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Understanding the effect of alcohol consumption by Airline Passengers in Safety Sensitive Aisles

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Overview

- Review of current Federal Aviation Administration (FAA) legislation that pertains to alcohol consumption by passengers onboard commercial carriers
- Survey Study- Reliance on available subject survey to assess the impact of education on passenger attitudes regarding alcohol usage on commercial carriers
- Discussion of Results
- Questions?

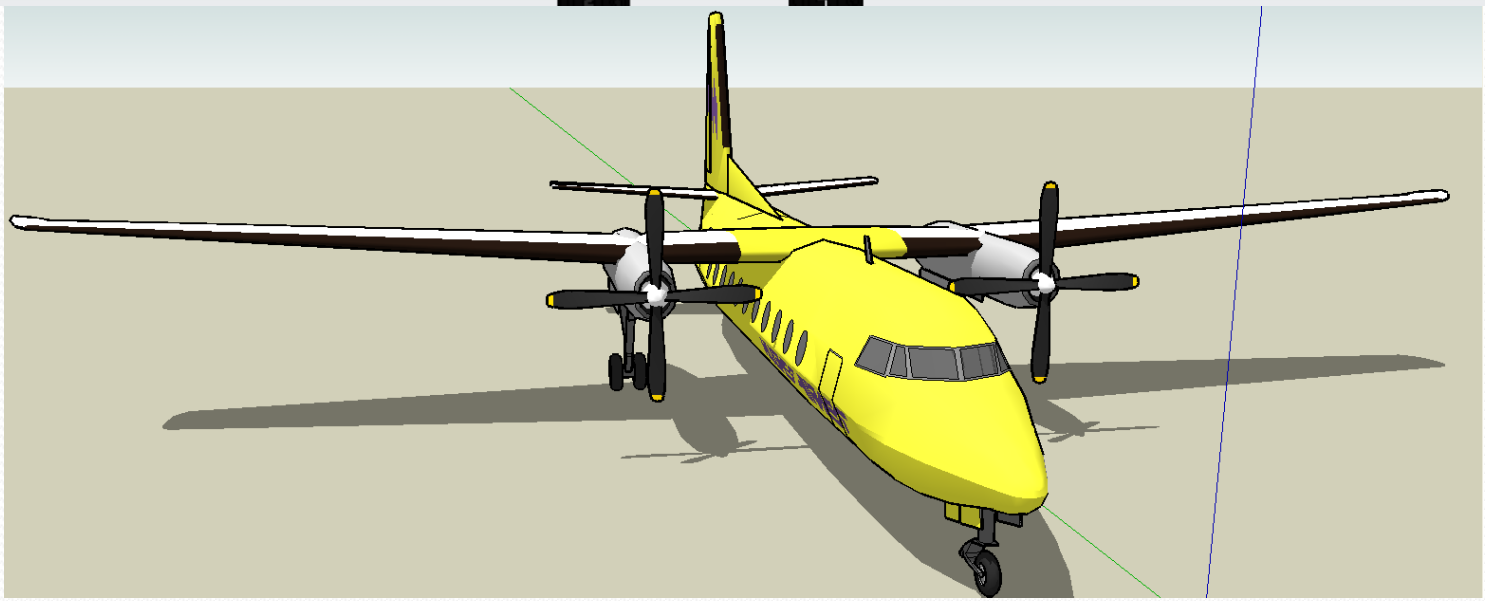
Case Study

Los Angeles International Airport (LAX) just after 6 o'clock on February 1st, 1991

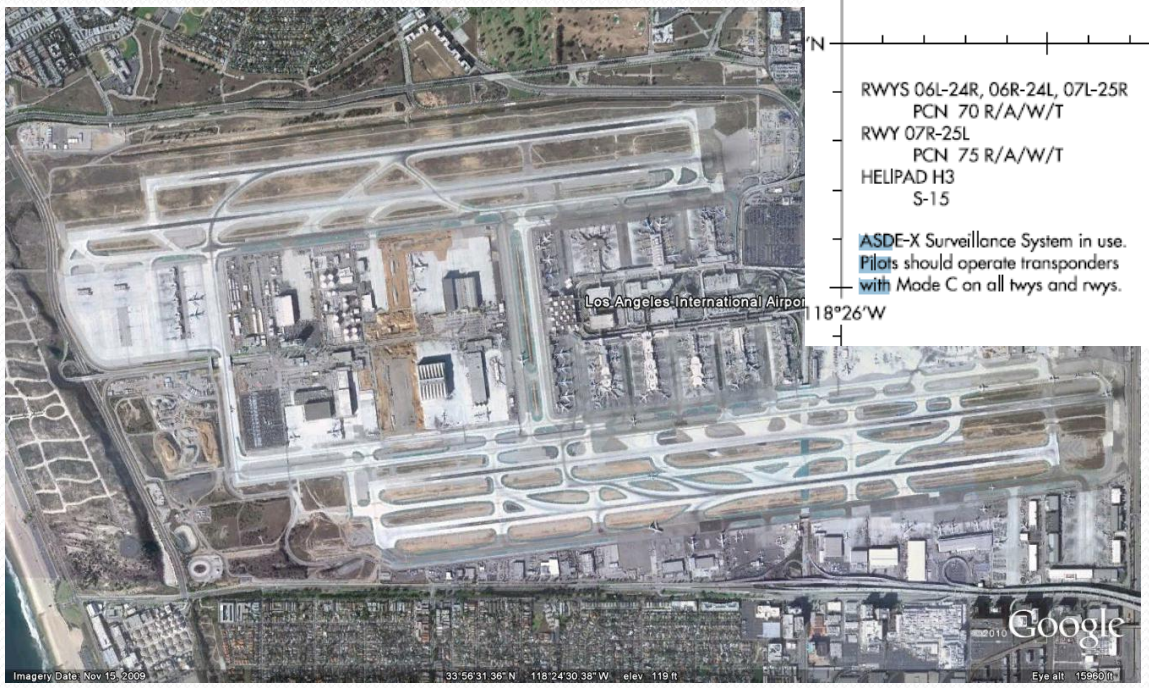
Fairchild Metroliner bound for Palmdale California.

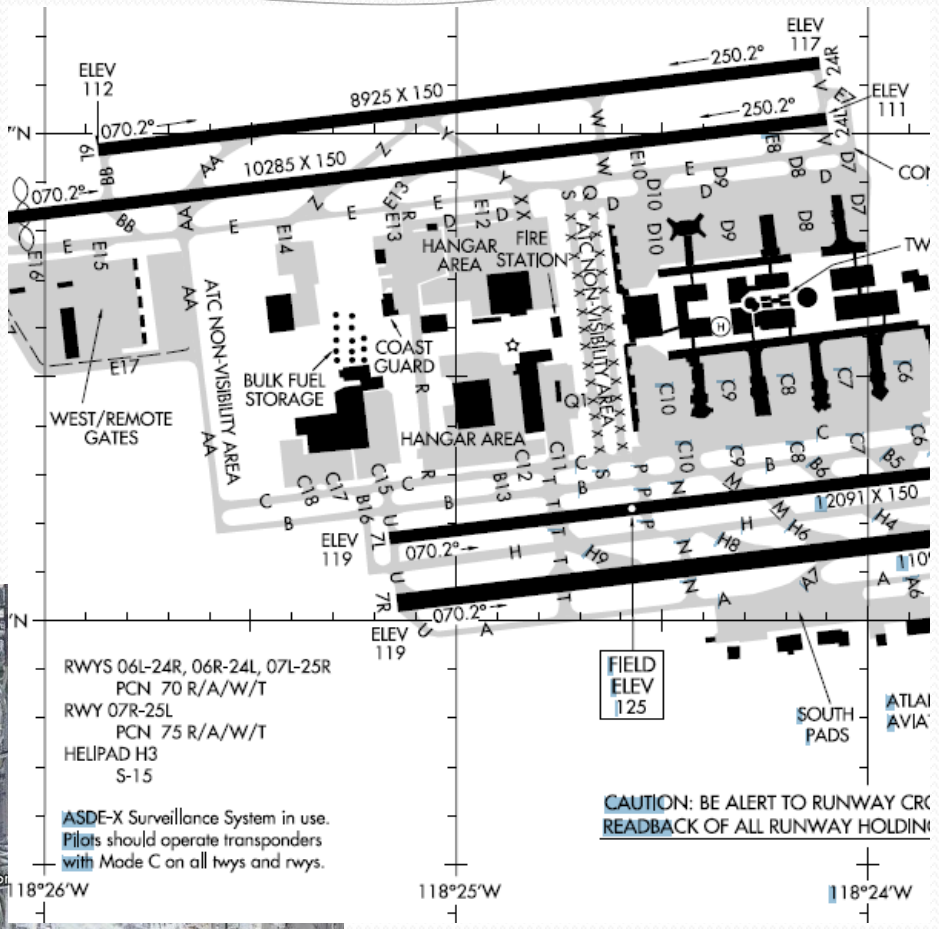
At 6:03:40pm (dusk), Skywest Flight 5569(a part 135 Fairchild Metroliner bound for Palmdale California) was given clearance to taxi into position for take-off on runway 24L (left) and hold.

Minutes later at 6:05:53pm, the local controller cleared USAir flight 1493 (a Boeing 737 bound to LAX from Syracuse, New York [SYR]) for landing the same runway, 24L (10,285 feet by 150 feet).



Runway 24L


Los Angeles International Airport
Google
Imagery Date: Nov 15, 2009


ELEV 112
ELEV 117
ELEV 111
8925 X 150
10285 X 150
12091 X 150
250.2°
070.2°
24R
24L
ATC NON-VISIBILITY AREA
HANGAR AREA
FIRE STATION
COAST GUARD
BULK FUEL STORAGE
WEST/REMOTE GATES
ELEV 119
FIELD ELEV 125
SOUTH PADS
RWYS 06L-24R, 06R-24L, 07L-25R
PCN 70 R/A/W/T
RWY 07R-25L
PCN 75 R/A/W/T
HELIPAD H3
S-15
ASDE-X Surveillance System in use.
Pilots should operate transponders with Mode C on all twys and rwys.
CAUTION: BE ALERT TO RUNWAY CRO
READBACK OF ALL RUNWAY HOLDIN
118°26'W
118°25'W
118°24'W


Los Angeles International Airport (LAX), Los Angeles, CA 90045
Gray Buildings © 2010 CyberCity
Data CSUMB SFML, CA OPC
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
©2010 Google
Imagery Date: Nov 15, 2009
33°56'54.77" N 118°24'28.99" W elev 120 ft
Eye alt 2381 ft

From the NTSB report…

- SKW5569, N683AV, HAD BEEN CLEARED TO RWY 24L, AT INTERSECTION 45, TO POSITION AND HOLD. THE LOCAL CONTROLLER, BECAUSE OF HER **PREOCCUPATION WITH ANOTHER AIRPLANE, FORGOT SHE HAD PLACED SKW5569 ON THE RUNWAY** AND **SUBSEQUENTLY CLEARED USA1493, N388US, FOR LANDING.**

- AFTER THE COLLISION, THE **TWO AIRPLANES SLID OFF THE RUNWAY INTO AN UNOCCUPIED FIRE STATION.**

- THE TOWER OPERATING PROCEDURES **DID NOT REQUIRE FLIGHT PROGRESS STRIPS TO BE PROCESSED THROUGH THE LOCAL GROUND CONTROL POSITION**.

- BECAUSE THIS STRIP WAS NOT PRESENT, THE LOCAL CONTROLLER (Tower) MISIDENTIFIED AN AIRPLANE AND ISSUED A LANDING CLEARANCE.

- All the occupants of the Metroliner, including crew, were killed as a result of the impact. Twenty-two (22) occupants of the USAir Boeing 737 died as a result of the accident, two of which were crew members.

Other risk factors affecting crash survivability:

Later studies of toxicology reports implicated ***alcohol intoxication*** as a risk factor for passenger fatality in this accident (Reinhart, 1992).

Li (Li et. al.,1998) determined that intoxicated passengers were less able to recognize the hazard, follow directions and egress in a timely manner.

In fact, during a personal conversation between the science investigators and the NTSB Board in 1997, it was determined that one of the passengers on USAir Flight 1493 had a blood alcohol content (BAC) of 0.24% and was found to have not unfastened his safety belt.

Li et al.

- Investigators find alcohol in non-pilot occupants to be twice as much (x 2) as in pilot victims and that positive BACs (over 0.09%) exceed twenty (20%) percent.

Title 14 of the US Code of Federal Regulations (CFR) 121.575(b),(c)

§ 121.575 Alcoholic beverages.

(b) No certificate holder may serve any alcoholic beverage to any person aboard any of its aircraft who—

(1) Appears to be intoxicated;

(c) No certificate holder may allow any person to board any of its aircraft if that person appears to be intoxicated.

CFR 121.458 (c)

§ 121.458 Misuse of alcohol.

(b) *Alcohol concentration.* ***No covered employee*** shall report for duty or remain on duty requiring the performance of safety-sensitive functions while having an alcohol concentration of 0.04 or greater. No certificate holder having actual knowledge that an employee has an alcohol concentration of 0.04 or greater shall permit the employee to perform or continue to perform safety-sensitive functions.

(c) *On-duty use.* ***No covered employee*** shall use alcohol while performing safety-sensitive functions. No certificate holder having actual knowledge that a covered employee is using alcohol while performing safety-sensitive functions shall permit the employee to perform or continue to perform safety-sensitive functions.

Unqualified Passengers

- Elderly
- Those with medical conditions
- Small children

Should passengers, asked to perform ***safety sensitive functions*** during an emergency, have to comply with the same regulations as crew members?

Problem Statement

Currently, there is no requirement restricting alcohol consumption by passengers seated in safety sensitive aisles that may be called upon to perform safety duties in the event of an emergency evacuation of a commercial aircraft carrier.

Culture

- Prior to deregulation in the 1970s, there was a two drink minimum for passengers on commercial airlines (Drew, Colquhoum, & Long 1959)
- Under deregulation policies, airlines self-determine passenger limits
- Unfortunately, this is prior to departure and prior to any on-board alcohol consumption
- flight crews reserve the right to remove passengers from that aisle if they feel they cannot execute their duties

General affects of alcohol consumption

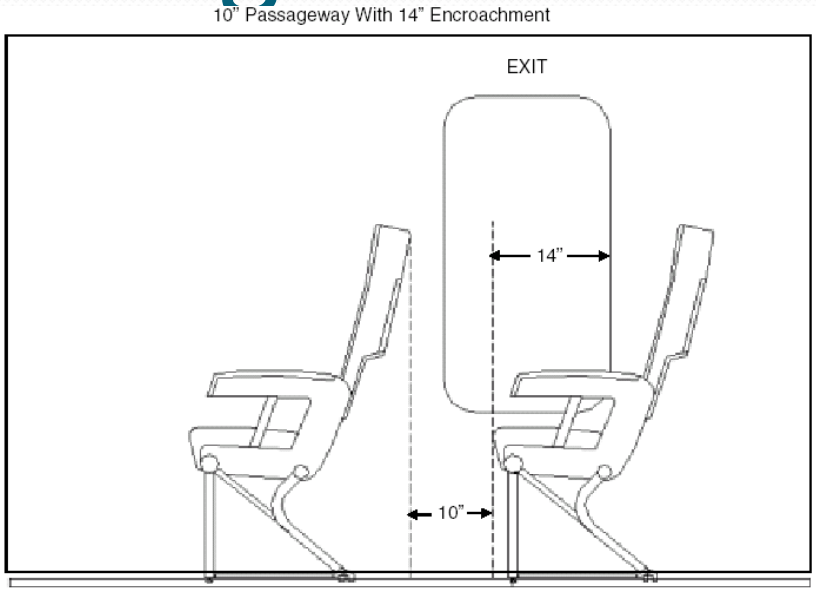
- Decreased reaction times
- Decreased tracking ability
- Decreased spatial judgment
- Difficulty with rudimentary cognition
- Person under the influence is often ***unaware of the impairment*** of performance.

- Supposition: The absence of alcohol intoxication increases one's survivability during an emergency evacuation onboard a commercial airline.

Width not a factor

- Researchers conducting egress studies found increasing seating spacing had little effect on time to exit aircraft.
- Flow-rates were equivalent for 13” and 25” (Ideal spacing) passageways. Deviations from those widths were less effective.

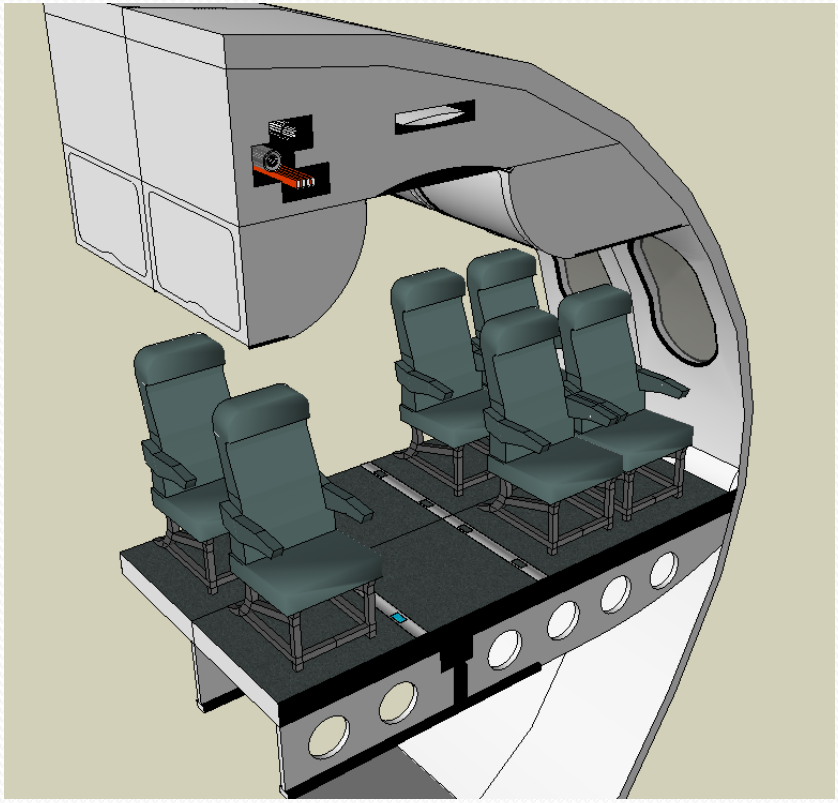
Access to Egress



McLean, Corbett, Larcher, McDown, Palmerton, Porter, Shaffstall (2002). Access-To-Egress I: Interactive Effects of Factors That Control the Emergency Evacuation of Naïve Passengers Through the Transport Airplane Type-III Over wing Exit. *DOT/FAA/AM-02/16*. FAA Civil Aeromedical Institute.

Access to Egress

- Knowing that row configuration and seating plays a role in more speedy evacuations when combined with prior knowledge of layout of emergency equipment operation, location and the physical attributes and responses of an average passenger on board an aircraft operating with a type-III over-wing exit system.
- Thus, any cognitive impairment or decrement caused by alcohol consumption would pose a critical threat to one's recall ability (prior knowledge recall) and the overall egress time.



- The effects of alcohol are crippling on human performance during aircraft accidents.

- Hypoxia experienced after a rapid decompression is only worsened by the presence of alcohol in the body, decreasing one's time of useful consciousness (TUC) and survivability.

Hypothesis

- Individuals that have an increased knowledge of effects of alcohol consumption on motor functioning and increased knowledge of aviation safety factors will be in favor of requiring passengers seated in safety sensitive aisles aboard commercial air carriers should be subject to the same restrictions on alcohol consumption as flight crew members.
- In addition, Participants given additional knowledge on the effects of alcohol via a data sheet will be more conservative (toward greater restrictions concerning alcoholic consumption and impairment levels) in their answers.

Research Design

- Static group comparison
- Surveys were distributed to undergraduate students in Aviation Science programs.

Population

- Undergraduate students (freshman, sophomore, junior and senior) of various concentrations of the field of Aviation Sciences
- n = 127

Research Design

- One group received learning on the subject matter of the effects of alcoholism and flying and one group simply completed a survey
- Surveys were administered and collected in person
- Data was collected individually from a Likert-scale survey administered by this researcher

Data Collection Device

- A t-test was used to compare the mean responses of undergraduate aviation students who were given an informational handout outlining the effects of alcohol on motor functioning and students not given the handout.
- T-test was used to determine whether the two means were significantly different at a selected probability level.

- A Likert-scale questionnaire was utilized. The rating of answers was matched with a numeric value with "*Strongly Agree*" equaling five points, "*Agree Somewhat*" equaling four points, "*Undecided*" equaling three points, "*Disagree Somewhat*" equaling two points, and "*Strongly Disagree*" equaling one point.

Instrument Reliability

- This survey ***was not*** field tested or standardized in order that it could be replicated at any place or time.

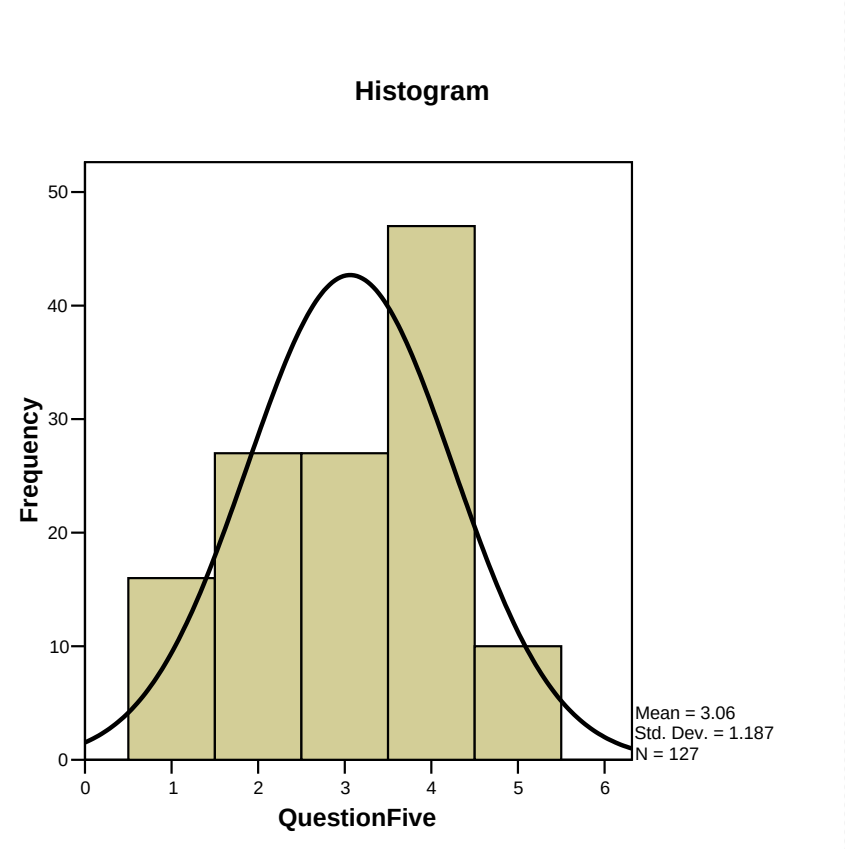
- Responses could vary based differences in personal belief, economic factors, and attitudes toward air carrier operations, drinking, individualism, and social responsibility.

Instrument Validity

- A Student's t-test was utilized to compare the results of two groups on individual questions. A survey pretest was conducted prior to administering the survey. The researcher relied on the accuracy of SPSS Science, Inc.™ software to perform the statistical calculations. The researcher is unaware of any existing flaws in the program. For the purpose of this study, alpha (α) is set at 0.05.

Results

- Question #5: *Alcohol should be served on-board domestic Airlines.*



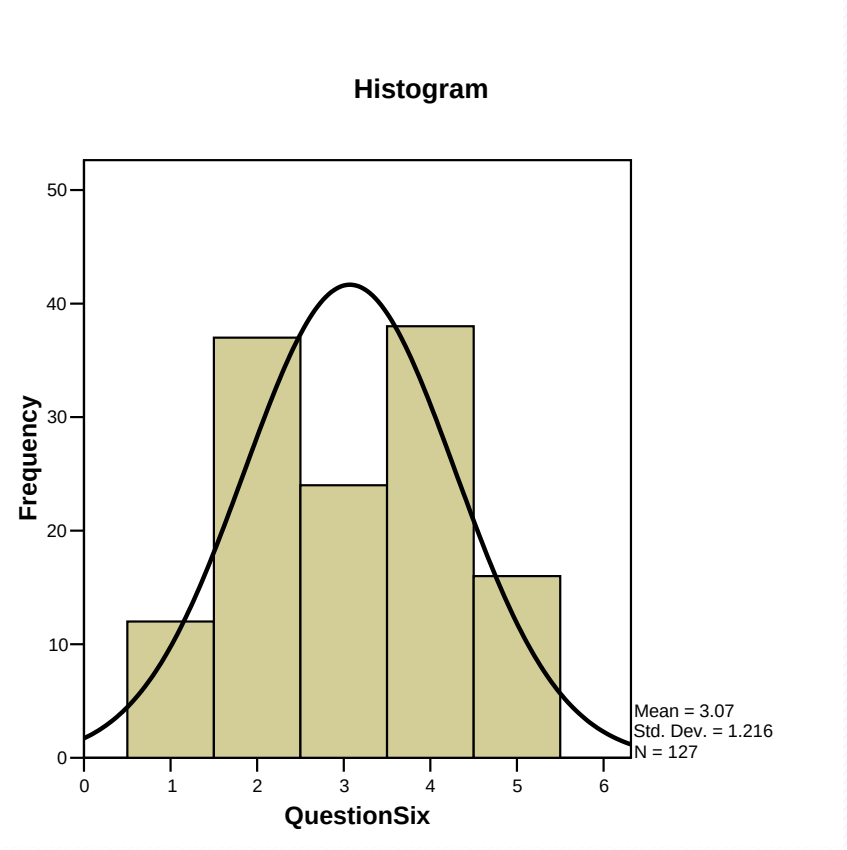
- Question #5: *Alcohol should be served on-board domestic Airlines.* The mode response for this question overall was ***Agree*** (4.0).

- This indicates that the **survey population does not wish to enforce an overall alcohol ban on *all* airline passengers as a whole.**

- When this researcher conducted the t-test to distinguish the two groups from each other, it found that the data given group was more in favor of alcohol being served on-board airlines than the no data group. This may indicate that the informed group was more interested in applying restrictions only to individuals performing safety functions while on-board the aircraft.

Results

- Question #6: *All passengers should be screened for intoxication prior to boarding.*

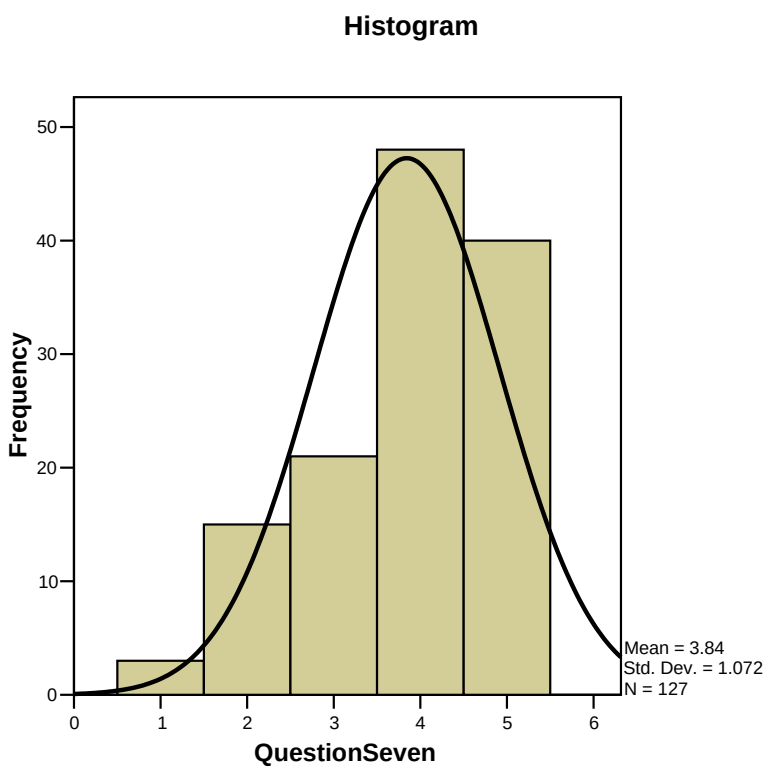


- Question #6: *All passengers should be screened for intoxication prior to boarding*.
- Again, the overall mode for this question was ***Agree*** (4.0).

- This indicates that the survey population is for passenger screening. Passenger screening would allow air carrier crew to enforce the existing regulation restricting intoxicated passengers from boarding domestic carriers for flight.
- The **data given** group was more in agreement with a group mean of **3.17** and the **no data** given group was not in agreement with a group mean of **2.97**. The information given in the data sheet influenced the student's response to answer more in agreement to this statement due to the details regarding error rates, decreased cognitive ability and performance.

Results

- Question #7: *Passengers occupying emergency exit rows should be screened for intoxication prior to boarding.*



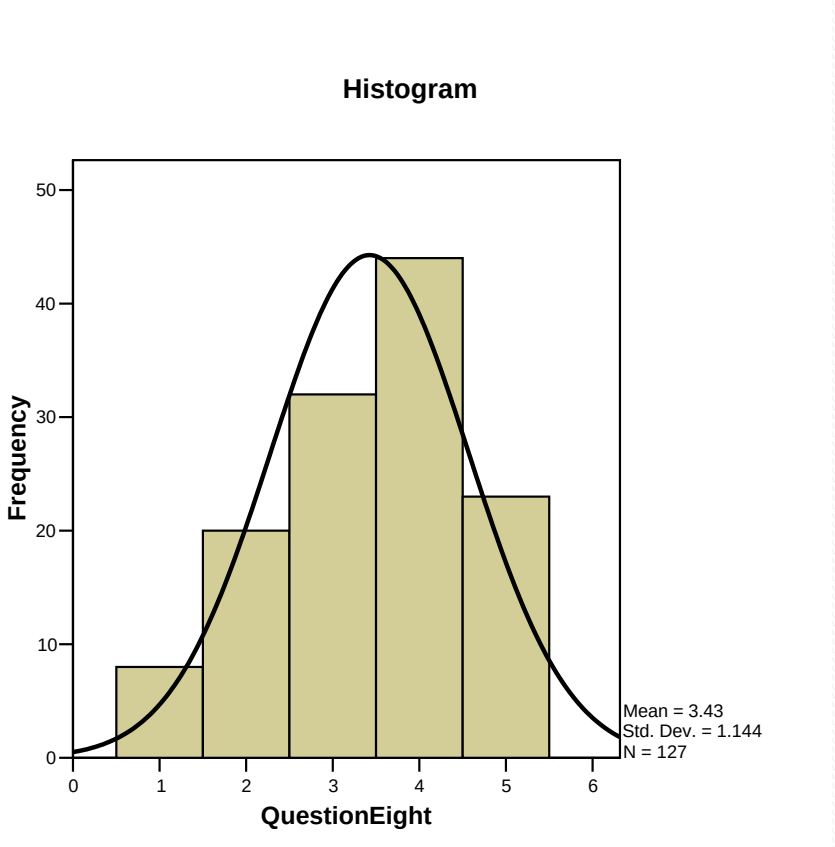
- Question #7: *Passengers occupying emergency exit rows should be screened for intoxication prior to boarding*.

- The mode response for this question was ***Agree*** (4.0).

- This question solicited the highest overall mean score of all the survey questions. The overall **mean** indicated **3.84** as the average response.
- Clearly, the majority of the population group is for screening of the exit rows. As predicted, the data given means exceeded the no data given means (3.87 and 3.81 respectively).
- More students strongly agreed with this statement after reading the informational data sheet.

Results

- Question #8: *A Blood Alcohol Content of .04 or greater would impair my ability to operate an emergency exit door during an evacuation.*



- Question #8: *A Blood Alcohol Content of .04 or greater would impair my ability to operate an emergency exit door during an evacuation.*

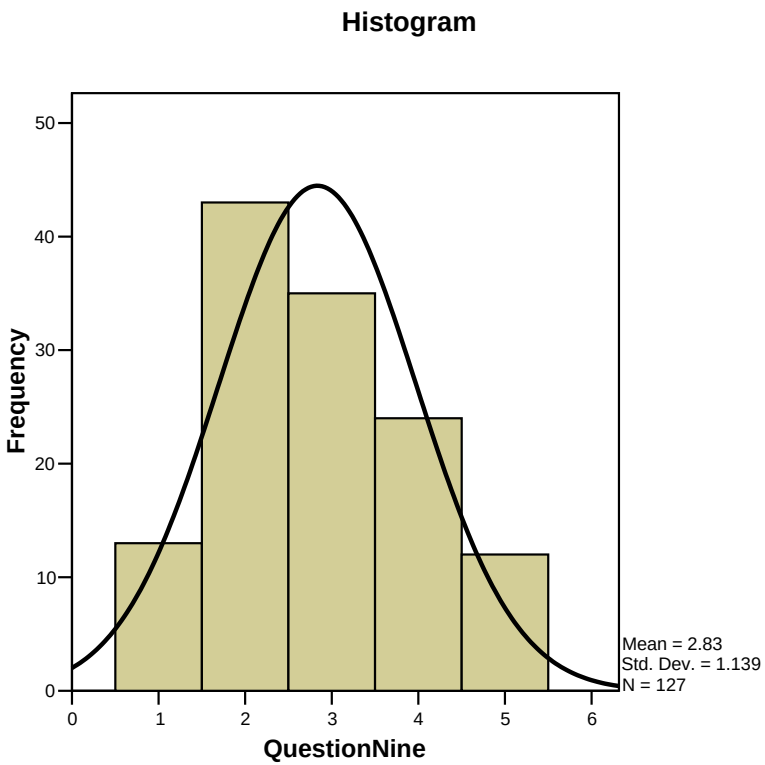
- The mode response for this question was ***Agree*** (4.0). Both groups had almost identical means approaching 3.4.

- With or without the data, respondents agreed that a *BAC of 0.04 or more* ***would*** *impair one's ability to egress from the emergency exit*.

- This result is likely due to the student's knowledge of regulations for crew regarding BAC levels and performance.

Results

- Question #9: *A Blood Alcohol Content of .04 or less would inhibit my ability to operate an emergency exit door during an evacuation.*



- Question #9: *A Blood Alcohol Content of .04 or less would inhibit my ability to operate an emergency exit door during an evacuation.*

- The mode response to this question was ***Disagree*** (2.0). The no data given group was less in agreement with this statement than the data given group.

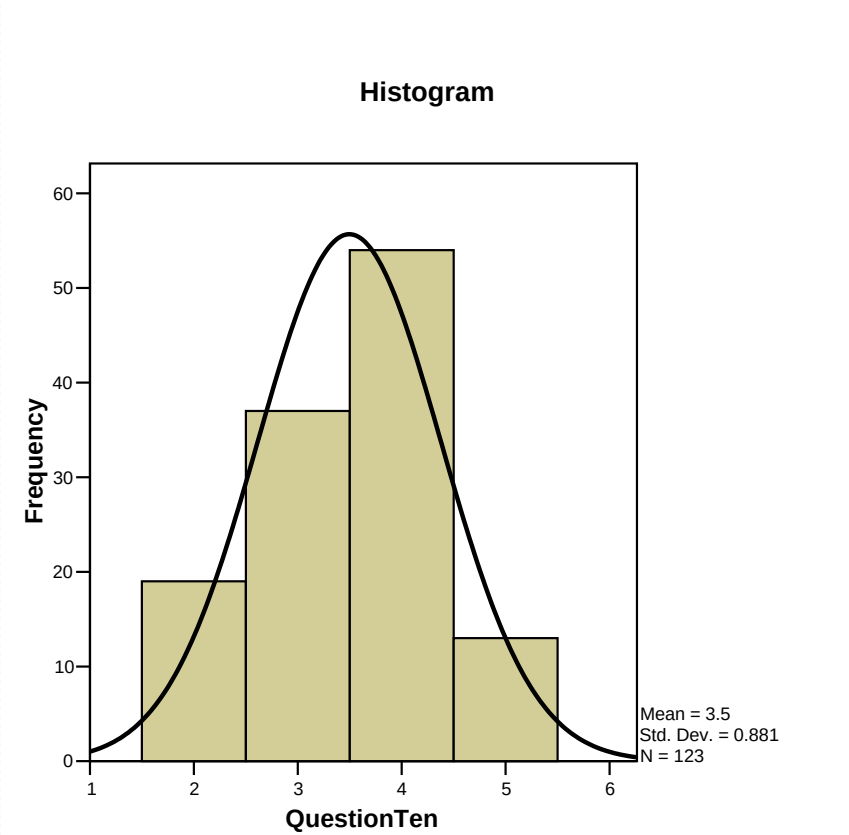
- Both groups lean toward disagreement but the group given data sheet leans even greater toward disagreement.

- The no data group had more students that agreed with this statement than the data given group.

- This researcher can not give a reason for why this may have occurred. The hypothesis predicted that the data given group would have had more respondents answer *Agree* or *Strongly Agree* due to the material covered regarding error rates with BAC lower than 0.04.

Results

- Question #10: *The current alcohol restrictions on passengers and crew provide a sufficient margin of safety for flight.*



- Question #10: *The current alcohol restrictions on passengers and crew provide a sufficient margin of safety for flight*.

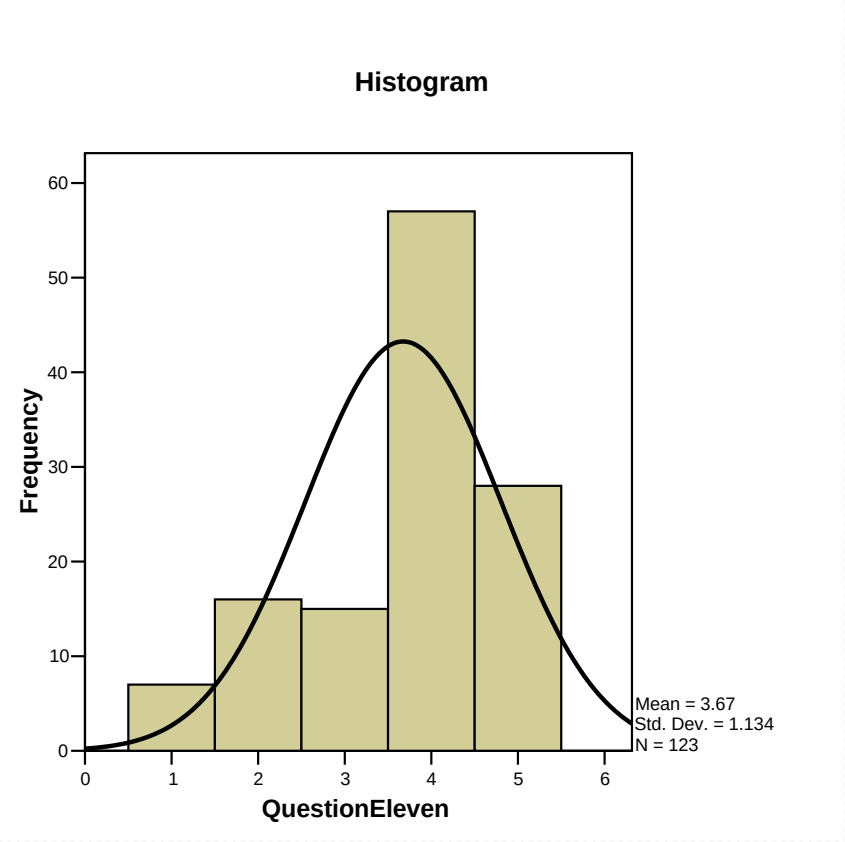
  - The mode response for this question was *Agree* (4.0). Although both groups individually responded closely to the combined mean of 3.5, the **no data group agreed more** (3.52) and the **data given group was less in agreement**(3.47).

  - Both groups answered relatively the same regarding their impression of the overall safety of flight.

  - The **data given groups response is, however, slightly less supportive of the statement**. This is likely due to the influence of the data sheet that exposes the cognitive impairment and increase in error at significantly lower Blood Alcohol Contents (BAC).

Results

- Question #11: *Passengers occupying an emergency exit row that may have to perform duties similar to flight crew members during an emergency should meet the same restrictions regarding alcohol consumption as flight crew members.*



- Question #11: *Passengers occupying an emergency exit row that may have to perform duties similar to flight crew members during an emergency should meet the same restrictions regarding alcohol consumption as flight crew members.*

- The mode response to this question was ***Agree*** (4.0). This question solicited the **highest percentage of *Agree* responses** (46%) and the highest *Strongly Agree* responses (22.8%)of all the survey questions.

- Regardless of information given, the survey population agrees that flight crew requirements regarding alcohol restriction should be applied to passengers that are expected to perform crew duties during an emergency.

- Based on the responses for Question #8 regarding a BAC of 0.04 and higher, this researcher expected lower numbers from the no data group. This was not the case.

- The no data group had more students answer that they strongly agreed to this question than the data given group. Clearly, another determining factor is at play here that is not being measured directly by the survey tool.

Conclusions

- Educating the public on safety related issues that affect them does have an impact on their decision making and opinion on policy (or lack thereof).

- The research found that students educated on the debilitating effects alcohol were more in favor of greater restrictions and monitoring of alcohol consumption by passengers in exit rows who must perform safety sensitive functions *in the event of an emergency.*

Conclusions

Students disagree more with the use of alcohol by all passengers after reviewing the data sheet.

Even though both groups responded in agreement with the statement regarding the current alcohol restrictions and the margin of safety being adequate (Question #10), the group that reviewed the data sheet was less in agreement then that the group with no additional information.

Conclusions

Student responses indicated that both groups (those receiving educational data and those not) are not convinced that a BAC of 0.04 is enough impairment to affect one's level of safety onboard a commercial aircraft.

Conclusions

Not a single student strongly disagreed with the statement regarding *the need for passengers who would be operating the emergency exit doors to comply with the same regulations covering the flight crew (Question #11).* Implication: student population

Both student groups answered more in agreement for (Question #7) the testing for BAC of passengers occupying the exit row seat.

Conclusions

The student population surveyed was supportive of *limiting alcohol consumption to passengers sitting in emergency exit rows* and *testing their BAC levels* to verify their eligibility to perform those duties.

Conclusions

The data that is most paradoxical is the results from Question #10. The researcher can not tell whether the data sheet was effective or not. If the researcher had given the group 2 (data given) students a test without the data sheet and then given them another survey after having them read the data sheet.

One might be able to measure whether or not the answer was more influenced by the information given. This technique, however, would have tipped the students off to the researcher's hypothesis and may have skewed the data and influence students to answer in such a way as to support that hypothesis

Recommendations

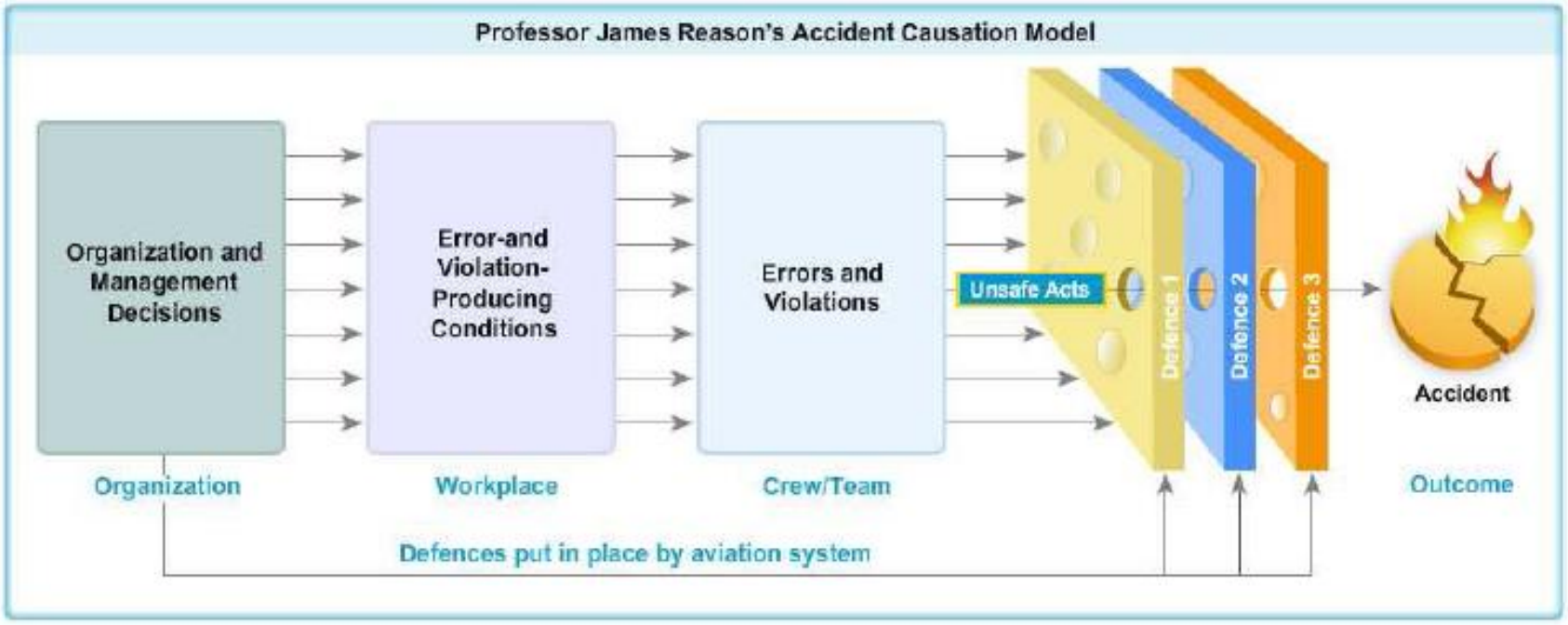
- The airline industry might consider a policy limiting, if not restricting, alcohol to passengers seated in aisles that would require them to perform safety sensitive duties during emergency operation.

Recommendations

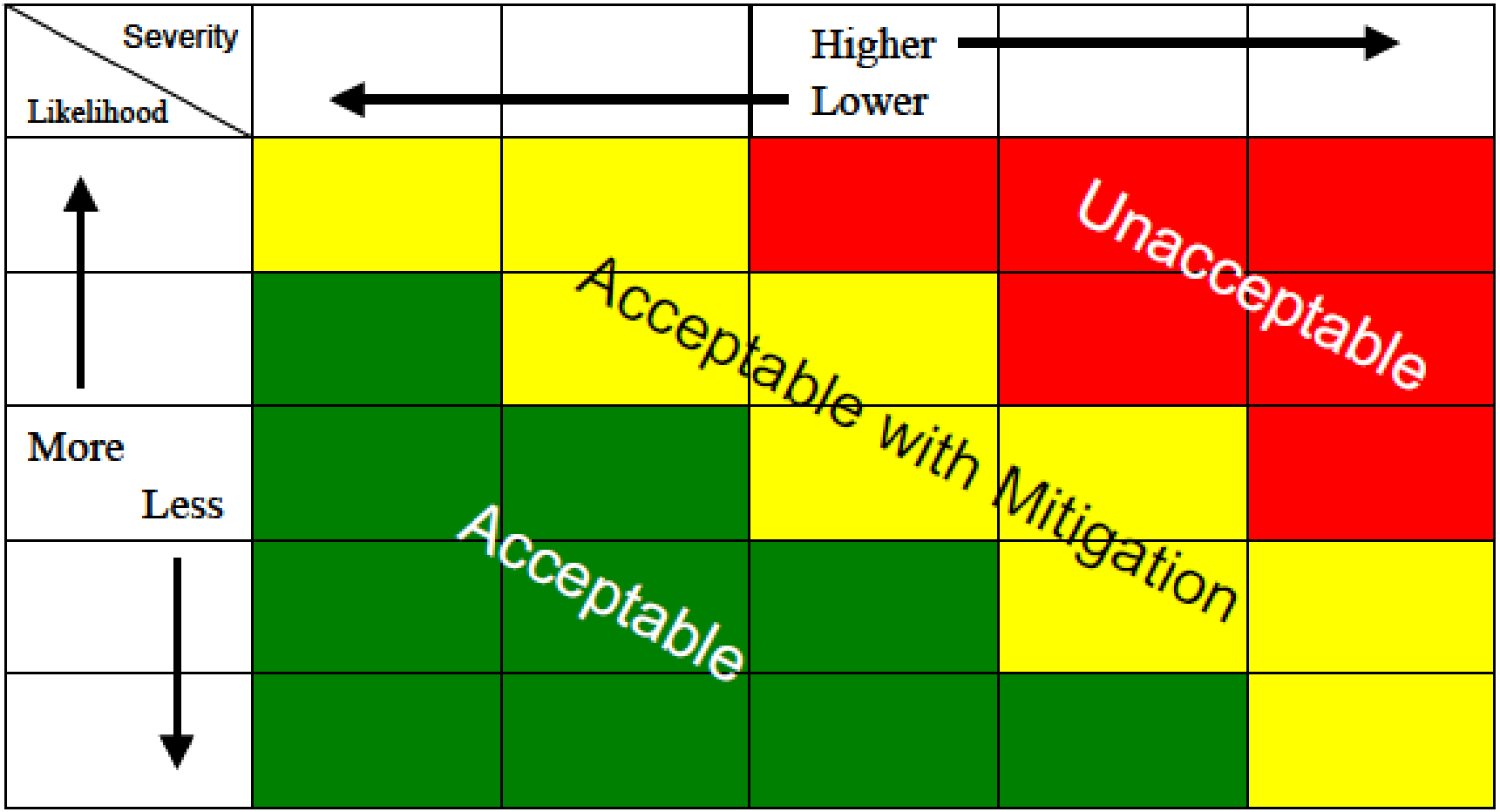
- Both survey group's means supported the use of measuring the BAC levels of passengers in the *safety aisles* before flight if there is reasonable suspicion.

- This could be implemented voluntarily by the airlines themselves or made a requirement under Title 14 of the Code of Federal Regulations for domestic air carriers.

Why is this important?



Risk Assessment Matrix



Thank you very much!

Questions?

Group Statistics

	Question #12	N	Mean	Std. Deviation	Std. Error Mean
Question # 5	1 Not Given Data	64	2.98	1.161	.145
	2 Given Data	63	3.14	1.216	.153
Question #6	1 Not Given Data	64	2.97	1.221	.153
	2 Given Data	63	3.17	1.212	.153
Question #7	1 Not Given Data	64	3.81	.974	.122
	2 Given Data	63	3.87	1.171	.148
Question #8	1 Not Given Data	64	3.47	1.112	.139
	2 Given Data	63	3.38	1.184	.149
Question #9	1 Not Given Data	64	2.91	1.109	.139
	2 Given Data	63	2.76	1.174	.148
Question #10	1 Not Given Data	63	3.52	.820	.103
	2 Given Data	60	3.47	.947	.122
Question #11	1 Not Given Data	63	3.83	.925	.117
	2 Given Data	60	3.52	1.308	.169

Table 1. Group Statistics

Table 2. Independent T-Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Question #5	Equal variances assumed	.118	.732	-.751	125	.454	-.158	.211	-.576	.259
	Equal variances not assumed			-.751	124.522	.454	-.158	.211	-.576	.259
Question #6	Equal variances assumed	.823	.366	-.953	125	.342	-.206	.216	-.633	.221
	Equal variances not assumed			-.953	124.991	.342	-.206	.216	-.633	.221
Question #7	Equal variances assumed	2.494	.117	-.317	125	.752	-.061	.191	-.438	.317
	Equal variances not assumed			-.316	120.298	.752	-.061	.191	-.439	.318
Question #8	Equal variances assumed	.296	.588	.431	125	.667	.088	.204	-.316	.491
Question #9	Equal variances assumed	.159	.691	.713	125	.477	.144	.203	-.257	.545
	Equal variances not assumed			.712	124.339	.478	.144	.203	-.257	.545
Question #10	Equal variances assumed	2.215	.139	.358	121	.721	.057	.160	-.259	.373
	Equal variances not assumed			.357	116.717	.722	.057	.160	-.260	.374
Question #11	Equal variances assumed	13.973	.000	1.517	121	.132	.309	.204	-.094	.712
	Equal variances not assumed			1.504	105.762	.135	.309	.205	-.098	.716

Survey Questions

a) *Alcohol should be served on-board domestic Airlines*. The researcher expected participants to disagree more after the training;

b) *All passengers should be screened for intoxication prior to boarding*. The researcher expected this answer to have no change or lean slightly more toward disagreement;

c) *Passengers occupying emergency exit rows should be screened for intoxication prior to boarding*. The researcher expected this response to be more in agreement after the training;

d) *A Blood Alcohol Content of .04 or greater would impair my ability to operate an emergency exit door during an evacuation*. The researcher expected this response to be more in agreement after the training;

Survey Questions

e) *A Blood Alcohol Content of .04 or less would inhibit my ability to operate an emergency exit door during an evacuation*. The researcher expected this response to be more in agreement after the training;

f) *The current alcohol restrictions on passengers and crew provide a sufficient margin of safety for flight*. The researcher expected this response to have increased disagreement after the training;

g) *Passengers occupying an emergency exit row that may have to perform duties similar to flight crew members during an emergency should meet the same restrictions regarding alcohol consumption as flight crew members (BAC <.04, 8 hours since last alcoholic beverage)*. The researcher expected this response to be more in agreement after the training. Subgroups based on sex, age, aviation concentration, and student classification should occur.