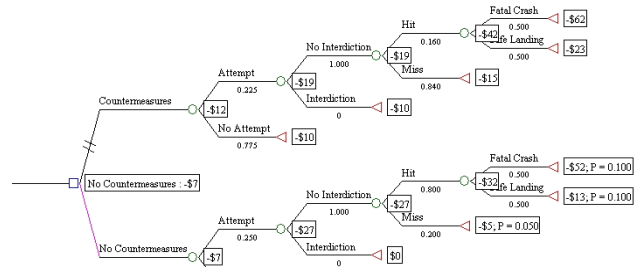


**Advanced Risk and Decision Analysis**  
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This project will develop advanced decision and risk analysis models and tools for terrorism threat assessment

Brief Description - The project has the following sub-projects

- Developing terrorist’ values, objectives and preferences with the help of intelligence analysts and other terrorism experts
- Comparison of probabilistic and non-probabilistic approaches to modeling terrorist threats



Objectives - Terrorism threat (quantified as the probability of a mode and target of attack) is the least well understood part of terrorism risk analysis. During the past year, we have developed a random utility model of terrorists’ probabilistic preferences for attack types and targets. This effort was largely a “proof in principle,” and in the coming year we plan to develop more realistic versions of this model. We also intent to pursue the dynamic and adaptive decision tree models and compare this approach with extended forms of game theory.

Interfaces to other Center Projects - This project is closely related to the game theoretic projects that deal with terrorist threats as well as with the intelligence project proposed by Henry Willis and CPSS. There is also a close relationship with the project on applied decision and risk analysis.

Interfaces to non-Center Projects - The project team will collaborate with the START center and the Homeland Security Institute.

Major Products and Customers - Many S&T divisions and operational divisions at the DHS have expressed interest in this work. We are working with the Human Factors division and the Intelligence Analysis Directorate on the terrorist values and preferences. For the adaptive decision tree modeling, we are working on a test application with the Homeland Security Institute and the Risk management and Analysis Office of DHS.

Technical Approach

- To assess the probabilities of future terrorist attacks, we need to better understand terrorist objectives and preferences. In Year 4 we developed a complete random utility model to reflect Al Qaeda’s values and preferences as well as their perceptions of the likelihood of success or failure of attack. This was essentially a “proof in principle,” which produced results that make sense. In the coming year, we plan to begin a more realistic implementation of this model, starting with the structuring of values, preferences, and multiattribute utilities for attack modes and targets. To provide more realism, we will ask intelligence analysts to provide the model inputs and we will also ask them for direct assessments of the probabilities of attack modes and targets. (Primary responsibility: Richard John)

- In Years 3 and 4 we have successfully used an extension of the MANPADS analysis to explore shifting terrorist actions in response to our defensive actions. This is equivalent to using an extended form of a game theoretic analysis, but rather than treating the terrorists' "downstream" actions as optimal decisions, it treats them as uncertainties. These uncertainties are quantified as probabilities of attacks, which will shift with out "upstream" defensive actions. In Year 5, we will complete an article on this approach and its implementation to the MANPADS problem, and contrast it with extended forms of games. (Primary responsibility: von Winterfeldt)

### Major Milestones and Dates

#### Year 5

- Implementation of the random utility framework with intelligence analysts' inputs – June 30, 2009
- Document the dynamic adaptive decision tree approach – December 31, 2008
- Contrast dynamic adaptive decision trees with other approaches – June 30, 2009

#### Year 6

- Year six will be reserved for dissemination and transfer of knowledge and tools