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# The Relationship Between Labor Unions and Safety in US Airlines: Is There a "Union Effect?"

Renee Catherine Zapf

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THE RELATIONSHIP BETWEEN LABOR UNIONS AND SAFETY  
IN US AIRLINES: IS THERE A “UNION EFFECT?”

By

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Bachelor of Science, University of North Dakota, 2008

A Thesis

Submitted to the Graduate Faculty

of the

University of North Dakota

In partial fulfillment of the requirements

for the degree of

Master of Science

Grand Forks, North Dakota

December

2014

This thesis, submitted by Renee Zapf in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done, and is hereby approved.

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Committee Chairperson

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Committee Member

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Committee Member

This thesis is being submitted by the appointed advisory committee as having met all of the requirements of the Graduate School at the University of North Dakota and is hereby approved.

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Dean of the Graduate School

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Date

## PERMISSION

Title                      The Relationship Between Labor Unions and Safety in US  
Airlines: Is there a “Union Effect?”

Department              Aviation

Degree                     Master of Science

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## ABSTRACT

Every airline union claims to work for safety and presents anecdotes where greater airline safety has been achieved through union efforts. The effect unionization has on safety outcomes in U.S. commercial airlines, however, wasn't found to be previously tested. Studies have shown that in industries such as coal mining, retail, and construction, unionization does lead to an increase in safety. This study evaluated the safety rates of 15 major US commercial airlines to compare the difference between unionized and non-unionized airlines. These safety rates were compared based on if and how long each airline's pilots and flight attendants have been unionized, to determine if unionization had an effect on safety outcomes. The 15 airlines included in the study identified as operating most of the years between 1990 and 2013, with annual departures averaging over 130,000, available through the Bureau of Transportation Statistics. Accident and Incident information was acquired through the National Transportation Safety Board database. The number of accident and incidents divided by the total departures at each airline was used as the safety rate. Union websites provided information on unionization at the airlines. Due to the complex nature of the aviation industry, a number of confounding factors could have affected the tests, including mergers, route structures, and legislation. To help control for these confounding factors, this study was limited to airlines with a stable presence in the industry over time, which limited the number of airlines included. No significant difference was found between unionized and non-unionized airlines in this study, though the mean safety rate of unionized airlines was found to be better than non-

unionized airlines. This study did not take into account safety improvements that were union-backed and eventually required at all airlines, regardless of unionization. Due to the large sample size of the small population the difference in safety rate means could be indicative of greater safety in unionized airlines.

## CHAPTER 1

### INTRODUCTION

Aviation is a high-risk industry, with potentially disastrous safety consequences for employees, companies, and the public. As representatives of the front line employees of an airline, pilot and flight attendant labor unions are heavily invested in creating the safest airlines possible. While every airline labor union claims to work towards safety, the actual effect of a union on airline operations is unproven. Safety in airlines is achieved through several different methods, each of which work together to foster safety in the industry. The most common methods to increase safety include regulation, the efforts of individual airlines, and the efforts of labor unions. The purpose of this thesis is to determine the relationship between safety and unionization in US airlines, and to quantify the effect, if any, that labor unions have on safety.

The 2009 Colgan Air crash in New York prompted nationwide outrage over the conduct of smaller regional airlines (Wald, 2009), and resulted in regulation reforms for Part 121 commercial air carriers. (Dorr & Duquette, 2013). The effects of these changes are yet to be fully realized; there is concern that they may be too restrictive and harm the industry's ability to recruit the new pilots desperately needed for the increase in air travel (Thurber, 2013), though the regulation may result in fewer safety errors.

Regulation is, of course, not the only way to increase safety in the airlines.

Particularly in industries with large barriers to entry (such as aviation), management is

concerned with keeping expensive equipment in good working condition. Alaska Airlines recently debuted a “Ready, Safe, Go!” campaign, focusing on a company-wide dedication to safety (Prnewswire.com, 2014). But airlines controlled by boards and other stake holders may focus on short term financial savings, and not adequately take the rare but extreme costs of a safety error into consideration. Indeed, several studies have shown that the myopic views of financially insecure airlines lead to an underinvestment in safety (Noronha & Singal, 2004, and Deppe, Hansen & Swearingen, 2012). This shortcoming leaves the public and airline employees open to long term safety vulnerabilities. Known as a “tombstone technology” (Schiavo, 1997), changes in the aviation industry, particularly expensive changes, often require a large number of deaths before safety innovations become industry standards.

As representatives of front line workers, airline labor unions have long held that safety is one of their biggest priorities; for example, the largest pilots’ union, the Air Line Pilots Association (ALPA), has the motto “Schedule with Safety” (n.d). The American Airlines pilots union, Allied Pilots Association (APA), has a promise that 20% of its members' dues go to “support aviation safety” (n.d.). And the Association of Flight Attendants (AFA) call themselves “Aviation's First Responders” (n.d.), an acknowledgment of the front line work that flight attendants do for aviation safety.

Since the late 1960s, however, the American workforce has seen a decline of unionization. In 1967, overall American worker participation in unions was approximately 28%; in 2011, it was only 12% and falling (Madland, Walter, & Bunker, 2011). If the unions are as good for safety as they claim to be, safety in the airlines could be compromised by decreasing unionization. If, however, the actual effect of unions on

safety is negligible, or even negative, then at least from a safety viewpoint the decrease may be nothing for which to be concerned. Therefore, determining the relationship between unions and airline safety could have a dramatic impact upon how the aviation industry and the public as a whole view labor unions in commercial airlines.

No studies were found that attempted to determine the direct impact that labor unions have on safety in the aviation industry. In other industries, such as retail, coal mining, and construction, studies (Sinclair, Martin, & Sears, 2010, Gillin, Baltz, Gassel, Kirsch, Vaccaro, 2002, and Morantz, 2012) have confirmed that safety culture and safety outcomes are both improved in unionized workplaces. Noronha & Singal, (2004) concluded that companies in poor financial health, possibly as an unintended consequence of union-affected reasons such as high wages or strict working rules, may have an increase in safety error instances as a result of less investment in safety programs or maintenance. Rose (1989) determined that a 9.92% decrease in operating margin results in a 5% increase in total accident rate. But a later study by Raghavan (2012) showed that even poor financial health may not be an indication of safety investment by an airline.

This study proposes to determine if there is a labor union effect on safety in the commercial airline industry by comparing accident and incident rates to the extent of unionization in a company. This difference in mean safety rate between unionized and non-unionized airlines is the “Union Effect,” that is, the measurable effect that a union has on the safety accident and incident rate of individual airlines.

## Literature Review

Support for the positive, neutral, or negative link between safety and commercial airline unionization has not been well researched. However, in other industries, such as retail, coal mining, and construction, research has been done in an attempt to understand the connections between unionization and safety outcomes. A study by Sinclair, Martin, and Sears (2010) determined that union status had a significant positive correlation with the perception of job safety and a good safety culture in the retail industry. The authors indicated an implication of the study is that it is important for managers to alert workers to dangerous situations more effectively, and to practice better safety habits. An alternative implication, however, could be that unions are currently more effective than traditional manager-employee relations at disseminating safety information and nurturing a positive safety culture. A study by Morantz (2012) showed a positive relationship between unionization and safety in coal mines. Although unionization predicts higher total and non-traumatic injuries, it is also true that unionization predicts a substantial and significant decline in traumatic injuries and fatalities. Morantz hypothesizes that these seemingly contradictory findings indicate not only an increase in safety for unionized coal miners, but that reporting of non-traumatic injuries increases in unionized workplaces. These findings concur with the other studies in this research indicating higher incident reporting and a greater awareness of safety culture in unionized workplaces.

Gillin, Baltz, Gassel, Kirsch, and Vaccaro (2002) found there was a positive correlation between unionization and safety in the construction industry. Unionized employees were significantly more likely to feel supported by their peers and superiors,

to be made aware of dangerous situations, to have more safety meetings, and to perceive that risk taking was not a part of their job. This last point has particularly important implications for aviation, as a risk-taker in an aircraft could easily kill hundreds of passengers and innocents on the ground. Risk-taking is not encouraged in the standardized commercial aviation industry, and a risky pilot is a liability in the strictly controlled cockpit.

One problem identified by Morantz in the 2009 meta-analysis is that few, if any, studies attempted to determine which union activities were the ones that had an effect on safety. Beneficial activities may be supported by management or unions in some companies but not in others, which presents confounding variable. It is possible that a program supported by unions in one company or industry would have a similar program supported by management in another company or industry. This possible confounding variable is of some concern to a search for the “union effect” specifically in airlines.

### Financial Resources and Safety Spending

Finite resources are available to an airline. Revenue varies greatly in the aviation industry, due to fluctuating fuel prices and unstable (if not entirely unpredictable) trends in consumer purchases. In recent years, fuel has accounted for an average of 23% of the cost of operating a US commercial airline, and labor costs another 28%, representing the two largest expenditures of an airline (Airlines.org, n.d.). Some of the variation is passed directly to the customer in increasingly common fuel surcharges (Martin, 2012), helping airlines to offset unplanned cost increases. Labor costs, on the other hand, are infrequently negotiated and do not directly rely on the airline's short term ability to pay.

Therefore, maintenance programs and safety investments are areas in which the higher wages negotiated by the labor unions, and their net effect on airlines, may hurt airline safety.

A study by Deppe, Hansen, and Swearingen (2012) found a positive relationship between the level of maintenance expenditures and financial distress for financially weak companies. However, “an inverse relationship between maintenance expenditures and financial distress was found to exist for financially strong companies....given that maintenance cost is a measure of safety, the results provide evidence of myopic behavior in the deregulated period and an erosion of safety between the regulated and deregulated periods (pg. 17)” Overall, this study finds that airlines have become less safe as a result of deregulation, effects of which include lower salaries for workers and lower ticket prices for travelers. But a 1989 study by Morrison and Winston found that as a result of deregulation, and thus the increased cost cutting competition between airlines, airline safety has not been significantly compromised. Deregulation occurred in 1978, around the same time as the decline in unionization (Moore, 1986), and was possibly a factor in the decrease of safety found in the Deppe, Hansen, and Swearingen study.

In 2004, Noronha and Singal found that a whole letter difference in bond rating of an air carrier affected the likelihood of that carrier having a safety error by 10%. Companies with higher bond ratings, a measure of financial health and security, were significantly less likely to have a “safety mishap.” A study conducted by Raghavan in 2012, however, found that there is little relation between the financial health of a company and its spending on maintenance. One of the criticisms of the Noronha and Singal study, which was mentioned in the study itself, is that operating margin and



profitability, the two measures used by the study, are historical trends. The investment in safety, however, is a forward-looking prediction of future payoffs and requirements that are affected by, but also largely independent from historical trends. By looking at the Altman-Z score of a company, the measure of the likelihood of bankruptcy in the next two years, Raghavan's study determined how financially healthy airline companies were. Raghavan then used spending on maintenance as a useful metric for determining safety, much as the Deppe, Hansen, and Swearingen study. Raghavan's study found that, despite there being a non-significant negative relationship between financial health and spending on safety, "airlines in poor financial health do not compromise on safety." (pg. 256) Therefore, although airlines may have limited resources to spread between safety spending and potentially higher union-negotiated labor wages, safety may not significantly be affected by such labor contracts.

Gittell, Von Nordenflycht, and Kochan (2004) conducted a study that brings the financial costs of the union-airline relationship on safety one step further. Their mixed methods study showed that the nature of the relationship between employees and management was more important to the financial health of an airline than the structure of the relationship. The structure may or may not include union presence. Unions that assist in a positive relationship between the company and the employees also help create financially sound airlines. On the other end of the spectrum, airlines with poor employee relations, with or without unions, are going to have a lower likelihood of long-term financial health, resulting in a decreased investment in safety.

## Union Activities to Increase Safety

One of the key ways in which unions attempt to increase safety in airlines is through regulation. For example, ALPA, the largest airline pilot union in the U.S., supported H.R. 182, a bill designed to limit the duty time for pilots regardless of the type of operations they fly (Air Line Pilots Associations, n.d.). Fatigue is a very dangerous condition to fly under (Reason, 1997) as human factors, the interaction between people and machine, have contributed to nearly 80% of all aviation safety errors. Therefore any successful attempt at limiting fatigue would help to increase safety, which airline unions recognize and work for. Other regulation changes ALPA and other unions included having seatbelt signs in commercial cabins, and installing TCAS (Traffic Collision Avoidance System) in every cockpit. These and other union lobbying efforts at regulation of the aviation industry have helped to increase safety through the entire industry.

Other union attempts at improving safety are through litigation rather than regulation. The Teamsters Local 1224 (Airline Professionals Association, n.d.) is a union representing pilots from eleven regional airlines from around the country. It recently filed a lawsuit against ABX Air on behalf of a represented captain, who had been terminated for “exercising his FAA-mandated authority to ensure safe flight operations and his refusal to operate the aircraft in a manner that was prohibited by FAA-approved aircraft procedures (Airline Professionals Association, n.d.)” The captain had “identified safety concerns” while operating in Japan, and requested changes to the flight plan. He was fired, allegedly for the economic inconvenience, and his dismissal was announced to all the crew members at ABX Air. The union determined that the announcement created fear of reprisal for other captains who might attempt to operate their aircraft in a safer but less

economic way. The Teamsters filed suit not only to protect the individual captain, but to secure every captain's right to operate their aircraft in a manner they deem fit for every pilot at ABX Air. While the effect of an accident that does not occur is extremely difficult to determine, ensuring that pilots are able to amend or cancel a flight plan for safety reasons is paramount to good airline safety.

Educating members is another way that unions seek to increase safety for their members, which consequently increases safety for the entire airline and air travel industry. Information campaigns are popular methods for unions to improve workplace conditions at airlines. ALPA produced an informative and easy-to-read brochure titled "The Airline Pilots Guide to Fighting Fatigue" that was inserted into the Air Line Pilot magazine mailed to union members (Wykoff, Kay, Kilmer, Nordengen & Gauthier, 2008). This brochure, which is also available online in PDF format, contains the definition and causes of fatigue, how to spot fatigue in oneself and others, and strategies to try to mitigate the effects of fatigue. While pilots are exposed to this information from many sources throughout their careers, reminders and reinforcement increase the effectiveness of their knowledge. The Association of Flight Attendants has a "Latest News" segment on their website that includes videos and articles to remind flight attendants of the safest procedures and other safety upgrades the AFA has secured (AFA.org, n.d.).

There is, of course, plenty of incentive and opportunity for organizations to provide information of all sorts to their employees. Unions, however, may be able to reach members of organizations that are too small to devote many resources to informing employees of best practices or potential workplace hazards. And they may be more

effective at promoting safety practices that are labor or resource intensive and therefore may not be promoted by the airline.

### Purpose of the Study

As previously discussed, this study found limited research done to determine if there is a difference between airlines with or without a labor union and that airline's safety record. The meta-analysis by Morantz published in 2009 indicated a need to identify the empirical relationship between safety and unions. Morantz identified that many unions use a safety emphasis to create the impression that they are beneficial not just to their individual members, but to the group and industry as a whole. Research supporting this, however, appears to be absent. In the face of declining union membership, determining the truth of the union impact on safety could have enormous implications for the safety and public confidence in air travel. Therefore, the purpose of this study is to test the effect of labor unions on safety as it relates to the commercial airline industry. The independent variable is defined as the safety rate (the total number of accidents and incidents divided by the total number of departures) between 1990 and 2013, including accidents that result in deaths or major aircraft losses, and incidences that result in injuries or minor aircraft damage. The dependent variable is the extent of unionization, if any, at the airline. Unionization includes both pilot and flight attendant workgroups, who have been unionized for all or part of the time between 1990 and 2013, or not unionized at all.

## Research Questions

To guide the tests, the research question is:

Is there a difference in safety rates of unionized and non unionized U.S. commercial airlines?

To further clarify the relationship, a sub-question was also asked:

Is the safety rate difference affected by the severity of loss of safety (accidents versus incidents)?

By answering these questions, this study determined if labor unions affect the safety rate of an airline as compared to non-unionized airlines. If a positive union effect can be found, the decrease in unionization should be considered a problem for future safety in the airlines. If a negative correlation is found, the usefulness of unions may still be considered based on other merits, but not necessarily on the grounds of safety.

## CHAPTER II

### METHODS AND PROCEDURES

#### Introduction

In order to determine the relationship between labor unions and safety in the US airlines, a quantitative study was conducted. This study used public data available online on airline safety errors and the extent of unionization. The data collected was used for a statistical test to determine the “union effect” on safety.

#### Participants

The participants in this study were commercial airlines that operate mostly or wholly within the United States of America. These airlines were identified through the Federal Aviation Administration (FAA) website as being US-based and certified for operations in the United States National Airspace. The constantly merging and changing nature of the airline industry creates a possible confounding variable for finding the “union effect,” and complicated this study. While major airlines maintain a stable presence in the industry throughout years and decades, regional airlines create a shifting landscape of unionization and cultures, through creation, mergers, and bankruptcies. Other times, the regional airline flies on behalf of multiple major carriers, such as SkyWest's operations for United, Delta, Alaska, American Eagle, and US Airways (Customer service plan, n.d.). Because of the difficulty of determining the impact of these

mergers on the employees and their unionization, each airline was considered on its own when it exists as an individual company, regardless of past or future unionization and mergers. In the case of regional airlines with strong ties or outright ownership by a major airline, any incidences or accidents were considered for the record of the regional airline alone, and did not reflect on the incident/accident rate of the major airline. This ensured that the unionization of each airline was considered for its own incident/accident rate, and gave a more accurate “union effect.” For example, non-unionized SkyWest's incident/accident rate did not affect the unionized Alaska Airline's incident/accident rate, even though many Alaska Airlines flights are operated by SkyWest (Customer Service Plan, n.d.). Airlines that operated for at least 15 years since 1990, had an average of at least 130,000 departures per year, and had data available through the National Transportation Safety Board and the Bureau of Transportation Statistics were considered for this study.

Due to the nature of this study, approval from the Institutional Review Board at the University of North Dakota was not required as there was no data collection pertaining to individuals.

### Data Collection

The methods design for this project consisted of a collection of existing data. All the required information was a matter of public record. Accidents and incidents are required by federal law to be reported to the National Transportation Safety Board (NTSB). Airlines were identified through the FAA website. Unionization statistics were available through individual union websites and individual airline websites.

### *Incidents and Accidents*

Accidents and incidents have specific definitions according to the NTSB and are laid out in a 1994 document on the Investigation Process Research Resource Site.

Essentially, an accident is a loss of safety where a fatal or major injury happens to a person or aircraft, including engine damage or hull loss. An incident is defined as “an occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation” (Investigation Process Research Resource Site, 1994).

These levels of safety measurement are set by industry and legal professionals, who have had years to develop exact criteria for safety errors. This ensures that, while each accident is unique, similar results are grouped together, making for a more accurate comparison. Using the same levels as the NTSB and FAA also enables the researcher to access records and evaluate safety errors for the appropriateness of including them in the tests.

As with unionization, incidents and accidents were measured in different ways for different tests. The total number of accidents and incidents between 1990 and 2013 was determined for each airline. The number of incidents, accidents, and incidents/accidents combined were then be divided by the total departures between 1990 and 2013 of each airline, creating an accident, incident, and total safety error rate that could be fairly compared across different airlines. Though reporting safety rates in terms of hours or miles flown is common, comparing safety rates by number of departures is a good metric because the most dangerous and incident/accident prone portions of a flight are take-off and landing (Statistical Summary of Commercial Jet Airline Operations, Worldwide



operations 1959-2014, 2014, pg. 20). Both take-off and landing happen only once per flight, regardless of the total number of hours flown. In the same eight hours, a major airline might only fly between a single city pair, while a regional airline could complete up to six different legs. So while they might be flying for the same amount of time, a major and a regional airline have a very different number of opportunities for having an incident or accident for a similar number of hours of operation. At the same time, a major airline might have thousands of operations a day, to a regional airline's dozens or hundreds of operations. By creating an accident/incident rate that takes both these concerns into consideration, very different airlines can be more accurately compared. Aircraft manufacturer Boeing also measures losses per million departures, recognizing that not all flight hours carry the same probability for damage (Statistical Summary of Commercial Jet Airline Operations, Worldwide operations 1959-2014, 2014).

A separate test was run for each rate to determine if there is a difference in safety rate for unionized and non-unionized airlines for only incidents, only accidents, or on the total rate of both accidents and incidents.

The National Transportation Safety Board (NTSB.gov, n.d.) is the agency that investigates and collects records of aviation accidents and incidents. These records are public information, and were gathered online for this study. The database was filtered for operations within the United States by US Commercial carriers operating under Part 121 (Air Carrier) certifications. 2032 records met the search criteria, though only the larger passenger airlines were included in the study. 330 cases, including accidents and incidents were included.

Incidents and accidents that occurred outside of the United States were excluded from this study. There are simply too many confounding factors involved with such incidents, including language and cultural misunderstandings, varying safety standards between countries, and possible unfamiliarity with international procedures. The exclusion of these accidents makes comparing larger, international airlines and smaller, US-only airlines more equitable.

### *Airlines*

The airlines included in the study were AirTran/ValuJet, Alaska, America West, American, Continental, Delta, Frontier, Horizon, JetBlue, Mesa, SkyWest, Southwest, United, and US Airways. Though large enough to be considered for the study, American Eagle/Envoy/Simmons Air has too convoluted a history to be reliably included in the study. The large number of mergers, rebranding, unionization and de-unionization create enough confounding factors to make any difference between safety rates for unionized and non-unionized unreliable. And though they were both large and consistent enough to be included in the study, the two airlines by the name ExpressJet were excluded. Since the accident reports didn't specify which ExpressJet they accident report was for, there was too much difficulty of separating each airline's actions for proper analysis.

Table 1. Preliminary Sample of Annual Departures. Departure information is from the Bureau of Labor Statistics for example years 1990, 1995, 2000, 2005, 2010, and 2013. The average of the sample years is included.

| Airline Name    | 1990    | 1995   | 2000   | 2005    | 2010    | 2013    | Average | Note |
|-----------------|---------|--------|--------|---------|---------|---------|---------|------|
| Southwest       | 338,106 | 685220 | 903831 | 1029284 | 1114811 | 1124432 | 865947  | A    |
| Delta           | 836530  | 878908 | 894470 | 644692  | 725151  | 759391  | 789857  | A    |
| American        | 747040  | 679216 | 716528 | 666371  | 534179  | 530412  | 645624  | A    |
| US Airways      | 1012767 | 768513 | 723548 | 418168  | 401964  | 411256  | 622702  | A    |
| SkyWest         |         |        |        | 509613  | 589166  | 616956  | 571911  | A    |
| United          | 617658  | 713031 | 735075 | 481182  | 340184  | 504231  | 565226  | A    |
| Northwest       | 474697  | 509929 | 537803 | 478068  |         |         | 500124  | A    |
| Envoy Air       |         | 200322 | 443083 | 516558  | 426046  | 425408  | 402283  | B    |
| Continental     | 446215  | 426891 | 387551 | 295357  | 238888  |         | 358980  | A    |
| ExpressJet (ev) |         | 207868 | 220221 | 303573  | 314949  | 734866  | 356295  | B    |
| ExpressJet (xe) |         | 206430 | 300130 | 396013  | 379988  |         | 320640  | B    |
| Trans World     | 274922  | 266977 | 263155 |         |         |         | 268351  | C    |
| Eastern Air     | 261759  |        |        |         |         |         | 261759  | C    |
| Endeavor Air    |         |        |        | 237858  | 254185  | 291298  | 261113  | B    |
| Mesa            |         | 218002 |        | 312057  | 171713  | 142997  | 233924  | A    |
| Comair          |         |        | 167759 | 370699  | 142587  |         | 227015  | C    |
| America West    | 222001  | 191983 | 210083 | 195815  |         |         | 204971  | A    |
| Westair         | 180873  |        |        |         |         |         | 180873  | C    |
| Chautauqua      |         |        |        | 231283  | 167444  | 137952  | 178893  | B    |
| AirTran         |         | 6539   | 101638 | 193628  | 246588  | 172934  | 144265  | A    |
| Alaska          | 102537  | 133595 | 147535 | 159199  | 139258  | 156645  | 139794  | A    |
| JetBlue         |         |        | 10134  | 110181  | 197979  | 240654  | 139737  | A    |
| Independence    |         |        |        | 134339  |         |         | 134339  | C    |
| Horizon Air     | 163465  | 197743 | 160363 | 155462  | 115922  | 105     | 132177  | A    |
| Business Exp    |         | 131569 |        |         |         |         | 131569  | C    |
| Piedmont        |         |        |        | 156472  | 115999  | 111357  | 127942  | C    |
| Cape Air        |         |        |        | 115530  | 125362  | 117412  | 119435  | C    |

Table 1 cont.

| Airline Name   | 1990  | 1995   | 2000   | 2005   | 2010   | 2013   | Average | Note |
|----------------|-------|--------|--------|--------|--------|--------|---------|------|
| PSA Airlines   |       |        |        | 113381 | 120391 | 115745 | 116886  | C    |
| Air Wisconsin  | 87492 | 34200  | 113934 | 162389 | 156307 | 145886 | 116701  | D    |
| Hageland Avit  |       |        |        | 78689  | 99616  | 113634 | 97313   | D    |
| Trans States   |       | 133975 | 105119 | 139203 | 52579  | 54499  | 97075   | D    |
| Colgan Air     |       |        |        | 86933  | 99216  |        | 93074   | C    |
| Valujet        |       | 67617  |        |        |        |        | 67617   | A/E  |
| Aloha Airlines | 65449 | 68285  | 67739  | 56051  |        |        | 64381   | D    |
| Hawaiian       | 71167 | 59036  | 64063  | 48919  | 68523  | 72686  | 64065   | D    |
| Compass        |       |        |        |        | 55486  | 60975  | 58230   | C/D  |
| Skyway         |       |        |        | 57646  |        |        | 57646   | C/D  |
| Frontier       |       | 14502  | 37361  | 76252  | 80465  | 75490  | 56814   | D    |

## Notes-

- A- Airline was included in the study.
- B- Airline was excluded from the study due to large numbers of confounding factors, including large numbers of mergers, name changes, divisions, acquisitions, or name duplications.
- C- Airline was excluded from the study due to too short a history.
- D- Airline was excluded from the study due to being too small in size.
- E- ValueJet was included in the study even though it operated for only a few years because it was a direct predecessor to AirTran

*Departure Records*

The number of operations used in the safety rate for each carrier was collected through the Research and Innovative Technology Administration's Bureau of Transportation Statistics website. This is public information. Departures Performed totals were available for most major carriers, by year, beginning in 1990 through 2013. Take-off and landing are the most dangerous phases of flight (Statistical Summary of Commercial Jet Airline Operations, 2014) and where an accident or incident is most

likely to occur. Therefore, departures performed was used in this study, as a measure of individual flights performed, to determine a carrier's safety rate. Some air carriers did not have reports for departures performed for years they were in service, and so any accidents or incident report during those years were removed from the study. Atlantic Southeast, a relatively large and stable airline operating for most of the years between 1990 and 2013, was excluded because no departure figures were listed.

### *Unionization*

The largest pilot's union, the Air Line Pilots Association (ALPA, n.d.) website supplied the majority of unionization data for pilots. Other pilot unions' websites, including the Transportation Worker's Union (TWU.org, n.d.), the Teamsters (teamsterair.org, n.d.) , Southwest Airline Pilot's Association (TWU.org, n.d.), Frontier Pilots Association (TWU.org, n.d.), and the Allied Pilot's Association (Alliedpilots.org, n.d.), supplied information about unionization for non-ALPA pilots.

The Association of Flight Attendants (AFA.org, n.d.) represents the majority of unionized flight attendants at the airlines included in the study. AFA membership information was supplied through emails with a representative. Membership information for non-AFA unionized flight attendant workforces came from websites for the International Association of Machinists and Aerospace Workers (IAM.org, n.d.), Transport Workers Union (TWU.org, n.d.), and the Association of Professional Flight Attendants (APFA.org, n.d.).

Airlines were grouped according to how long they have been unionized. Group 1 was airlines that have been continuously unionized during their operations between 1990

and 2013. These airlines were Air Tran, Alaska, American, Continental, Horizon, Northwest, Southwest, United, and US Airways. Group 2 was airlines that were not unionized, or that became unionized partway through their operations between 1990 and 2013. These airlines were America West, Delta, JetBlue, Mesa, SkyWest, and ValuJet. The same tests were run with each group to determine if a statistically significant difference could be found between different levels of unionization and safety.

### Statistical Tests

The dependent variable in this test was the unionization of airlines, measured as previously described. The independent variable was the number of safety incidences and accidents, also measured as previously specified. A *t*-test was used to determine if there was a difference between the mean of the safety rate of Group 1 (airlines with long standing unionization), and the mean of the safety rate of Group 2 (recently or non-unionized airlines). Several tests were run to determine if the difference between safety rates was affected by the severity of the safety error.

Table 2. Airlines Included in the Study. With the total number of departures (Deps '90-'13), the total number of incidents (Incdnts), the incident safety rate (Inc Rate), the total number of accidents (Accdnts), the accident safety rate (Acc Rate), the total accidents plus incidents (Acc+Inc), and the accident plus incident safety rate (Acc+Inc Rate). Sorted into airlines with longstanding unionization (Group 1), or the recently or non-unionized airlines (Group 2).

| <b>Airline Name</b>               | <b>Deps '90-'13</b> | <b>Incdnts</b> | <b>Inc Rate</b> | <b>Accdnts</b> | <b>Acc Rate</b> | <b>Acc+Inc</b> | <b>Acc+Inc Rate</b> |
|-----------------------------------|---------------------|----------------|-----------------|----------------|-----------------|----------------|---------------------|
| <b>Longstanding Unionization</b>  |                     |                |                 |                |                 |                |                     |
| AirTran                           | 2,939,497           | 2              | 0.68            | 10             | 3.40            | 12             | 4.08                |
| American                          | 15,998,872          | 44             | 2.75            | 79             | 4.94            | 123            | 7.67                |
| Alaska                            | 3,399,254           | 22             | 6.47            | 10             | 2.94            | 32             | 9.41                |
| Continental                       | 7,929,064           | 37             | 4.67            | 34             | 4.29            | 71             | 8.95                |
| Horizon                           | 3,611,726           | 7              | 1.94            | 8              | 2.22            | 15             | 4.15                |
| Northwest                         | 9,522,127           | 29             | 3.05            | 33             | 3.47            | 62             | 6.51                |
| Southwest                         | 20,971,304          | 33             | 1.57            | 39             | 1.86            | 72             | 3.43                |
| United                            | 13,906,968          | 68             | 4.89            | 68             | 4.89            | 136            | 9.78                |
| US Airways                        | 14,320,979          | 32             | 2.23            | 37             | 2.58            | 69             | 4.82                |
| <b>Non- or Recently Unionized</b> |                     |                |                 |                |                 |                |                     |
| America West                      | 3,525,174           | 8              | 2.27            | 20             | 5.67            | 28             | 7.94                |
| Delta                             | 18,189,7222         | 63             | 3.46            | 73             | 4.01            | 136            | 7.48                |
| Jet Blue                          | 1,954,866           | 7              | 3.46            | 2              | 1.02            | 9              | 4.60                |
| Mesa                              | 3,286,607           | 8              | 2.43            | 12             | 3.65            | 20             | 6.69                |
| SkyWest                           | 6,056,247           | 11             | 1.82            | 10             | 1.65            | 21             | 3.47                |
| ValuJet                           | 212,477             | 3              | 14.12           | 5              | 23.53           | 8              | 37.65               |

All timeframes are 1990-2013

Safety rates are reported in the number of incidents, accidents, or incidents plus accidents per million departures.

## CHAPTER III

### RESULTS

#### Independent *t*-Test

There was no significant difference between the nine Group 1 airlines with either longstanding unionization (those unionized before 1990, or airlines formed after 1990 but unionized the same year), and the six Group 2 airlines recently unionized or not unionized.

For the accident rate (number of accidents per million departures), there appeared to be a difference between the airlines with longstanding unionization ( $M= 3.36$ ,  $SD= 1.13$ ,  $N=9$ ) and the recently or non-unionized airlines ( $M= 6.56$ ,  $SD= 8.51$ ,  $N=6$ ,  $t(5.117)= -.916$ ,  $p>.05$ , two-tailed) with the unionized airlines appearing safer, though the difference was not significant. For the incident rate (number of incidents per million departures), there also appeared to be a difference between the airlines with longstanding unionization ( $M= 3.14$ ,  $SD= 1.85$ ,  $N=9$ ) and airlines that were recently unionized or non-Unionized ( $M= 4.59$ ,  $SD= 4.73$ ,  $N=6$ ,  $t(13)= -.829$ ,  $p>.05$ , two-way). Again the unionized airlines appeared to have fewer incidences than the recently or non-unionized airlines, though the difference was still not significant.

The largest difference between safety means was in the total safety rate (accidents + incidents per million departures). The difference was still not found to be significant,



however, between airlines with longstanding unionization ( $M= 6.54, SD= 2.51, N=9$ ) and recently or non-unionized airlines ( $M= 11.31, SD= 13.02, N=6, t(5.248)= -.886, p>.05$ ).

#### ANOVA

No significance was found with a one-way independent ANOVA between airlines that were unionized between 1990 and 2013, and airlines that were not unionized.

Accident Rate-  $F(1, 13)= 2.146, p> .05$ . Incident Rate- $F(1, 13)= 3.066, p>.05$ . Total

Safety (Accident+Incident) Rate-  $F(1, 13)= 2.792, p>.05$

## CHAPTER IV

### DISCUSSION

#### Discussion of Findings

Previous research in other industries indicates that labor unions have a distinct positive effect on workplace safety. In some industries such as coal mining, this effect is significant enough to play a role in outcomes between different workplaces in the same industry. In other industries such as construction, labor unions played a significant role in the safety culture at different workplaces, including making workers feel more supported and less likely to take risky actions. The history of unionization in the airlines indicates that all unions consider themselves on the forefront of safety promotion, a claim that is supported by slogans and actions at all of the major airline unions. Airline labor unions have fought to increase on the job safety for their members through litigation, supporting regulations, and member education. Labor unions were instrumentals in pushing for the adoption of safety measures such as TCAS and the anti-fatigue rest rules of FAR117. Through education labor unions attempted to decrease threats from terrorists and fatigue. Union sponsored litigation ensured that individual pilots and flight attendants were able to fulfil their safety-focused job functions without fear of reprisal. Therefore, it was surprising that labor unions were not found in this study to have a distinct positive effect on safety rates of unionized or non-unionized airlines. There may be several reasons for this unexpected finding, including limitations of the t-test in a small population, many

confounding factors of the industry, and the number of smaller airlines that were excluded from this study.

#### Limitations of the *t*-test

The *t*-test didn't find any significant differences between the safety rate means of the unionized and recently or non-unionized airlines. The *t*-test, though, is designed to take a small sample of a large population. The airlines included in this study, on the other hand, were a small population from which this study took a large sample. Of the largest, most established airlines (those with over 130,000 average departures and operating most of the years between 1990 and 2013), only three were excluded because of overly complicated or missing data. Therefore, though the *t*-test didn't find a significant difference, it could be surmised from the mean safety rates alone (total safety error rate of 6.54 incidents and accidents per million departures) for longstanding unionized airlines, versus 11.31 accidents and incidents per million departures for recently or non-unionized airlines), that unionized airlines do in fact have a better safety rate than non-unionized airlines.

#### Confounding Factors

The aviation industry is very complex. Despite the exceptionally high barriers to entry, such as the highly skilled and regulated workforces, million dollar aircraft, and gate spaces in airports, or perhaps because of them, airlines are constantly entering and exiting the industry, or merging and dividing amongst themselves. Since Deregulation in 1978, airlines have been in especially fierce competition, adjusting investments in safety

and their labor groups as the industry fluctuates (Morrison and Winston, 1989). The workforce is also constantly changing; at many regional airlines, it is expected that most pilots will move up to a larger airline as quickly as they can, staying at the regional airlines perhaps a decade or less of their career (Zillman, 2014). At major airlines, pilots may only be able to work for a short amount of time due to mandatory retirement at age 65, or other career-limiting factors. The short term nature of the workforce can mean that a positive safety culture can be harder to build at the regional airlines.

Unionization is a long and difficult process, and requires an engaged workforce with a long enough memory to be willing to organize (ALPA.org, n.d.). Because of this, unionization is less likely to find favorable ground in the smaller, regional airlines where turnover is high. These airlines also have smaller salaries for their workforce (Aviation Sciences, n.d.), which drastically limits the possible dues amount and curtails any potential unions' finances. Less well known airlines may also be more willing to risk their reputations with unethical maneuvers or outright illegal union busting activities than a large carrier concerned with their public image. These same airlines are more likely to employ a less experienced workforce (Zillman, 2014), possibly follow less stringent maintenance schedules, or favor economics over safety. All these issues could lead to a high level of correlation between high accident/incident rates, regardless of unionization of the airline. Future studies that include these smaller airlines would be more comprehensive and might have a different outcome.

Another confounding factor is the extreme range of causes of accidents and incidents in the airlines. Some accidents are attributed directly to a failure of the airline; ValuJet's 1996 crash into the Everglades killing everyone on board is attributed partly to

improper loading procedures of hazardous material, and the lack of recommended fire detectors in the cargo hold (NTSB, 1998). But other accidents that appear in this study are less the fault of the airline, such as American and United's involvement in the 9/11 terrorist attacks. In other areas, fault can be much more difficult to assign. Bird strikes and turbulence are common causes of inflight incidents. These are seemingly random “acts of God” that happen at any airline, though they may be more or less prevalent depending on a particular airline's routes. An airline with a good safety culture, however, may be more proactive in routing to avoid known bird areas, or have better turbulence procedures in place (Customer Experience Featured Article, 2014). Therefore these accidents and incidents have been included in the study, as they may be indicative of a failure of safety culture, and to give a complete range of accidents and incidents.

### Labor Unions’ Safety Effect on Non-Unionized Airlines

Despite the fact that some airlines are not unionized, labor unions can have an effect on the entire airline industry. This is particularly true of safety efforts that may not be seen as cost effective, and not voluntarily implemented by airlines until they are required to do so. Safety efforts include the requirement of fire detection and suppression systems in cargo holds, putting TCAS units in all cockpits, and the creation of anti-fatigue FAR 117 rest rules. These efforts were strongly backed by airline labor unions such as ALPA and the AFA, and often fought by airline lobbyists. When adopted, these safety-positive changes were required at all airlines, not just those that were unionized. This study, however, only looked at the mean safety rate difference between unionized and non-unionized airlines. Therefore, any effects that labor unions have on safety that

are required for the entire industry did not affect the outcome of this study. It cannot be concluded that labor unions have no effect on safety. It can only be shown that there was no significant difference in safety rates between unionized and non-unionized airlines.

### Recommendations for Further Study

In order to get a safety rate that encompassed a large timeframe, airlines with a smaller number of average yearly departures, or with shorter histories were not included in this study. These airlines may tend to be less unionized, and may have a higher rate of safety incidents and accidents. In order to get a different understanding of the effect labor unions have on safety rates, a study that included these smaller airlines might be useful. Such a study would likely have to encompass a smaller timeframe and may be less likely to capture a true safety rate due to the infrequent occurrences of airline accidents and incidents.

Unionization of mechanics, ground crew, and dispatchers was not examined for this study. This was due to the complicated nature of these labor groups, who may be contracted workers not under direct airline employment, or the employees may work for more than one airline depending on the operations any given airport. Each of these front line worker groups, however, can have a profound impact on safety, from planning to operations. Labor unionization's effect on safety could be different if these groups were included in future studies.

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