

Characteristics of Agricultural Aviators and Perceptions of Risk Among Operators and Pilots

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ABSTRACT

This study explores risk perceptions of hazards among agricultural aircraft operators and pilots and the true relative frequency of accident events as reported by the Federal Aviation Administration. Our research team conducted a web-based survey of Federal Aviation Regulations Part 137 certificate holders (hereafter referred to as operators) and pilots between December 14, 2010 and March 31, 2011 for the National Agricultural Aviation Association (NAAA). Five hundred and eight operators and 344 pilots responded to the survey. If a respondent was an operator and a pilot, he responded as an operator only.

To assess risk perceptions, operators and pilots were asked to rate 12 hazards on a scale of one-to-ten where ten was the highest perceived risk. Hazardous event frequency differed from the perceived risk of the event. Power lines were perceived to be the greatest risk, yet they were the third most frequently occurring event. Mechanical failure was ranked a relatively low risk, but FAA data show this is the second leading cause of incidents. Pilots and Operators ranked communication towers, meteorological towers, birds, wind turbines and limited space for maneuvering as high risk, yet they account for a very small portion of the incidents reported by FAA.

Overall, operators ranked risks lower than pilots. Those in the industry for 25 or more years ranked chemicals, mechanical failure, limited space for maneuvering, wind turbines and meteorological towers significantly lower than those working in the industry less than 25 years.

BACKGROUND & OBJECTIVES

The National Agricultural Aviation Association (NAAA), SSS¹ survey researchers, and Part 137 certificate holders collaborated to balance survey length, the need for representative data and timing of the survey's administration. Part 137 operation is defined below.²

The purpose of the survey was to:

- Gather data from the population of Part 137 operators on demographics, experience, scope of work operations, equipment, standard practices, drift mitigation techniques, crops and acres treated.
- Gather data on risks, risk perceptions, safety practices and health for future training purposes.

The overriding principles were to create a short, precise survey that gathered only the necessary data, could be answered by operators and pilots in a secure, cost-effective manner and could address the research questions:

- How do pilots and operators perceive risks?
- Do operators and pilots perceive risks differently?
- How closely do perceived risks match accident data?

SAMPLE & METHODS

SSS purchased a file of all Part 137 operations from Airpac, Inc. in Edmond, Oklahoma containing 1,734 operator names, addresses, telephone numbers, aircraft and company names. We then merged this list with a list maintained by the NAAA containing email addresses so, where possible, an email address was linked to an operator.

In collaboration with the NAAA, SSS crafted questions on demographics, operations, practices, risk perception, injuries and health. We modeled questions after prior NAAA surveys so that we could make comparisons between them. The questionnaire and methods were reviewed by the Environmental Protection Agency. We pilot tested the questionnaire among three operators whose comments were incorporated into the questionnaire to improve question clarity. We also incorporated minor changes at the request of the NAAA Government Relations Committee upon review of the questionnaire. Categories of risk were defined in consultation with NAAA.

SSS loaded the survey into the SPSS web tool for administration on a secure web site and testing by the SSS research team. We launched the final questionnaire in December 2010, just prior to the NAAA Convention and Trade show in Savannah, GA.

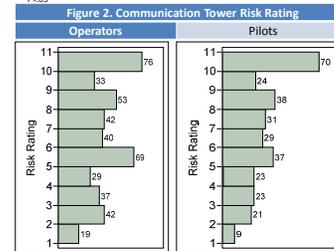
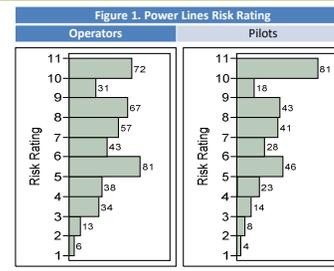
SSS designed the survey to obtain data from the operators, and pilots. We asked respondents to rate 12 hazards on a scale of one to ten where ten was the perceived highest risk. We analyzed results using SAS JMP.

RESULTS

Table 1. Ranking Pilots and Operator Risk Ratings Combined (n= 832)

Risk	Median	Mean (SD)
Power Lines	7	6.74 (2.43)
Communication towers	6	6.3 (2.79)
Meteorological towers	6	5.59 (3.64)
Chemicals	3	3.75 (2.30)
Limited Space for Maneuvering	3	3.58 (2.59)
Rotating Prop	3	4.31 (3.07)
Wind turbines	3	4.19 (3.46)
Engine noise	3	3.3 (2.24)
Adverse weather	3	3.8 (2.58)
Mechanical failure	3	4.10 (2.68)
Birds	3	3.77 (2.18)
Cockpit clutter	1	2.22 (1.85)

RESULTS, continued



*p<.05 Wilcoxon rank sum reported due to non-normality of the distribution of responses

- Pilots perceive power lines, communication towers, birds, adverse weather, and limited space for maneuvering as significantly higher risks than operators.
- For those risks consistently perceived as high, there were no differences between those who had been in the industry less than 25 years and those who were in the industry 25 years or more.
- For those in the industry less than 25 years, the only significant difference in risk perception between operators and pilots was birds. Pilots rate birds as a greater risk than operators.
- For those in the industry 25 years or more, pilots and operators perceive birds, power lines, engine noise, limited space for maneuvering and communication towers significantly different.
- Risks perceived as low, such as chemicals, mechanical failure and limited space for maneuvering, differed significantly based on the number of years in the industry. Those in the industry 25 years or more ranked these risks lower.

RESULTS, continued

Table 2. Risks and Frequency of Events

Survey risk category	*FAA report category	Percent of 3840 events	Risk Value from FAA report*
Limited space for maneuvering	Controlled collision with ground, collision with trees, collision with other	29.89%	.61
Mechanical Failure	Engine malfunction, forced landing, propeller malfunction /failure, system failure	18.39%	.31
Power lines	Collision with wires/poles	13.44%	.32
Communication tower, meteorological tower	Collision with tower	.26%	.01
Birds	Collision with birds	.08%	0

*We reviewed FAA report Hazard Identification and Risk Assessment in Title 14 CFR Part 137 Operations 3840 events

CONCLUSIONS

Pilots make decisions based on the perceived risk in a given situation. Evaluating risk perception and using this information to guide training programs may lead to better decision-making processes and ultimately result in improved performance through lowered risk-taking actions. Pilots rated power lines, communication towers, birds, adverse weather, and limited space for maneuvering as significantly higher risks than operators.

Frequency of actual events differs from the risks perceived for these hazards. Pilots and operators perceived communication towers, meteorological towers and wind turbines as risks, yet collision with these objects is a very rare event. Pilot and operator perception of power lines as a risk matched the FAA reports events. Pilots and operators did not perceive mechanical failure as a risk among pilots and operators, yet they were high frequency events, according to the FAA report.

Limitations: This study only describes risk perceptions of operators and pilots and not risk tolerance. These self-report results may not reflect actual risk. Classification of actual FAA reported events was not directly comparable to the risk perception categories in this study

RECOMMENDATIONS

Training curriculum should be developed with an understanding that risk perceptions differ between pilots and operators and risk perception does not always match actual events.

¹SSS formerly SRA
²From Section 137.2 of the Federal Aviation Regulations: Agricultural aircraft operation means the operation of an aircraft for the purpose of (1) dispensing any economic poison, (2) dispensing any other substance intended for plant nourishment, soil treatment, propagation of plant life, or pest control, or (3) engaging in dispensing activities directly affecting agriculture, horticulture, or forest preservation, but not including the dispensing of live insects.