SOUTHERN REGION.

This study examined the top ten initiating causes of GA accidents in the Southern Region. The trends found are similar to the nationwide trend and the trends in other regions. Airspeed, for example, is most frequently the number one initiating cause of Fatal GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents.

The number of GA accidents in the Southern Region has decreased from 500 in 1982 to 231 in 2008, which is more than a 50% decrease. However, in 2009, the number significantly increased to 267 GA accidents.

Analysis of GA accidents in the Southern Region based on month shows that the majority of GA accidents occurred between March and August; nationwide, the majority of GA accidents occurred between May and August.

The majority of GA accidents in the Southern Region occurred between 07:00 and 22:00 hours (7 a.m. and 10 p.m.) with the highest number of GA accidents recorded at 15:00 hours (3 p.m.) and 14:00 hours (2 p.m.); nationwide, the highest number of accidents occurred at 14:00 hours (2 p.m.) and 15:00 hours (3 p.m.).

Analysis of GA accidents in the Southern Region based on phase of flight reveals that the highest number of accidents occurred during the landing phase. Fatal GA accidents were higher

during the cruise, descent, and maneuvering phases. Serious GA accidents were most likely to occur during the takeoff phase, which is similar to the nationwide data.

Analysis of GA accidents in the Southern Region based on purpose of flight shows that personal flights contribute the highest rate of GA accidents in the Southern Region, which is similar to the nationwide data.

The top initiating cause of Fatal GA accidents in the Southern Region is airspeed followed by VFR flight into IMC, which is similar to the nationwide data.

The top initiating cause of Serious GA accidents is fluid, fuel in the Southern Region, which is similar to the nationwide data.

The top initiating cause of Minor/None GA accidents is directional control in the Southern Region, which is similar to the nationwide data.

Based on pilot experience in total flight hours, the following results were found.

- The top initiating cause of Fatal GA accidents, for pilots with
  - less than 100 hours, is airspeed in both the Southern Region and nationwide.
  - between 100-299 hours, are airspeed and VFR flight into IMC in the Southern Region and VFR flight into IMC nationwide.
  - between 300-1999 hours, is airspeed in both the Southern Region and nationwide.
  - between 2000-4999 and more than 5000 hours, is airspeed in the Southern Region and aircraft control nationwide.
- The top initiating cause of Serious GA accidents, for pilots with
  - less than 100 hours, is airspeed in both the Southern Region and nationwide.
  - between 100-299 hours, is in-flight planning/decision in the Southern Region and airspeed nationwide.
  - between 300-1999 and between 2000-4999 hours, is airspeed in both the Southern region and airspeed nationwide.
  - more than 5000 hours, is in-flight planning/decision in the Southern Region and airspeed nationwide.
- The top initiating cause of Minor/None GA accidents, for pilots of all experience levels, is directional control in both the Southern Region and nationwide.

Based on aircraft engine power, following results were found.

- The top initiating cause of Fatal GA accidents, for aircraft with
  - less than 200 hp, is airspeed in both the Southern Region and nationwide.
  - more than 200 hp, is VFR flight into IMC in both the Southern Region and nationwide.
- The top initiating cause of Serious GA accidents, for aircraft with
  - less than 200 hp, is airspeed in both the Southern Region and nationwide.
  - more than 200 hp, is fluid, fuel in both the Southern Region and nationwide.
- The top initiating cause of Serious GA accidents for aircraft in both engine power categories is directional control in the Southern Region and nationwide.

9. THE SOUTHWEST REGION.

This section discusses the Southwest Region, which includes Arkansas, Louisiana, New Mexico, Oklahoma, and Texas.

9.1 FREQUENCY OF GA ACCIDENTS IN THE SOUTHWEST REGION.

Generally, the frequency of GA accidents in the Southwest Region has decreased significantly between 1982 and 1994. As shown in figure 120, the number of GA accidents has decreased from 468 in 1982 to 192 in 1994, which is more than a 50% decrease. However, the number significantly increased in 1995, approximately 30.7% higher than in 1994. Another significant increase occurred in 1998 with a 22.8% increase in the number of GA accidents. The trend from 2006 onward shows a slight increase in an average of 3% increments.

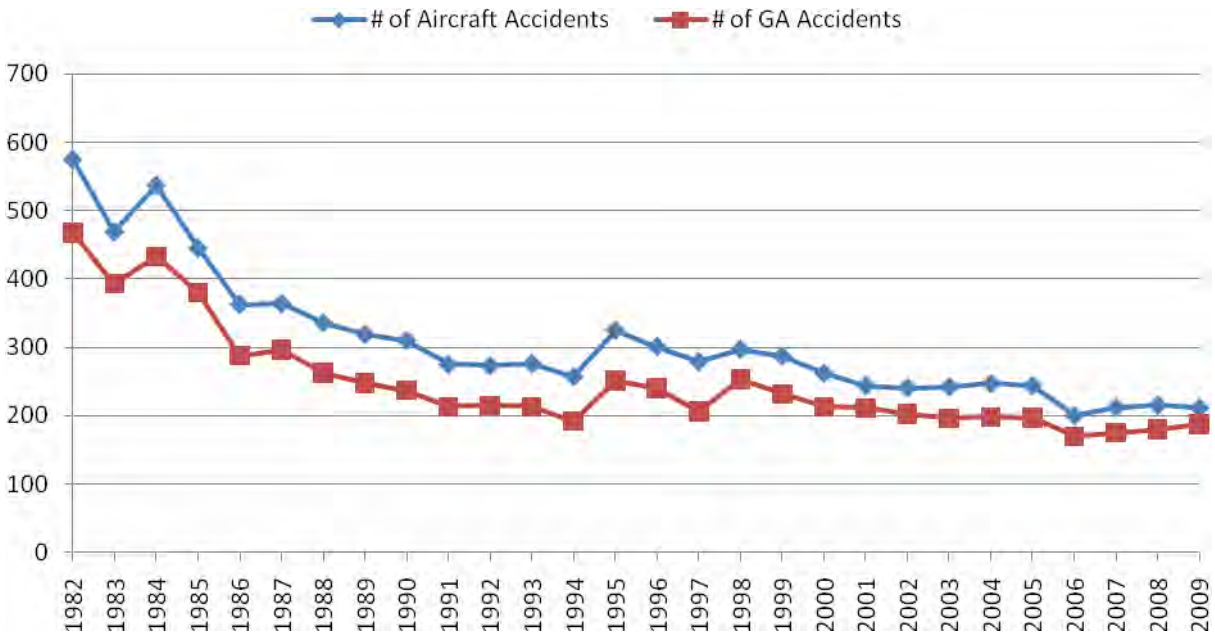

Figure 120. Number of Aircraft Accidents and Number of GA Accidents in the Southwest Region

Figure 121 shows the percentage of GA accidents in the Southwest Region out of all aviation accidents in the same region. It confirms that the decline in the number of GA accidents is slower than that of aviation accidents, especially between 2006 and 2009. It also confirms that the gap between the two lines is getting smaller. Additionally, the Southwest Region is one of the nine regions (besides the Alaskan Region) that has a steady percentage of GA accidents along the 28-year period.

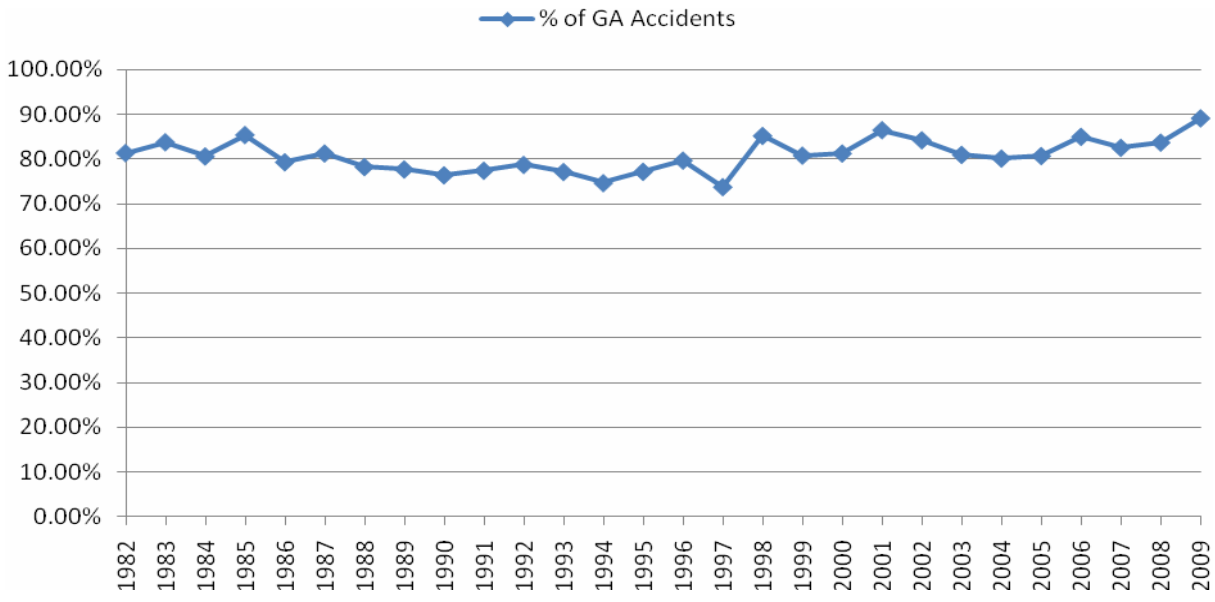

Figure 121. Percentage of GA Accidents of all Aviation Accidents in the Southwest Region

Figures 122 and 123 show the number of Fatal GA accidents and fatalities in the Southwest Region over the same period. Similar to the number of total GA accidents, the number of Fatal GA accidents decreased by more than half between 1982 and 1997, as shown in figure 122. The number of Fatal GA accidents remained in the range of 29 to 58, with an average of 39 between 1998 and 2009. The highest number of Fatal GA accidents in the 10-year period between 1999 and 2009 occurred in 1998 (58), while the lowest occurred in 2006 (29). In 2007, the number significantly increased approximately 24% from the 2006 number. The number of fatalities appears low compared to the number of accidents. This is because, unlike commercial aircraft, most GA flights have fewer passengers. Similar to the number of GA accidents, the number of fatalities in the 1990s decreased by more than half the 1982 number, as shown in figure 123. Despite achieving the lowest record for number of fatalities in 2008 (39), this region had a significant increase (approximately 46%) in 2009.

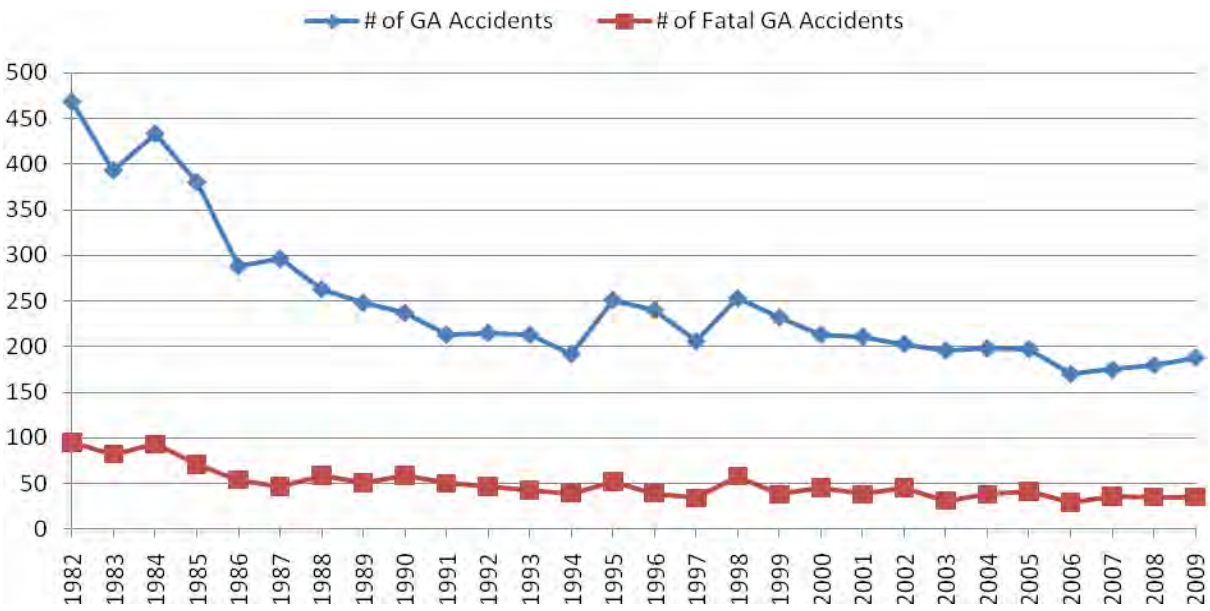

Figure 122. Number of GA Accidents and Fatal GA Accidents in the Southwest Region

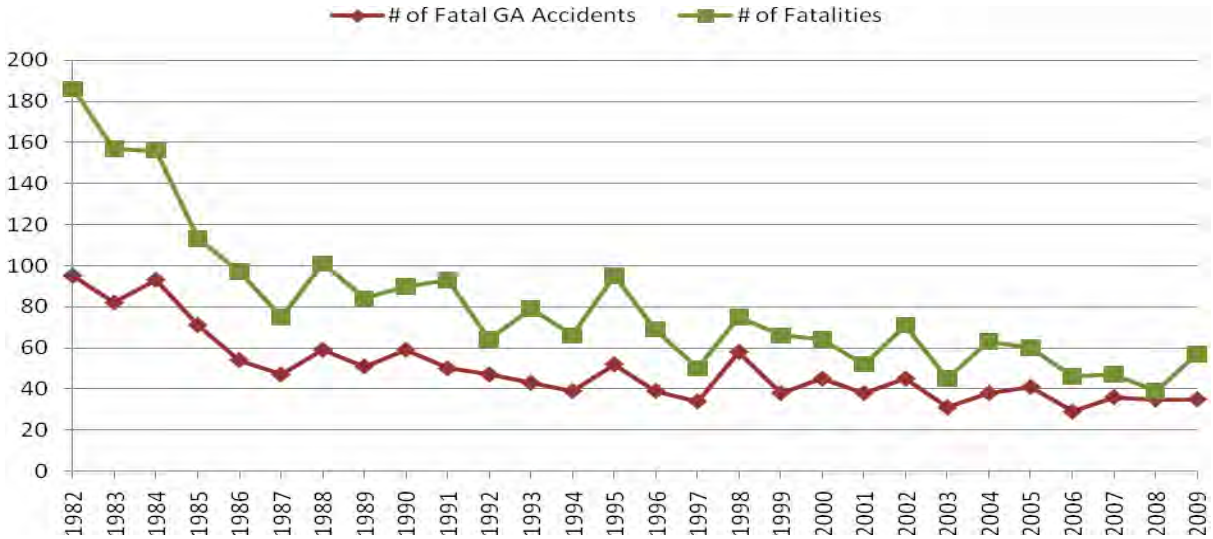

Figure 123. Number of Fatal GA Accidents and Fatalities in the Southwest Region

9.2 PERCENTAGE OF GA ACCIDENTS BASED ON MONTH AND TIME OF DAY IN THE SOUTHWEST REGION.

Figure 124 shows that the frequency of GA accidents in the Southwest Region was dispersed evenly throughout the year with a slight increase between May and August when the summer weather is more suitable for flying. The percentage of Fatal GA accidents is higher during November, December, and January.

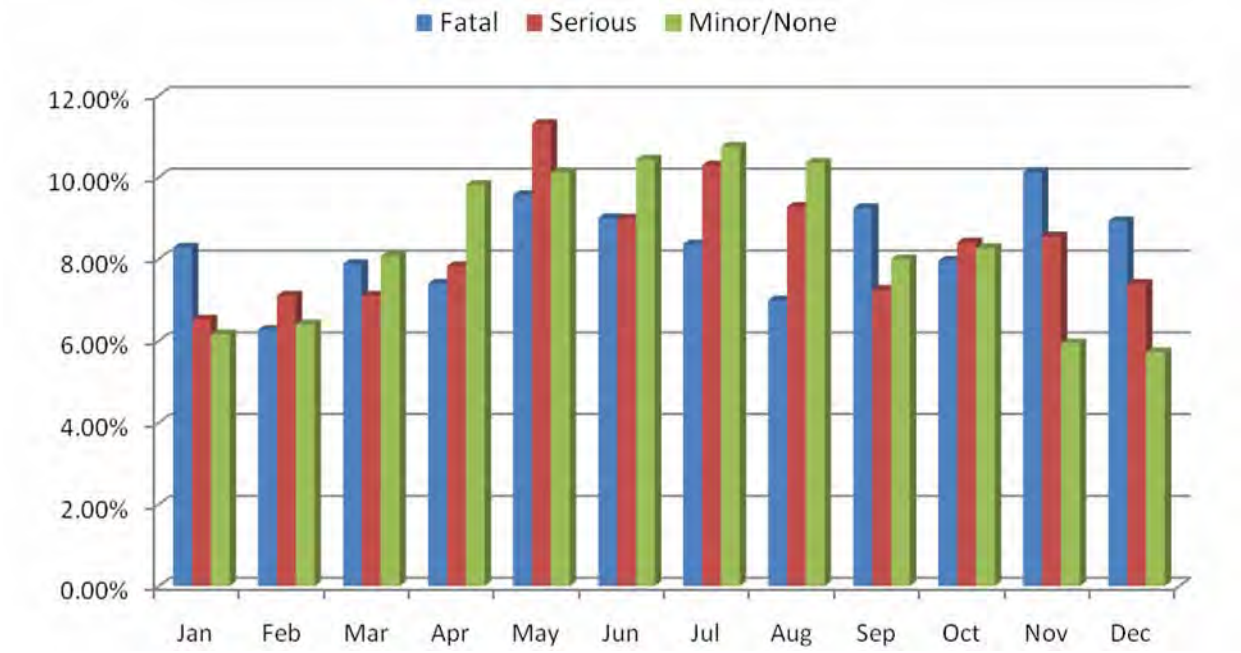

Figure 124. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Month in the Southwest Region (1982 to 2009)

With regard to time of day, figure 125 shows the majority of GA accidents in the Southwest Region occurred between 08:00 and 20;00 hours (8 a.m. and 8 p.m.). The highest number of accidents, in total between 1982 and 2009, occurred at 17:00 hours (5 p.m.) with 539 accidents and at 16:00 hours (4 p.m.) with 524 accidents. The percentage of Fatal GA accidents is higher between 18:00 and 07:00 hours (6 p.m. and 7 a.m.).

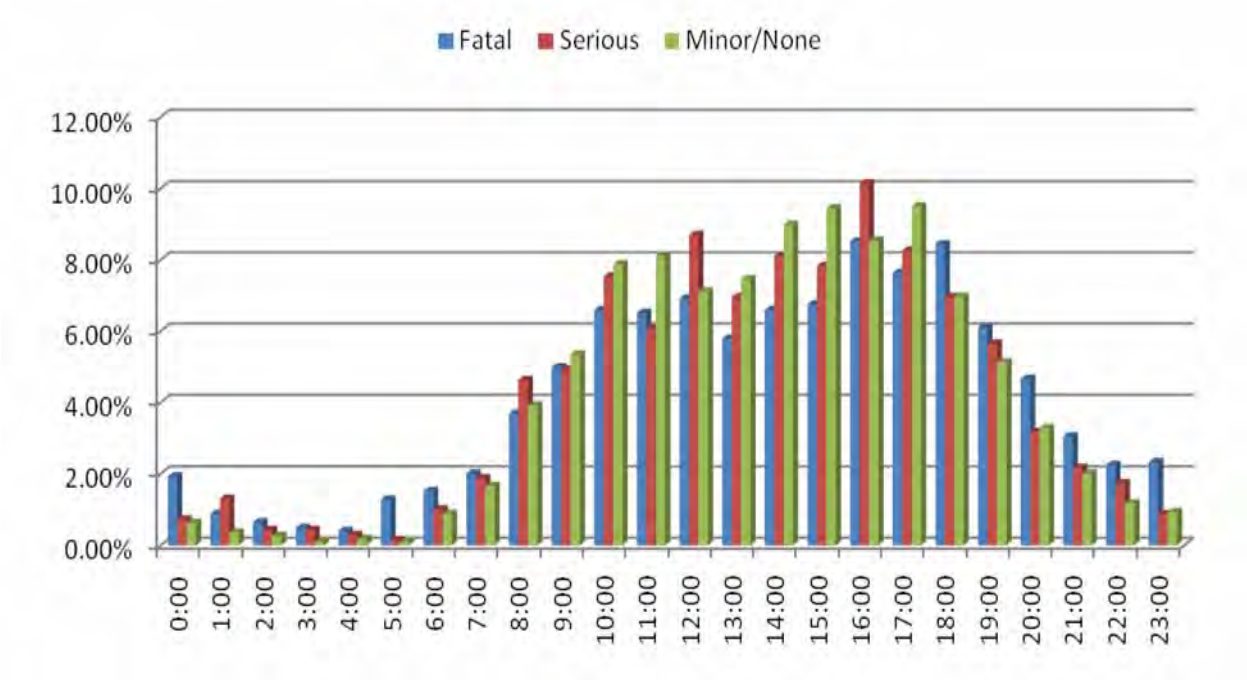

Figure 125. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Time of Day in the Southwest Region (1982 to 2009)

9.3 PERCENTAGE OF GA ACCIDENTS BASED ON PHASE AND PURPOSE OF FLIGHT IN THE SOUTHWEST REGION.

Figure 126 shows the percentage of GA accidents based on phase of flight. The percentage of Fatal GA accidents is higher during the cruise, descent, approach, and maneuvering phases. Serious GA accidents, however, were most likely to occur during the landing phase. Similar to the nationwide data, the highest number of GA accidents occurred during the landing phase.

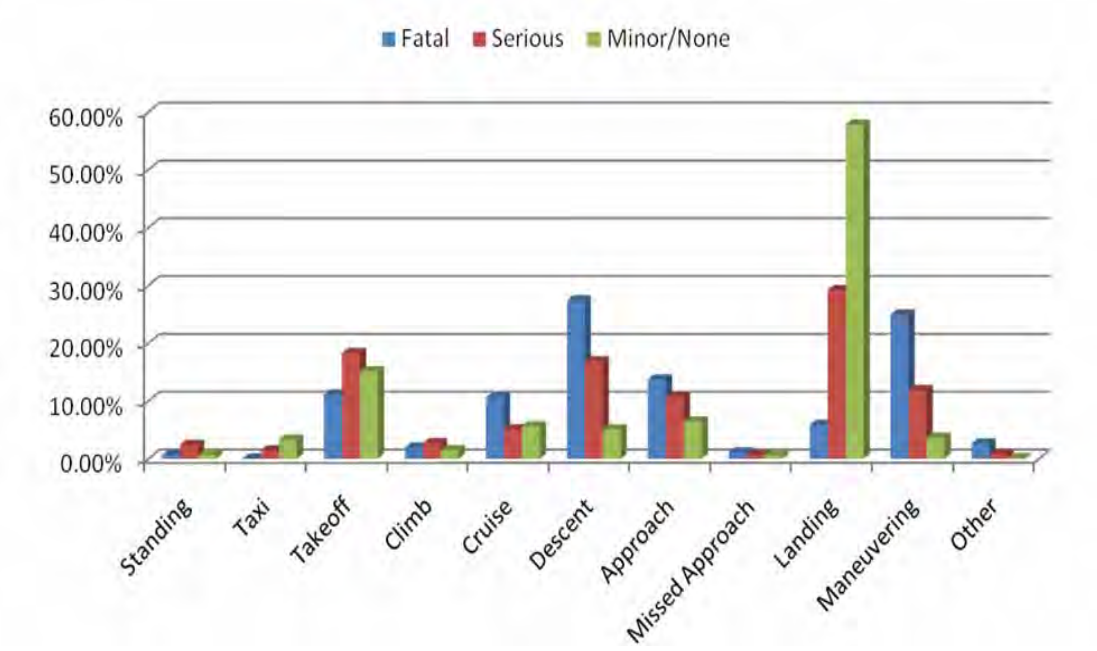

Figure 126. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Phase of Flight in the Southwest Region (1982 to 2009)

Figure 127 shows the percentage of GA accidents based on the purpose of flight. Because of the large number of personal aircraft in operation, personal flights contribute the highest rate of GA accidents in the Southwest Region, followed by instructional and business flights.

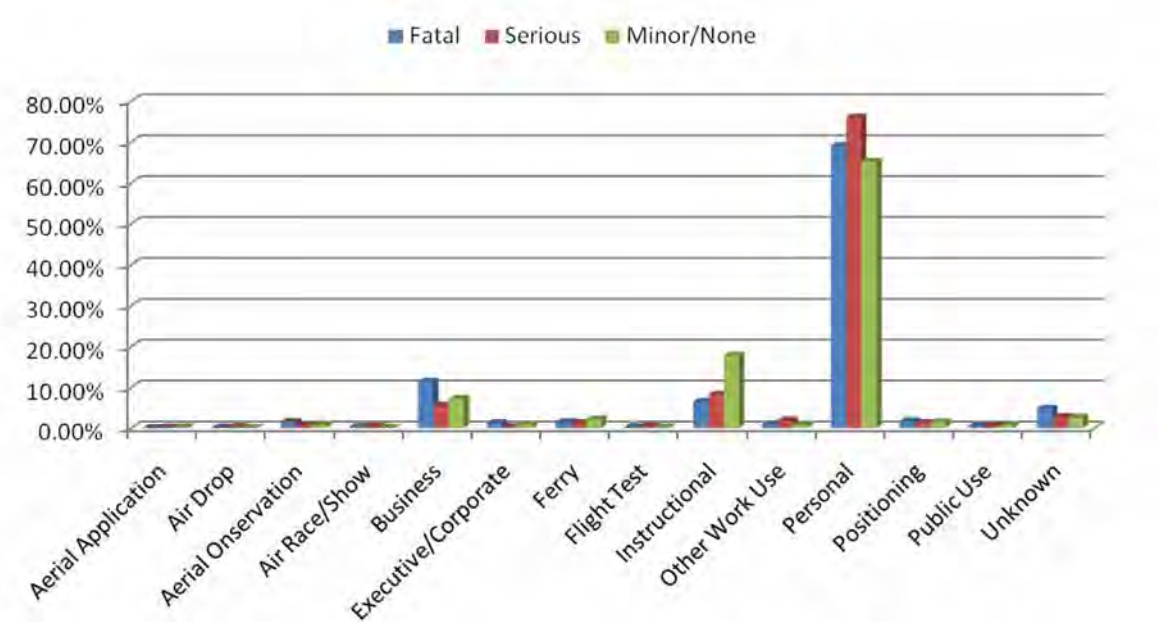

Figure 127. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Purpose of Flight in the Southwest Region (1982 to 2009)

9.4 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS IN THE SOUTHWEST REGION.

This section examines the initiating causes of GA accidents. The NTSB database allows for input of up to five occurrences (major events) for each accident and up to ten sequences of events for each occurrence to explain the chain of events that led to the accidents. The initiating cause of every accident is addressed in this report because it is the trigger of all other events. The study of the initiating causes is expressed in terms of frequency and percentage. Contributing factors were excluded from the analysis because they are not causal in nature.

Figures 128 through 130 show the frequency and percentage of the top ten initiating causes of GA accidents, which together contribute to almost 50% of all causes of GA accidents. Aircraft control and airspeed are the top initiating causes of Fatal GA accidents in the region, as shown in figure 128. Fluid, fuel is the number one initiating cause of Serious GA accidents, as shown in figure 129. Similar to the nationwide data, directional control is the number one cause of Minor/None GA accidents, as shown in figure 130.

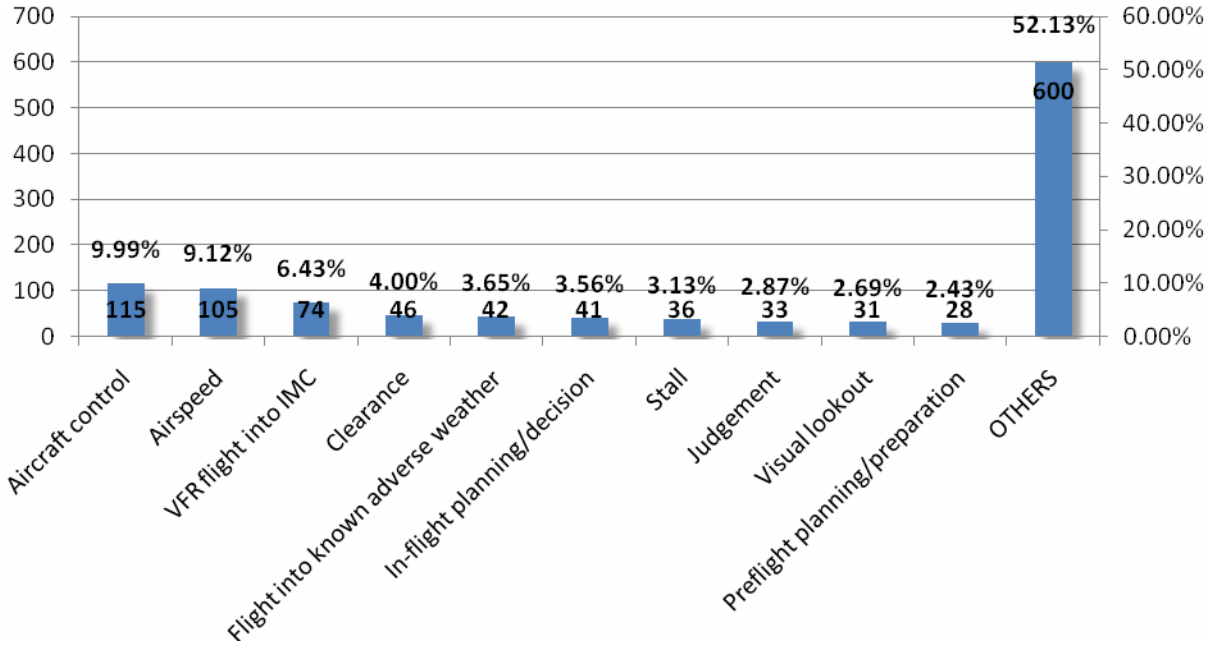

Figure 128. Frequency and Percentage of Initiating Causes of Fatal GA Accidents in the Southwest Region (1982 to 2009)

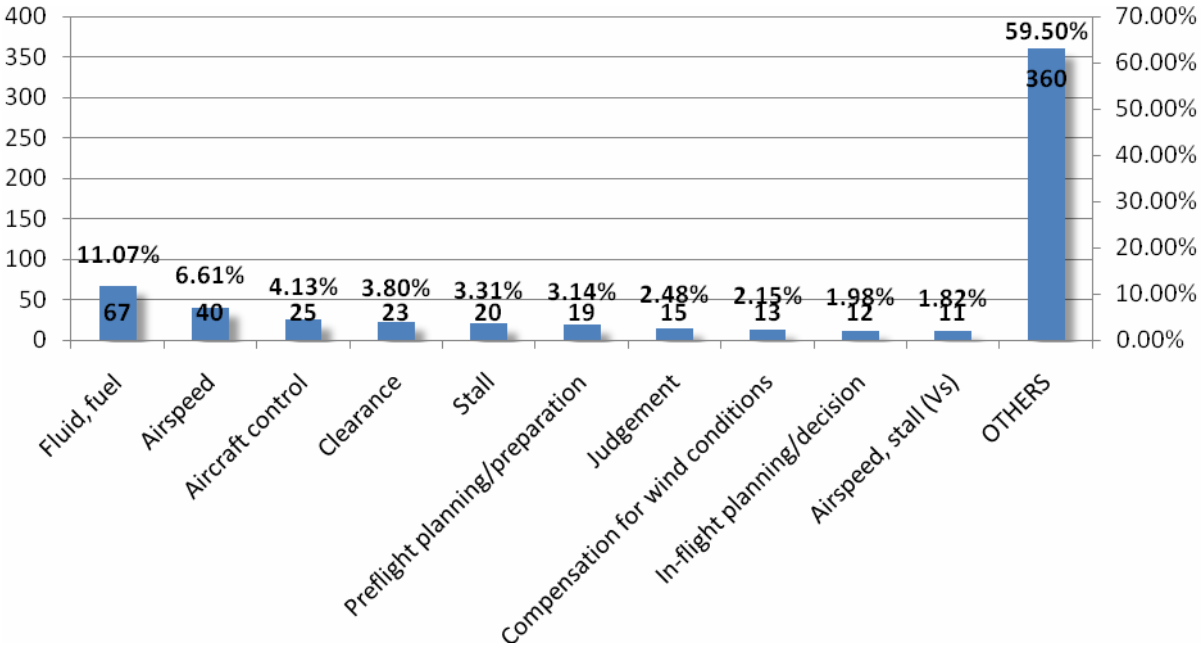

Figure 129. Frequency and Percentage of Initiating Causes of Serious GA Accidents in the Southwest Region (1982 to 2009)

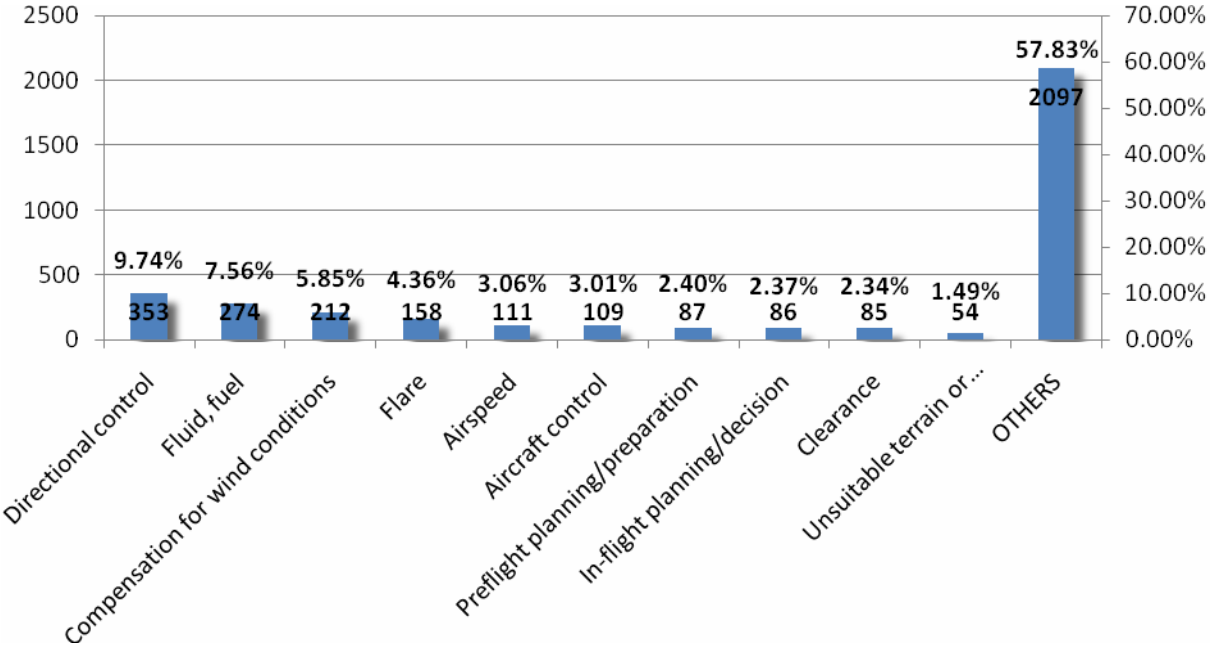

Figure 130. Frequency and Percentage of Initiating Causes of Minor/None GA Accidents in the Southwest Region (1982 to 2009)

9.5 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS RELATED TO PILOT EXPERIENCE IN THE SOUTHWEST REGION.

According to the FAA, pilot error is the number one cause of aircraft accidents and incidents followed by faulty maintenance errors. The NTSB database confirms that approximately 70% of GA accidents in the Southwest Region are caused by pilot error. The following sections provide statistical analyses of GA accident causes in the Southwest Region related to pilot error. In particular, pilot experience in hours is used in this report to examine the top ten initiating causes of GA accidents that lead to other events.

Figures 131 and 132 show that airspeed is the number one initiating cause of both Fatal and Serious GA accidents for pilots with less than 100 total flight hours of experience. For pilots with 100 to 300 total flight hours, VFR flight into IMC is the number one initiating cause of Fatal GA accidents. For pilots with more than 5000 total flight hours, airspeed and aircraft control are the most frequent initiating causes of both Fatal and Serious GA accidents. Directional control is the top initiating cause of Minor/None GA accidents for all experience categories, as shown in figure 133.

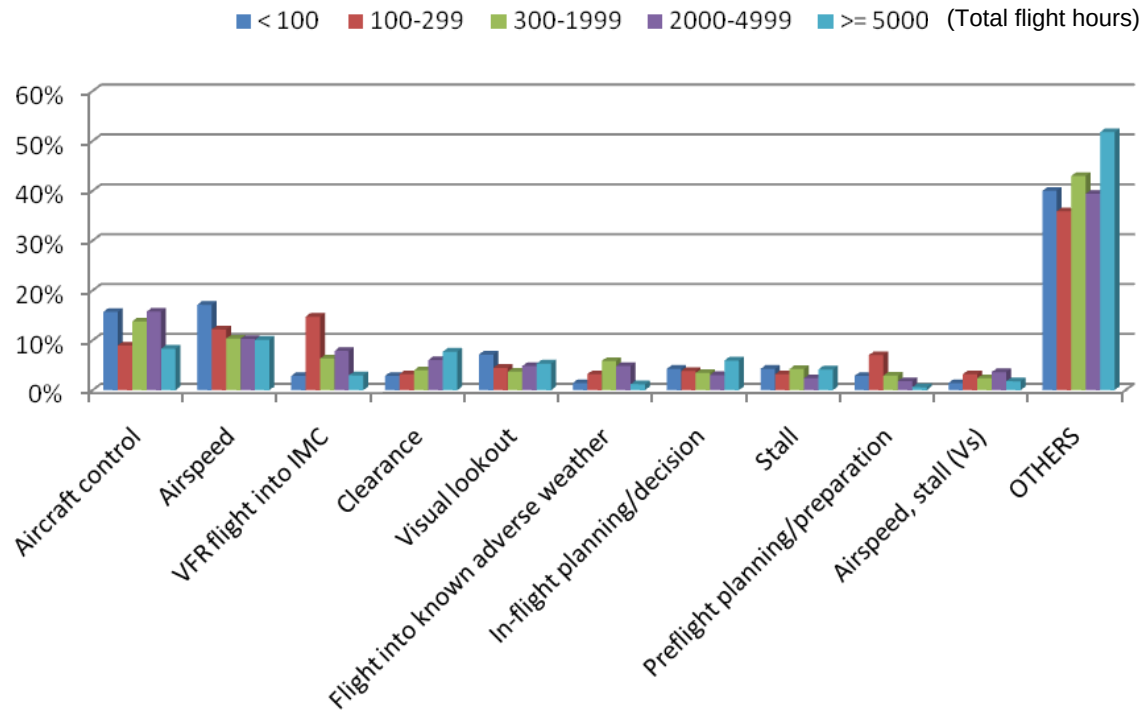

Figure 131. Percentage of Initiating Causes of Fatal GA Accidents Based on Pilot Experience in the Southwest Region (1982 to 2009)

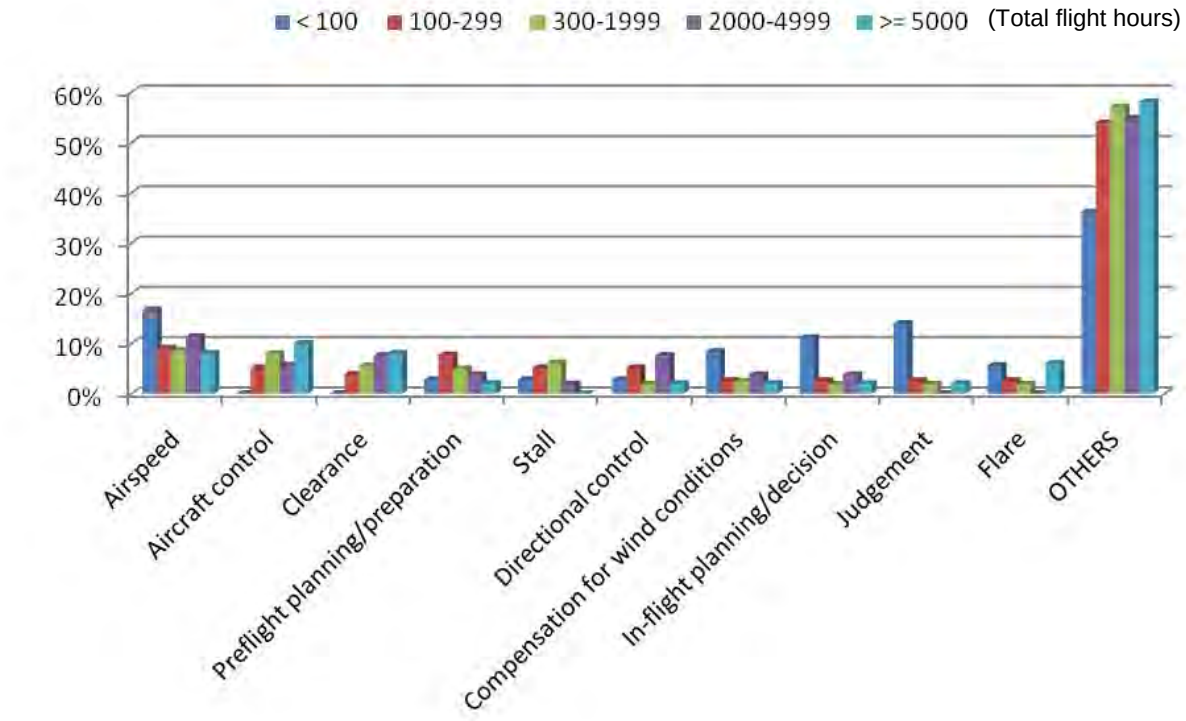

Figure 132. Percentage of Initiating Causes of Serious GA Accidents Based on Pilot Experience in the Southwest Region (1982 to 2009)

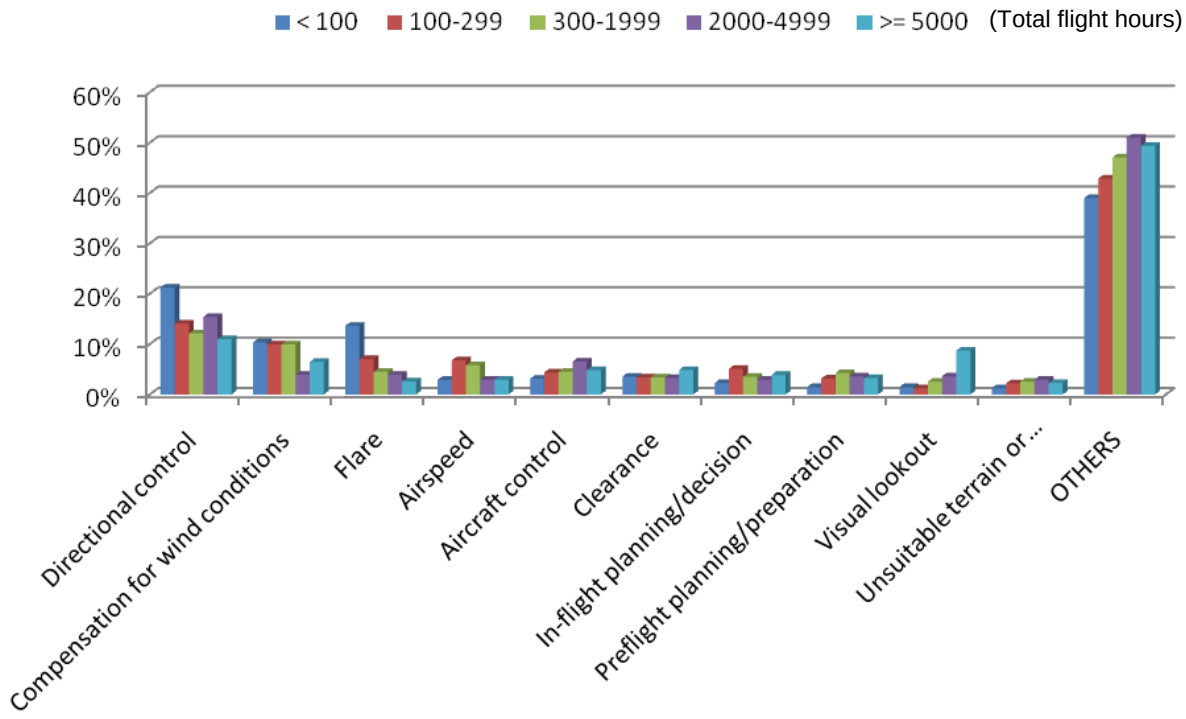

Figure 133. Percentage of Initiating Causes of Minor/None GA Accidents Based on Pilot Experience in the Southwest Region (1982 to 2009)

9.6 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS RELATED TO AIRCRAFT COMPLEXITY IN THE SOUTHWEST REGION.

Figures 134 through 136 show the percentage of GA accidents involving aircraft with less than 200 engine hp and accidents involving aircraft with more than or equal to 200 engine hp. Figure 134 shows that aircraft control is the number one initiating cause of Fatal accidents for the two categories combined. Figure 135 shows fluid, fuel as the number one initiating cause of Serious accidents. Finally, directional control, again, is the number one initiating cause of Minor/None accidents, as shown in figure 136.

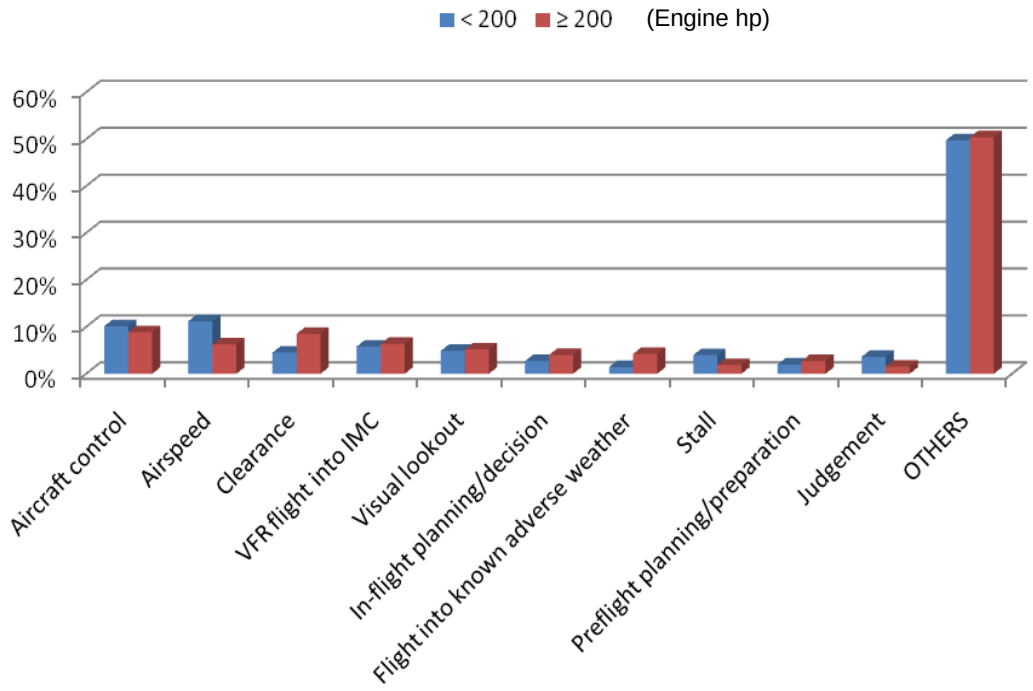

Figure 134. Percentage of Initiating Causes of Fatal GA Accidents Based on Aircraft Engine Power in the Southwest Region (1982 to 2009)

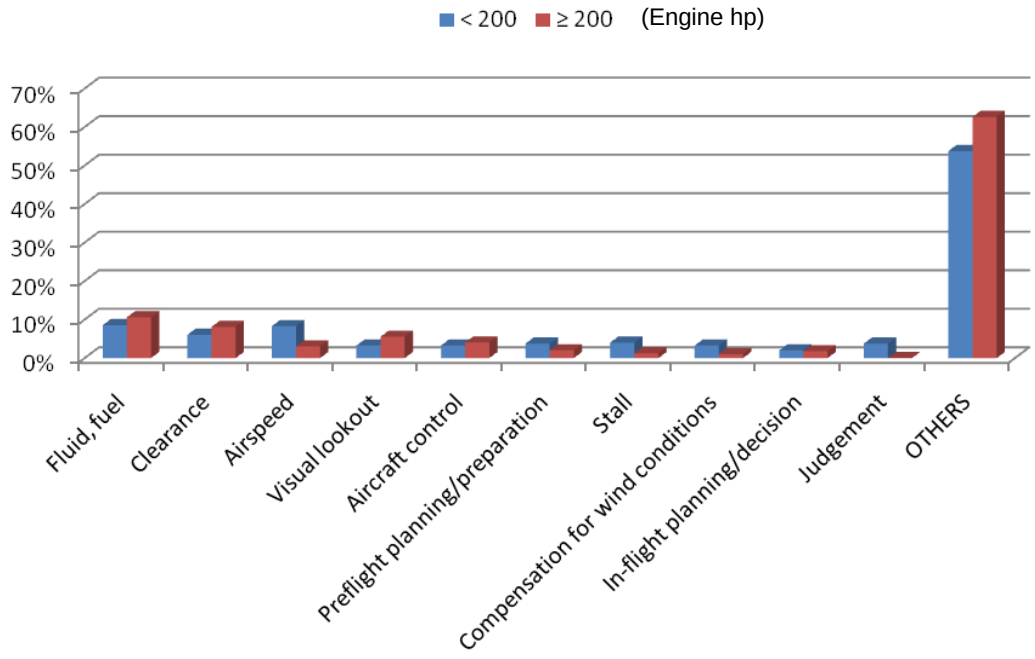

Figure 135. Percentage of Initiating Causes of Serious GA Accidents Based on Aircraft Engine Power in the Southwest Region (1982 to 2009)

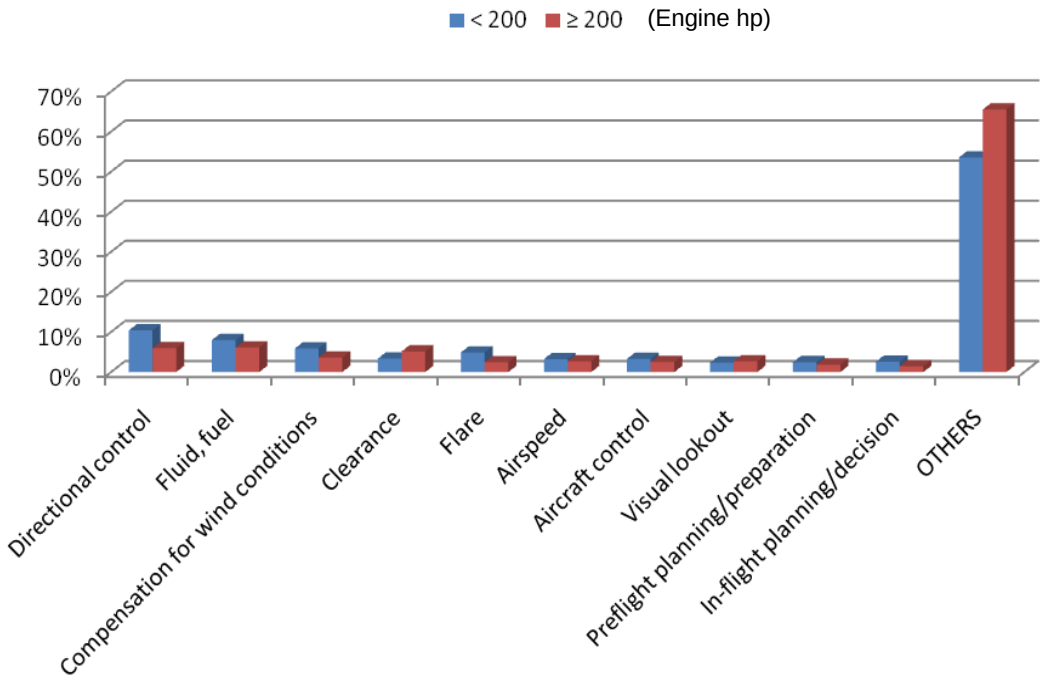

Figure 136. Percentage of Initiating Causes of Minor/None GA Accidents Based on Aircraft Engine Power in the Southwest Region (1982 to 2009)

9.7 RESULTS FOR THE SOUTHWEST REGION.

This study examined the top ten initiating causes of GA accidents in the Southwest Region. The trends found are similar to the nationwide trend and the trends in other regions. Airspeed, for example, is most frequently the number one initiating cause of Fatal GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents.

The number of GA accidents in the Southwest Region has decreased from 468 in 1982 to 192 in 1994, which is more than a 50% decrease. This is similar to the nationwide trend in which the number of GA accidents is declining, most likely due to improved safety measures introduced by the FAA.

Analysis of GA accidents in the Southwest Region based on month shows that for the Southwest Region, the trend is similar to the nationwide trend, with the maximum number of GA accidents occurring between May and August.

The majority of GA accidents in the Southwest Region occurred between 08:00 and 20:00 hours (8 a.m. and 8 p.m.) with the highest number of accidents recorded at 17:00 hours (5 p.m.) and 16:00 hours (4 p.m.); nationwide, the highest number of GA accidents occurred at 14:00 hours (2 p.m.) and 15:00 hours (3 p.m.).

Analysis of GA accidents in the Southwest Region based on phase of flight shows that the highest number of GA accidents occurred during the landing phase. Fatal GA accidents were higher during the cruise, descent, approach, and maneuvering phases. Serious accidents were most likely to occur during the takeoff and landing phases. This is similar to the nationwide data.

Analysis of GA accidents in the Southwest Region based on purpose of flight shows that personal flights contribute the highest rate of GA accidents in the Southwest Region, which is similar to the nationwide data.

The top initiating causes of Fatal GA accidents in the Southwest Region are aircraft control followed by airspeed; nationwide, the top initiating causes of Fatal GA accidents are airspeed followed by VFR flight into IMC.

The top initiating causes of Serious GA accidents are fluid, fuel followed by airspeed in the Southwest Region, which is similar to the nationwide data.

Among the top initiating causes for Minor/None GA accidents, directional control is at the top followed by compensation for wind conditions in the Southwest Region. This is similar to the nationwide data.

Based on pilot experience in total flight hours, the following results were found.

- The top initiating cause of Fatal GA accidents, for pilots with
  - less than 100 hours, is airspeed in both the Southwest Region and nationwide.
  - between 100-299 hours, is VFR flight into IMC in the Southwest Region and nationwide.
  - between 300-1999 hours, is airspeed in the Southwest Region and aircraft control nationwide.
  - between 2000-4999 hours, is aircraft control in the Southwest Region and nationwide,
  - more than 5000 hours, is aircraft control in the Southwest Region and airspeed nationwide.
- The top initiating cause of Serious GA accidents, for pilots with
  - less than 100, between 100-299, 300-1999, and 2000-4999 hours, is airspeed in the Southwest Region and nationwide.
  - more than 5000 hours, is airspeed in the Southwest Region and aircraft control nationwide.
- The top initiating cause of Minor/None GA accidents, for pilots of all experience levels, is directional control in both the Southwest Region and nationwide.

Based on aircraft engine power, the following results were found.

- The top initiating cause of Fatal GA accidents, for aircraft with
  - less than 200 hp, is airspeed in the Southwest Region and nationwide.
  - more than 200 hp, is aircraft control in the Southwest Region and VFR flight into IMC nationwide.
- The top initiating cause of Serious GA accidents, for aircraft with
  - less than 200 hp, is airspeed in the Southwest Region and nationwide.
  - more than 200 hp, is fluid, fuel in the Southwest Region and nationwide.
- The top initiating cause of Minor/None GA accidents, for both aircraft engine categories is directional control in the Southwest Region and nationwide.

10. THE WESTERN-PACIFIC REGION.

This section discusses the Western-Pacific Region, which includes Arizona, California, Hawaii, and Nevada.

10.1 FREQUENCY OF GA ACCIDENTS IN THE WESTERN-PACIFIC REGION.

Generally, the frequency of GA accidents in the Western-Pacific Region has decreased significantly between 1982 and 1994. The number of GA accidents has decreased from 500 in 1982 to 260 in 1997, which is almost a 50% decrease. However, the trend from 1997 onward shows a slight increase in three- to four-year intervals, then followed by a drop. The number significantly declined in 2008 (from 289 GA accidents in 2007 to 230 in 2008), but it increased to 267 GA accidents in 2009.

Figure 137 shows the number of total aviation and GA accidents in the Western-Pacific Region between 1982 and 2009 and shows the gap between the two lines is getting smaller. Figure 138 shows the percentage of GA accidents in the Western-Pacific Region of all aviation accidents in the same region and confirms that the decline in the number of GA accidents is slower than that of aviation accidents.

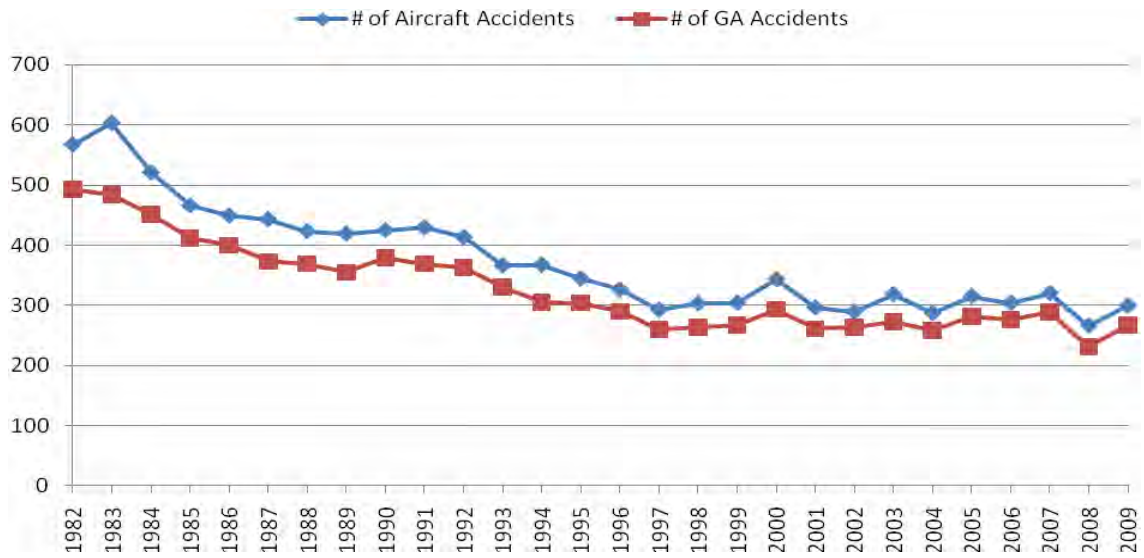

Figure 137. Number of Aircraft Accidents and GA Accidents in the Western-Pacific Region

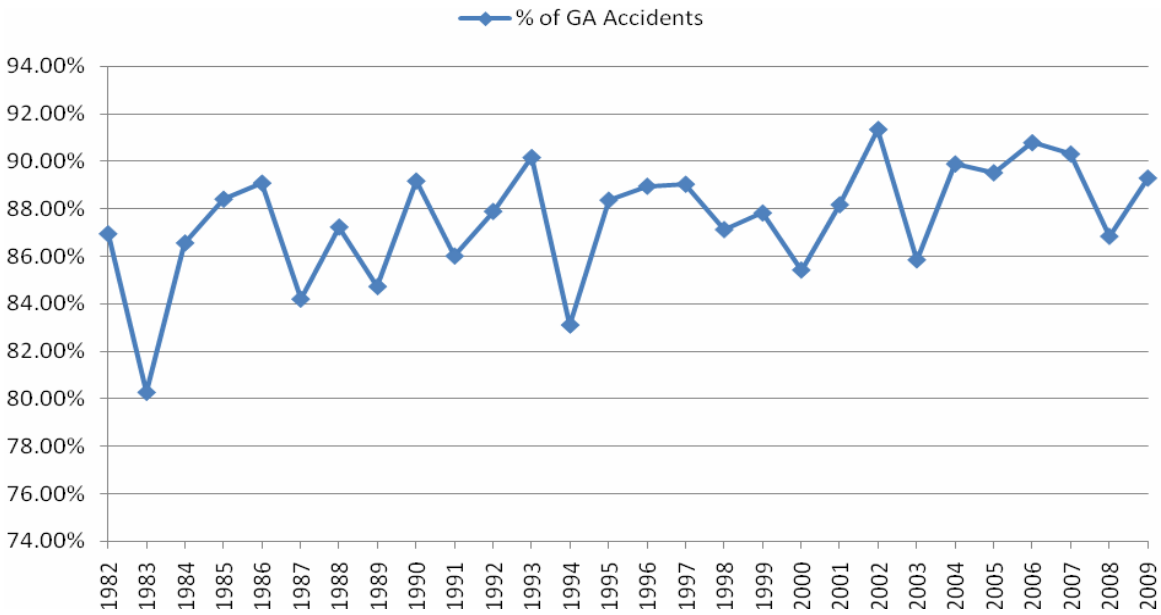

Figure 138. Percentage of GA Accidents of all Aviation Accidents in the Western-Pacific Region

Figures 139 and 140 show the number of Fatal GA accidents and fatalities in the Western-Pacific Region. Similar to the number of total GA accidents, the number of Fatal GA accidents decreased by more than half between 1982 and 1997, as shown in figure 139. The number of fatalities appears low compared to the number of accidents. This is because, unlike commercial aircraft, most GA flights have fewer passengers. Similar to the number of GA accidents, the number of fatalities in the 1990s decreased by more than half the 1982 number, as shown in figure 140.

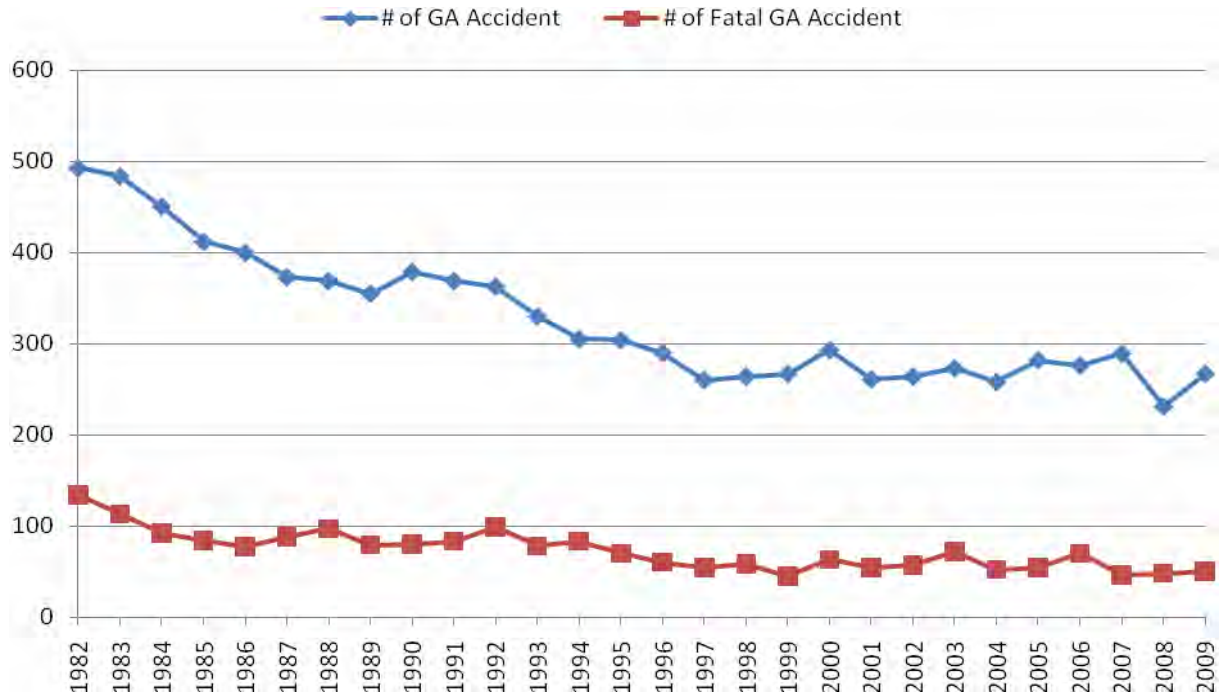

Figure 139. Number of GA Accidents and Fatal GA Accidents in the Western-Pacific Region

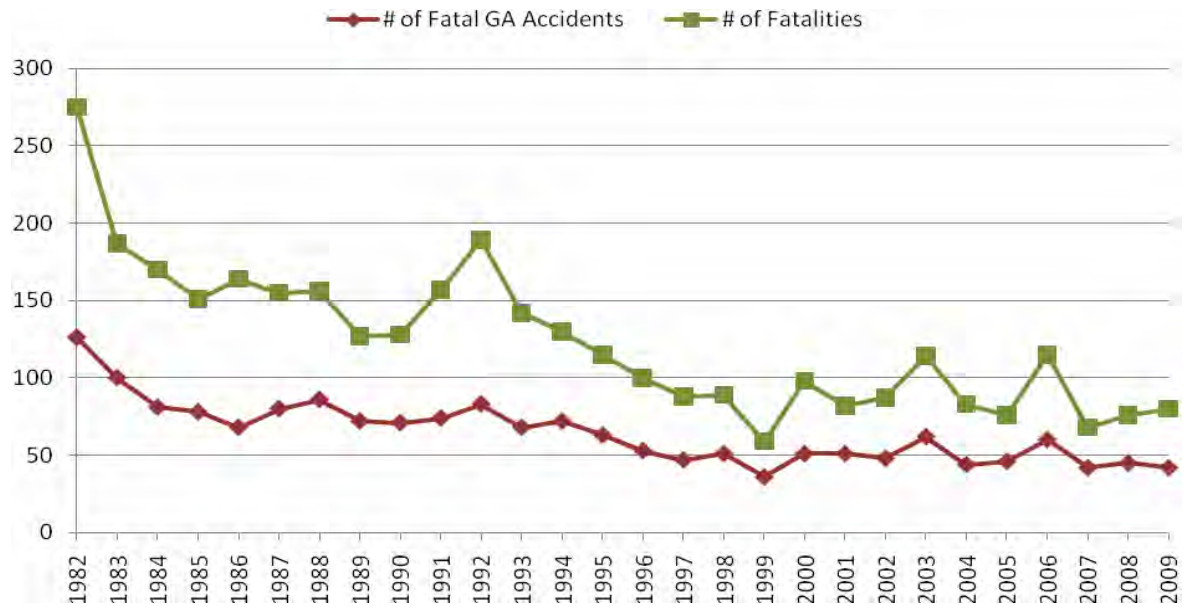

Figure 140. Number of Fatal GA Accidents and Fatalities in the Western-Pacific Region (1982-2009)

10.2 PERCENTAGE OF GA ACCIDENTS BASED ON MONTH AND TIME OF DAY IN THE WESTERN-PACIFIC REGION.

Figure 141 shows that the frequency of GA accidents in the Western-Pacific Region is dispersed evenly throughout the year with a slight increase between May and August when the summer weather is more suitable for flying.

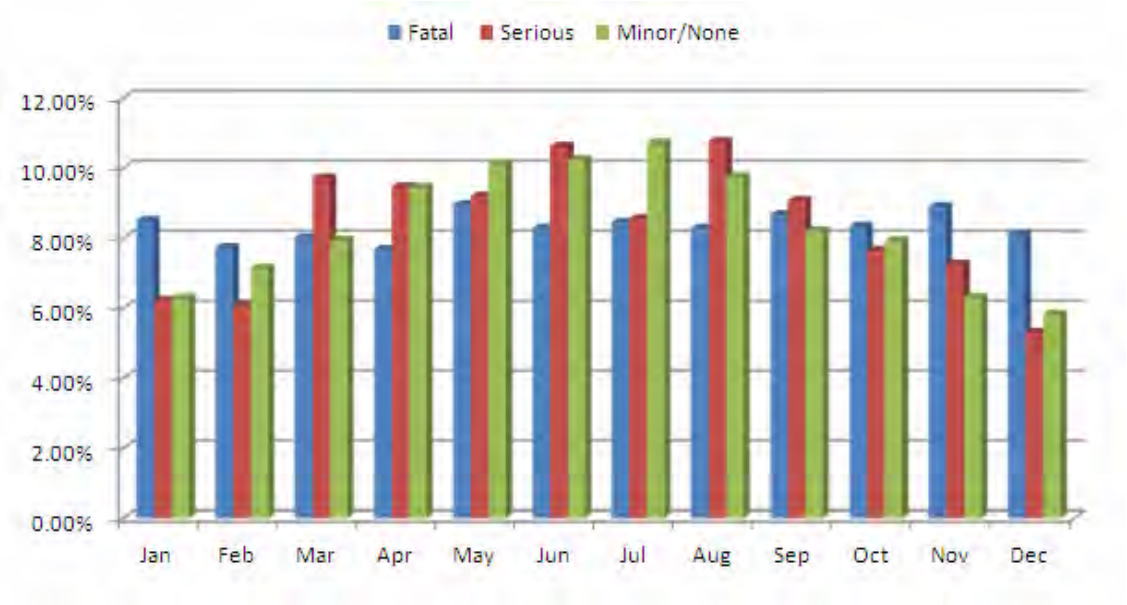

Figure 141. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Month in the Western-Pacific Region (1982 to 2009)

With regard to time of day, the majority of GA accidents in the Western-Pacific Region occurred between 07:00 and 23:00 hours (7 a.m. and 11 p.m.), as shown in figure 142. The highest number of accidents, in total between 1982 and 2009, occurred at 11:00 hours (11 a.m.) with 716 accidents and at 14:00 hours (2 p.m.) with 707 accidents.

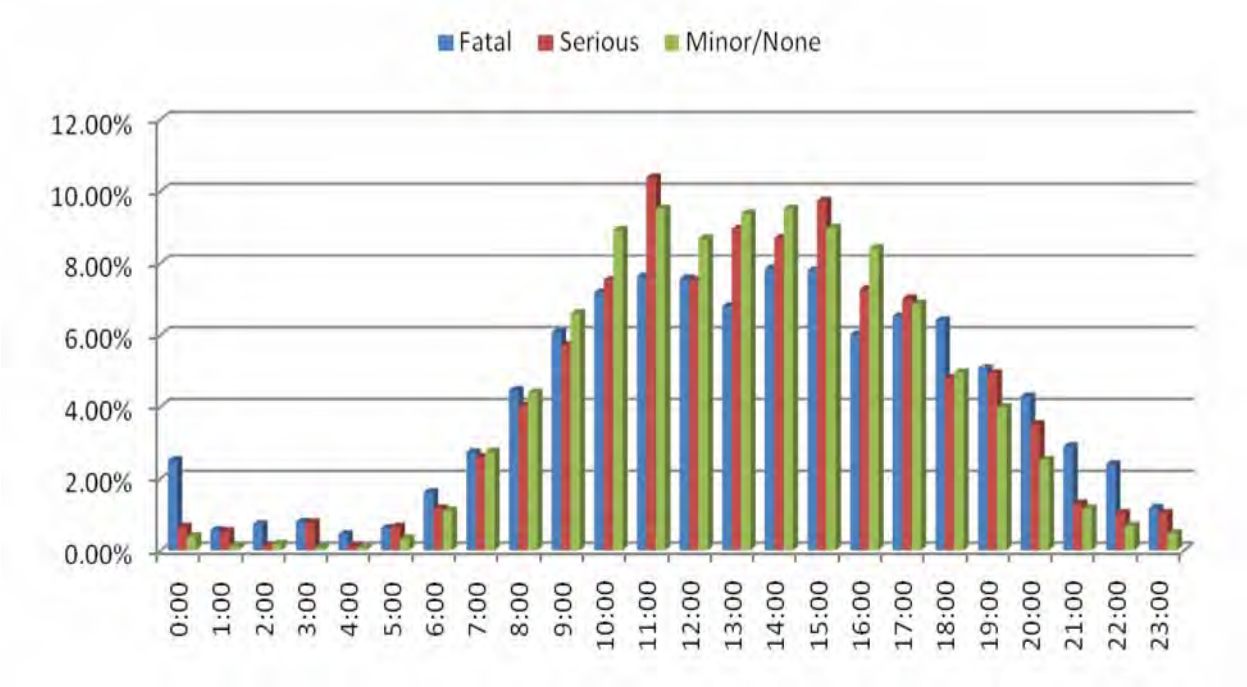

Figure 142. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Time of Day in the Western-Pacific Region (1982 to 2009)

10.3 PERCENTAGE OF GA ACCIDENTS BASED ON PHASE AND PURPOSE OF FLIGHT IN THE WESTERN-PACIFIC REGION.

Figure 143 shows the percentage of Fatal GA accidents is significantly higher during the cruise, descent, and maneuvering phases. Like the nationwide data, the highest number of GA accidents occurred during the landing phase. Serious GA accidents, however, were most likely to occur during the landing phase.

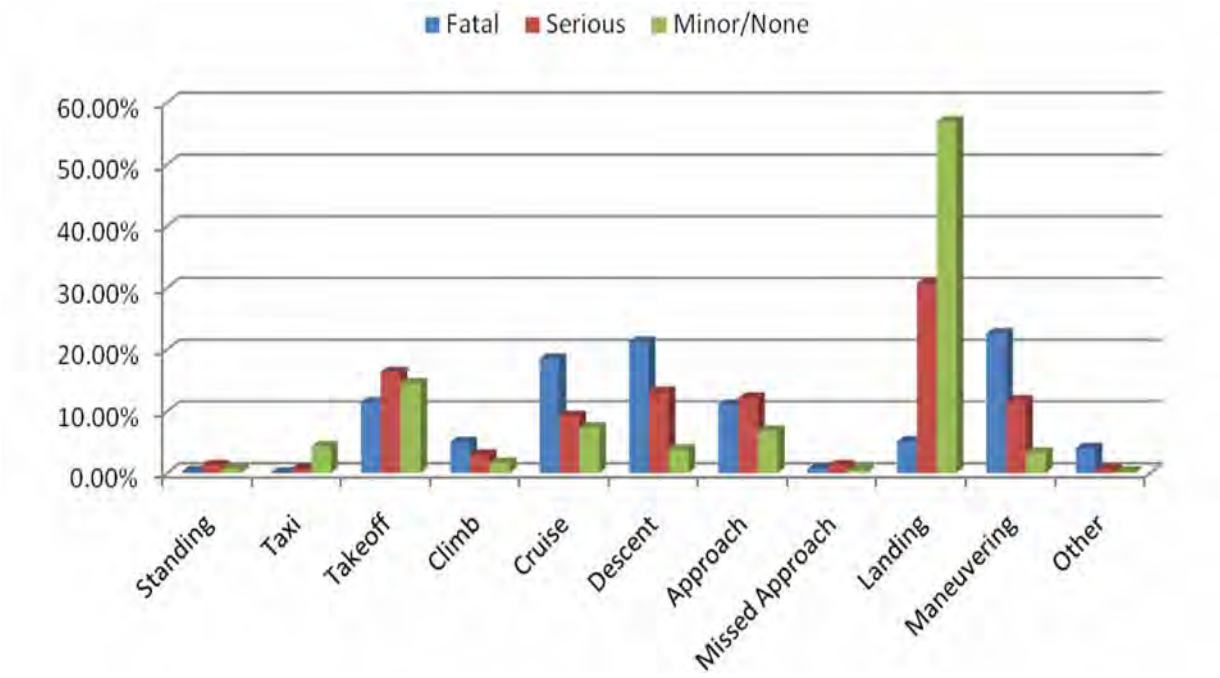

Figure 143. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Phase of Flight in the Western-Pacific Region (1982 to 2009)

Figure 144 shows the percentage of GA accidents based on purpose of flight. Personal flights contribute the highest rate of GA accidents in the Western-Pacific Region followed by instructional and business flights.

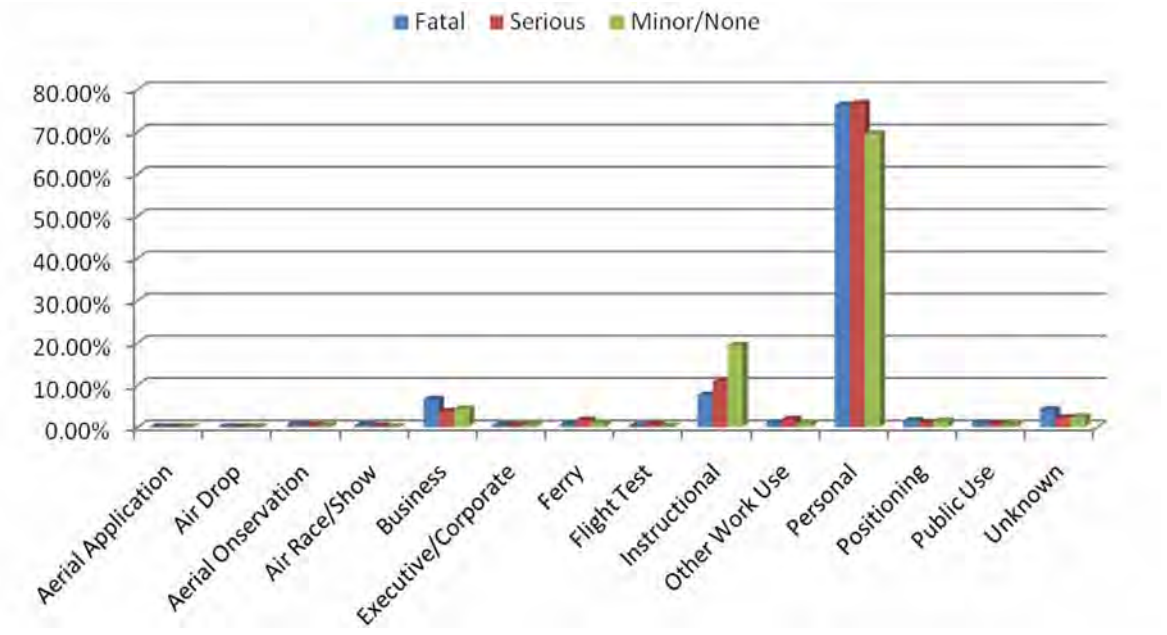

Figure 144. Percentage of Fatal, Serious, and Minor/None GA Accidents Based on Purpose of Flight in the Western-Pacific Region (1982 to 2009)

10.4 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS IN THE WESTERN-PACIFIC REGION.

This section examines the initiating causes of GA accidents in the Western-Pacific Region. The NTSB database allows for input of up to five occurrences (major events) for each accident and up to ten sequences of events for each occurrence to explain the chain of events that led to the accidents. The initiating cause of every accident is addressed in this report because it is the trigger of all other events. The study of the initiating causes is expressed in terms of frequency and percentage. Contributing factors were excluded from the analysis because they are not causal in nature.

Figures 145 through 147 show the frequency and percentage of the top ten initiating causes of GA accidents. The top ten most frequent initiating causes of GA accidents contribute to at least 49% of all GA accidents in the Western-Pacific Region. Figure 145 shows the frequency and percentage of initiating causes of Fatal GA accidents in the region. VFR flight into IMC is the number one initiating cause of Fatal GA accidents in the Western-Pacific Region, as shown in figure 145. Figure 146 shows that fluid, fuel is the number one initiating cause of Serious GA accidents in the same region. Directional control is the number one initiating cause of Minor/None GA accidents, as shown in figure 147. This is similar to the nationwide data.

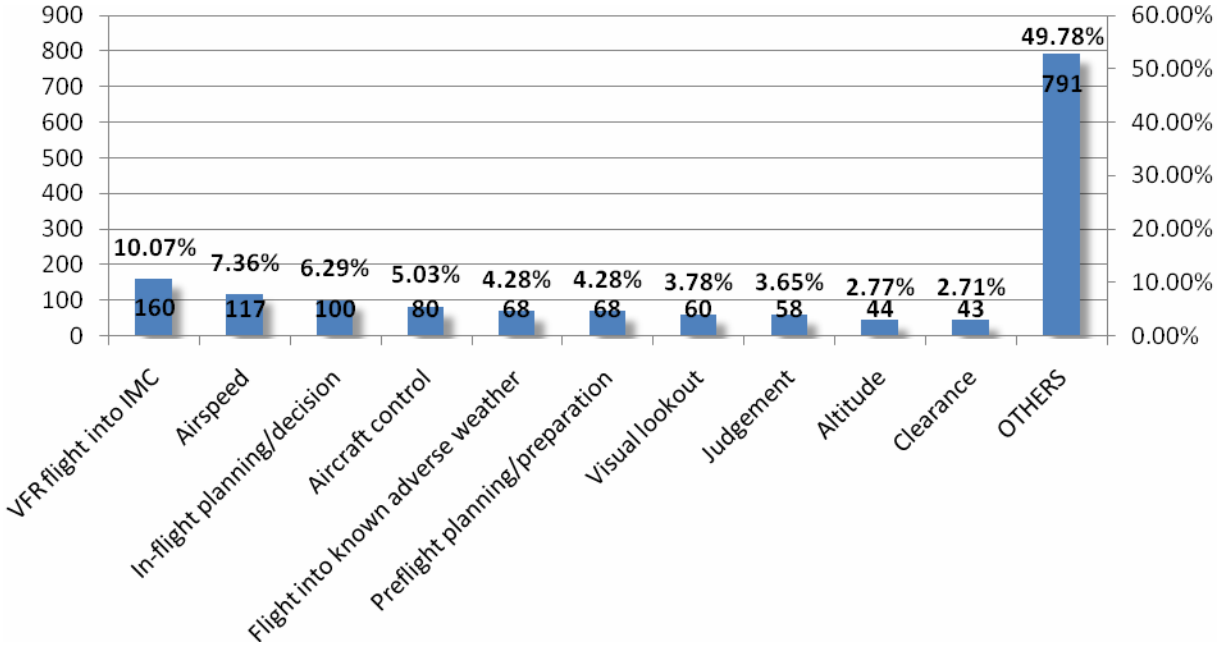

Figure 145. Frequency and Percentage of Initiating Causes of Fatal GA Accidents in the Western-Pacific Region (1982 to 2009)

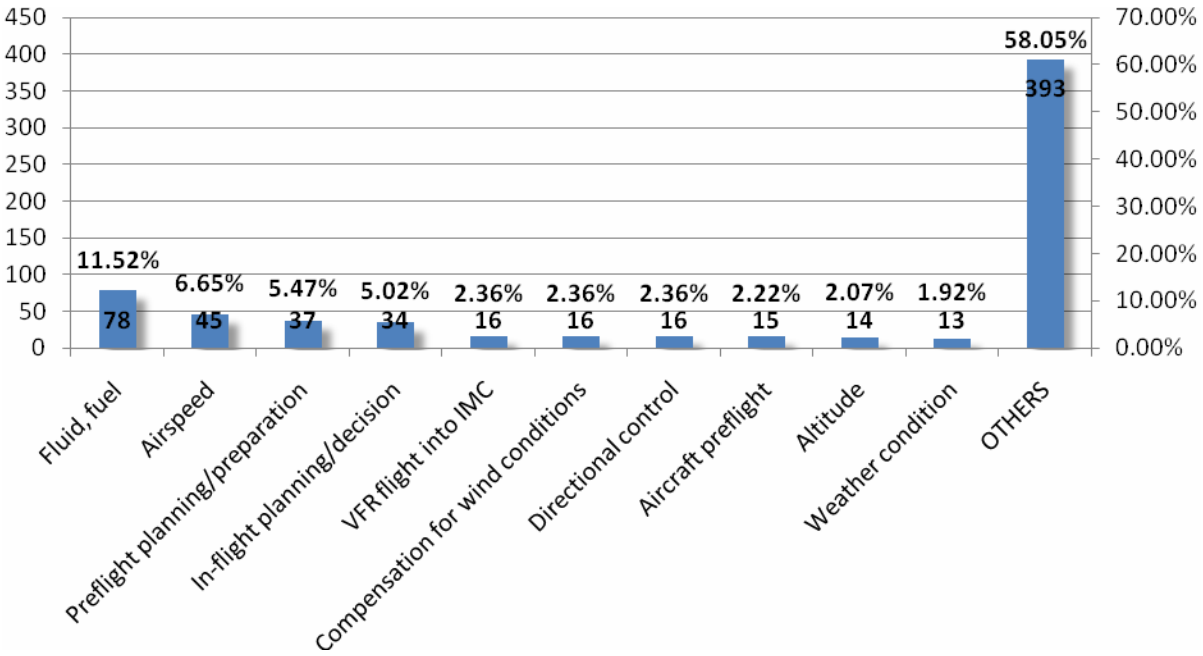

Figure 146. Frequency and Percentage of Initiating Causes of Serious GA Accidents in the Western-Pacific Region (1982 to 2009)

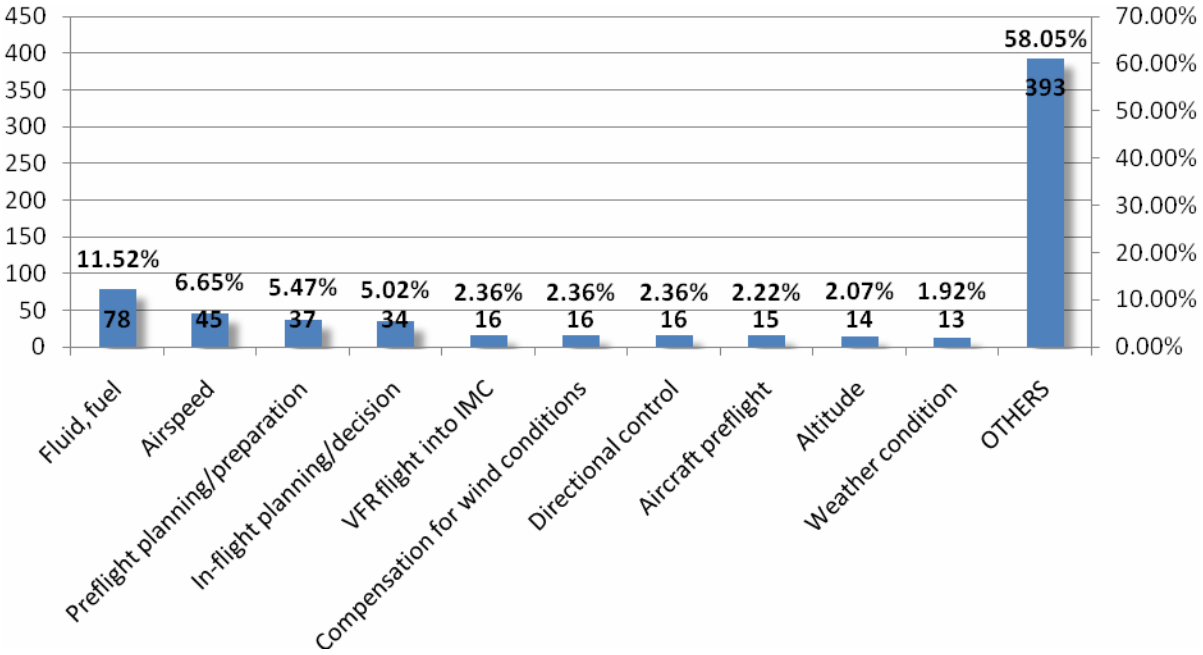

Figure 147. Frequency and Percentage of Initiating Causes of Minor/None GA Accidents in the Western-Pacific Region (1982 to 2009)

10.5 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS RELATED TO PILOT EXPERIENCE IN THE WESTERN-PACIFIC REGION.

According to the FAA, pilot error is the number one cause of aircraft accidents and incidents followed by faulty maintenance errors. The NTSB database confirms that approximately 72% of GA accidents in the Western-Pacific Region are caused by pilot error. The following sections provide statistical analyses of GA accident causes in the Western-Pacific Region related to pilot error. In particular, pilot experience in hours is used in this report to examine the top ten initiating causes of GA accidents that lead to other events.

Figures 148 through 150 show the percentage of pilot experience based on total flight hours in relation to initiating causes of GA accidents.

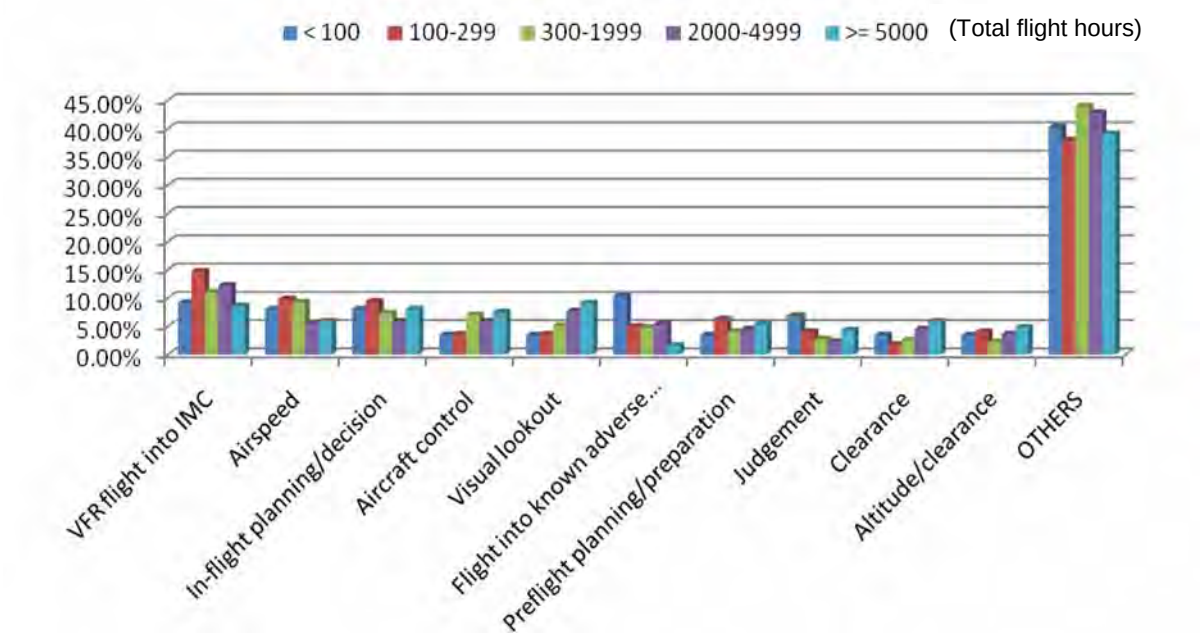

Figure 148. Percentage of Initiating Causes of Fatal GA Accidents Based on Pilot Experience in the Western-Pacific Region (1982 to 2009)

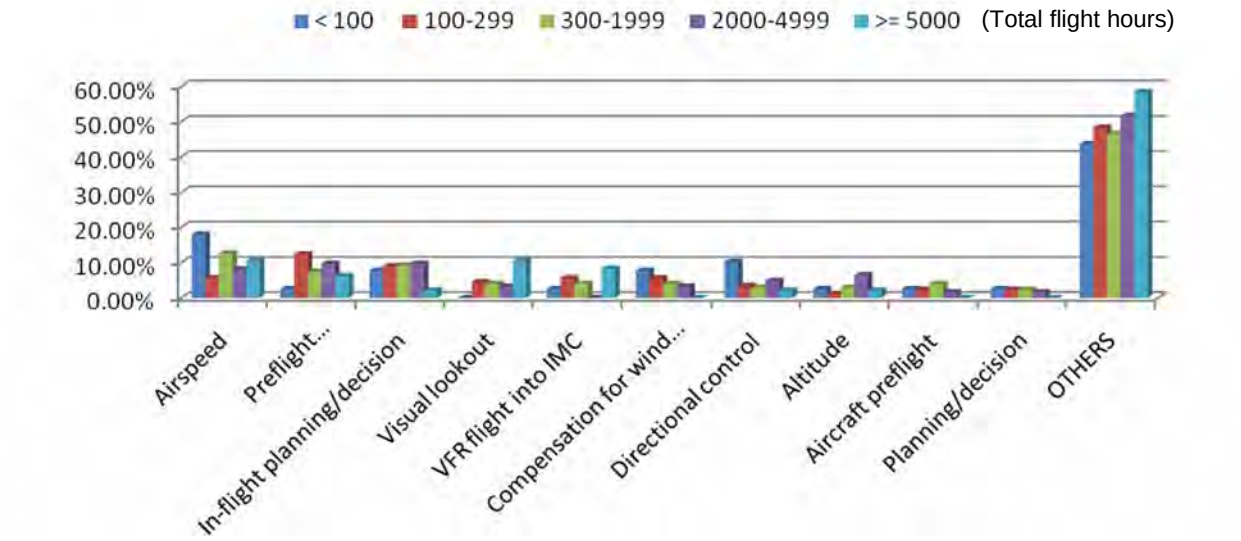

Figure 149. Percentage of Initiating Causes of Serious GA Accidents Based on Pilot Experience in the Western-Pacific Region (1982 to 2009)

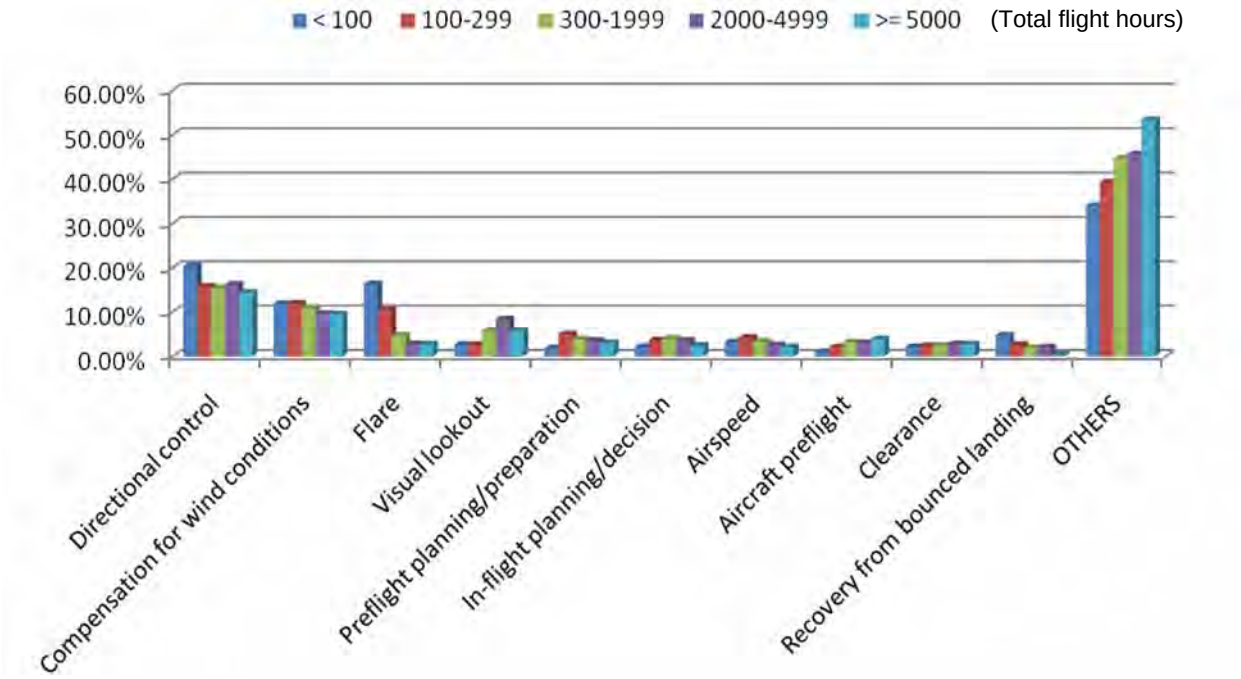

Figure 150. Percentage of Initiating Causes of Minor/None GA Accidents Based on Pilot Experience in the Western-Pacific Region (1982 to 2009)

10.6 MOST FREQUENT INITIATING CAUSES OF GA ACCIDENTS RELATED TO AIRCRAFT COMPLEXITY IN THE WESTERN-PACIFIC REGION.

Figures 151 through 153 show the percentage of accidents involving aircraft with less than 200 engine hp and accidents involving aircraft with more than or equal to 200 engine hp. Figure 151

shows VFR flight into IMC is the number one initiating cause of Fatal GA accidents for both categories. Figure 152 shows fluid, fuel is the number one initiating cause of Serious GA accidents. Directional control is the number one cause of Minor/None GA accidents, as shown in figure 153.

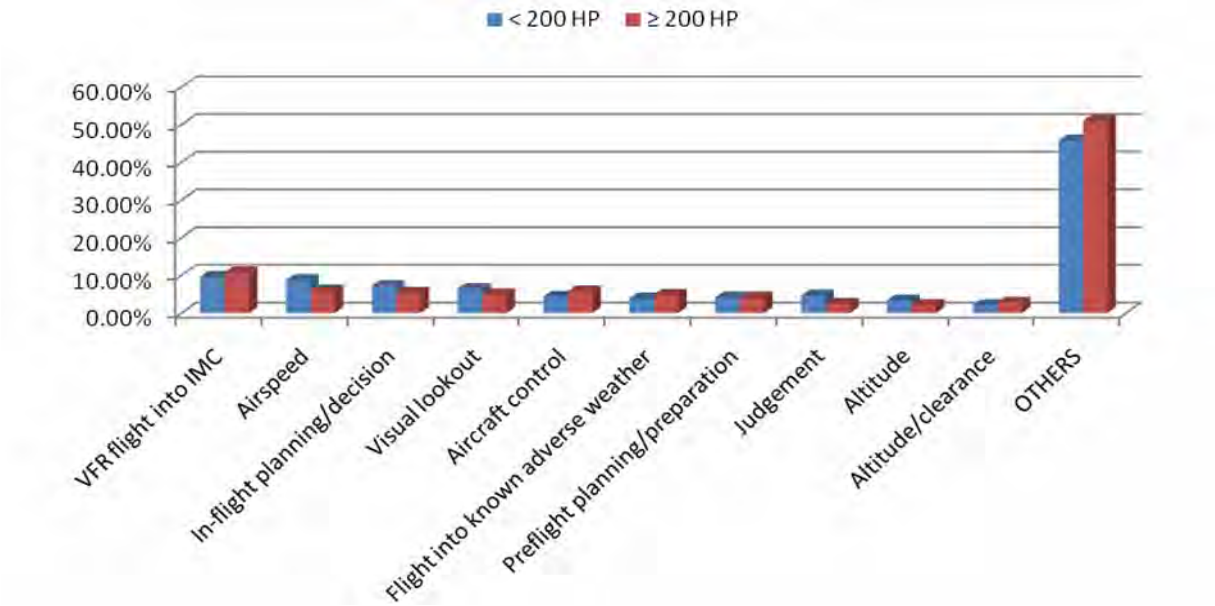

Figure 151. Percentage of Initiating Causes of Fatal GA Accidents Based on Aircraft Engine Power in the Western-Pacific Region (1982 to 2009)

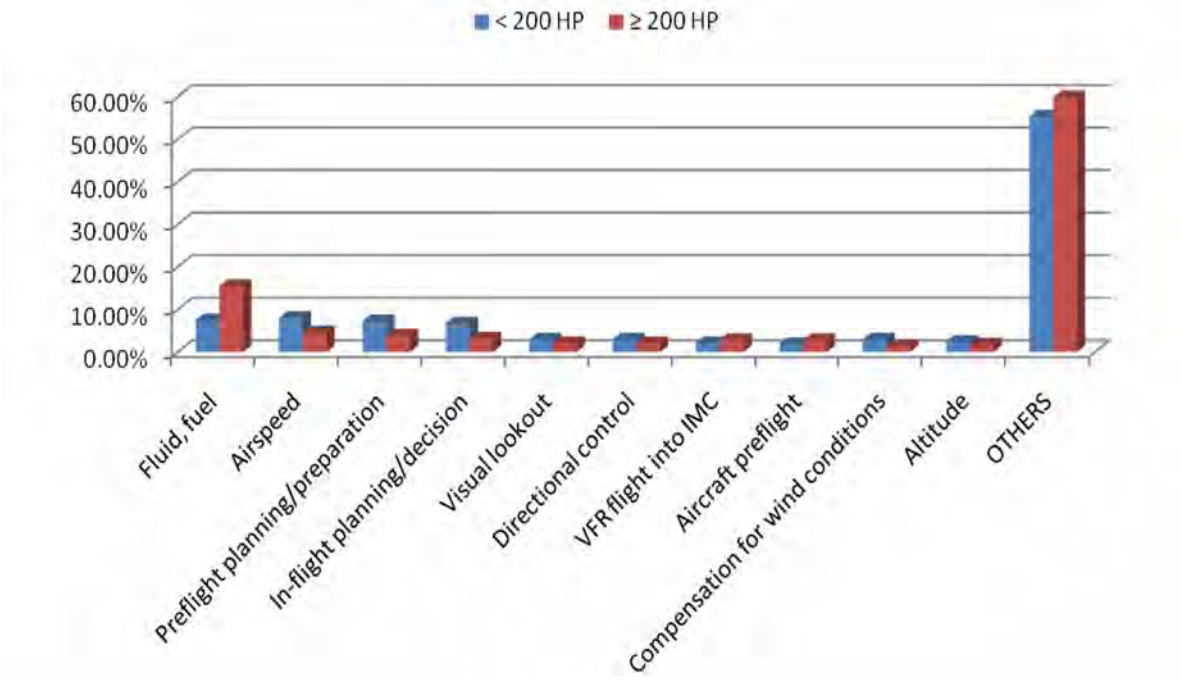

Figure 152. Percentage of Initiating Causes of Serious GA Accidents Based on Aircraft Engine Power in the Western-Pacific Region (1982 to 2009)

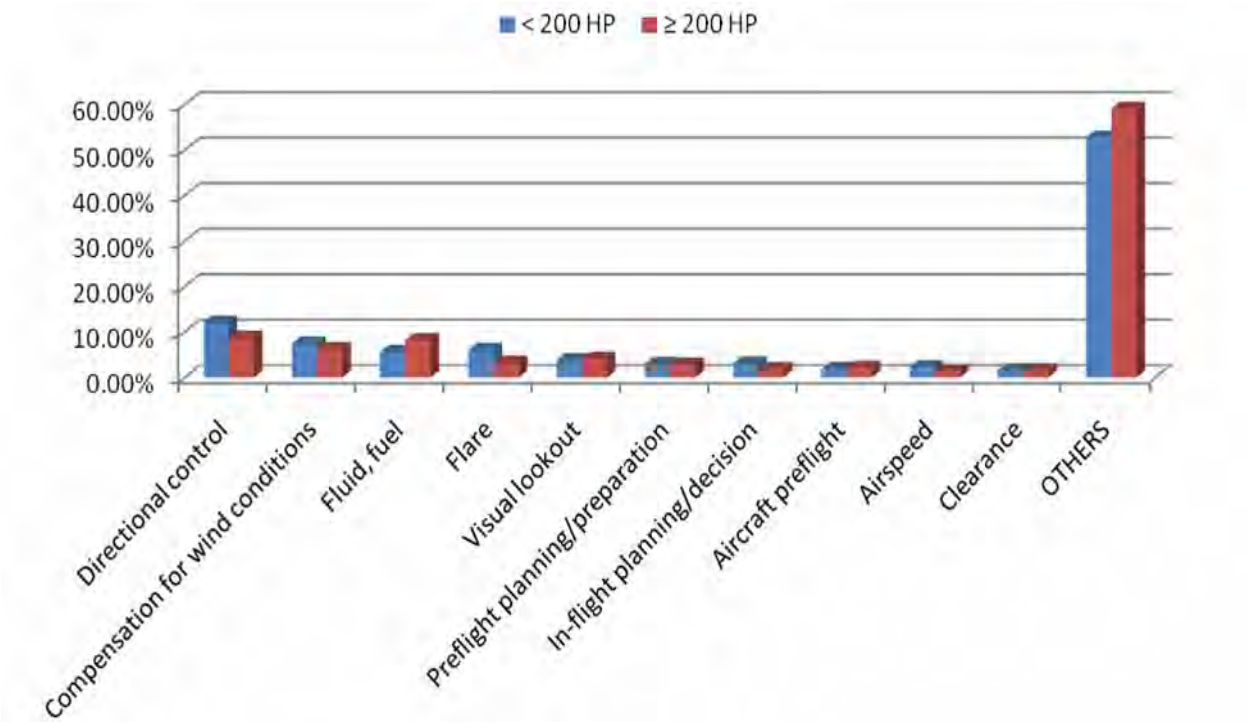

Figure 153. Percentage of Initiating Causes of Minor/None GA Accidents Based on Aircraft Engine Power in the Western-Pacific Region (1982 to 2009)

10.7 RESULTS FOR THE WESTERN-PACIFIC REGION.

This study examined the top ten initiating causes of GA accidents in the Western-Pacific Region. The trends found are similar to the nationwide trend and the trends in other regions. Airspeed, for example, is most frequently the number one initiating cause of Fatal GA accidents. Directional control is the number one initiating cause of Minor/None GA accidents.

The number of GA accidents has decreased significantly from 568 in 1982 to 299 in 2009.

Analysis of GA accidents in the Western-Pacific Region based on month shows that the Western-Pacific Region trend is similar to the nationwide data with the maximum number of accidents between May and August.

The majority of GA accidents in the Western-Pacific Region occurred between 07:00 and 22:00 hours (7 a.m. and 10 p.m.), with the highest number of GA accidents recorded at 14:00 hours (2 p.m.) and 15:00 hours (3 p.m.), which is similar to the nationwide data.

Analysis of GA accidents in the Western-Pacific Region based on phase of flight shows that the highest number of GA accidents occurred during the landing phase. Serious GA accidents were most likely to occur during the takeoff and landing phases. This is similar to the nationwide data.

Analysis of GA accidents in the Western-Pacific Region based on purpose of flight shows that personal flights contribute the highest rate of GA accidents in the Western-Pacific Region, which is similar to the nationwide data. Fatal GA accidents are most likely to occur during the cruise, descent, and maneuvering phases in both the Western-Pacific Region and nationwide.

The top initiating causes of Fatal GA accidents in the Western-Pacific Region are VFR flight into IMC followed by airspeed; nationwide, the top initiating causes of Fatal GA accidents are airspeed followed by VFR flight into IMC and aircraft control.

The top initiating causes of Serious GA accidents are fluid, fuel followed by airspeed in the Western-Pacific Region, which is similar to the nationwide data.

The top initiating causes of Minor/None GA accidents are directional control followed by compensation for wind conditions in the Western-Pacific Region. This trend is similar to the nationwide data.

Based on pilot experience in total flight hours, the following results were found.

- The top initiating cause of Fatal GA accidents, for pilots with
    - less than 100 hours, is flight into known adverse weather in the Western-Pacific Region and airspeed nationwide.
    - between 100-299 hours, is VFR flight into IMC in the Western-Pacific Region and nationwide.
    - between 300-1999 hours, is VFR flight into IMC in the Western-Pacific Region and airspeed nationwide.
    - between 2000-4999 hours, is VFR flight into IMC in the Western-Pacific Region and aircraft control nationwide.
    - more than 5000 hours, is visual lookout in the Western-Pacific Region and aircraft control nationwide.
- The top initiating causes of Serious GA accidents, for pilots with
    - less than 100 hours, is airspeed in both the Western-Pacific Region and nationwide.
    - between 100-299 hours, is preflight planning/preparation in the Western-Pacific Region and airspeed nationwide.
    - between 300-1999 hours, is airspeed in both the Western-Pacific Region and nationwide.

- between 2000-4999 hours, are preflight planning/preparation and in-flight planning/decision in the Western-Pacific Region and airspeed nationwide.

- more than 5000 hours, are airspeed and visual lookout in the Western-Pacific Region and airspeed nationwide.

- The top initiating cause of Minor/None GA accidents, for pilots of every experience level, is directional control in both the Western-Pacific Region and nationwide.

Based on aircraft engine power, the following results were found.

- The top initiating cause of Fatal GA accidents, for aircraft with

  - less than 200 hp, is VFR flight into IMC in the Western-Pacific Region and airspeed nationwide.

  - more than 200 hp, is VFR flight into IMC in both the Western-Pacific Region and nationwide.

- The top initiating cause of Serious GA accidents, for aircraft with

  - less than 200 hp, is fluid, fuel in the Western-Pacific Region and airspeed nationwide.

  - more than 200 hp, is fluid, fuel in both the Western-Pacific Region and nationwide.

- The top initiating cause of Serious GA accidents for aircraft of both engine power levels is directional control in the Western-Pacific Region and nationwide.

11. RESULTS.

This research identified and analyzed the trends, distributions, and causes of GA accidents that occurred in each of nine FAA regions. The GA accidents were categorized as Fatal, Serious, and Minor/None.

The GA accidents analyzed in this research occurred in the United States from 1982 to 2009, and revealed the associations between GA accidents and several factors including month, time of day, purpose of flight, phase of flight, pilot flight experience, and aircraft complexity.

The top ten initiating causes of GA accidents for the different GA accident categories and factors were thoroughly identified and analyzed. The findings from each region were compared with nationwide results to identify the unique patterns for each region.

This report provides comprehensive information of GA accidents that occurred during the 28-year period. These findings can be used as guidance for each FAA region to improve GA safety.

12. REFERENCES.

1. Department of Transportation, Federal Aviation Administration, Title 14 Code of Federal Regulations, Part 91—General Operating and Flight Rules, U.S. Federal Register, U.S. Government Printing Office.

2. National Transportation Safety Board, NTSB Form 6120.1, "Pilot/Operator Aircraft Accident/Incident Report."

3. Bazargan, M., Kosalim, H., and Williams, M., "A Database Management System for General Aviation Safety," FAA report DOT/FAA/AR-xx/xx, to be published.