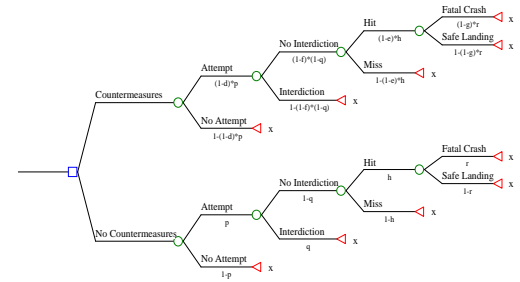


**Project 3: Advanced Decision and Risk Analysis (von Winterfeldt)**

This project develops advanced decision and risk analysis models and tools and explores their uses in counterterrorism.

**Modeling Area:** Risk Assessment  
**Case Studies Supported:** WMD, MANPADS  
**Principal Investigator:** Detlof von Winterfeldt  
**Institution:** University of Southern California  
**Other Investigators:** Richard S. John., Don Kleinmuntz  
**Student Investigators:** Heather Rosoff, Carl Southwell, Mayank Mohan, Wei Chen



Adaptive MANPADS Decision Tree

**Brief Description:**

Decision and risk analysis consists of a set of models and tools to improve decisions with multiple objectives and risks. Decision and risk analysis are the main modeling approaches that the CREATE team uses to evaluate alternative policies to reduce the risks and consequences of terrorism. In the first two years, decision analysis models and computer tools were developed to evaluate MANPADS countermeasures and to assess the risks of a dirty bomb attack on LA harbor. In the first case, a relatively traditional cost-effectiveness version of a decision tree analysis was developed. In the second case, a novel approach was developed that uses project risk analysis to reverse engineer a terrorist attack. In the third year, we split the decision and risk analysis activities into an advanced modeling component (described below) and an applied component (described under the risk management heading).

**Objectives and Technical Approach:**

This research is to develop advanced methods of risk and decision analysis for the evaluation of policies to counter terrorism and apply these advancements in selected terrorism and counter-terrorism settings. Examples are adaptive dynamic decision trees, in which terrorist probabilities of action shift; project risk analysis models to assess vulnerabilities, and threat assessment models that use terrorist preferences and capabilities as inputs.

**Interfaces to other CREATE Projects:**

This work will maintain a close connection with the applied decision analysis project and with economics impact assessment projects.

**Interfaces to non-CREATE Projects:**

This work will be in collaboration with the MANPADS Countermeasure Office at the DHS, the National Biodefense Analysis and Countermeasures Center (NBACC), and the Office of Intelligence Analysis at the DHS.

**Major Products and Customers:**

- MANPADS: After developing a relatively standard decision tree model to evaluate MANPADS countermeasures, we developed an advanced model that considers alternative countermeasures as well as shifting probabilities of terrorist actions depending on the countermeasures selected.

- NBACC: We extended standard probability elicitation techniques to handle assessments of a large class threats posed by the use of biological agents. This included the development of tools for hierarchical probability assessment of relative frequencies and the use of Dirichlet distributions to characterize uncertainties about these relative frequencies.
- Intelligence Analysis: We are developing random utility models that take into account the values and capabilities of terrorists to first determine their preferences for certain modes and targets of attack and then to assess the probabilities of these preferences.

**Major Milestones and Dates:**

- MANPADS case study, models, and computer tools completed and delivered to DHS MANPADS Countermeasures Office in November, 2005; updates delivered in December 2005 and December 2006.
- Dirty bomb case study, models, and computer tools completed and presented to the DHS and multiple audiences beginning in the spring of 2005.
- Preliminary model of values of terrorists – completed August, 2006
- Advanced MANPADS model – completed August 2006.
- Development and test applications of advanced expert elicitation tools for NBACC
  - Preparation of training materials – completed in April, 2006
  - Training and practice elicitation – completed in June, 2006
  - Development of an advanced elicitation tool – under development, to be completed in March, 2007
  - Elicitation of social science experts – January to March 2007
- Design of an expert elicitation study of the relative likelihood of major terrorist attacks by type and target. – March, 2007
- The edited book “Advances in Decision Analysis” completed and submitted to Cambridge University Press in May, 2006. The expected publication date is March, 2007
- Expert elicitation of relative likelihoods of major terrorist attacks – summer of 2007
- Second edition of von Winterfeldt and Edwards’ book “Decision Analysis and Behavioral Research” completed and submitted to the publisher – August 2007