Airline Passenger Regulatory Compliance and Personal Attitudes -

A Study of Passenger Behavior and Discussion of Passenger-Cabin Crew Relationships

by

Sam Lolwing

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Graduate Supervisory Committee:

Michael Cirillo, Chair
Sandra Park
John Drew

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ABSTRACT

The primary purpose of this study is to evaluate the current state of affairs regarding regulatory compliance and passenger safety aboard commercial aircraft. Throughout the broad scope of the number of unique airline operations throughout the United States and the world, special consideration is given in order to ensure that passengers are both safe inflight and prepared for contingencies that can arise. The continued safety of passengers and crew members is the highest priority in every operational scope within the aviation industry. The process through which passenger awareness of safety is achieved, specifically during 14 CFR Part 121 and Part 135 commercial airline operations, is executed through the performance of live safety demonstrations by flight attendants, presentation of operator-developed videos, and the provision of printed safety cards to passengers who are encouraged (and in some cases legally required) to view them. Through the analysis of data derived from a newly distributed research study, current passenger attitudes towards safety and regulatory compliance onboard commercial aircraft will be measured and weaknesses identified. This research will leverage this data to identify and defend possible methods to improve the quality of airline passenger safety awareness and regulatory compliance procedures. Identified improvements involve inquiry into the relationships created between flight crewmembers and passengers, and also include potential modifications to procedural components such as emergency exit row briefings.

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CHAPTER 1

INTRODUCTION

Background

The impact that the COVID-19 pandemic has rendered on the passenger transportation industry has inspired the implementation of a variety of risk controls intended to mitigate operational health and safety hazards. Such controls include the requirement to wear face coverings at all times. “Throughout the first year of the COVID-19 pandemic, they (flight attendants) were typically instructed to “remind” a non-compliant passenger and then, at some point, issue a card which included another polite reminder. At one airline, however obnoxious a passenger may have been during a flight, if they were wearing their mask when the aircraft arrived at the gate, then their failure to comply was not logged” (Anderson, 2022). Such strategies have historically remained dependent on the compliance of all passengers with health and safety instructions. However, operational events documented by both the FAA and air carriers in the past few years have demonstrated a relative resistance to this compliance. Some of these events have included physical altercations (both inside and outside the cabin), defiance of instructions verbally issued by flight crewmembers, and refusal to leave an aircraft. If safety awareness and associated attitudes of all passengers is improved, a reduction in these types of disruptive events may begin to materialize.

Statement of Purpose

The primary purpose of this study is to evaluate the current state of affairs regarding regulatory compliance and passenger safety aboard commercial aircraft. To achieve this, our research specifically intends to further understand the motivations

related to the different types of certain passenger-driven operational events, their probability and magnitude, and the application of these potential impacts to inflight safety preparedness. Previous research has approached similar subjects such as the effectiveness of safety demonstrations (see Literature Review). However, the research has done so exclusively on a qualitative basis and was not performed under current industry conditions. The research team has elected to apply a quantitative analysis through the distribution of a novel survey which can assist airline industry leadership in updating their practices and ensuring that risk and human factors associated with inflight safety can be mitigated appropriately. Analysis of data derived from the distributed survey will evaluate current trends in passenger awareness and will aim to further understand methods to improve both the quality of passenger safety awareness schemes and the work environments of flight crewmembers, which are known to have been deteriorating following the COVID-19 pandemic due to a noticeable lack of passenger compliance.

Further proposals in this study will examine the voluntary function of exit row seating. Although the existence of exit row seats and briefings depends on the aircraft type utilized by the carrier, there is noticeable room for revision regarding the associated procedures. This inquiry will propose methods of flight crew/passenger relationship building that federal regulators and air carriers can develop and implement. This aims to ensure that passengers in the exit row are fully informed and adequately prepared to assist in the event of an emergency.

Research Questions

1. Do individual passenger views regarding safety and regulatory compliance adequately inform recent industry trends?
2. Are people who fly on passenger aircraft fully prepared to respond to an emergency onboard?
3. Are airlines and regulators taking effective approaches to ensuring that passengers are prepared for the unexpected?
4. What safety awareness approaches can be implemented by air carriers to make sure everybody is safe?

CHAPTER 2

LITERATURE REVIEW

Where the Industry Stands

Safety assurance is a key component of properly functioning safety management, and has remained an important motivation in the incorporation of recent industry changes. The continued safety of passengers and crew members through components that include safety assurance is the highest priority in essentially every operational scope. The process through which passenger awareness of safety is achieved, specifically in commercial airline operations, is assumed through the performance of live safety demonstrations by flight attendants, presentation of operator-developed videos, and the provision of printed safety cards to passengers who are encouraged (and in some cases legally required) to view them. This review examines both quantitative and other passenger studies which examine individual safety attitudes in addition to magnitudes of safety information comprehension that are internalized by all types of air carrier passengers (revenue, non-revenue, etc).

A Quantitative View

To gain a more inclusive understanding of the potential outcomes of poor comprehension of safety information and regulatory compliance data, the modern aviation regulatory environment requires a more personalized means to establish a measurement of both passenger safety information comprehension and compliance scores. Previous studies demonstrated that participants took an extended amount of time to state their total comprehension of safety instructions. The analysis performed in this

study will be based on self-disclosed survey information based on the Likert Scale to establish and analyze novel data. In the current industry environment, this quantitative method of gauging passenger attitudes is more inclusive and comprehensive than relying on factors such as symbol recognition (or inquiring whether participants understand specific instructions).

Safety Card Design

In order to establish a "state of the art" for safety card design, a 2008 study by the Federal Aviation Administration Medical Aerospace division (Corbett et al) formally examined the individual performance of test subjects related to their comprehension of pictorial diagrams as they appear on a typical aircraft safety card. The experiment included participants (n=785) at various levels, including high schools, public and federal offices, and professional-level cabin safety workshops. Participant gender was reported to have been evenly split. Individual understanding of pictorial diagrams was rated by a specific criterion. Certain = Response was correct and complete; Likely = Response was mostly correct but missing a key element(s); Arguable = Response contained words or ideas that indicated partial correctness but were ambiguous or unclear; Suspect = Response contained words or ideas that were related but misconstrued; Opposite = Response contained words or ideas that were related but contradictory to the correct response; Wrong = Response was wrong; None = Response was "don't know"; and Blank = No response was given. Based on the category of answer given, a different weight was given to a participant's "comprehension score". The agency established through the collected data that test subjects performed well below the acceptable comprehension criteria. While participants included flight attendants with high flight

time, which enabled an inherent correlation between flight experience and total comprehension of the safety information presented, comprehension scores tended to drop when the participants who were more familiar with the safety information were removed from analysis.

There are no universally accepted comprehension criteria content for the safety card diagrams presented. The participants were wrong or right to various degrees only depending on whether their responses matched the unique criteria written by researchers and were accepted internally within the study as the "correct" answer. While the correct answers for certain diagrams may be similar to what the diagrams depict, some diagrams may visually depict concepts which are not part of the "correct" criteria. Considering these gaps, it further justifies the academic and practical need for standardized awareness criteria and scoring that is not dependent on the visual quality of the content of the illustrations themselves.

Furthermore, procedures within the study reveal potential issues in comprehension that may continue to pose a significant risk to airline passengers today. "The inability to return to a prior page was intended to preclude post hoc priming and correcting of a previously miscomprehended pictorial. The entire comprehension test required about 30 minutes to complete." In actual cabin conditions, it is worth ascertaining the time required for a passenger to read and understand safety information. What is a reasonable time duration for the average passenger in real time to read and understand the safety briefing card to obtain a desirable comprehension outcome? Future work that examines comprehension of diagrams should take into consideration the rate at

which safety demonstrations are performed and how much time a person should reasonably be expected to take to read through an aircraft safety information card.

Safety Demonstrations

Ruenruoy (2014) examined the responsiveness of participants to the individual content presented within inflight safety demonstrations. A survey was conducted that examined passenger preferences related to the safety demonstration given before taxi. The information presented here is a valuable indication of the preferred mediums to receive safety information. “When considering the overall effectiveness of the safety demonstration, the video safety demonstration method had an average slightly higher success rate compared to other safety demonstration methods in terms of maintaining passenger attention” (Ruenruoy, 2014). While comprehension ratings within this study were derived from a comparison among a recorded audio demonstration, a live demonstration, and a video demonstration, to evaluate which was more positively impactful towards understanding safety instructions, there is little emphasis placed on determining which safety demonstration results in the greatest passenger understanding and ultimately may translate to improved emergency performance.

Further, the aforementioned survey was limited in its sample construct. The study’s interest was in the state-level population; however the survey only collected data from faculty, staff, and students. Therefore, the survey’s results were not entirely indicative of the results from a larger or more diverse population regarding responses related to their perception of, not only the safety demonstration, but safety information in general. Adding to and verifying the contributions of these findings requires questioning

the population beyond the local university environment. Surveying and understanding the habits and views of a greater demographic may allow insight of a higher quality related to how commercial aviation safety preparedness processes can be improved.

Evacuation

Xu, et al (2022) examined the factors relating to passenger emergency evacuation from multimodal transportation hubs. The majority of behaviors strongly relate to the individual emergency preparedness requirements of commercial aircraft environments. “In an evacuation, pedestrian speed, pedestrian density, and pedestrian flow rate are key factors that affect the effectiveness of evacuation strategies. (Xu et al, 2022). While the environments analyzed are mostly applicable to rail and other communal transportation hubs, similar findings related to crowd behavior, such as pedestrian density, may be able to adequately inform future work in passenger emergency response and preparedness. If these findings are adequately reflected in air transportation outcomes, air carriers could consider a lower density seating configuration as a potential control to further mitigate emergency safety risk.

Rehman et al (2019) conducted a cross-regional study in China which looked closely at the safety attitudes and risk perception qualities of passengers in commercial air travel. The work also examined differences in the cabin safety briefing and developed a survey method to address safety attitudes and risk perception with their respective scales. This work was performed with the cooperation of experts from China Eastern Airline and Pakistan International Airline. The analysis of responses in Rehman, et al was conducted using a t-test, one-way ANOVA. The mean scores of both female and male

passengers on the risk perception and safety attitude scales indicated that there was a significant difference in safety attitudes by gender (male and female). The study confirmed that safety attitude and risk perception constructs differ on a regional level. While this work is helpful in understanding the safety attitudes and risk perception of the people from the analyzed region (China), it may benefit future work to consider the safety attitudes and risk perception of airline passengers in more specific regions. If similar research were to be conducted again, it may be beneficial for participants to be sorted based on either the origin of their respective flight or their own region or state of residence to understand specific regional differences in safety attitudes and safety information comprehension. An additional component of Rehman addressed their observation that a physical safety briefing instead of just a video and audio demonstration may be more effective. “We have also analyzed safety finding (sic) regarding safety attitude and risk perception and it was observed that respondents who focus more on a physical demonstration during (the) safety briefing have a high level of safety attitude and better perception of risk as compared to just a video or audio demonstration” (Rehman et al, 2019). If future research continues to suggest that a live briefing is more effective to ensure that passengers are appropriately responding to emergencies, then air carriers could consider the removal of alternative media.

Australia Post-Flight Inquiry

Parker (2006) took a different approach to analyzing safety attitudes and safety preparedness actions among Australian airline passengers. Instead of focusing on the quality or type of safety demonstration delivered, the study focused on interviewing and

surveying participants and further understanding their behaviors as they relate to their preparedness. The questions asked in the surveys and interviews placed responses on a scale from “I have never done this” to “I do this on every flight”. It is noted that this scale is not quantitative. The study also made a distinction between mainline and regional carriers, which may be less of an important consideration in today’s industry environment, especially in the U.S. regulatory system. Further, Parker states that passengers' attention towards safety information would shift away from safety-related issues in the presence of distractions. “Passengers recognized that, in the absence of explicit safety triggers (such as turbulence), and the presence of distractions such as food and beverage service, in-flight entertainment and music quickly shift their attention away from consideration of safety issues” (Parker, 2006). It would be valuable to test domestic U.S. respondents on this idea, especially since the use of portable electronic devices in the aircraft has become more prevalent since Parker’s publication.

Legal Background: Intoxication

At least domestically, new disruption-level events recorded almost daily by air carriers and regulators are showing greater frequencies in what will be referred to here informally as “runaway” passenger intoxication. This behavior may consist of defiant attitudes towards pilot crewmembers and their flight attendant representatives in the cabin, cockpit security threats, and even aircraft damage. Bowe (1988) analyzed legal liability issues related to inflight alcohol sale and passenger consumption and noted that air carriers had little to no incentive or motivation to discontinue this practice. It is especially noted that the work in question identifies that alcohol-related incidents and their impacts on safety were not widely known by the public and were only indicated by

“one-off” events requiring diversions to remove an intoxicated passenger. However, Bowe does make the case that “The airlines' financial incentive to continue alcohol service must be balanced with the promotion of passenger safety, as well as…liability for the negligent acts of drunk passengers” (Bowe, 1988). As such, it is important even today for air carriers to consider not only the value of alcohol service, but the value of passenger preparedness in response to a developing emergency situation. If these types of revenue-generating practices that support air carrier profitability are to be consistently maintained at a risk level acceptable to leadership, further analysis of passenger preparedness and safety attitudes and service adjustments to ensure compliance and general safety awareness among passengers will remain one of the most important considerations.

In an effort to gain a more inclusive understanding of the potential outcomes of poor comprehension of safety information and regulatory compliance data, the modern aviation regulatory environment requires a more personalized means to establish a measurement of both passenger safety information comprehension and compliance scores. Previous studies demonstrated that participants took an extended amount of time to state what their total comprehension was of safety instructions; this analysis will be based on self-disclosed survey data to establish an overall novel score that can be uniquely analyzed.

Fully determining the different variations that exist in aircraft cabin safety considerations and attitudes requires individual evaluations to determine actual passenger responses, especially those that may or may not be adequately informed by inflight safety briefings and passenger-responsible safety card overviews.

Hypotheses

Items that can often be casually observed, in addition to what has been previously revealed in literature about the recent condition of passenger preparedness, can inform several predictions about potential survey results.

1. The number of passengers who at least "partially agree" (5 or higher) that they will utilize the lavatory if needed regardless of the status of the seat belt sign will be higher than the number of passengers who "partially agree" that they look at the safety information card every time they fly.
2. The number of passengers who at least "partially agree" (5 or higher) that they look around for the closest emergency exit prior to departure will be high relative to the number of passengers who state that they place their phone on Airplane or Flight Mode (or equivalent) every time they fly. This can be predicted based on cabin design and the intended obviousness of exits that are always visually apparent to passengers, such as, "They may be behind you".
3. If open ended feedback is received from participants regarding how safety and emergency preparedness can be enhanced, some feedback may allude to cabin seating configuration as a contributing risk factor to even worse outcomes.

CHAPTER 3

METHODOLOGY

Introduction

This study utilized a survey-based approach. The collected survey data was utilized to further understand personal regulatory compliance and safety behaviors on-board commercial aircraft. No verbal interviews of survey respondents were performed, and all collected data that is used is sourced from the questions included in the distributed survey. This way, respondents are not pressured to provide the "correct" answer under the watch of a subject matter expert in an environment such as an airport, and these views are not influenced by factors that could have reasonably surfaced in similar studies, such as post-flight exhaustion or "get there-itis" relating to expedited survey completion.

Researcher Background

The primary researcher is currently employed in the safety department for a regional airline, and often communicates with flight attendant management regarding safety procedures and industry developments. As such, he acknowledges that the results obtained from participants and the survey data may differ from his own personal views, but every passenger experience and opinion regarding safety and regulatory compliance is completely valid.

To avoid bias, the primary researcher ensured that questions were included that could be understood and answered honestly and accurately by every potential respondent. Both the primary researcher and the supervisory committee remained involved in the formal ethics approval process by the ASU Institutional Review Board (IRB).

Definitions

For the sake of research clarity and conciseness, the following terms utilized in the survey measure are defined here:

Table 1

Key Terms and Definitions

Term	Definition
Airplane or Flight Mode	Any mode on a mobile phone or other personal electronic device that restricts radio communication by the cellular radio band, but still may allow communication to other local services.
Evacuation	Sudden removal of passengers and crew members from an aircraft because of a hazardous condition, or the sudden removal of passengers after an emergency landing has occurred to prevent further injury or death after impact.
Overhead	An overhead bin ("locker"), a space intended for storage of personal items and baggage by passengers on commercial aircraft. This space does not lock.
Safety Information Card	A printed document, usually laminated and placed either in the seat pocket or on the back of the headrest of the seat immediately forward, prepared by an air carrier that contains safety information. Contents may include instructions related to emergency equipment use and door operation for the specific aircraft type/model.
Seat Belt Sign	A lighted passenger information sign, as required by 14 CFR § 121.317, which advises passengers when it is required to remain in their seats with their seat belts fastened.

Research Applicability

The questions and corresponding definitions discussed in the survey (specifically those in Table 1) are written based on the provisions and regulatory requirements of 14 CFR Part 121. Individuals who respond to the survey are doing so based on their experience receiving service by Part 121 certificated air carriers. However, because of similarities in

the general air carrier certification process, it is noted by the primary researcher that the proposals developed can be easily applied to other air carriers, such as air carriers operating under 14 CFR Part 135. As such, any recommendations are intended as a general advisory and are not intended strictly for a specific type of operation. Instead, it is up to air carriers and regulators to collaborate and utilize these findings to create improvement within the entire air transportation industry.

Research Design

A mixed survey-based approach based on a seven-point Likert scale and an open-ended response format was utilized for each participant. The survey consisted of nine quantitative questions based on the seven-point Likert scale, in addition to one qualitative question that was open-ended. The seven-point Likert scale was selected due to the primary researcher's belief that such a scale could produce a more accurate representation of participant views. The quantitative and qualitative data were gathered simultaneously and were not separate measures. Every participant received the same set of questions, and the responses indicated by participants did not influence the order or weight of succeeding questions.

The quantitative analysis analyzes the overall extent to which participants agreed with statements on a scale from 1 to 7. For the sake of transparency, definitions will be assigned to each answer choice, reflected in Table 2.

Table 2

Response Scale

Scale	Definition
1	Strongly Disagree
2	Disagree
3	Somewhat Disagree
4	Neither Agree nor Disagree
5	Somewhat Agree
6	Agree
7	Strongly Agree

Participants

Individuals who were eligible for participation in the research survey consisted of any person, 18 years of age or above, who has traveled on a passenger aircraft at least one time in the past two years. There was no maximum age of eligibility for this survey. This span of time was decided by the research team because it most accurately reflected the timeframe of the industry changes for which the characteristics are being measured.

Research Measure

All survey questions were novel questions developed by the primary researcher with input from members of the Graduate committee. Survey questions were not derived from any previous works. However, the seven-point Likert scale that is utilized was based on techniques and tools developed by Likert (1932). Questions were created based on known safety and compliance issues that have been trending, both within safety data and in popular culture. These questions were specifically created for this research only as a tool to inquire about passenger attitudes and practices.

Demographic and Qualifying Questions

Qualitative information was collected to determine the demographics of the respondents. However, respondents were not identified using any sensitive information that could compromise their protections as participants. In order to differentiate responses and further determine their uniqueness relative to the rest of the sample, the following demographic information was collected:

a. Age Range

b. Sex/Gender

The primary researcher chose to place demographic questions at the end of the survey (last two questions prior to completion and return).

Within the survey measure, only one qualifying question was asked relating to flight frequency (see Q1, Appendix B).

This qualifying question was intentionally placed at the beginning of the survey measure. An exact number of "trips" is not necessarily a survey requirement, but a range is expected as an estimation in order to further compare the indicated "experience level" to participant responses. For the sake of this research, any responses which indicate that the respondent has flown on a passenger aircraft 0 times within the past two years will be eliminated from analysis to ensure data accuracy and while ensuring that any data outliers associated with the response of "0 Times" did not influence the rest of the data set. In addition, open-ended responses associated with the response of "0 times" were excluded from analysis.

Data Collection Procedure

The process of recruitment and consent for participants was developed and conducted digitally by the research team. Potential participants were identified, recruited, and consented utilizing social media and e-mail. The research team did not actively recruit potential participants in-person. Participation in the Airline Survey Research Procedure was estimated to take about 10 minutes to complete. A participant could withdraw their participation at any time with no penalty. All responses were collected digitally by the research team using Google Forms. The total period of data collection was two weeks from the date of the first response. At that time, no more responses were able to be collected.

No compensation was proposed to be given to participants. No external funding sources for the study were identified. Direct benefits to research participants include an increased awareness of their personal safety practices during air travel. Additionally, research participants directly benefit from being able to uniquely identify (and potentially improve) weaknesses in their own attitudes and habits during air travel.

Procedure of Data Analysis

The analysis of the collected survey data was aided by demographic and qualifying questions designed to determine a participant's uniqueness relative to the rest of the data set. For qualification, respondents were asked to indicate the following:

- Sex/Gender (Q11)
    - Male
    - Female
    - Other (please specify)
- Age Range (Q12)
    - 18-24
    - 25-34
    - 35-44
    - 45-54
    - 55-64
    - 65 and over
- Number of times flown on a commercial aircraft in the past 2 years (Q1)
    - 0 times
    - 1-4 times
    - 5-7 times
    - 7 or greater times

A multivariate analysis for each question was performed using IBM SPSS. For the sake of analysis, 18 respondents indicated that they have flown on a commercial aircraft "0

times". This data was excluded as "missing" data, and thus was not included in the results calculations. The Likert Scale data and open-ended responses for respondents that indicated "0 times" was excluded from analysis. Thirty-six respondents did not provide age demographic information, but those responses are not excluded unless the include a response of "0 times" related to frequency. One participant did not provide sex/gender identifying information in Q2, but was not entirely excluded from analysis. Furthermore, all participants identified as either "Male" or "Female". As such, consideration for nonbinary participants was not performed. Tables 3 through 8 show the nature of the participant demographics and response frequencies to the qualifying questions.

Ethical Considerations

All participants consented to participate and provide their answers to the research survey. Participants had the opportunity to withdraw their consent at any time with no penalty. Since no compensation was offered, participation in the procedure may have cost participants the amount of time taken to complete the survey. To mitigate risks associated with participant's loss of time, the survey material has been optimized by the research team to mitigate the loss of time as much as possible without sacrificing the value of collected data. No other reasonably foreseeable risks to participation were identified.

Assumptions

This research operated under the following assumptions:

- Participant responses are accurate and representative of the indicated demographics.
- Participants answered questions truthfully and to the best of their knowledge.

Limitations

Although the research team aimed to ensure that the research conducted was as encompassing to the actual industry environment as possible, several limitations were present. The research operated with the following limitations:

- No verbal interviews were conducted for privacy reasons and by choice of the primary researcher.
- The survey measure lacked deeper identifying information, such as region of residence and indication of routes flown.
- Survey measure questions did not cover actions that an individual may take during extended overwater operations and ditching (emergency water landing). This decision was made due to the low likelihood of ditching in everyday operations and a low number of recorded events related to passenger-specific compliance issues after ditching.

CHAPTER 4

RESULTS AND DISCUSSION

Age Range

Table 3

Total Participant Demographics (Q12 - Age Range)

Participant Group	N	Percentage %
18-24	5	2.51%
25-34	8	4.02%
35-44	11	5.53%
45-54	55	27.64%
55-64	57	28.64%
65 and over	26	13.07%
Age not indicated	37	18.59%
Total	199	

Table 4

Analyzed Sample Demographics (Q12 - Age Range)

Participant Group	N	Percentage %
18-24	5	2.76%
25-34	8	4.42%
35-44	7	3.87%
45-54	50	27.62%
55-64	53	29.28%
65 and over	23	12.71%
Age not indicated	35	19.34%
Total	181	

Sex/Gender

Table 5

Total Participant Demographics (Q11 - Sex/Gender)

Participant Group	N	Percentage %
Male	64	32.16%
Female	134	67.34%
Other (Please specify)	0	0.00%
Sex/Gender not indicated	1	0.50%
Total	199	100

Table 6

Analyzed Sample Demographics (Q11 - Sex/Gender)

Participant Group	N	Percentage %
Male	54	29.83%
Female	126	69.61%
Other (Please specify)	0	0.00%
Sex/Gender not indicated	1	0.55%
Total	181	

Flight Frequency

Table 7

Total Participant Demographics (Q1 - Flight total, last 2 Years)

Participant Group	N	Percentage %
0 times	18	9.05%
1-4 times	76	38.19%
5-7 times	41	20.60%
7 or greater times	64	32.16%
Flight total not indicated	1	0.50%
Total	199	

Table 8

Analyzed Sample Demographics (Q1 - Flight total, last 2 Years)

Participant Group	N	Percentage %
0 times	0	9.05%
1-4 times	76	38.19%
5-7 times	41	20.60%
7 or greater times	64	32.16%
Flight total not indicated	1	0.50%
Total	181	

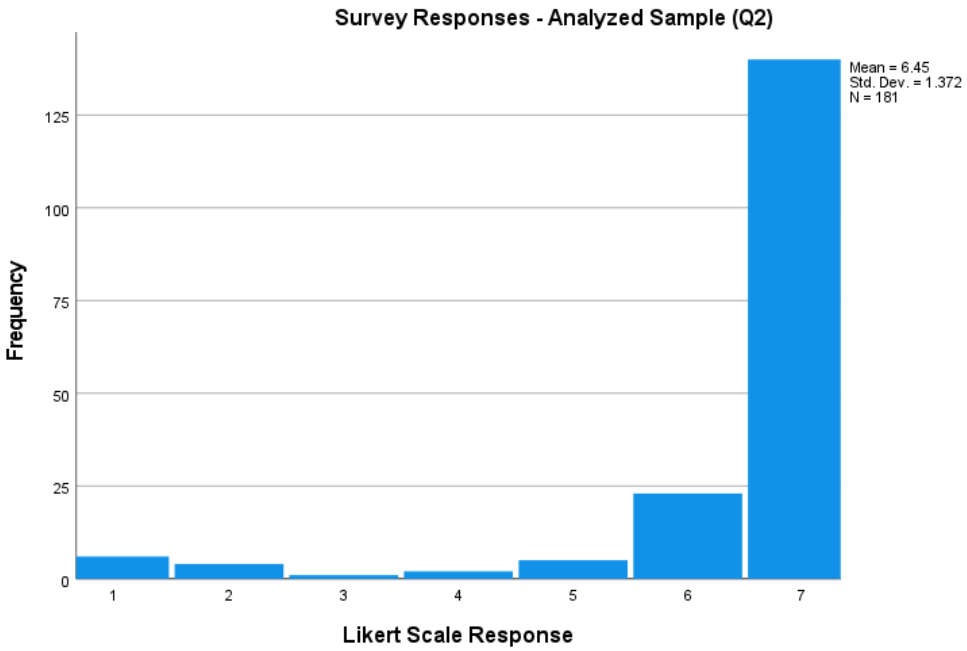
Safety Attitudes

Participants who submitted responses based on the Likert Scale presented a wide variety of responses to Q2, Q3, Q4, and Q5 (see Appendix B), which were questions presented to quantitatively gauge individual safety preparedness. Initially, a rudimentary analysis based on the mean response was conducted for each safety attitude question. Following the analysis of frequencies, a multivariate analysis was performed in SPSS to further determine relationships between each variable. See Table 2 for Response Scale information.

For Q2, “When the seat belt sign is on, I always wear my seat belt”; 181 eligible participants out of 199 respondents were analyzed.

Figure 1

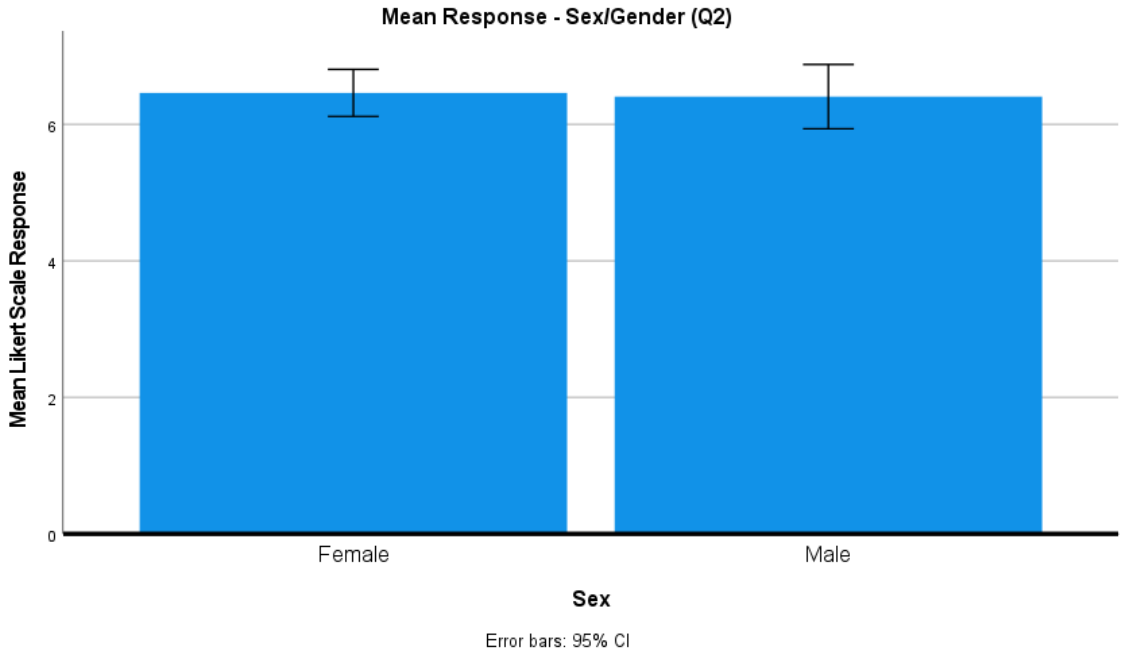
Mean Responses - Analyzed Sample (Q2)



Female participants were slightly more likely to agree more with this statement, although the difference between the responses of the two demographics was not statistically significant [F=0.115, p=0.735).

Figure 2

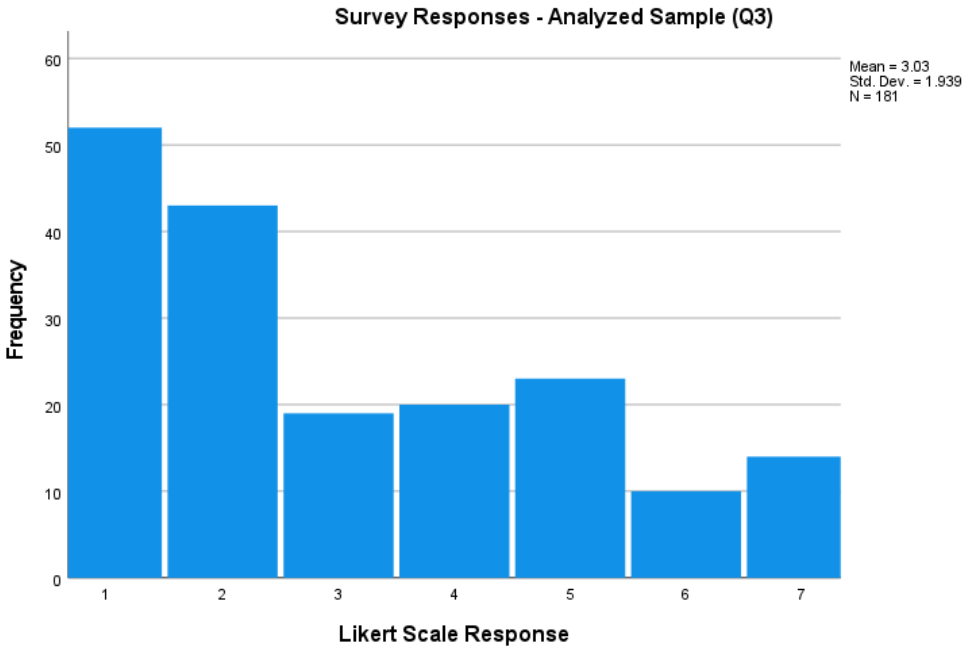
Mean Response - Sex/Gender (Q2)



For Q3, “I will utilize the lavatory if needed regardless of the status of the seat belt sign”; 181 eligible participants out of 199 respondents were analyzed.

Figure 3

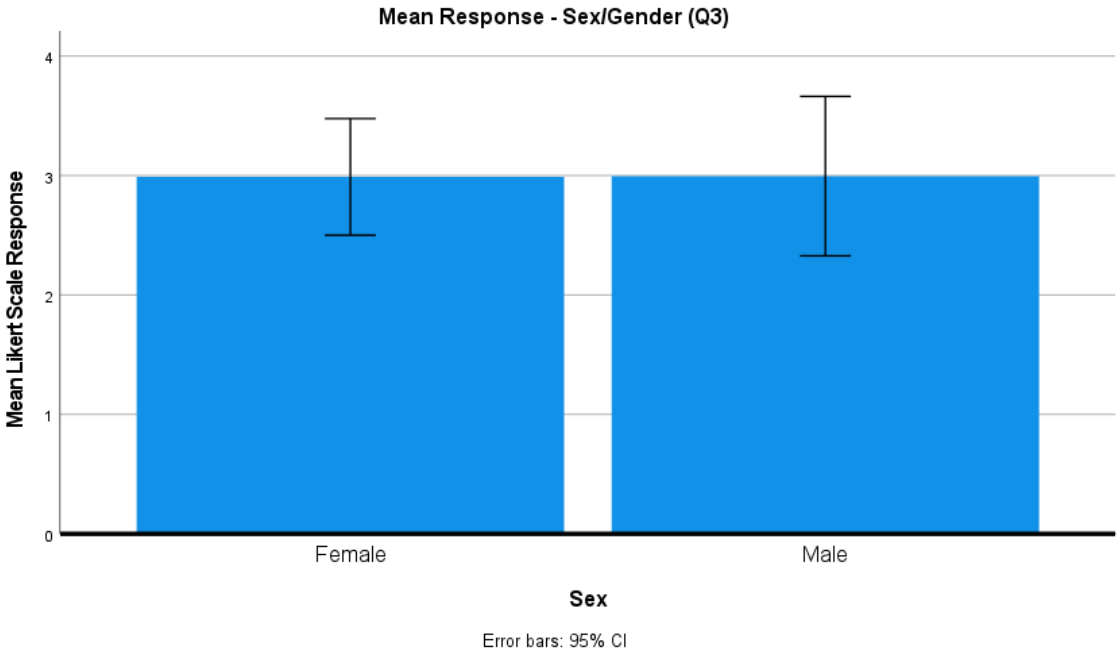
Survey Responses - Analyzed Sample (Q3)



Male respondents agreed with the statement slightly more than female respondents within this particular sample, but the difference in mean responses was not statistically significant [F(0.386) p=6.81]. The mean male response to this particular question was 2.99, and the mean female response was 3.00.

Figure 4

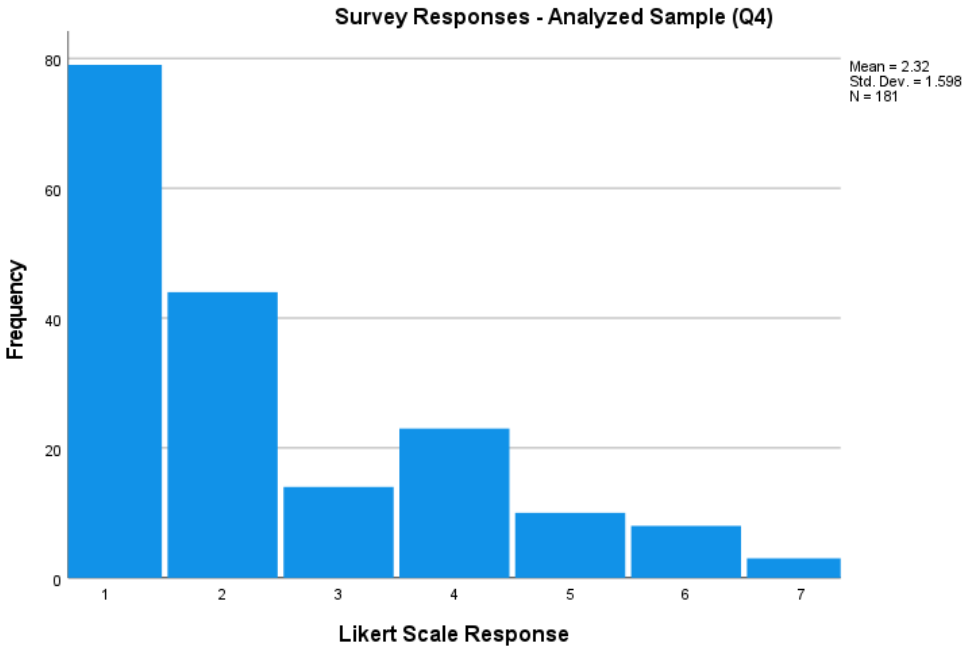
Mean Response - Sex/Gender (Q3)



For Q4, “If I suddenly had to evacuate an airplane, I would take the time to retrieve my personal items from the overhead or items under the seat in front of me when leaving the airplane”; 181 eligible participants out of 199 respondents were analyzed.

Figure 5

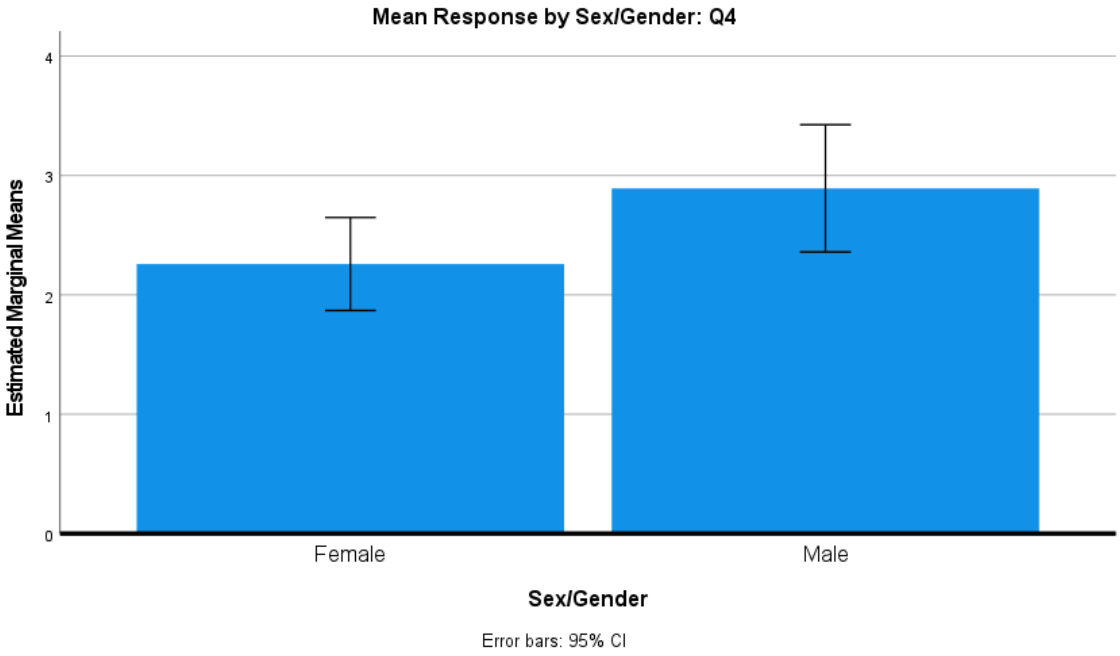
Survey Responses - Analyzed Sample (Q4)



By sex/gender, male participants tended to agree more on average when compared to the mean response of female participants in this survey. The mean male response was 2.89 and the mean Female response was 2.26. However, the difference was not statistically significant F(2.459), p=0.119.

Figure 6

Mean Response - Sex/Gender (Q4)

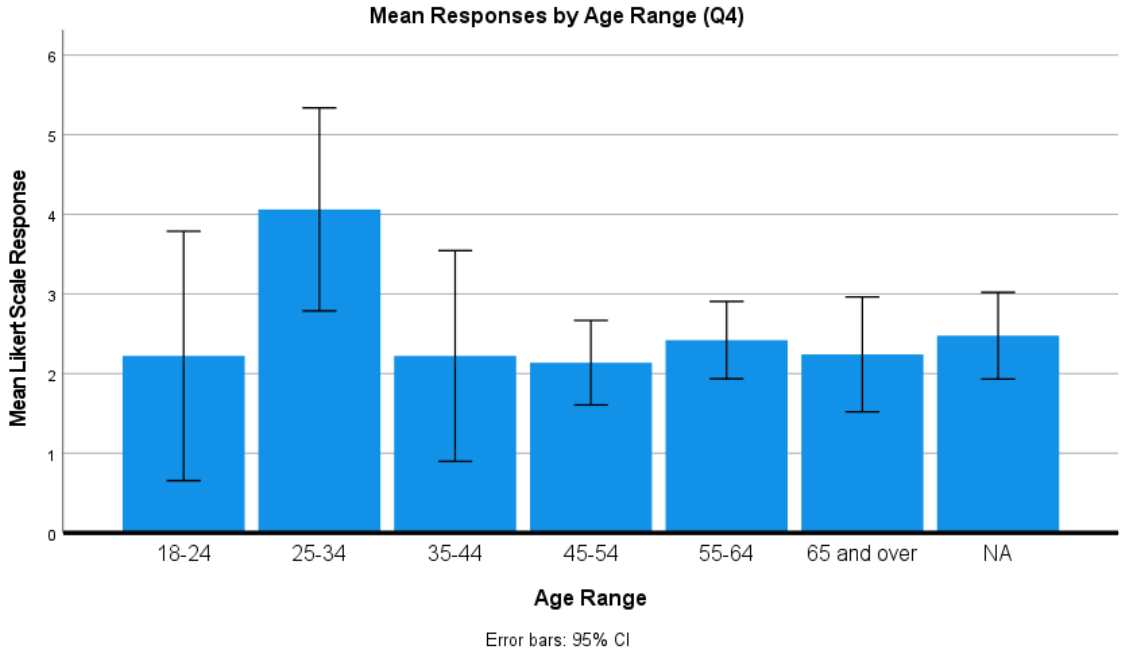


Despite no statistical significance by sex/gender specifically for Q4, it is well-worth noting that the effect of sex and gender on the mean responses to Q4 is among the most significant correlation of all data collected p=0.119.

The second most significant finding in the entire data set associates an effect on the Q4 mean response by age range, F=1.622, p=0.145. Specifically for the 25-34 demographic, there is a visually noticeable difference in the mean response for Q4 compared to other age ranges. Although this finding was not technically significant, it may indicate that some work is needed that focuses on reducing the likelihood of those in the 25-34 age range taking personal items with them during an evacuation. Note that participants who did not provide an age range are categorized as "NA" in this figure.

Figure 7

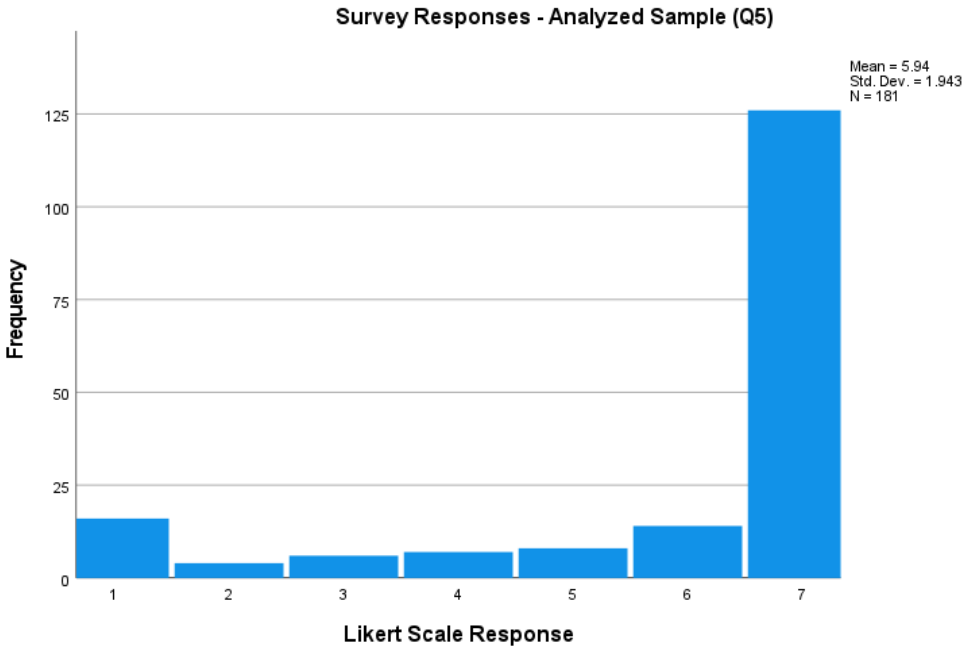
Mean Responses by Age Range (Q4)



For Q5, “I put my phone on Airplane or Flight Mode (or equivalent) when instructed when flying on passenger aircraft”; 181 eligible participants out of 199 respondents were analyzed.

Figure 8

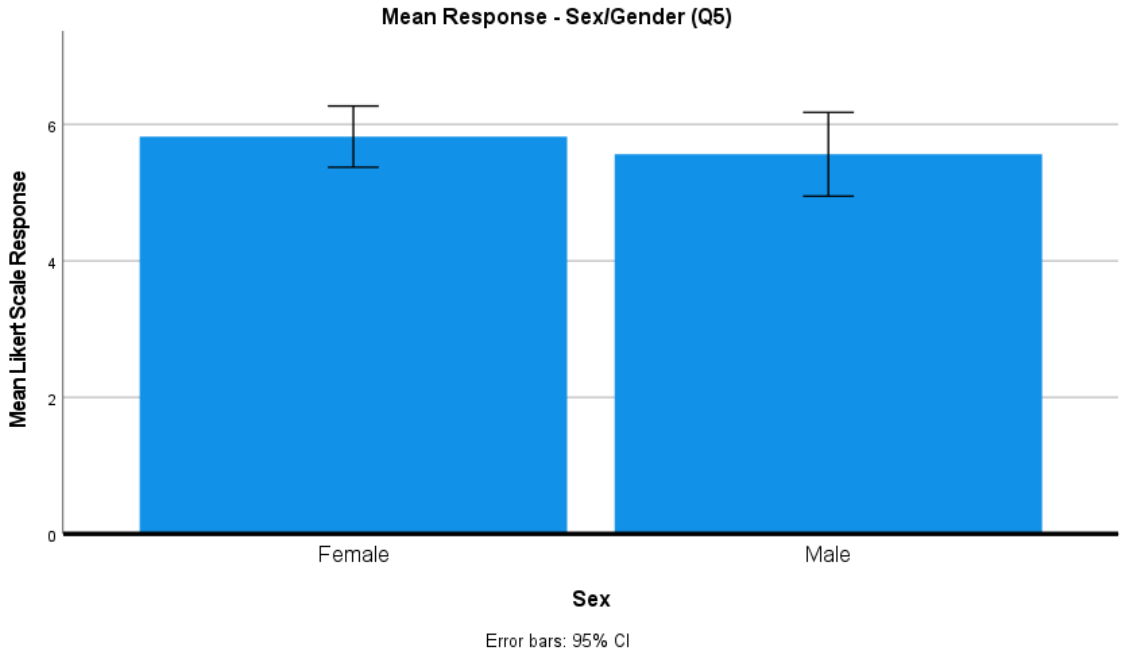
Survey Responses - Analyzed Sample (Q5)



For Q5, female respondents tended to agree with the statement more than male respondents; however, the difference was not statistically significant [F(0.794), p=0.454]. The mean male response was 5.82 and the mean female response was 5.56.

Figure 9

Mean Response - Sex/Gender (Q5)

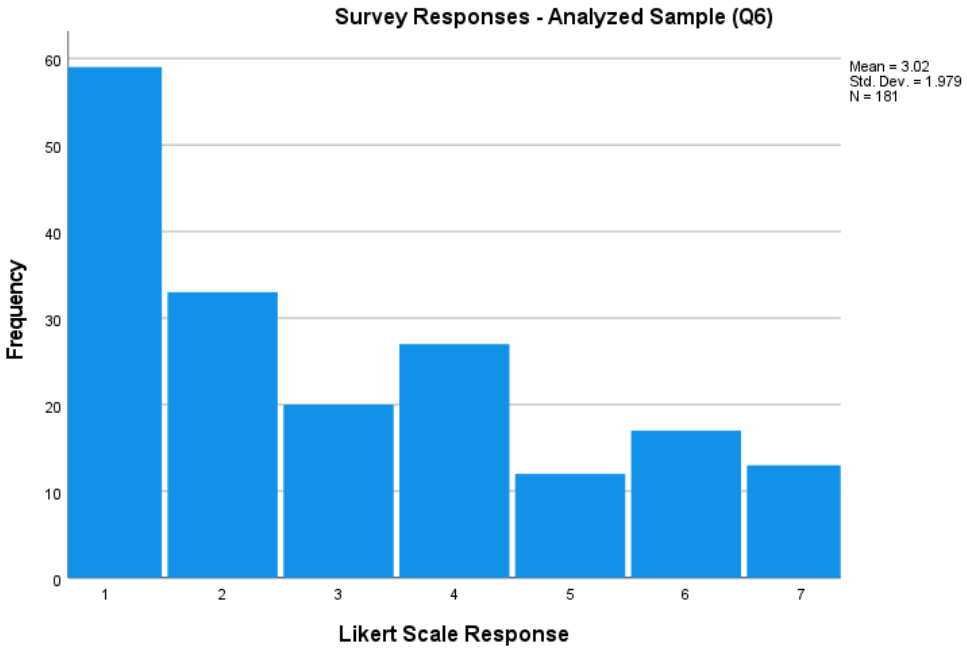


Safety Preparedness

For Q6, “I look at the safety information card provided to me every time I fly”, 181 eligible participants out of 199 respondents were analyzed.

Figure 10

Survey Responses - Analyzed Sample (Q6)

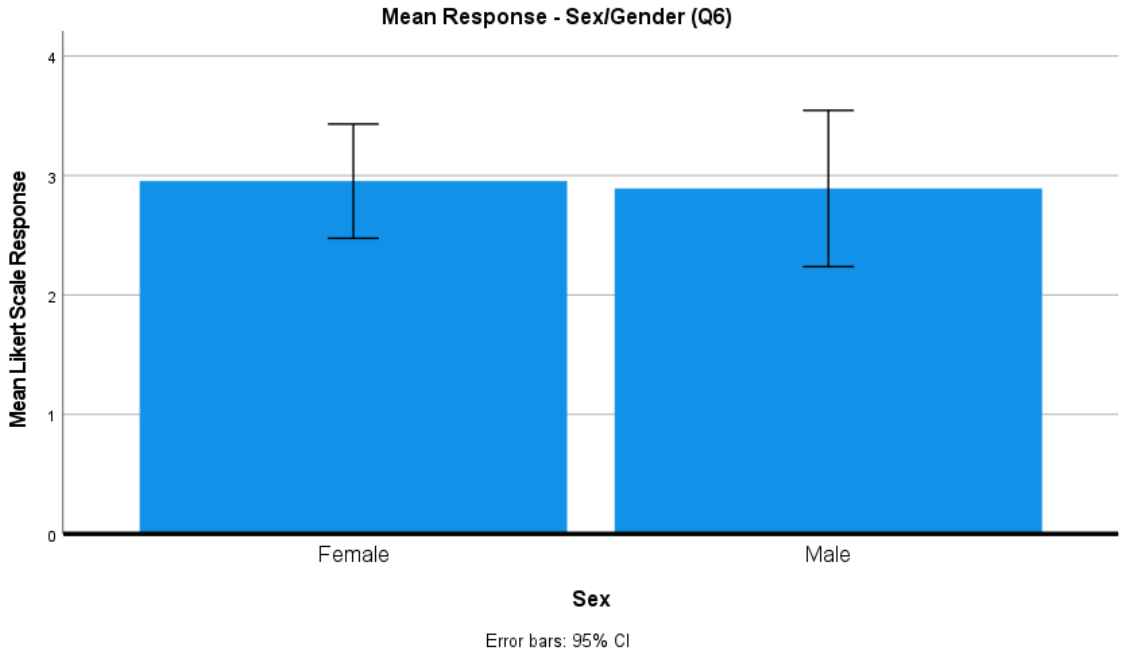


This particular finding is possibly among the most interesting in terms of its overall ramifications. The data showed a skewness towards the left of -0.863. Upwards of 30 percent of respondents indicated that they “strongly disagree” that they do not look at the safety information card every time they fly. “Strongly Disagree” remains the Mode for the data. Despite the lack of a significant difference by sex, age range, or flight history, the responses demonstrate that the safety information card as a tool for individual safety preparedness may be underutilized.

For this question, female respondents again agreed more strongly that they look at the aircraft safety information card, with the mean female response being 2.89 and the mean male response being 2.95.

Figure 11

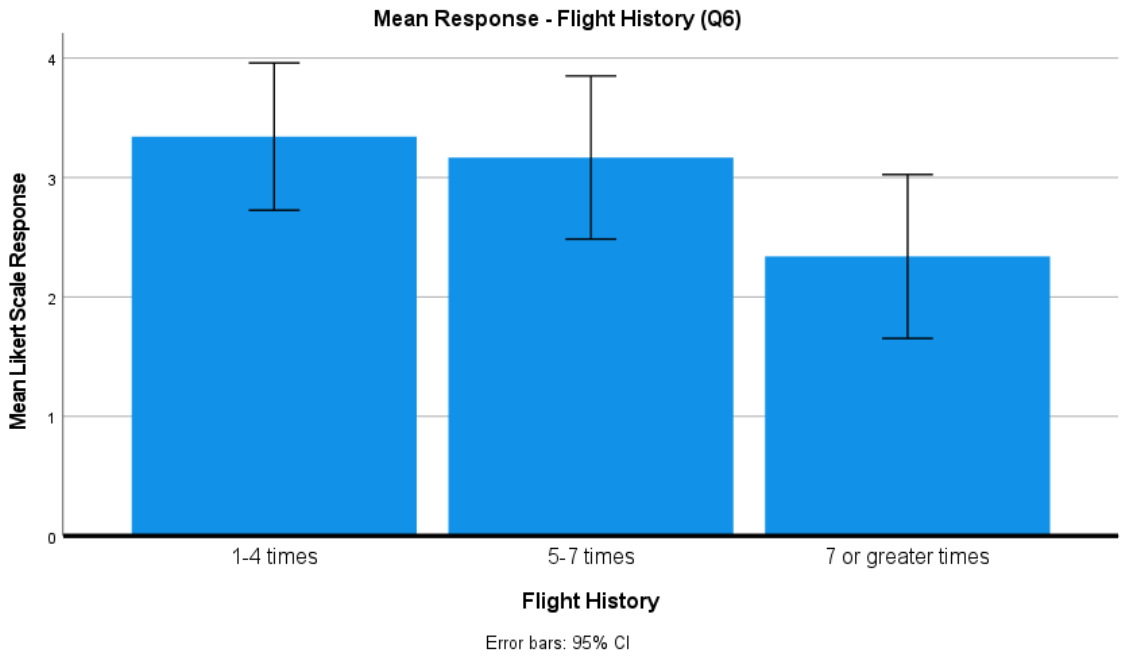
Survey Responses - Sex/Gender (Q6)



It is also noted by the research team as well that flight history (flights taken in the past 2 years) contributed to a relatively meaningful effect on the mean responses to Q6. While the result is still within the quantitative realm of statistical error (F=2.298, p=0.104), it may show that passengers with an overall lower amount of flight experience (1-4 times) may be slightly more likely in general to look at the aircraft safety card provided.

Figure 12

Survey Responses - Flight History (Q6)

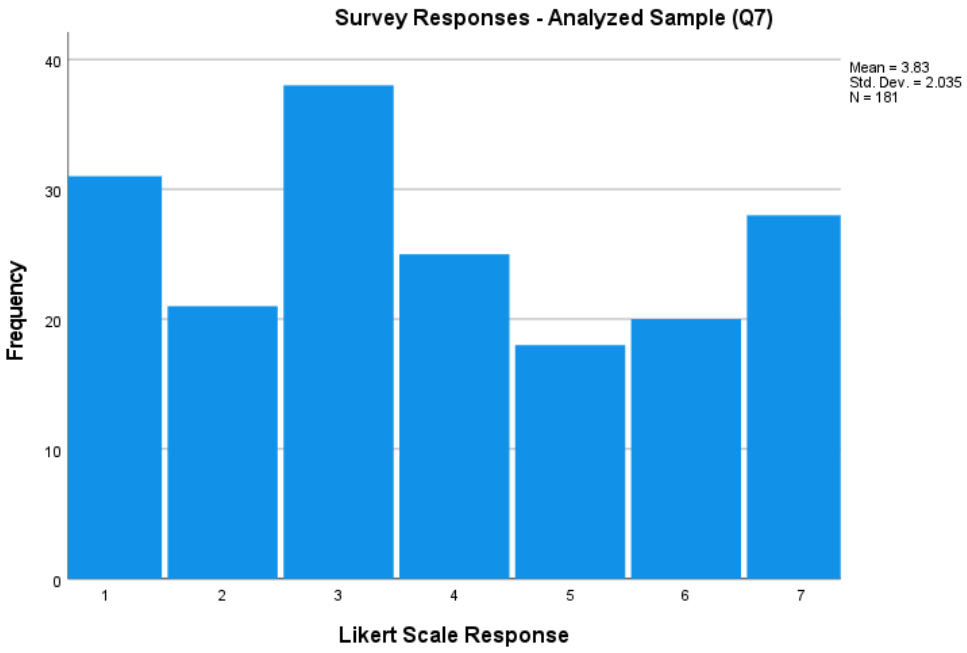


A rather similar difference in the mean response also exists for the 18-24 demographic. Per the sample, younger passengers within the 18-24 age demographic had higher response scores despite all age ranges answering “neutral” or below on the Likert Scale [F=1.455 p=0.198].

For Q7, “I give my complete attention to the safety briefing provided at the beginning of every flight”, 181 eligible participants out of 199 respondents were analyzed.

Figure 13

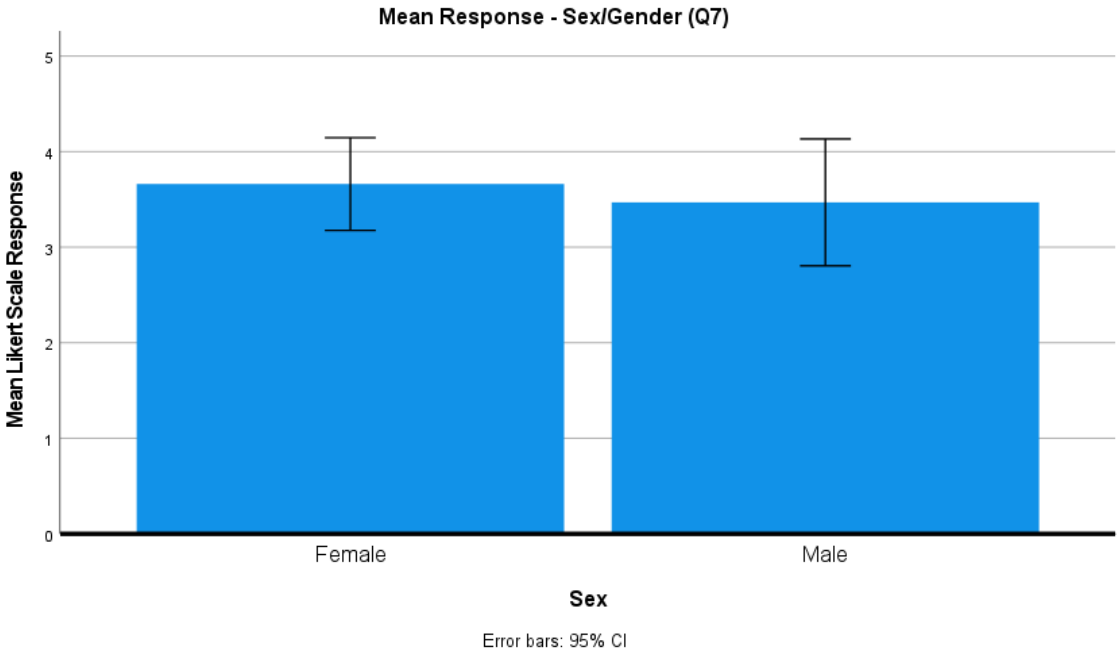
Survey Responses - Analyzed Sample (Q7)



For this question, Female respondents tended to agree with the statement more than male respondents. The mean response from female participants was 3.66 and the mean response from male participants was 3.47. However, the difference was not statistically significant [F(0.658), p=0.519].

Figure 14

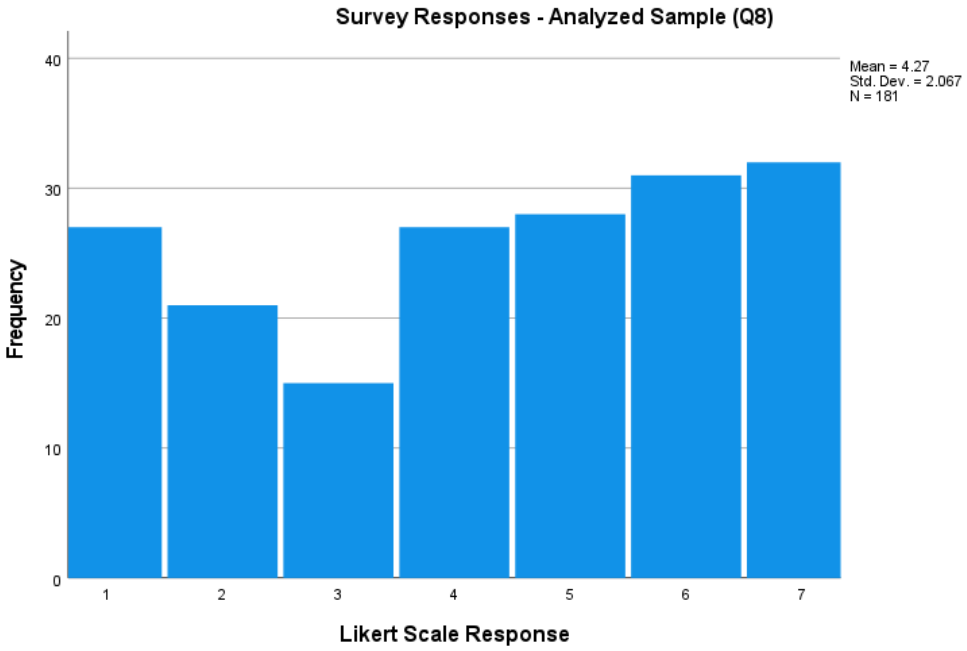
Mean Response - Sex/Gender (Q7)



For Q8, “Every time I fly, I plan the actions I would take in the event of an emergency on the aircraft.”, 181 eligible participants out of 199 respondents were analyzed. Overall, these results did not trend based on a particular age range or recent flight experience. These results may demonstrate that actual planning of emergency actions ahead of time by passengers cannot be reliably predicted or guaranteed unless industry changes can encourage preparation in the future.

Figure 15

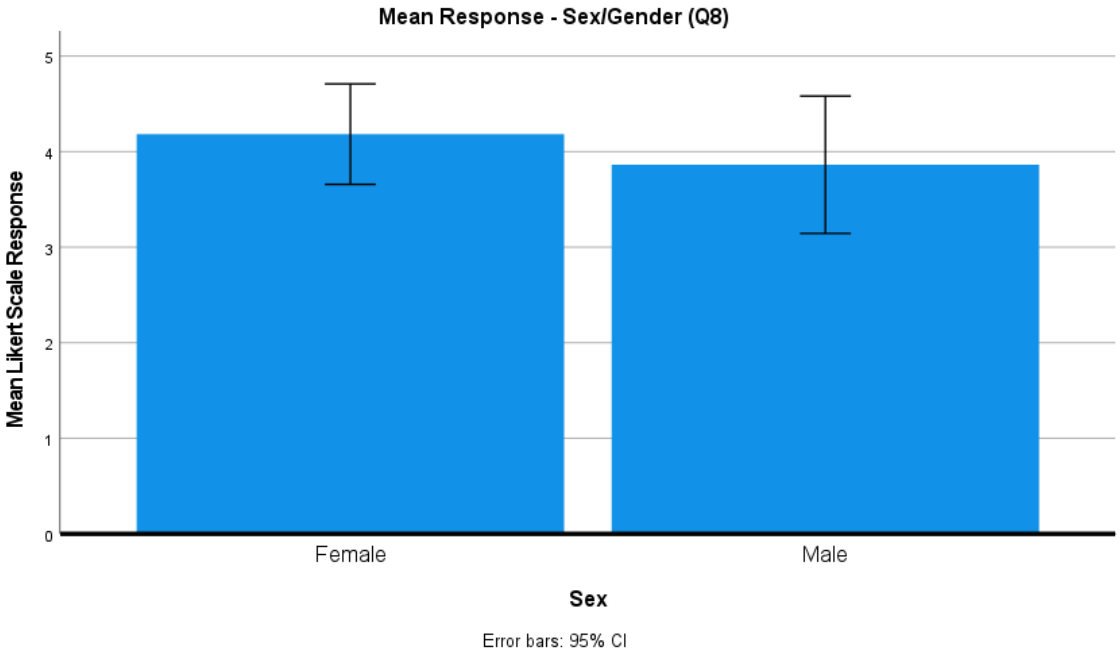
Survey Responses - Analyzed Sample (Q8)



Female respondents tended to agree with the statement slightly more than male respondents. The mean female response was 4.18 and the mean male response was 3.86. The difference in mean responses was not statistically significant [F(0.393), p=0.676].

Figure 16

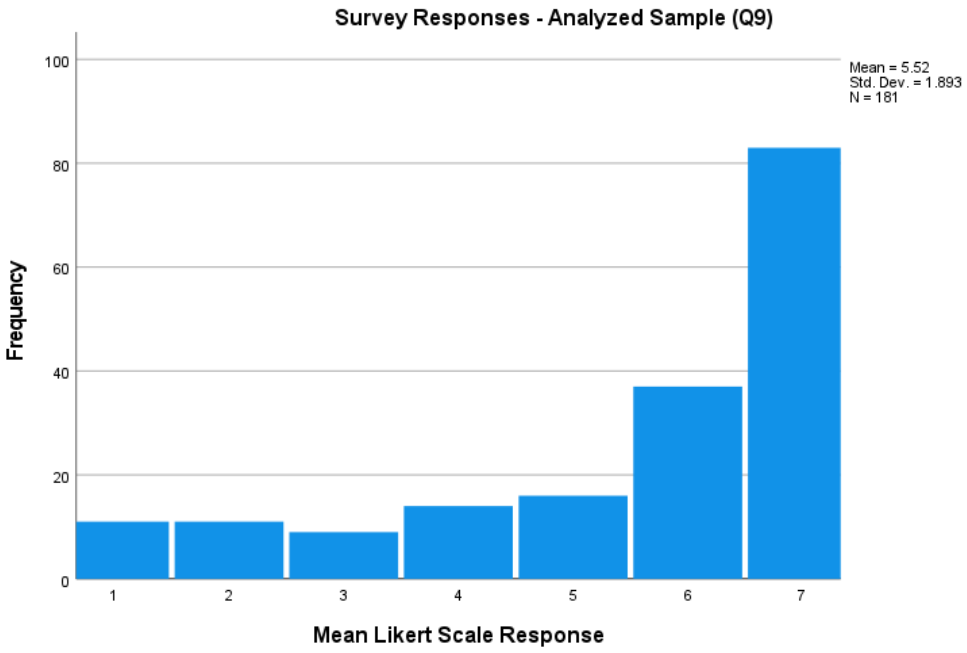
Survey Responses - Analyzed Sample (Q8)



For Q9, “Every time I fly, I look around for the closest emergency exit prior to departure.”, 181 eligible participants out of 199 respondents were analyzed.

Figure 17

Survey Responses - Analyzed Sample (Q9)

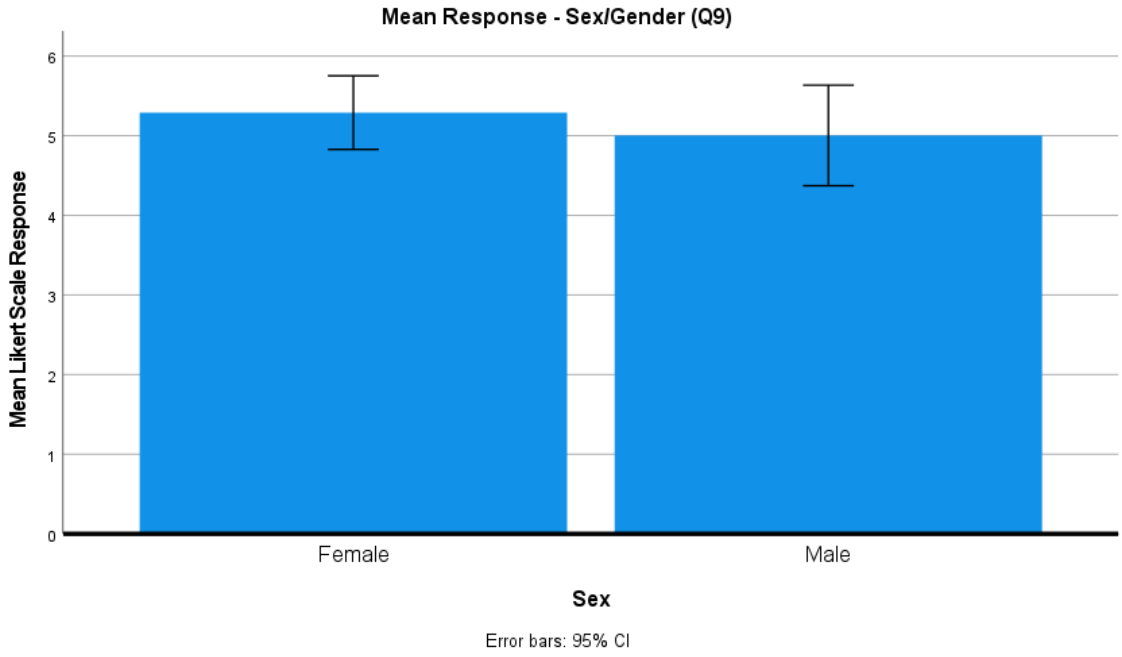


“Strongly agree” remains the Mode for this data set, indicating that people in general at least look for the location of the emergency exit closest to them prior to departure. The overall mean response from all respondents was 5.52, signaling that there is a decent likelihood that passengers will retain their own knowledge of the exit point closest to them. However, the actual influence of this knowledge on actual emergency outcomes has not yet been fully identified.

Female respondents tended to agree with the statement slightly more than male respondents. The mean response from female respondents was 5.29 and the mean response from males was 5.00. However, the difference was not statistically significant [F(0.689), p=0.504].

Figure 18

Mean Response – Sex/Gender (Q9)



Open-Ended Recommendations

While most questions included in the survey consisted of either demographic identification questions or questions that utilized the Likert Scale, it has been noted by the research team that a qualitative question regarding individual opinions related to aircraft safety is appropriate to ensure that the research served to identify weaknesses that may not have been identified previously, either through existing research or by industry

professionals. Many different proposals were suggested and should be considered by both individual air carriers and regulators to ensure practicality.

The most common response relating to improvements that can be made by airlines for emergency preparedness praised the effectiveness of a safety video. A total of 14 respondents indicated that modification to or addition of an inflight safety video could help them be more prepared in the event of an emergency situation, thus improving their own comprehension of safety information.

- Proposed methods of improvement include the greater incorporation of fun and humor into the videos (4 respondents, F 55-64, F 65 and over, F 45-54 and F 25-34), making safety videos interactive in some form (1 respondent), and making the safety videos "better", "more interesting", or entertaining (3 respondents, F, M, and F 65 and over). One respondent (M, 55-64) indicated that airlines should "Make it fun to review or watch the demo"

One respondent who indicated that safety demos should use humor also suggested that the humor in question puts passengers "at-ease". The participant stated that "(Humor) not only increased the attention of the passengers, but it also served to relax and put us at ease." Conversely, one respondent (F, 55-64) recommended that all flights perform the safety demonstration live as opposed to a video because safety demonstration videos have a tendency to be "boring" and are easily ignored. "Do the instructions live b/c (sic) we seem to ignore the boring videos". Similarly, 2 respondents indicated that safety briefings, regardless of the method, should be less "repetitive" or "routine" and more meaningful towards safety as a whole.

- "Perhaps make the safety briefing more interactive so that it's less routine and more meaningful…the current modern videos are a little better than the flight attendants going through their tired routine." M 55-64
- "I feel that they do a good job. Essentially, there is the same information presented every time, on every airline……just in slightly different formats. Live or via the video screens." F 55-64

It was previously hypothesized in Chapter 2 that, as part of open-ended feedback received from participants, some responses may allude to cabin seating configuration as a contributing risk factor to even worse outcomes. Of the 149 participants who elected to provide recommendations for how airlines could prepare them better for an emergency situation, five (5) respondents referenced inadequacies relating to the cabin configuration.

- One respondent (F, 55-64) directly relates their own seating configuration concerns to the efficiency of an evacuation if it were to occur. "Give more room between seats so passengers can exit easier and faster."
- One respondent (F, 45-54) recommended carriers incorporate more comfortable seats and more legroom. "Deny boarding to intoxicated and belligerent people. Stop charging extra for families to sit together. Provide more comfortable seats and more legroom. People will get up less."
- Another respondent (F, 55-64) directly recommended reconsideration to seat placement. "Seat placement. Increase space/leg room"
- Another respondent (F) recommended emergency exits to be better indicated. "Indicate the emergency exits a little better." The primary researcher notes that, even though this does not directly relate to seating

configurations, such changes may indicate underlying inadequacies with cabin seating arrangements.

Several participants suggested that airlines tailor their safety briefings to focus on which types of emergencies are most likely to occur onboard a commercial aircraft.

- One respondent (F, 18-24) indicated that an explanation of the types of terrain to be prepared for in the event of an accident would be helpful. “I think explaining the types of terrain to be prepared for would be helpful. As well as risks if instructions aren’t followed”
- Two respondents (F, 25-34 and M) recommended air carriers tell them the likelihood of an emergency happening. The participant failed to specify the type of emergency, but it can generally be predicted that passengers could use a better idea overall of the likelihood of a particular occurrence. “Tell me the likelihood of an emergency happening” and “Show the probabilities of different types of emergency situation, to give a sense how often (sic) the emergency situations occur.
- Another respondent (F) recommends airlines change the strategy of distributing safety information and providing instruction based on collected data. “Collect data regarding the most common emergencies and the most catastrophic-but-survivable emergencies, tailor plans and instructions around that. Have a clear and consistent communication method that differs from standard communications”

- Another respondent (F, 55-64) recommended further iteration by flight crew regarding emergency situations that could happen. “Talk about situations that could happen”.

It is noted by the primary researcher that all potential risks of a notable likelihood are already mentioned in safety announcements, but more iteration regarding these situations may have been the intent behind many of these responses.

Perhaps most importantly, certain participants indicated that deficiencies exist regarding the access and use of flotation devices, including for aircraft which are equipped for seat cushion-only flotation capability in the event of a water landing.

- One participant (F) indicated that airlines should “Physically show where the flotation device is stored”
- Another participant (F) indicated that airlines should explain how the flotation devices are accessed. “Show how to access the flotation device”
- A third participant (F) responded slightly differently from others who have stated this deficiency, specifically requesting airlines to demonstrate the process of using the seat cushion as a flotation device. “Demonstrate how to use the seat cushion as a flotation device.” Life vest equipped aircraft were not mentioned here.
- Another respondent (F, 65 and over) stated that the location description provided for life vests is inadequate. “Explain exactly where life vests are and how to retrieve them, under your seat is not a clear enough explanation”.

These responses clearly indicate that there are perceived discrepancies in the explanation of life vest and floatation seat cushion use that should be addressed. Depending on the specific scope of an air carrier's operation and the configuration of their fleet, safety information could be revised to ensure that the description of the location of life vests and usage instructions are worded appropriately and are reasonably applicable to all situations, including low-visibility scenarios.

Two respondents recommended a method of engagement intended to most effectively ensure emergency preparedness is discussed in more detail. Two participants (F 45-54 and F 18-24) stated that more, not clearer, instruction to emergency exit passengers should be provided. The latter participant (F 18-24) stated that more instruction to those in an exit row seat should be provided, "just on the off chance there isn't much time in an emergency".

Exit Row Seating

Among the other methods discussed, the primary researcher has found that providing information on a personal level and building relationships between crew members and passengers could be among the most practical and effective to mitigating negative safety impacts associated with human error. This solution was considered feasible by the primary researcher before the data collection process. The process of "creating time" through providing additional instruction to exit row occupants ahead of time in case of an unexpected emergency occurrence was not initially considered.

Several open-ended responses from the survey data, in addition to related findings by air carriers and the general public, have indicated that there are major limitations to how exit row/emergency exit briefings are conducted. As discussed earlier in the chapter, two

participants openly stated that more instruction to emergency exit passengers should be provided. One such participant stated that more instruction to those in an exit row seat should be provided, “just on the off chance there isn’t much time in an emergency”. Currently, air carriers are only required by 14 CFR 121.585 to “make…passenger exit seating determinations required by this paragraph in a non-discriminatory manner…by persons designated in the certificate holder's required operations manual” (14 CFR 121.585). No portion of the regulation requires air carriers under Part 121 to ensure that passengers actually understand exit row criteria. **Survey data has indicated that exit row information provided is not enough. Therefore, air carriers should individually redefine their suitability requirements to be more restrictive than what is required by regulation.** The option of pursuing these changes individually as opposed to collectively is primarily justified by the process changes having to be put through change management processes associated with each airline’s Safety Management System.

A method that could potentially be put in place by air carriers is incorporating measures to keep those in the exit row, and, by extension, whole groups of passengers, engaged. Specifically, the primary researcher recommends greater focus on the relationships that are developed between flight attendants delivering a briefing and passengers themselves (regardless of whether they are in the exit row or not). If these relationships are created and maintained on each flight pursuant to established policies in an operations manual, there could be potential for long-term increases in safety and regulatory compliance. The creation and maintenance of safety-oriented relationships in the aircraft cabin that are designed to engage passengers will help to mitigate the common complaint among our survey respondents that the safety briefing or announcement is repetitive or “boring”. In

addition, these relationships can be advantageous when situations arise when passengers are needed to assist the flight crew, especially on aircraft requiring only one flight attendant. Furthermore, when a flight requires flight attendants and pilot crewmembers to identify available resources (such as a medical doctor, nurse, or law enforcement officer), any action that is needed can be positively influenced by the relationships that have already been developed. While regulators do not have to take any action for the incorporation of these practices, it would be wise for this strategy to be considered for overall effectiveness.

Attitudes by Region

There is still little study on how both safety and regulatory compliance attitudes differ by geographic or cultural factors, such as country or state. Future work could modify the questions asked in this research to identify additional factors such as region or country of residence and attempt to determine which differences exist, and perhaps even use those differences to inform carriers on how to best approach their own safety improvements in each region that they operate. While this research did not identify region, state, or other similar identifying factors for each participant, it did manage to collect a diverse sample with new data that has built upon the safety briefing work of Ruenroy (2014) while proposing new solutions to the issue of the gaps that exist in airline inflight safety and regulatory compliance.

CHAPTER 5

CONCLUSION

This research aimed to assess and evaluate the current state of affairs related to passenger regulatory compliance and safety preparedness through a quantitative, survey-based approach based off of the Likert Scale. Further, this research provided recommendations backed primarily by recommendations from a number of airline passengers.

Significant Findings

There were no significant statistical findings between the independent and dependent variables; everybody had a slightly different approach to safety for the majority of questions. However, data trends existed both quantitatively and qualitatively which can inform regulators and air carriers in charting a course of action. The collected data has indicated, both from the Likert scale responses and open-ended responses from the sample, that there is still noticeable room for improvement regarding the current state of inflight cabin safety and regulatory compliance measures. While air carriers have generally accepted the risk of undesirable behavior and events occurring during an evacuation due to the rarity of the circumstance, there are multiple methods found through this research that air carriers and regulators can implement that can improve safety preparedness, which may also create substantial improvements in deteriorating onboard regulatory compliance.

Perhaps the most important quantitative finding was collected through the quantitative portion of the distributed questionnaire. Data taken from Q6 of the survey measure indicated that upwards of 30 percent of respondents clearly indicated that they

do not read the aircraft safety card. This is an unfortunate finding as air carriers expect passengers, especially those sitting in an emergency exit row (when applicable) to develop at least basic safety awareness when they board. An additional finding from the sample data appeared to demonstrate that individuals in the 18-24 demographic agreed slightly higher on the safety card question (although this difference was not statistically significant). Therefore, carriers may possibly be able to consider tailoring new awareness measures towards other age demographics.

Separate from safety briefing improvements, it has been found through trends in the open-ended survey responses that instructions specific to the usage of life vests and/or seat cushions in the event of a water landing may not be the clearest nor the easiest to understand. Carriers who are certified for operations such as extended overwater and ETOPS should consider the actual effectiveness and clarity of their instructions specifically related to retrieval of life vests to achieve the most desirable outcome in emergency situations.

Closing

In closing, the current state of affairs regarding commercial aircraft safety and regulatory compliance needs to be improved; carriers and regulators have ample work to do. It must be emphasized that the various improvements recommended here must be put through safety risk management processes, from both operators and regulators, and that these recommendations are intended to increase individual engagement. If all passengers are actively engaged in the safety process, potential outcomes in emergency situations could be improved and negative impacts mitigated. Furthermore, this engagement can be extended to the relationships built between flight crewmembers and passengers. This

research is not necessarily a final verdict on what measures should be taken by every carrier, but it is designed to help the industry chart a course towards being safer while not extensively modifying existing systems.

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APPENDIX A

SURVEY CONSENT FORM

Aircraft Cabin Safety and Regulatory Compliance Study

I am a graduate student under the direction of Professor Michael Cirillo in the Ira A. Fulton School of Engineering at Arizona State University. I am conducting a research study to further understand individual safety attitudes of people who have traveled by commercial aircraft in the last 2 years.

I am inviting your participation, which will involve a short survey involving collection of information regarding safety preparedness and regulatory compliance onboard commercial aircraft. You have the right not to answer any question, and to stop participation at any time.

Your participation in this study is voluntary. Participation will take approximately 10 minutes. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. You must be 18 or older to participate in the study.

There are no foreseeable risks or discomforts to your participation. Although there is no benefit to you, possible benefits of your participation are an increased safety awareness the next time you travel and identification of improvements that you can make in your future travel routine.

De-identified data collected as a part of the current study will not be shared with others (e.g., investigators or industry partners) for future research purposes or other uses.

Your responses will be confidential. No sensitive personal information will be collected.

The results of this study may be used in reports, presentations, or publications but your name will not be used.

If you have any questions concerning the research study, please contact the research team at: 520-288-0188. If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480) 965-6788. Please let me know if you wish to be part of the study.

Return of the survey is considered your consent.

If you consent to the study and wish to continue, press “I agree” to continue to the survey.

APPENDIX B

SURVEY MEASURE QUESTIONS

Aircraft Cabin Safety and Regulatory Compliance Survey Measure

Note: Questions 2-9 are questions answered on a scale of 1 (Strongly Disagree) to 7 (Strongly Agree)

1. How many times have you flown on a passenger aircraft within the past 2 years?
    a. 0 Times
    b. 1-4 Times
    c. 5-7 Times
    d. 7 or greater times
2. When the seat belt sign is on, I always wear my seat belt.
3. I will utilize the lavatory if needed regardless of the status of the seat belt sign.
4. If suddenly had to evacuate an airplane, I would take the time to retrieve my personal items from the overhead when leaving the airplane.
5. I put my phone on Airplane or Flight Mode (or equivalent) when instructed when flying on passenger aircraft.
6. I look at the safety information card provided to me every time I fly.
7. I give my complete attention to the safety briefing provided at the beginning of every flight.
8. Every time I fly, I plan the actions I would take in the event of an emergency on the aircraft.
9. Every time I fly, I look around for the closest emergency exit prior to departure.
10. In your own words, what could airlines do better to prepare you for an emergency situation? (Open-ended free-form response)

11. State your sex/gender.

    a. Male

    b. Female

    c. Other (please specify)

12. State your age range.

    a. 18-24

    b. 25-34

    c. 35-44

    d. 45-54

    e. 55-64

    f. 65 and over

APPENDIX B

INSTITUTIONAL REVIEW BOARD (IRB) APPROVAL

ASU Knowledge Enterprise Development

EXEMPTION GRANTED

Michael Cirillo
IAFSE-PS: Aviation
-
Michael.A.Cirillo@asu.edu

Dear Michael Cirillo:

On 3/9/2023 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Aircraft Cabin Safety and Regulatory Compliance Study
Investigator:	Michael Cirillo
IRB ID:	STUDY00017442
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• Digital Consent Form, Category: Consent Form; • Digital Recruitment Sample, Category: Recruitment Materials; • IRB Protocol, Category: IRB Protocol; • supporting documents 02-07-2023, Category: Other;

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2)(ii) Tests, surveys, interviews, or observation (low risk) on 3/8/2023.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

If any changes are made to the study, the IRB must be notified at research.integrity@asu.edu to determine if additional reviews/approvals are required. Changes may include but not limited to revisions to data collection, survey and/or interview questions, and vulnerable populations, etc.

Sincerely,

IRB Administrator

cc: Sam Lolwing
Sandra Park
John Drew
Sam Lolwing