Aviation Safety, Quality, and Economic Impact: A Policy Research System

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Abstract

The United States airline industry is experiencing an underlying mix of challenges in areas of Quality, Safety, and Economics. This research focuses on three major components and the economic impact of each. The first aspect, Airline Quality and Safety Analysis, lays down a focus on imperative safety factors that affect major airlines in overall performance. Quality and Safety findings relate to potential safety shortcomings in the second aspect, aviation maintenance Safety Management Systems (SMS). The third aspect involves implementing the Policy Research Construct (PRC) methodology, which relates the underlying challenges in Airline Quality, Safety, and Economic areas by conducting research and analysis, in order to provide policymakers with action-oriented recommendations for correcting problems.

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Airline Quality Rating

The leading objective method for assessing airline quality was developed and announced by researchers in 1991 and has continued to do so every year since. The national report, entitled the Airline Quality Rating (AQR) has built upon 28 continuous years of work. The present study attempts to move beyond basic descriptive information of air travelers to identify attitudinal patterns and relationships in the way consumers view the commercial air industry. Using the AQR, researchers are able to easily observe major airline's differences and deviations comparing them against the industry average and identifying specific airlines that have either performed well or need reform, all enabling a detailed analysis of airlines overall quality (AQR, 2018).

Criteria. The Airline Quality Rating employs a multi-factor, weighted average approach utilizing published, publicly available data from the Department of Transportation (D.O.T.) *Air Travel Consumer Report*, which had not previously been used in the industry. In considering elements for inclusion in the rating scale, two basic criteria were needed to be met; 1) the

element must be obtainable from published data sources for each airline; and 2) the element must have relevance to consumer concerns regarding airline quality. The criteria were narrowed down to four qualifying consumer important categories. These four categories include, On-Time Arrivals, Involuntary Denied Boarding's, Mishandled Baggage, and Consumer Complaints and are all reported and publicly available through the *Air Travel Consumer Report* (AQR, 2018).

Weights. AQR weights were originally established by surveying 65 airline industry experts regarding their opinion as to what consumers would rate important (on a scale of 0 to 10) in judging airline quality. Each weight and element were assigned a plus or minus sign, reflecting the nature of impact for that criterion on a consumer's perception of quality. For instance, the criteria of on-time arrival performance is viewed as a positive element because it is reported in terms of on-time successes, suggesting that a higher number is favorable to consumers. The weight for this criterion is high due to the importance most consumers place on this aspect of airline service. Conversely, the mishandled baggage criteria are included as a negative element and is reported in terms of mishandled bags per 1000 passengers served, suggesting that a higher number is unfavorable to consumers. Because having baggage arrive with passengers is important to consumers, the weight for this criterion is also high. Weights and positive/negative signs are independent of each other (AQR, 2018).

When all criteria, weights, and impacts are combined for an airline over the year, a single interval scaled value is obtained and is comparable across airlines and across time periods

Procedure. The Airline Quality Rating criteria and the weighted average methodology allow a focused comparison of domestic airline performance. Unlike other consumer opinion approaches that have relied on surveys and subjective opinion, the AQR continues to use a mathematical formula that considers multiple weighted objective criteria to arrive at a single,

fully comparable rating for airline industry performance. In the spring of 2002, a nationwide survey of frequent flyers was conducted that allowed a revisiting of the weights for the AQR elements. Analysis of the sample of 766 opinions showed no appreciable difference in the relative weights for the AQR elements. To maintain comparability across the years, the weights have been held constant (AQR, 2018).

The Airline Quality Rating provides both consumers and industry watchers a means for monitoring comparative quality for each airline on a timely basis, using objective, performance-based data. Over its 28-year history, the Airline Quality Rating has been cited as an industry standard for comparing airline performance and currently stands as the longest regularly published rating available for airline performance.

Airline Safety

Commercial air travel is the preferred method of travel in the United States. Large volumes of passengers and the risks involved in flight operations make commercial aviation a high-consequence industry (Cusick, Cortés, and Rodrigues, 2017). Due to safety concerns for passengers and the public, air travel in the United States is heavily regulated by the Federal Aviation Administration. The responsibilities of the FAA include the regulation of aviation to promote and improve safety (Cusick, Cortés, and Rodrigues, 2017). Regulations that are created and required by the FAA define the minimum standards that manufacturers, maintenance technicians, certificated pilots, and operators must comply with.

The commercial aviation safety aspect of this research analyzes data gathered from various government and international organizations through reports to determine individual airline's degree of safety. The four major categories of aviation safety pertaining to airline

performance that are to be examined include: accidents and incidents of each individual airline, governmental enforcement actions, airline operations, and airline financial stability.

Accidents and incidents. Accidents and incidents will be categorized by the degree of severity. Major accidents are those that include an aircraft that is destroyed, there are multiple fatalities, or a single fatality coupled with substantial damage to an aircraft. Serious accidents are categorized by either one fatality without substantial damage to an aircraft or at least one serious injury and an aircraft was substantially damaged. Injury accidents include no fatalities, at least one serious injury, and no substantial damage to an aircraft. Damage accidents are categorized by no fatalities, no serious injuries, but an aircraft received substantial damage. Lastly, an incident is categorized by something that happened during the operation of an aircraft which did or could affect the safety of operation, but which did not rise to the severity of an accident (NTSB, n.d.).

Enforcement actions. Enforcement actions are categorized first by the Airline which suffered the penalty. This is broken down further by the reason for the sanction, the dates these sanctions occurred and ended, and the amount each airline was required to pay as a result (FAA, 2019).

Airline operations. Airline operational safety is determined through the analysis of three categories. These three categories include the airline's operational fleet age, route profiles, and airline participation in IATA Operational Safety Audit (IOSA).

Financial stability. Financial stability considerations for each individual airline are assessed through various reports from the Department of Transportation's Bureau of Transportation Statistics, including the 2017 Annual Airline Rankings which outlines revenue passenger miles, passengers carried, available seat-miles, operating revenue, operating profit/loss

and margin, as well as full time equivalent employees. Additionally, Carrier Snapshots and Net Income Reports are analyzed (BTS, 2018).

Aviation Maintenance Safety Management Systems

Safety Management Systems, or SMS programs, are standardized approaches for aviation organizations to oversee safety and provide a systematic approach to achieving acceptable levels of safety risk (FAA, 2017). Organizations may participate in safety programs to ensure the safety of their employees, passengers, and the general public. Safety measures can cost an organization a significant amount annually, however cutting safety management system costs can produce greater financial strain in insurance and lawsuits in the event of an accident. Conversely, aviation organizations can see a return on their investment in safety programs when injury and material losses are reduced. The SMS structure was designed by the International Civil Aviation Organization (ICAO) to standardize the program across various countries and operations. The structure of a Safety Management Systems is composed of four functional components or "pillars." These pillars include Safety Policy, Risk Assessment, Safety Assurance, and Safety Promotion.

Safety policy. The first component of SMS, Safety Policy primarily demonstrates management's commitment to improving safety in the organization. This component defines methods, processes, and organizational structure in meeting safety goals and establishes management transparency. The approach, processes, and policies needed to meet safety objectives are fully outlined and documented, and employee reporting and resolution systems are developed. Both employee and management accountability as well as cross-organizational communication and cooperation are imperative here.

Risk assessment. The second component of SMS consists of assessing acceptable risk and reviewing or determining the need for new or revised risk controls. Here, a formal process is developed. This process is typically composed of describing the system, identifying the hazards, assessing the risk, analyzing the risk, and finally controlling the risk.

Safety assurance. The third component of SMS involves evaluating and improving the effectiveness of the implemented risk controls and supports identifying new potential hazards. This pillar ensures compliance with the Federal Aviation Administration's regulations, standards, policies and directives, and with the SMS requirements. To support compliance, organizations participate in Information Acquisition, in the form of employee reporting, evaluations and audits, as well as Data Analysis and System Analysis. Here, insight is provided regarding opportunities or methods for improving safety and minimizing risk.

Safety promotion. The fourth and last component is SMS Promotion. This pillar, most importantly, includes providing SMS training to the organization's employees. Additionally, communication and other actions may be included as the organization advocates and encourages a strong, positive safety culture. Some other safety promotion activities can include, system and safety communication and awareness, matching competency requirements to system requirements, and circulating learned safety lessons. At this level, every employee plays a vital part in the safety of the organization.

Currently, the Federal Aviation Administration (FAA) only requires authorized part 121 commercial air operators in the United States, to develop and implement a Safety Management System. The FAA and ICAO have both released documents containing safety standards defined in safety management systems. However, the lack of research into the implementation and effectiveness of SMS in aviation maintenance has been mentioned by McDonald, Corrigan, Daly

and Cromie in a study of four maintenance organizations entitled *Safety Management Systems and Safety Culture in Aircraft Maintenance Organizations* (2000). Additional challenges arise when considering the field's general substandard safety culture and the poor adherence to SMS. Adding to that, maintenance professionals are both expected and required to perform the highest standard of work whilst working in an unsafe environment. Considering this, it becomes apparent that maintenance operations alone have their own internal challenges that affect the overall performance of an organization as a whole.

Policy Research Construct

This research will utilize the Policy Research Construct (PRC), as introduced by Chien-tsung Lu and Brent D. Bowen, 2012, as a new systemic policy-making model. Lu and Bowen gathered feedback on the policy construct in 2002, 2003, and 2004, from domestic and international scholars, and first introduced the model in the aviation security field. The Policy Research Construct (PRC) is implemented by conducting research and analysis on an existing social problem, in order to provide policymakers with action-oriented recommendations for fixing the problem. The PRC includes three policymaking phases: Policy Review, Policy Research, and Policy Action. Instead of the traditional approach of treating each phase as a linear, one-time process, the model is intended to combine policy review, policy research, and policy analysis as a cyclic, discursive whole. Throughout the model, the user is to incorporate new information and either continue on the path outlined, or back-track as appropriate.

Policy review. The policy review phase of the model includes first identifying the aviation policy-related problem that needs change, identifying the policy issues and legislation, and finally conducting regulatory reviews and acquisition.

Policy research. The phase of policy research includes determining data collection tools to be used, conducting policy analysis, and examining the analytical findings.

Policy action. During the policy action phase of the model, pilot-testing is run, resolved, and evaluated, and finally recommendations of policy or regulatory change are presented to the appropriate body.

Economic and Policy Outcomes

Within the focus areas of airline quality and safety management, the policy and economic considerations enter at the strategic decision-making phase. Where quality factors influence the various elements of operations and safety management, the financial bottom line of a company will be impacted. This concept can be applied across many different businesses and industries. We see one such case example that is currently active and on-going with the nationally visible issue of Southwest Airlines grounding numerous aircraft due to potential maintenance problems. Because of these safety concerns, the carrier is forced to delay and cancel flights and is reportedly losing millions of dollars due to the inability to operate efficiently and productively. According to USA Today, the Southwest Airlines Chief Financial Officer Gary Kelly said, “The damage to the company runs into the millions of dollars weekly” (USA Today, 2019). The CEO is also said at a JP Morgan investor conference that “The company filed suit against AMFA (Aircraft Mechanics Fraternal Association) last week to recover those damages and prevent more from occurring” (abcNews, 2019). The resulting application of the Policy Research Construct (PRC) is to provision a guided analysis of key aviation policy actions. The action is intended to result in strategic decision-making for policy change at any organizational level.

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