Study of Flight School Pilot Incident Data: Implication for Educators

R. Troy Allen
Indiana State University

ABSTRACT

Flight training presents some of the most dangerous times in a pilots flying career. Lack of experience, decision-making abilities and youth can create a recipe for a potential disaster. The majority of pilots complete their training at an established flight school. A collegiate aviation department or a Fixed Base Operator can operate these flight schools. In both situations, there are associated risk factors.

This study was completed to identify aircraft incidents that occurred with pilots who were piloting flight school aircraft and to thereby identify possible training weaknesses. The researcher utilized the Federal Aviation Administration (FAA), Aviation Safety Information Analysis and Sharing (ASIAS), Accident/Incident Data System (AIDS) to obtain 397 aircraft incidents that occurred at flight schools from January 1978 to July 2007. The incidents were broken down based on the highest pilot certificate held by the pilot; incident categories were established, and then incidents were tabulated in order to generate descriptive statistics. Meaningful data was derived under each of the pilot certificates and recommendations were made to improve safety.

INTRODUCTION

According to Green (2001) "Aviation is a high-risk activity" (p. 101). This case study was completed to identify the risk exposure for flight school pilots by analyzing associated aircraft incidents. A study completed by Chappell (1997) stated, "The premier value of incident knowledge is its potential role in preventing accidents" (p. 149). Therefore, implementation of the findings of this study could prevent substantial damage to an aircraft and or serious injury to the occupants. By reviewing these incidents, risk can be exposed and specific actions can be taken to tailor training to prevent or reduce their occurrence.

Students rely upon educators to use their expertise to take all possible measures to reduce the risk that are inherent with flight. A proper method in which to accomplish this according to Green (2001, p. 101) as reported in the AOPA Nall Report (1997) is to "…gain knowledge about the risks and take proactive steps to control them" (p. 2). Knowledge can be gained by researching aircraft incidents associated with flight school pilots and educators can thus use training to attempt to improve safety.

Problem Statement

The AOPA Nall Report (2006) documents that "The total number of General Aviation (GA) accidents is relatively low, but remains significantly higher than the airlines", (p. 4). This need for improvement in GA safety establishes the basis for this study. Furthermore, pilots who are in training are especially vulnerable because of their lack of experience. Thus, by identifying aircraft incidents, proactive steps can be taken to arrest a problem prior to a more serious event such as an accident occurring. The two questions that were developed to guide this research are as follows:

1. What aircraft incidents do flight school pilots most frequently report?
2. What methods can be adopted to improve safety at flight schools when studying the most frequently reported flight school pilot incidents?

RISK IDENTIFICATION

Accident Data

One common method used to identify safety problems is accident data. By reviewing the results of a breakdown in a safety system, changes can be made to prevent further mishaps from occurring. This is a useful way in which to identify weak areas and shore them up through strengthening curriculum and other accident prevention methods. It also is the only way to collect data on certain events. For example, a typical accident scenario occurs when a non-instrument rated pilot flies into Instrument

Meteorological Conditions (IMC), and subsequently, loses control of the aircraft. The scenario is a familiar one usually resulting in a fatality. Therefore, accident data in some flight regimes is the only data available. Another danger can arise when a pilot loses control during a takeoff. These low altitude mistakes leave little time to recover and, thus, an accident occurs. If the pilot does recover, then neither an accident nor incident would have occurred, and no data would be available. This is important to note since incident data has limitations and cannot warn us in all areas that present danger. Therefore, understanding that incident data is not all-inclusive when considering the hazards associated with flight is important. Undoubtedly, there is value in studying accident data but in order for this data to exist; a serious event must take place. Incident data allows us to see trends that could lead to an accident before they occur.

Incident Data

Incident data is commonly used as a way to identify risk associated with flight. This methodology has a distinct advantage over accident data in that it identifies a weakness in the safety system prior to a complete failure of the system. Incident data was used to determine the most commonly reported incidents that are being committed by flight school pilots. Analyzing incident data provides the means to identify areas for improvement. As stated by Chappell (1997) "Proper use of incident data can provide unique insights into safety issues for which follow-up laboratory research can be conducted" (p. 152). Additionally, by identifying these areas, educators can raise awareness and allocate additional training resources in order to eliminate or reduce the likelihood of an accident. Utilizing incident data is a valid way in which to determine what could be changed to prevent reoccurrence of a type of incident and possibly prevent an accident.

Shared Responsibility

Although the pilot in command has ultimate responsibility for the safety of a flight, it is without a doubt a shared responsibility of many individuals. Consider that the aircraft mechanics, airport inspectors, and certified flight instructors are just some of the individuals who can play a positive role in breaking the incident or accident chain. There are, in fact, many individuals who have the ability to prevent a mishap before it occurs (Gill, 2004). A variety of studies have clearly established that there are many contributing factors when an accident occurs. A study completed by Lu, Pretzak and Wetmore (2006, p. 121), found the following non-flight groupings could contribute to an air carrier accident.

1. Flight operations
2. Ground crew
3. Turbulence
4. Maintenance
5. Foreign Object Damage
6. Flight Attendant
7. Air Traffic Control
8. Manufacturer
9. Passenger
10. Federal Aviation Administration

These individuals and organizations can also play a role in preventing incidents.

Mattson, Petrin, and Young (2001), found that in the early years of accident investigation, the pilot or an air traffic controller was typically cited as the cause of an accident instead of looking past the initial facts and determining an underlying root cause. This superficial type of investigation creates more of a blame mentality than one that is focused upon discovering the root causes of an incident/accident and eliminating them. For example, if a pilot was slow to recognize a system failure in an aircraft and take corrective action in time to prevent an incident, would it be prudent to blame only the pilot? Could a more in-depth investigation uncover an underlying deficiency such as an organization that took a blasé stance toward safety? Lu, Pretzak and Wetmore (2005) found that "the aviation safety net consists of flight crews, maintenance personnel, air traffic controllers, airplane dispatchers, flight attendants, ramp agents, airport security, and related professionals" (p. 138). This suggests that safety is the responsibility of more than just the pilot in command of the aircraft at the time of a mishap.

Research completed by Mattson, Petrin and Young (2001) found that "A major challenge to accident investigators is the analysis of factors

that may have caused a chain of events reverberating all the way through the organization to the individual" (pg. 39). Once again, research suggests that there is a correlation between an aircraft mishap and, not only the pilot, but a myriad of individuals including educators.

SAFETY CULTURE

Culture is defined by Pidgeon and O'Leary (1994) "…as the set of beliefs, norms, attitudes, roles, and social and technical practices within an organization which are concerned with minimizing the exposure of individuals, both within and outside an organization, considered to be dangerous" (p. 32). The individuals who are in a position to establish these criteria create a flight school culture. This includes faculty, certified flight instructors, and other flight school employees.

An effective safety culture should permeate throughout an organization. This has been publicized by Pidgeon and O'Leary (1994, p. 33) where they documented the ways in which safety should be infused into an organization.

1. Strategic management level
2. Distributed attitudes of care and concern throughout an organization
3. Appropriate norms and rules for handling hazards
4. On going reflection upon safety practice

Safety culture is not only a responsibility of an aviation department but is a shared responsibility of many levels in a university. An organization's culture can be a deterrent or a contributor to an incident/accident. As found by Pidgeon and O'Leary (1994) "… under the general heading of human factors, wider organizational factors have only recently been clearly identified as contributing significantly to accident causation, and hence as a topic of concern for both aviation safety researchers and practitioners" (p. 21). Thus, the culture of a flight school has implications when considering safety. Early airmail operations would be a case in point. With an attitude of completing a flight regardless of the risk, pilots were forced into adverse weather conditions to their own demise. Additionally, consider that investigations at the National Aeronautics and Space Administration (NASA) conducted after the shuttle accidents were focused on analyzing the organization in order to identify contributing factors (Pidgeon & O'Leary, 1994).

Safety Audit

Safety deficiencies within organizations may not be as easy to find and correct as they once were. However, that does not mean that they do not exist. Obvious deficiencies are eliminated or minimized in the early years of an organization. The remaining safety deficiencies are more difficult to detect. Fortunately, there are trained professionals who can assist in this area. There are a variety of organizations that will conduct an audit for a flight school. One such safety audit is performed by experienced educators on behalf of the University Aviation Association (UAA). These safety experts all have experience with flight schools and in a variety of aviation positions.

Instructional Methods

Educators act as guardians of those who desire to follow in their footsteps. Therefore, the findings of Dillman, Lee, and Petrin (2003) are relevant "Concrete measurements and detailed observations are required to determine where there are weaknesses in the safety culture so that appropriate remedies can be devised" (p. 93). The structure of a course, educator's attitudes, and methods used to convey concepts all influence a students understanding of what is normative behavior when piloting an aircraft.

An educator's personal experiences can be useful in teaching safety. However, it is important to be aware of what is implied when recalling personal narratives to impressionable students. For example, proudly interjecting flying stories for the sole purpose of establishing one's own prowess in an aircraft could lead students to believe that risk taking is a rite of passage. However, properly framed as an "I'll never do that again" story provides valuable first hand experience that can lead students to a greater understanding. Students not only hear the message but also pick up on body language. Thus, educators need to evaluate the manner in which they are delivering their personal narratives.

Instructional design and instructional strategies indicate to students an instructor's attitudes towards the importance of course content. Enthusiasm and organized curriculum convey that an instructor believes in the importance of a topic; whereas, yellowed notes brought into a classroom from decades past can be seen as not only dated but lead students to believe that the topic is not worthy of an instructor's best effort. This inference might then manifest itself in a mimicked attitude when the student is studying material or preparing for a flight.

Dillman, Lee, and Petrin (2003) found that "One of the ways that an awareness of a safety culture can be promoted is by placing the idea of safety at the forefront from the beginning of training all the way through the certification process" (p. 93). An effective safety culture can be established if safety is imbedded in the curriculum and espoused by instructors in the collegiate classroom. This can be a very effective deterrent to an incident/accident.

According to Green (2001) "If and how we adapt our educational practices to enhance pilot decision-making will have important implications for aviation safety in the future" (p. 108). Her findings are consistent with the 2006 Nall report where it was reported that accidents could be reduced by "improving aeronautical decision making." Therefore, safety can be strengthened by teaching proper techniques and good decision-making. Good decision-making is challenging to teach, but when accomplished, it provides a powerful force in the prevention of accidents or incidents.

Teaching safety is possible, and no one in the business of educating pilots should shirk their responsibility to make a positive contribution; imbedding safety into their curriculum must be a priority. Consider that Thom and Clariett (2004) found, "Safe behavior like any other behavior is learned through the repetitive interaction of action and consequence" (p. 99). This leaves little doubt that the collegiate aviation classroom provides fertile soil for "safety seeds". Case studies and other instructional strategies can provide a catalyst to assist a student in understanding the relationship between cause and effect.

Flight Schools

Flight schools can be owned and operated by a collegiate aviation program or a fixed based operator. Regardless of which organizational umbrella that they are under, informing all parties concerned about the types of incidents committed by flight school pilots is equally important.

The majority of pilots complete their primary and advanced training at a flight school. The quality of training received at these institutions has safety implications across civil and military flying. It was reported by Green (2001) that "The research demonstrates that pilot attitude toward risk and risk management strategies are established quite early in flight training" (pg. 106). There is truth in the adage that states, "Old habits die hard." It is therefore crucial that sound flight training be given at the earliest stages so that the habits developed are best practices and not poor procedures that lead to an incident.

Flight schools serve a valuable role in preparing pilots to manage the risk associated with flight. The vast majority of airline, military and civilian pilots can trace their flying roots back to one of these establishments. They provide the instructional building blocks upon which many more hours of instruction and experience will be laid. When unsafe practices, attitudes, and theories are imbedded at this early stage, they can contribute to a future aircraft accident. Therefore, it is imperative to identify these bad traits prior to an incident/accident occurring. According to Lee, Fanjoy and Dillman (2005) "Clearly, initial training in a collegiate flight program is one of the most defining stages for future professional pilots" (p. 5). This fact is supported by the 2006 Nall report, "The first 500 hours of a pilot's flying career are the most critical, with 30.9 percent of the total accidents and 30.7 percent of fatal accidents occurring within that timeframe" (p. 16).

Inadequate training or bad habits taught early in a pilot's career can eventually lead to disastrous results. This suggests the need for a mechanism that can be used to determine when an accident might occur. Incident data provides one such mechanism. It is imperative to review this data to glean useful information in order to

incorporate best practices into training and break a link in the incident/accident chain.

RESEARCH METHODOLOGY

The researcher utilized the FAA, ASIAS, AIDS database to obtain 408 incidents committed by flight school pilots. The data was then separated by using a coding form that was developed for this study. This categorized the incidents by pilot certificate and type of incident. Once the data was separated it was entered into a Microsoft Excel spreadsheet to generate descriptive statistics. This method of statistically analyzing the data is supported by Chappell, (1997) where she stated, "The most common and often the only valid quantitative analyses of incident data are descriptive, rather than inferential" (p. 163). Additionally, a review of the literature was completed to establish the need for this research and report on relevant studies that frame the need for this study.

This study took the following three-step approach to answer the research questions.

1.) Data concerning flight school incidents was obtained from the FAA, ASIAS, AIDS database and subsequently analyzed.
2.) A literature review was completed to identify other relevant research and to frame this study.
3.) Recommendations were developed to equip educators with a means to prevent an incident before it occurs.

This study utilized a systematic approach in order to provide need-to-know information to educators so that they could fulfill their responsibilities in minimizing risk exposure to flight school pilots.

The data derived by this report has value not only to collegiate educators but also to anyone in the business of training pilots for certificates and ratings. This includes certified flight instructors who provide the training, collegiate aviation instructors, and many others who can provide another safety barrier to prevent an incident/accident from occurring.

Data Collection

The data collected for this research was obtained from the Federal Aviation Administration (FAA), Aviation Safety Information Analysis and Sharing (ASIAS), Accident/Incident Data System (AIDS). This online database is a compilation of several incident-reporting mechanisms including information supplied to the FAA through the accident/incident reporting form 8020-5.

The researcher coded and subsequently analyzed 397 pilot incidents that occurred from January 1978 to July 2007. All of the incidents occurred while pilots were flying in association with a flight school. The research was completed in order to analyze incident types and frequency of occurrence with pilots flying flight school aircraft. Trends and safety issues can be gleaned from the data and steps can be taken to mitigate them.

RESULTS

When interpreting the results of this study, the researcher avoided comparing incidents rates across flight certificates. It would not be accurate to compare the groups across types of incidents since it is unknown how many flight hours each group flew. For example, perhaps the private pilot group flew three times as many hours as commercial pilots during the data collection period and, thus, experienced more landing type incidents. Would it be accurate to say that commercial pilots are less likely to experience a landing type incident as compared to the private pilot group? The frequency of flights of the private pilots would push up the probability of an incident occurring and, without controlling for these factors, accurate interpretation of the data would not occur. Therefore, the results of this study will only analyze the data found within one pilot certificate group and not compare across the groups. It should also be noted that the categories of "Gear None" and "Retract Gear" are not one in the same. "Gear None" is a heading used when the pilot landed without lowering the landing gear while "Retract Gear" describes an incident whereby a pilot inadvertently raised the gear lever while on the ground resulting in the fuselage coming in contact with the runway.

Student Pilot Certificate

When reviewing the incidents reported, the greatest probability for an aircraft incident for student pilots occurs during the landing phase. A review of Figure 1 shows that the two areas with the most incidents are Brake Ground Control (32%) and the Level Off (29%) phase of flight. These two incidents, both associated with landing an aircraft, account for more than half (61%) of all the incidents associated with student pilots. Additionally, the 2006 Nall report documents that, regardless of the pilot certificate held, the landing phase of flight has the highest incidence of accidents (35.3%).

The specific event classified under Brake/Ground Control or Level Off was one of the following:

1. Losing control of the aircraft while in the landing roll out
2. Flaring high resulting in a hard landing
3. Landing on the nose gear before the main gear touched down and losing directional control or causing its failure
4. Landing short of the runway

Pilots usually consider landing the aircraft to be one of the most challenging aspects of flight. The challenge of the maneuver, coupled with the fact that a landing is performed at least once with each flight, accounts for the high rate of incidents in this area. These incidents all occurred between the flare and the roll out. Landing is one of the greatest hurdles to overcome as a novice pilot. Therefore, Certified Flight Instructors should emphasize proper technique, and collegiate faculty should reinforce this training in the classroom. Additionally, special emphasis should be focused on decision-making. Student pilots not only lack technique, but they also have not had the chance to learn from experience and hone their decision-making abilities. This is a premier opportunity for education to play a role in improving the safety of this phase of flight. It also serves as a reminder to Certified Flight Instructor's (CFI's) that they must remain vigilant during this phase of flight. In addition, establishing when the CFI has the aircraft under their control is important. Many of the incident narratives that fell under "brake/ground control" occurred with a CFI and student countering each other on the controls. In some instances, the physical force of the pilot's counter inputs resulted in the breakage of aircraft mechanical parts. These incidents may be reduced by CFI's establishing clear procedures that delineate when they want the student to relinquish control of the aircraft.

If there is any good news surrounding this data, it is that although landings are a significant contributor to incidents and accidents, they are usually not fatal. The 2006 Nall report stated that landings make up 35.3% of accidents, but they only represent 5.0% of overall fatalities.

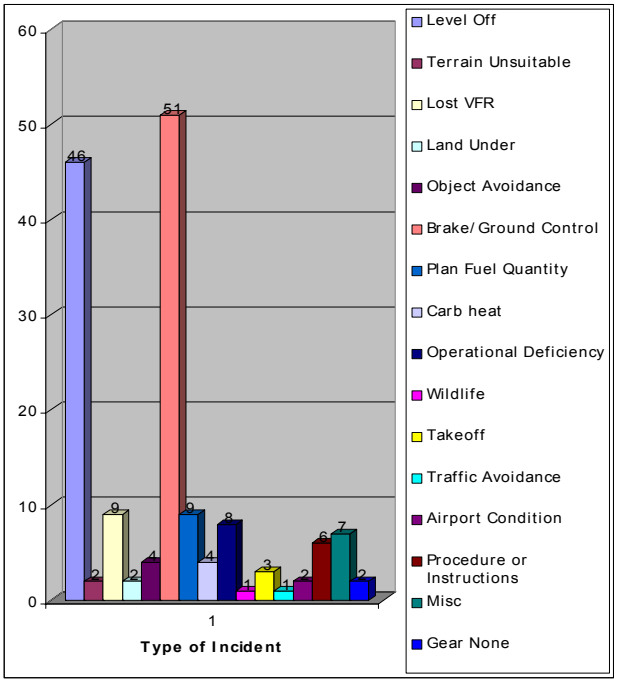

Figure 1. Student Pilot Incident Frequency January 1978 – July 2007.

Private Pilot Certificate Incidents

The data collected indicates that the top three incident areas in this category are Operational Deficiencies (21%), Gear None (14%), Brake Ground Control (12%) and Level Off (11%). It is interesting to note that pilots at this level appear to be gaining mastery of the aircraft with more incidents attributable to mechanical issues with the aircraft.

It should be noted that Operational Deficiencies were the leading reported cause of incidents for Private pilots (21%), Commercial pilots (34%) and Airline Transport pilots (33%). These operational deficiencies cover a wide

range of events, but all have commonality in that they all reflect an aircraft system breakdown. It becomes apparent that emergency procedures must be ingrained in a flight school culture so that when a breakdown occurs, the pilot will respond appropriately.

If Gear None (14%), Brake Ground Control (12%) and Level Off (11%) were categorized under a single heading of improper pilot technique, they would account for (37%) of the overall incidents. Moreover, all of the areas except "Operational Deficiency" could be listed under a broad heading of decision-making. This illustrates just how powerful of a role decision making can play in safe piloting. Teaching pilots how to assess the risk and make choices that lead to a safe outcome are paramount in improving flight school safety.

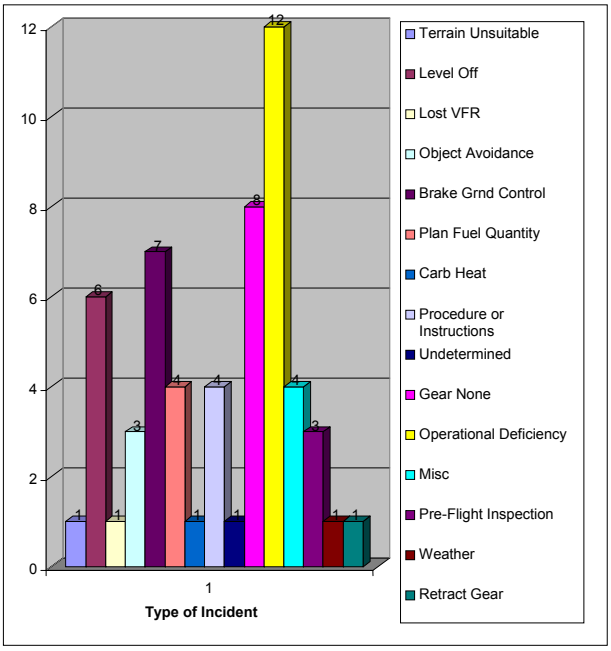

Figure 2. Private Pilot Incident Frequency January 1978 – July 2007

Commercial Pilot Certificate

The top five areas of flight that reported incidents occur are depicted in Figure 3 as Operational Deficiencies (34%), Brake Ground Control (13%), Retract Gear (13%), Level Off (7%) and Gear None (7%).

Nearly one third of all of the incidents that occur are the result of a mechanical issue. At first glance, this seems to be outside of the realm of a pilot's control. However, it remains a possibility that a pilot mismanaged an aircraft system thus leading to a mechanical breakdown. Such would be the case when a pilot thermal shocks the engine, runs the engine at above recommended power settings, or uses improper startup techniques during cold weather operations. The cumulative effect of this abuse may lead to a mechanical breakdown.

The other four areas listed above could be listed as procedural errors. Once again, stressing the importance of checklist and proper procedures could help in reducing these types of incidents.

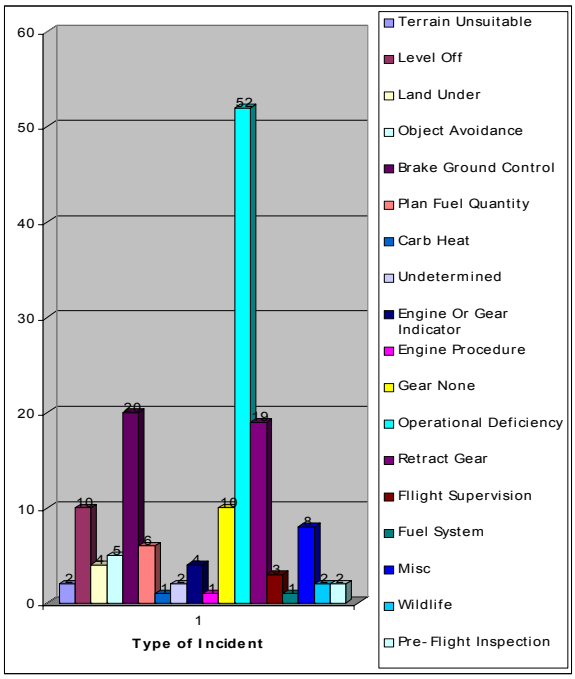

Figure 3. Commercial Pilot Incident Frequency January 1978 – July 2007.

.Airline Transport Pilot Certificate

For pilots who held an Airline Transport Certificate the top reported incidents were Operational Deficiencies (33%), Gear None (23%), Retract Gear (8%), Flight Supervision (8%) and Level Off (8%). Once again, Operational Deficiencies account for over one third of the incidents experienced by ATP certificate holders. These pilots are typically beyond the classroom environment and, thus, are somewhat more difficult for a collegiate faculty member to influence.

Gear none was the second most common area of aircraft incident accounting for (23%) of

the total. In reading the narratives, it was apparent that in most cases this is a missed item on a checklist. Maintaining a sterile cockpit below a certain altitude or within a certain distance of the airport and stressing the importance of not being complacent may reduce the amount of incidents occurring in this area. Once again, since pilots that hold this certificate are typically beyond the collegiate classroom, early training may be one of the most effective ways in which to safe guard against these incidents occurring.

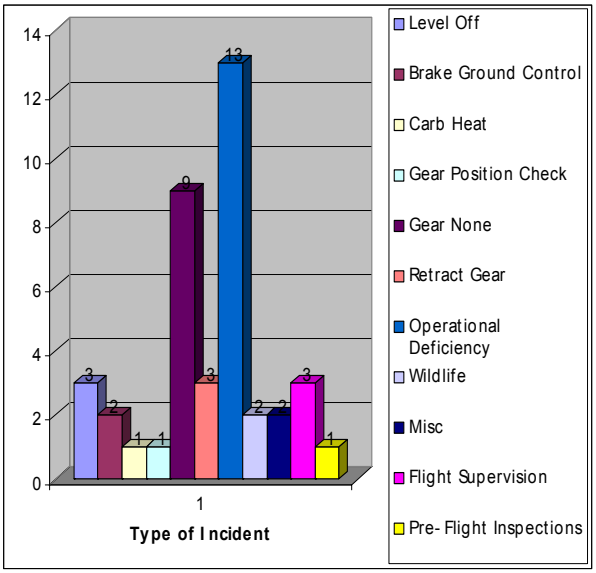

Figure 4. Airline Transport Pilot Incident Frequency January 1978 – July 2007.

IMPLICATIONS FOR EDUCATORS

This study was completed to identify risk associated with flying at a flight school and effectively use training to maximize the safety barrier that effective instruction can provide.

The following are recommendations that were developed from this study and are suggested to reduce the incidents associated with Flight Schools and minimize the possibility of an accident. It is also believed that implementing them will reduce the severity of an incident or accident if it were to occur.

1. Long runways, clear approaches and ARFF equipment all have the ability to stop an incident before it develops into an accident. If possible, pilot training should be conducted at an airport that has a comprehensive safety net in place to minimize the possibility of an accident.
2. Renewed emphases should be placed upon landing technique and proper go around procedures.
3. Certified Flight Instructors and student pilot certificate holders should be made aware of the dangers that the landing phase of flight presents and should assure that best practices are being used to teach this flight maneuver. Collegiate aviation faculty members and CFI's should strive to teach sound decision-making through case based studies, problem based learning, and the use of flight simulators. The ability to identify risk and determine what is an acceptable risk are the most effective deterrents to an incident/accident.
4. Consideration should be given to creating a non-punitive, confidential, incident-reporting program at flight schools so that safety issues can be identified and effectively addressed.
5. Flight school pilots, collegiate faculty members, and all other individuals that play a role in safety should be periodically brought together to address areas of safety concern.
6. Flight schools should consider implementing a safety management system to oversee all aspects of flight school safety.

The primary reason to improve safety is to prevent the loss of life. However, loss of property must also be considered. This cost is not only in equipment replacement but also in rising insurance premiums. Godlewski (2005) quoted Phil Kolczynski, an aviation attorney, as stating "There have been instances where a pilot has gone through the factory training, then after an accident filed suit against the person or school providing the training claiming that it was substandard" (p. 37). Lawsuits are yet another possible vulnerable area for flight schools. The bad publicity from such an event could curb enrollments and in the most dire cases cause university administrators to eliminate an aviation program.

REFERENCES

Aircraft Owners and Pilot Association, Air Safety Foundation. (n.d.). 1997 Joseph T. Nall Report: Accident Trends and Factors for 1996. Retrieved July 9, 2007, from http://www.aopa.org/asf/publications/97nall.pdf

Aircraft Owners and Pilot Association, Air Safety Foundation. (n.d.). 2006 Joseph T. Nall Report: Accident Trends and Factors for 2005. Retrieved July 15, 2007, from http://www.aopa.org/asf/publications/06nall.pdf

Chappell, S. L. (1997). Using voluntary incident reports for human factors evaluations. In N. McDonald & N. Johnston & R. Fuller (Eds.), *Aviation Psychology in Practice* (pp. 149-169). Brookfield, VT: Ashgate.

Dillman, B.G., Lee, J.R. & Petrin, D. (2003). Developing an Aviation Safety Culture: Utilizing databases to promote accident/incident prevention programs. *International Journal of Applied Aviation Studies*, 3(1), 91-104.

Federal Aviation Administration, Aviation Safety Information Analysis and Sharing Database. (n.d.) Retrieved June 28, 2007, from http://www.asias.faa.gov/portal/page?_pageid=56,86203,56_86210&_dad=portal&_schema=PORTAL

Gill, G.K. (2004). Perception of safety, safety violation and improvement of safety in aviation: Findings of a pilot study. *Journal of Air Transportation*, 9(3), 43-55.

Godlewski, M. (2005, November 4). Order in the court: Are lawsuits – frivolous or otherwise – to blame for the high cost of flying? *General Aviation News*, pp. 37-38.

Green, M.F. (2001). Aviation system safety and pilot risk perception: Implications for enhancing decision-making skills. *Journal of Air Transportation*, 6(1), 98-110.

Lee, R. L., Fanjoy, R.O., & Dillman B.G. (2005). The effects of safety information on aeronautical decision-making. *Journal of Air Transportation*, 10(3), 3-16.

Lu, C., Przetak, R., & Wetmore, M. (2005). Discovering the non-flight hazards and suggesting a safety-training model. *International Journal of Applied Aviation Studies*, 5(1), 135-151.

Lu, C., Wetmore, M., & Przetak, R. (2006). Another approach to enhance airline safety: Using management safety tools. *Journal of Air Transportation*, 11(1), 113-139.

Mattson, M., Petrin, D.A., & Young, J.P. (2001). Integrating safety in the aviation system: Interdepartmental training for pilots and maintenance technicians. *Journal of Air Transportation,* 6(1), 37-63.

Pidgeon, N. & OLeary, M. (1994). Organizational safety culture: Implications for aviation practice.In N. Johnson, N. McDonald, & R. Fuller (Eds.), *Aviation Psychology in Practice* (pp. 21-43).Brookfield, VT: Ashgate.

Thom, J.M, & Clariett, D.R. (2004). A structured methodology for adjusting perceived risk. *Collegiate Aviation Review*, 22(1), 97-121.