FAA'S SAFETY PLAN *DESTINATION 2025;* STUDIES IDENTIFY A NEED FOR AN AIRPORT DRIVER TRAINING EDUCATION STRATEGY AND METRIC

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ABSTRACT

In a dissertation study completed by Rankin in 2007, a review of literature examined training effectiveness from several aspects. Efforts by the FAA to date have focused primarily on air traffic controllers and airline pilots, although 20% of the annual accidents at the 35 largest U.S. airports involve airport vehicles deviations. In a 1994 study Rankin identified training of ground vehicle operators as the most effective FAA initiative to reduce runway incursions, however, ground vehicle operator training is still conspicuously absent from mention in most literature; even though vehicle operators traverse airport movement areas on a daily basis. In a previous study conducted by Rankin in 1994, runway driver training was included as a major objective identified by the FAA to reduce runway incursions, and ranked the most effective objective by the aviation industry in Rankin's 1994 study. Airport movement area driver training is no longer a specific objective, strategy, or metric in FAA's most recent safety plan titled *Destination 2025*. In another study conducted by Rankin in 2008, the industry was asked "should airport driver training be included as an FAA objective, strategy or metric? – Seventeen participants (89.5%) responded yes, while two (10.5%) responded no. As evidence by three studies conducted by Rankin in 1994, 2007, and 2008, the FAA's most recent *Destination 2025* strategies and metrics continues to exclude airport driver training within the plan's safety vision through the year 2025, and it still remains conspicuously absent from mention. As a result, this paper identifies the continuing need for an Airport Driver Training Education initiative, strategy, or metric in FAA's most recent safety plan.

Keywords: Driver Training, Runway Incursions, Runway Safety, Vehicle Operator Training, Airport Safety, FAA Safety Plan, Airport Driver Education

INTRODUCTION: 2007 STUDY

In a dissertation study completed by Rankin in 2007, a review of literature examined training effectiveness from several aspects. A review of literature on the *Runway Safety Blueprint 2002-2004* addressed the primary causes for runway incursions and the complexities involved in solving runway incursions. A review of literature on distance education and computer-based interactive training addressed knowledge gained by other researchers on traditional versus computer-based training, and the skills transfer capabilities of the various methods of training. Finally, a review of literature on Kirkpatrick's model addressed the four *aspects of training* in Kirkpatrick's model

with respect to training effectiveness. These aspects include:

1. Reactions -- What trainees' say about the value of the training.
2. Learning -- Objectives met, knowledge and skills learned.
3. Behavior -- The skills acquired are implemented on-the-job.
4. Results -- Impacts on job performance

As a result of the review of literature, Kirkpatrick's model was identified as the model most appropriate to use for the development of a model for the study of airport driver training methods at the largest U.S. towered airports.

Runway incursions are divided into three classification types. These types include pilot deviations, operational deviations, and vehicle deviations. In the United States, pilot deviations account for approximately 57% of the total runway incursions, operational deviations account for 23%, and vehicle deviations account for 20% . After type, runway incursions are further stratified into four distinct categories by increasing severity, ranging from category D, the least severe, to category A, the most severe.

METHODOLOGY AND FINDINGS OF THE 2007 STUDY

This study examined runway incursions at the 35 largest U.S. towered airports. This study focused only on the runway incursion problem caused by vehicle deviations, which is under the purview of airport operators. This research was intended to be primarily a descriptive and correlational (non experimental) analysis of the relationships that exist, if any, between the methods used for airport driver training and the number of runway incursions at the 35 largest U.S. towered airports.

Statistical analyses on runway incursion data were used to address the research question: Does a relationship exist between the methods used for airport movement area driver training and the number of runway incursions for any class of runway incursions at the 35 largest U.S. towered airports?

MANOVA identified the independent variable, *method of training*, as statistically significant at the 0.000 level. Pairwise comparisons in MANOVA identified traditional airport movement area drive training as statistically different from interactive computer-based airport movement area driver training at a statistically significant level of 0.000 for runway incursion categories A through C. The only exception, in the pairwise comparisons test, was category D runway incursions, which were not statistically significant at the 0.418 level. Finally, estimated marginal means values for runway incursion categories A through D supported the finding that those airports using AAAE interactive computer-based airport movement area driver training have the propensity for fewer runway incursions caused by vehicle deviations for all categories of incursions.

As a result, MANOVA analyses supported the alternative hypothesis that there is a relationship between the methods used for airport movement area driver training and the number of runway incursions for any class of incursions, with the exception of category D incursions.

Structured equation modeling (SEM) showed the linear relationships that existed between the variables. There were four aspects (latent variables) of training associated with the training methods. They

included (a) aspect 1- learning objectives met, (b) aspect 2 – knowledge increase, (c) aspect 3 – on-the-job confidence, and (d) aspect 4 - effectiveness of materials and methods.

The effect or variance caused by aspects 1 through 4 on the runway incursion variables was identified as .06 in the SEM. Therefore, aspects 1 through 4 accounted for 6% of the variation in runway incursions for categories A through D. As a result, SEM analysis supported the alternative hypothesis that there is a relationship between the methods used for airport movement area driver training and the number of runway incursions.

Although 6% of the total variation may appear small, airport movement area driver training is only one of many initiatives that must be properly implemented to effectively reduce vehicle deviations at the 35 largest US airports.

SUMMARY AND RECOMMENDATIONS OF THE 2007 STUDY

As a result, statistical analyses supported the hypothesis that there was a relationship between the methods used for airport movement area driver training and the number of runway incursions. Other than the publication of FAA Advisory Circular 150/5210-20 on airport vehicle surface operations, airport movement area driver training method is not specifically addressed in the 40 runway incursion prevention initiatives outlined in the *FAA Runway Safety Blueprint 2002-2004*. Efforts by the FAA to date have focused primarily on air traffic controllers and airline pilots, although 20% of the annual accidents at the 35 largest U.S. airports involve airport vehicles deviations.

Most U.S. airports use traditional airport driver training. The data from this study suggested that for those airports using traditional airport movement area driver training, the propensity for the number of runway incursion accidents is more likely than at those airports that are using computer-based airport movement area driver training. This implies that the propensity for runway incursions due to vehicle deviations is higher overall in the U.S. than would be the case if the interactive computer-based airport movement area driver training method was implemented at all the 35 largest U.S. airports. These finding are inconsistent with the generally accepted thinking within the airport industry that both methods of airport movement area driver training are equally as likely to reduce runway incursions.

Since the data suggested that there is potential to reduce runway incursions by replacing one driver training method with another, the potential exist to reduce airport liability exposure at all U. S. airports. Other benefits may include a reduction in property damage, and an overall lowering of airport liability insurance cost to airport owners.

Runway incursion data from the *FAA Runway Safety Report 2004* indicated that for the 18 airport driver training officials that participated in this study, their airports reported 216 runway incursions over the study period -- an average of more than four runway incursions per airport per year. Each incursion having the potential for loss of life and property damage.

Accordingly, it was recommended that the Federal Aviation Administration should mandate that all the 35 largest U.S. airports acquire and implement the AAAE or similar interactive computer-based airport movement area driver training system over

the next two-to-three year timeframe, or as quickly as the systems can be acquired and installed. This initiative should be added to the *FAA Runway Safety Blueprint 2002-2004* and implemented through an amendment of Federal Aviation Regulation Part 139.

One explanation for the lack of training effectiveness of both methods of airport movement area driver training may be similar in nature to motorist failing to observe proper and lawful automobile traffic controls such as speed limits, stop signs, and traffic lights, etc. Although the vast majority of the driving public operates in a safe and proper manner, a small percentage fails (by choice, ignorance, or inattention) to observe the rules of the road.

Study, education, and strict enforcement are the tools currently being used by airport operators to address the problem of vehicle deviations. This system of addressing vehicle deviations is sometimes called *study, educates, enforces* (SEE) and has been successful in many areas, not just aviation.

THE 1994 AND 2008 STUDIES

In a 1994 study Rankin identified training of ground vehicle operators as the most effective FAA initiative to reduce runway incursions, however, ground vehicle operator training continues to be conspicuously absent from mention in most literature; even though vehicle operators traverse airport movement areas on a daily basis. In the 2007 study Rankin also suggested that the current runway safety initiatives contained in the *FAA Runway Safety Blueprint 2002-2004, should be* evaluated and ranked in the order of their effectiveness by a survey of industry officials.

As a result, Rankin completed a similar study in 2008 that investigated the continued perception of industry officials as to the effectiveness of the FAA initiatives contained in the *FAA Runway Safety Blueprint 2002-2004*. The 1994 and 1998 studies were compared to see if there was a similarity of the perceived effectiveness by industry officials of the FAA initiatives or objectives. Since airport driver training was ranked as the number one initiate in the 1994 study and is not included in the FAA *Runway Safety Blueprint 2002-2004*, the 2008 study asked industry officials if airport driver training should, or should not be included in the *FAA Safety Blueprint.*

METHODOLOGY AND FINDINGS OF THE 1994 AND 2008 STUDIES

For the 2008 study descriptive statistics was used to rank the five most effective and five least effective objectives outlined in the *FAA Runway Safety Blueprint 2002-2004* and compared them to the five most and least effective initiatives in the FAA's *Runway Incursion Plan* of the 1994 study to determine what disparities, if any, were apparent. Both survey instruments were prepared and mailed out to all participants with a prepaid postage return envelope. Data collection from the latest
survey was completed in the Spring of 2008.

In the 1994 each participant was asked to rate the degree of effectiveness that each initiative in the *FAA's Runway Incursion Plan* has or will have on reducing the number of runway incursions using a five point Likert-type survey instrument with a scale of 0 (the least effective) to 5 (the most effective). A 96% response rate was achieved in the 1994 study. The same type of survey instrument was used to collect data for the 2008 study. Nineteen of the 54 participants surveyed in the 2008 study

responded achieving a 35% response rate. The mean for each initiative or objective was then determined using SPSS © software, which is the quotient of the sum of the values for each initiative or objective divided by the number of responses received for each initiative or objective. A comparison of the effectiveness of each initiative or objective was then determined by ranking each initiative or objective by its mean to establish the five most effective and the five least effective initiatives or objectives for both the 1994 and 2008 surveys.

In the 1994 survey the five most effective initiatives were identified by industry officials as: (a) Training of Ground Vehicle Operators with a mean value of 4.42; (b) Airport Surface Detection Equipment with a mean value of 4.30; (c) Stop Bar Lighting with a mean value of 4.23; (d) Airport Surface Traffic Automation with a mean value of 4.18; and (e) Airport Movement Area Safety System with a mean value of 4.00.

In the 1994 survey the five least effective initiatives were identified by industry officials as: (a) New Runway Safety Database with a mean value of 2.25; (b) Airport Technology Conference with a mean value of 1.92; (c) Audiotape on Runway Incursions with a mean value of 1.76; (d) Ground Movement Safety Awareness Products with a mean value of 1.75; and (e) New Computerized Database for Aircraft Performance with a mean value of 1.51.

In the 2008 survey the five most effective objectives were identified by industry officials as: (a) **–** Evaluate, and if appropriate, implement national procedures that require read backs of any clearance to enter a specific runway, hold short of a specific runway, or taxi into position and hold instructions with a mean value of 4.61; (b) Develop and evaluate a visual signal that provides direct warning to flight crews on final approach when the runway is occupied with a mean vale of 4.50; (c) Publish guidance on standard surface operations phraseology guidance for pilots and mechanics moving aircraft with a mean value of 4.44; (d) Assess selected Air Traffic procedures in terms of enhanced runway safety and recommend actions to retain, modify, or eliminate as appropriate with a mean value of 4.39; and (e) Improve runway safety data collection, storage, retrieval and distribution. Data and information useful for improving runway safety is contained in multiple data bases operated by different organizations with a mean value of 4.33.

In the 2008 survey the five least effective objectives were identified by industry officials as: (a) Create and accomplish a regional runway safety plan for each FAA region (every 18 to 36 months) tailored to specific operational and geographical needs with a mean value of 3.78; (b) Improve the collection and analysis of operational error data by supporting the implementation and dissemination of the JANUS tool throughout the air traffic control environment with a mean value of 3.72; (c) Maintain the published AMASS deployment waterfall schedule with a mean value of 3.61; (d) Complete over 1,000 safety seminars per year incorporating runway safety, RIIEP, surface movement Advisory Circulars and marking, signage and lighting as seminar themes with mean value of 3.56; and (e) Expand the role of Flight Service Station Specialists to provide runway safety information for towered and non-towered airports with mean value of 3.44.

In response to the question - *In a 1994 survey on FAA objectives, airport movement area driver training ranked the most effective objective. Airport movement area*

driver training is no longer a specific objective. Should it be included as an FAA objective? – Seventeen participants (89.5%) responded *yes,* while two (10.5%) responded *no.*

CONCLUSIONS AND RECOMMENDATIONS

The 1994, 2007, and 2008 studies support the proposition that training and education of airport drivers is a key safety factor in reducing the number of runway incursion accidents, and should be included in the FAA's most recent safety plan titled *Destination 2025* as a key safety strategy and metric. The results of the 1994 and 2008 studies support the 2007 dissertation study that the Federal Aviation Administration should mandate that all the 35 largest U.S. airports acquire and implement interactive computer-based airport movement area driver training system as quickly as the systems can be acquired and installed. This educational initiative should be added to the current FAA *Destination 2025* safety plan and implemented through an amendment of Federal Aviation Regulation Part 139. To date (Spring of 2012), no action in regard to these published studies or their recommendations has been effective in persuading the FAA to take action on implementing interactive computer-based airport movement area driver training and education at the 35 largest U.S. airports, nor has any amendment of Federal Aviation Regulation Part 139 been considered. Finally, it is recommended that FAA's *Destination 2025* safety plan be amended to address airport driver training as a major strategy and metric.

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