Intelligence Analysis for Homeland Security

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National Center for Risk and Economic Analysis of Terrorism Events  
University of Southern California  
Los Angeles, California

Intelligence Analysis for Homeland Security  
October 2010 to September 2011

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Cooperative Agreement No. 2010-ST-061-RE0001  
Department of Homeland Security

December 31, 2011
ABOUT CREATE
The National Center for Risk and Economic Analysis of Terrorism Events (CREATE) was the first university-based Center of Excellence (COE) funded by University Programs of the Science and Technology (S&T) Directorate of the Department of Homeland Security (DHS). CREATE started operations in March of 2004. This annual report covers the seventh year of CREATE funding from October 2010 to September 2011, the first year under Cooperative Agreement 2010-ST-061-RE0001 from DHS. While the text of this report focuses on the seventh year, all data tables, publications, lists of participants, students, and presentations and events are cumulative from the inception of CREATE.
CREATE’s research mission is to develop advanced models and tools for risk assessment, economic assessment, and risk management to counter terrorism. CREATE accomplishes this mission through an integrated program of research, education, and outreach, spanning the disciplines of economics, psychology, political science, industrial and systems engineering and information science. CREATE develops models, analytical tools, methodologies and software, and tests these tools in case analyses, representing critical homeland security investment and policy decisions.
Due to the cross-cutting nature of research in risk, economics, and risk management, CREATE serves the need of many client agencies at the DHS, including the Transportation Security Agency, Customs and Border Protection, Immigration and Customs Enforcement, FEMA and the US Coast Guard. In addition, CREATE has developed relationships with clients in the Offices of National Protection and Programs, Intelligence and Analysis, General Council, Health Affairs, and Domestic Nuclear Detection. Using a mix of fundamental and applied research, CREATE faculty and students take both the long-term view of how to reduce terrorism risk through fundamental research and the medium-term view of how to improve the cost-effectiveness of counter-terrorism policies and investments through applied research.

Please visit www.create.usc.edu for more information.
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1. Executive Summary

The research at Georgetown has focused on two specific projects: Terrorist Risk Factors and The Perception of Terrorist Events and the Influence of the Near-Miss. The first project, Terrorist Risk Factors (TRF) is led by Gary Shiffman, Director, Homeland Security Studies, CPASS, Georgetown University, in collaboration with Eli Berman, IGCC, University of California. The TRF project is working to develop innovative and original methodologies for assessing risk in homeland security environments. The project is working on outreach to subject matter expert communities, both on the law enforcement/civil as well as military/intelligence communities, writing and editing a journal article for submission to peer-reviewed journals, and mentoring graduate students. (Keywords: terrorist objective functions, economic and decision models of terrorist enterprises)

The second project, The Perception of Terrorist Events and the Influence of the Near-Miss is led by Robin Dillon-Merrill, Associate Professor in the McDonough School of Business at Georgetown University with Georgetown colleagues, Catherine Tinsley and Dan Byman. This project is collaborative with CREATE-colleague William Burns. The near-miss project is contributing to terrorism risk perception and communication by developing an understanding of how, why, and to what degree near-miss events are incorporated into a person’s decision calculus/objective functions at key points before a subsequent hazard. This research is critical to understanding how people interpret the level of risk following an event (and fortunately in the US most terrorist attacks have been near-miss events) and thus how they will respond to future threats. We participated with Dr. Burns’ six waves of panel data collecting between December 2009 and December 2010 focusing on the attack on Northwest Flight 253, the attempt on Times Square, and the attempt on the Portland Tree Lighting Ceremony. In addition, we developed and executed two behavioral lab studies to further our knowledge of how perceptions of events change over time. Participants in one study were students and in the other study were panelists recruited by Qualtrics. (Keywords: risk perception, near-misses)
Finally, as a university-administrative issue, we switched primary PI responsibility for this project from Dr. Shiffman to Dr. Dillon-Merrill because Dr. Shiffman changed to adjunct professor status in Fall 2011.

2. Research Accomplishments

2.1. Terrorist Risk Factors

After September 11, 2001, U.S. border enforcement authorities defaulted to and adapted existing tools to respond to the newly prioritized terrorist threat. Given that 1.1 million people enter the U.S. daily, 700,000 of which are foreign nationals, border authorities must constantly refine risk-based methodologies to address the newly prioritized counterterrorism mission while facilitating the normal flow of goods and people across the border. To do this, they evolved risk-based targeting models built for criminal and immigration threats however, room for improvement still exists. This project explored two rational choice models developed as part of other funded research efforts at CREATE to the University of California and Princeton University. The models applied to a homeland security context helped to explain individual motivations for joining and supporting terrorist and insurgent organizations. Applied properly, we demonstrated that social science algorithms can help to generate innovations in the DHS risk-based targeting methods to both increase border security and streamline the process for legitimate travelers and cargo.

2.2. The Perception of Terrorist Events and the Influence of the Near-Miss

Six waves of panel data were collected in collaboration with Dr. Burns regarding significant near-miss events between December 2009 and December 2010. Questions that we consistently asked in surveys about past events were how much does the participant feel that the event was almost successful and how much luck was involved in the outcome. Additionally, they were asked questions about their perceptions of the risk of flying (when the attack targets air travel), the risk of traveling to a tourist destination (when the attack targets a location like Times Square), and the risk of additional terrorist events. Finally, they are asked their feelings toward changing behaviors (such as postponing flying or changing travel plans), and government policies to counter terrorism. These data are then examined to see how individuals are influenced by prior near-miss events, how the construal of near-miss (how close; how much just luck) influences feelings of risk, individual protective action and support for government anti-terrorist policies, and how the decay in judgments (how close), risk feelings about specific terrorist hazard and specific protective action change when asked to reflect at different points in time. This data set is amazingly rich and we are currently working to analyze the data (collaboratively with Dr. Burns) using several techniques including System Dynamics models and latent growth curve models. Figures 1 and 2 show some of the data collected. Figure 1 shows how measures of participants’ feelings toward flying, visiting public places, and terrorism in general change over time given the different events that occurred. Figure 2 shows the same perception of general terrorism risk plotted against the participants’ support for strong government actions to deter terrorism. As can be observed in the graph, there is a correlation between perceptions of risk and support for actions.
Additionally, in the laboratory, we are able to manipulate details of the near-miss for example, three conditions we used in our March 2011 data collection effort were:

- U.S. officials have arrested an Al Qaeda operative outside of LAX with a MANPADS. *Officials believe he was minutes away from firing the missile at AA flight 101 from a truck in a long term parking structure.* DHS working with major airport security teams to expand airport perimeter surveillance, including… (“far” near-miss)

- An Al-Qaeda operative shot a shoulder-fired missile at UA flight 81 just minutes after its ascent from DCA. The missile missed hitting the aircraft by more than 100 yards, but with 139 people on board the aircraft made an emergency landing… There was no damage to aircraft and no injuries. U.S. officials arrested the believed terrorist outside of airport… (close near-miss)
• An Al-Qaeda operative shot a shoulder-fired missile at AA fl 101 just minutes after its ascent from LAX. The missile impacted the leading edge of the right wing. With 146 people on board, the aircraft made an emergency landing into Long Beach Airport, 37 people injured. U.S. officials arrested the believed terrorist outside of LAX.… (very close near-miss)

By assigning participants to different conditions which varied the different events over four time periods and using a Qualtrics panel of 400 national subjects, we have collected data that allow us to examine contrasting and cumulative effects. Specifically, for contrast effects, if a participant starts with near-miss that missed by a lot (terrorists caught early), then closer near-misses appear to look worse than if a participant starts with near-miss that is quite close (terrorists down a plane but no one killed). Also, we see that judging all events at once and if the last event was a very close near-miss then all prior events will look better than if judging all events at once and last event was a missed by a lot. For cumulative effects, we see that when asked to evaluate multiple events at once, people’s outlook appears more negative than if asked to judge each event as it happens.

We are currently running a second laboratory study (on-going as of October 20, 2011) to further examine how perceptions of events change over time and influence broader assessments of general terrorism risk and support for government policies.

3. Applied Relevance

3.1. Improved risk-based prioritization frameworks

September 11, 2001, catalyzed a focused shift from the long history of border programs prioritizing illegal immigration and criminal activity, to terrorism as the priority mission. In the weeks following the 9/11 terrorist attacks, the then-U.S. Customs Service changed its priority mission. This meant that in addition to the primary traditional mission of border security CBP’s priority mission became that of identifying terrorists or terrorist weapons crossing the U.S. border. The nature of this new mission requires constant innovation and evolution. Techniques and procedures that were once aimed primarily at criminals and illegal immigrants have to be modified to target international terrorists as well. By revisiting the existing border security programs, CBP’s screening techniques can confine the trend of effectiveness, specifically in the context of anti-terrorism, through refining the variables used for risk-based targeting.

Risk-based targeting remains the core of DHS efforts to facilitate trade and travel while maintaining the security of the United States. The success of DHS, and in particular CBP, depends on its ability to identify which people entering the United States likely to pose a terrorist, criminal, or immigration threat. Interrogating 100% of travelers and cargo upon entry to the U.S. is not only impractical, but also imprecise. Rather, DHS relies on algorithms that input available information about each person into decision-improvement tools that indicate how likely they are to pose a threat to the security of the U.S. These algorithms can be improved in two ways: by finding new variables which are correlated with a higher threat probability, and by enhancing existing variables to identify threats more accurately.

To improve these algorithms, social science models of counterterrorism that explore the motivations of individuals for joining terrorist and criminal organizations. Applied appropriately, many existing models provide theoretical implications for new risk factors that should be helpful in producing innovations in the United States’ risk-based homeland security screening methods.
3.2. Understanding Risk Perceptions to Design Risk Communication

We have discussed this work recently with two constituencies at DHS. The first is the National Protection and Programs Directorate (NPPD) who is responsible for motivating private companies to invest in protection measures. When private companies make decisions based on prior events, since successful terrorist attacks are rare, many companies are in fact making decisions based on near-misses commonly being interpreted as successes. Our research has shown that this interpretation commonly causes decision makers to take more risk (rather than less), in contrast to the behavior the NPPD is trying to motive.

The second organization at DHS that is potentially interested in this research is the Office of Risk Management and Analysis (RMA). Since RMA is tasked with creating and validating strategic, organization-wide risk models and actual terrorism events are rare, any validation will need to use near-miss data. Our research has shown that recognizing near-misses can be a challenging part of the learning process.

In terms of products, our research results will: (a) develop a comprehensive methodology for understanding how near-miss events influence future decision making; and (b) provide training materials for educating students, academic researchers, and DHS staff to recognize and collect the best lessons learned from near-miss events. Products will include: Risk assessment methodology for recognizing and characterizing natural and man-made disasters, near-misses, and to provide the appropriate lessons-learned. The findings will be published in peer-reviewed journals.

4. Collaborative Projects

Currently, both projects described here are collaborative with other partners at CREATE.

5. Research Products

<table>
<thead>
<tr>
<th>Research Products (Please detail below)</th>
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<tbody>
<tr>
<td>5a # of peer-reviewed journal reports published</td>
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<tr>
<td>5a # of peer-reviewed journal reports accepted for publication</td>
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<td>5b # of scholarly presentations (conferences, workshops, seminars)</td>
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<td>5c # of products in commercialization pipeline (products not yet to market)</td>
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<td>5c # of products introduced to market</td>
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*While considered a top-management publication, Harvard Business Review is not peer-reviewed – we do claim that it is refereed below

5.1. Publications and Reports
**CREATE PUBLICATIONS**

<table>
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<tr>
<th>Research Area</th>
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<tbody>
<tr>
<td>Referred</td>
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<tr>
<td>Not Referred</td>
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**Shiffman, Gary – Georgetown University**


**5.2. Presentations**

1. Dillon, Robin & Richard John (presenter), “Using MAU to Structure Domestic Intelligence Policy” INFORMS, Austin TX, November 8, 2010


6. Education and Outreach Products

<table>
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<th>Education and Outreach Initiatives (Please detail below)</th>
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<td># of students supported (funded by CREATE)</td>
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<td># of students involved (funded by CREATE + any other programs)</td>
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<td># of students graduated</td>
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<td># of contacts with DHS, other Federal agencies, or State/Local (committees)</td>
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<tr>
<td># of existing courses modified with new material</td>
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<td># of new certificate programs developed</td>
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<td># of new degree programs developed</td>
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* we created a homeland security concentration within our MA program.

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<tr>
<th>Last Name</th>
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<th>University</th>
<th>School</th>
<th>Department</th>
<th>Degree</th>
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7. Membership in Major DHS Related Committees

Robin Dillon-Merrill, Committee on Risk-Based Approaches for Securing the DOE Nuclear Weapons Complex, National Research Council

Gary Shiffman, Board of Advisors, DHS/BORDERS Center of Excellence, lead institution: University of Arizona

Catherine Tinsley, Committee on Behavioral and Social Science Research to Improve Intelligence Analysis for National Security, National Research Council.

Catherine Tinsley, Committee on Unifying Social Frameworks, Board on Behavioral, Cognitive, and Sensory Sciences Division of Behavioral and Social Sciences and Education, National Research Council.