1. Executive Summary

This research intended to (a) develop clear prescriptive recommendations for how to plan and communicate event information (especially regarding near-miss events) to reduce the potential for disproportionate fear and dread; (b) summarize and evaluate the conceptual and practical soundness of alternative risk communication strategies with specific focus on risk communication strategies regarding expedited screening for TSA and preparedness actions for natural disasters in areas subjected to repeated natural hazard events for FEMA; and (c) develop recommendations for how to include near-miss events in economic consequence modeling of terrorist events and natural disasters.

For the near-miss effort, as will be described in more detail in the body of this report, we developed and tested experimental materials for risk inoculation messages versus control conditions. Additionally, we researched and published a paper in the Risk Analysis journal, “Airline Safety Improvement through Experience with Near-Misses: A Cautionary Tale,” that examined empirical data available about commercial airline incidents.

The DARMS study while related did not clearly focus on near-miss events. Instead, in the DARMS study, objectives and attributes were identified for the TSA following procedures used to develop multi-attribute utility models (MAU). The search began broadly beginning with the TSA’s overarching strategic objective “Protect the Nation's transportation systems to ensure freedom of movement for people and commerce.” and then focused more narrowly on objectives pertaining to aviation security and specifically the DARMS initiative. Attribute measures, scales and consequences were selected and assessed based on informal conversations with colleagues from TSA and their contractor, Deloitte, and publically available information. Uncertainty about credible threats and flight vulnerability (the probability a security system can be defeated...
assuming a credible threat) was explored by decomposing the assessment of the probability of a successful attack into relevant component parts (e.g. risk classification, threat detection during screening) using probability trees. A probability function was derived to calculate system wide risk. A multi-attribute utility function was used as an illustration of how to compare the Current and DARMS approaches across attribute measures.

Probability trees were also constructed as an illustration of how flight vulnerability could be decomposed and its component parts assessed. Assessment of branch probabilities was guided not by sensitive information but rather by a reasonable ordering of relative probability magnitudes (e.g. passengers posing a threat will be much less likely to received expedited screening, standard screening lanes will have a higher rate of threat detection than expedited screening lanes, DARMS with its proposed sophisticated countermeasures will reduce flight vulnerability overall). As it turned out, vulnerabilities using the probability trees calculations were similar to TSSRA assessments, with the current system being slightly higher than DARMS.

2. Research and Research Transition Accomplishments

2.1. Research Results

2.1.1. Near-Miss/Risk Inoculation

We have developed and tested experimental materials for risk inoculation messages versus control conditions.

For example, we have developed a terrorist attack scenario at a National’s Baseball game. After reading the attack scenario, participants are asked whether they would attend a concert at the National mall the next day. In addition to the terrorist attack scenario, participants read either a risk inoculation message, a control message, or no message.

The risk inoculation message tested is as follows:

You continue reading the article and learn:

The goal of the terrorists is to generate fear and doubt in the ability of our government to prevent and minimize the impact of terrorist attacks.

The media will exaggerate claims about the dangers of attending public events. If we succumb to these fears and alter our way of life, they have truly won.

We can defeat the terrorists by continuing to trust government agencies at the national level like DHS, at the local level like fire fighters or police, and of course our family, friends and neighbors at a more personal level.

There also is an important role for the general public – we can contribute to government efforts by remaining vigilant and reporting suspicious activities thus protecting our communities.

In the control condition, participants read:

You continue reading the article and learn:

The Nationals are a member of the National League of Major League Baseball.
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Their nickname is "the Nats" - a shortened version that was also used by the old D.C. team. The club was founded as the Montreal Expos before moving to DC.

The Nationals regularly play the Baltimore Orioles in games called the Beltway Series.

The team's mascot is a bald eagle who wears the home cap and jersey of the team.

Additionally, there was a no message condition.

The following data summarizes the participant’s decision to attend the concert or not by condition.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Yes Attend Concert</th>
<th>No Do Not Attend Concert</th>
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<tbody>
<tr>
<td>No Message</td>
<td>57%</td>
<td>43%</td>
</tr>
<tr>
<td>Control Message (random information about baseball team)</td>
<td>58%</td>
<td>42%</td>
</tr>
<tr>
<td>Risk Inoculation Message</td>
<td>74%</td>
<td>26%</td>
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This difference is statistically significant ($\chi^2(2)=13.34$, $p = .001$) and has been reproduced in several trials. We are now attempting to understand why the risk inoculation message is effective. Our preliminary research shows that it does not increase positive affective feelings but instead decreases negative affective feelings. It also increases measures of self-efficacy.

To further examine and understand near-misses, we also looked at empirical data on accidents from aviation. In commercial aviation, some apparent successes are realized because of good fortune rather than good processes. The processes that create these near-misses could pose a threat if multiple contributing factors combine in adverse ways without the intervention of good fortune. Yet, near-misses (if recognized as such) can, theoretically, offer a mechanism for continuing safety improvements, above and beyond learning gleaned from observable failure.

We tested whether or not this learning is apparent in the airline industry. Using data from 1990-2007, fixed effects Poisson regressions show that airlines learn from accidents (their own and others), and from one category of near-misses -- those where the possible dangers are salient. Unfortunately, though, airlines do not improve following near-miss incidents when the focal event has no clear warnings of significant danger. Therefore, while airlines need to and can learn from certain near-misses, we concluded that more focus was needed on all types of near-misses. This part of the research has been accepted for publication in the Risk Analysis Journal.

2.1.2. Dynamic Aviation Risk Management Solution (DARMS) (in collaboration with Dr. William Burns and Dr. Richard John)

This summary briefly describes some of the tasks accomplished in the DARMS study.

Seven fundamental objectives were identified based on discussions with colleagues at the TSA and a brief review of the security literature. These were: 1) security effectiveness; 3) passenger satisfaction, 4) economic costs of a significant security breach; 4) operational efficiency; 5) TSO job satisfaction; 6) operational costs and 7) aviation industry vitality. Twenty eight performance
measures were proposed for consideration and twenty four were used in the MAU analysis. Likewise, attribute scales are developed and consequence ranges are assessed for each. Objective and attribute weights are assessed from one member of the research team as an illustration. The most weight is given to attributes such as operational costs, economic costs of security breaches and measures of security effectiveness such as fatalities and injuries.

For contingency successful attack and an unsuccessful attack scenario, consequences were assessed for the current approach and DARMS using suggestions from colleagues at the TSA and discussions among the research team members. DARMS fared better on all measures of security effectiveness and almost all measures of operational efficiency and operational costs regardless of the outcome of significant security breaches. The Current approach fared better on variation of passenger wait time and perceptions of fairness and security, TSO resources (FTE), all measures of TSO job satisfaction and measures of aviation industry vitality regardless of the outcome of significant security breaches. Focusing on economic costs favors the Current approach should there be significant security breach. Overall, regardless of whether a significant security breach occurs, DARMS had a higher utility.

2.2. Research Transition

The DARMS research which represented the majority of the PI’s efforts during this Fiscal Year did not need to be transitioned because the effort was specifically for the TSA and the final report was delivered to the Chief Risk Officer, Kenneth Fletcher.

2.3. Publications, Reports and Presentations

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<th>CREATE PUBLICATIONS</th>
<th>Referred</th>
<th>Not Referred</th>
<th>PDF to CREATE</th>
<th>Permission to Publish from Copyright Holder?</th>
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<tr>
<td>Dillon-Merrill – Georgetown University</td>
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CREATE SCHOLARLY/CONFERENCE PRESENTATIONS

Dillon-Merrill, Georgetown University


CREATE OUTREACH PRESENTATIONS

Dillon-Merrill, Georgetown University


2.4. Models, Databases, Software Tools, Invention Disclosures and Patents

Research Products Transitioned to Governmental Agencies

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