

Unconventional Weapons and Technology (UWT) Research Division

UWT applies innovative capabilities, multi-disciplinary expertise, and a multi-method research approach to create actionable end products for practitioners, policy makers, and academia.

OVERVIEW

START's **Unconventional Weapons and Technology Research Division (UWT)** integrates a portfolio of research projects seeking to provide actionable knowledge about chemical, biological, radiological, nuclear (CBRN) and other emerging technology threats emanating from non-state actors. UWT focuses on the behavioral elements of terrorism involving unconventional weapons, as well as transitioning cutting-edge research to the larger policy and practitioner communities.

RESEARCH PORTFOLIO

MODELS & TOOLS FOR RISK ANALYSIS

- The **Anatomizing CBRN Non-State Adversaries** effort employs a multi-perspective approach to rank the most likely future non-state CBRN threats, identify early warning indicators for these threats, and profile the operational behavior – including targeting and weapon selection – of prominent adversaries that might attack the United States using CBRN weapons. These findings have been applied in both red-team scenarios and a Bayesian network to allow for dynamic updating of the threat model.
- **Exploring the Nexus between Terrorism, Organized Crime, and Radiological/Nuclear (RN) Smuggling** is an ongoing effort to examine the threat of transnational criminal entities smuggling RN materials or weapons into the United States on behalf of terrorists. Analysis is based on case studies, field research, risk assessment, and social network analysis. Notably, it applies geospatial analysis techniques to determine the most likely routes and methods smuggling networks might utilize.
- The multidisciplinary project **Dissuading Adversaries and their RN Pathways: Integrating Deterrence Theory and Analytics in the Global Nuclear Detection Architecture (GNDA)** combines analytical and computational approaches into a single, comprehensive model for the analysis of deterrent and deflective effects of potential investments in the GNDA on adversary behaviors. UWT developed the **Future Adversary RN Attack Model** to forecast future violent non-state actors' behaviors surrounding the pursuit and use of RN weapons. The model highlights the motivations, acquisition methods, command and control, targeting, and weapon affinity aspects of RN terrorism and anticipates ideological, organizational, technical, and geopolitical developments within the next ten years.
- The **CBRN Insider Threat Unit** assesses the various types of insider threat relevant to CBRN, ranging from countering / detecting the radicalization of bioscientists, to preventing and interdicting the insertion of RN weapons and materials by insiders on international air cargo bound for the United States. In so doing, the unit develops multi-layered operational process models that characterizes the deterrent value of existing safety, security, regulatory and business systems, and identify where enhancements are needed.
- UWT designed the **RN Smuggling Threat Assessment Tool (RN-STAT)** as a method to identify and prioritize those organizational entities (such as transnational criminal organizations) that are most likely to assist terrorists – whether wittingly or unwittingly – in the transshipment of illicit nuclear and radiological materials.
- The **Terrorist Technology Adoption Model** analyzes the behavioral relationship between non-state actors and emerging technologies by examining a wide variety of ideological, organizational, strategic, and technological factors to evaluate the relative likelihood of a terrorist group: a) becoming aware of a new weapon or weapons-relevant technology, b) deciding to pursue adoption, and c) successfully incorporating the weapon or technology into its existing arsenal.



MULTI-DISCIPLINARY EXPERTISE

- POLITICAL SCIENCE
- CRIMINOLOGY
- SOCIOLOGY
- GEOGRAPHY & GIS
- HISTORY
- PSYCHOLOGY
- POLICY
- LIFE & PHYSICAL SCIENCES

POLICY ANALYSIS

- **International and Regional Architecture Reports** evaluate the existing status and vulnerabilities of the national RN detection architectures for 42 countries in the European Region, as well as Japan, Russia, North Korea, and several other countries. The work also produced a newly structured feasibility analysis of a European regional architecture strategy.



- The **Failure Points in Smuggling Networks** project examined the nexus between smuggling networks and the detection/law enforcement environment to outline key factors and trends for determining how networks fail. The study examines historical information in conjunction with the strategic behavior and multiplex relationships within these networks to identify potential interdiction opportunities.
- UWT conducts ongoing work on **Mapping RN Detection Capabilities Development Framework (CDF)** to recommend changes to a framework that organizes information about RN detection capabilities and provides strategic risk-based guidance to federal, state, local, and tribal planners about RN threats. The CDF covers two types of risk domains against which local jurisdictions can be evaluated: the risk of a locality becoming an RN attack target and the risk of it acting as a pathway for RN smuggling. The CDF incorporates a geospatial risk assessment tool, which includes a gap analysis between desired and actual capabilities.

- A study on **Threat Perception and Device Acceptance of Mobile Radiation Detectors** examines public perception surrounding mobile radiation detectors by combining multiple theoretical frameworks from social marketing and risk communication with rigorous quantitative and qualitative methods in order to facilitate the adoption of new RN detection technologies.

- UWT developed an expert-based **Consensus Framework for Informing Decision-making in the Biological Threat Characterization Program** to help guide program leaders and funders in determining research priorities for biological threat characterization and appropriate end points for studies with select agents.

- The **Assessing Future Chem/Bio (CB) Threats and Approaches to Addressing Them** project was designed to provide strategic guidance based upon an assessment of the current and likely future CB threat environment, including capabilities and trends in chemistry and biology that might enable more advanced application of these sciences by adversaries in the creation of future weapons within the next 10 years. The effort entailed a wide-ranging horizon-scan of current, near term, and emerging technologies that have dual use potential for CB offense or defense combined with a basic, qualitative threat analysis of these capabilities and technologies. This analysis then formed the basis for development of a functional and adaptable conceptual framework to assess strategic needs (in the face of the near-, medium- and longer-term CB security environments) and identify where current strategies might require modification.

- The **Profiling the CB Adversary: Motivation, Psychology and Decision-making** project is producing a comprehensive characterization of the psychology (e.g., motivations, judgment and decision making) of violent non-state chemical and biological (CB) adversaries to provide strategic guidance on incorporating these aspects into risk reduction efforts. The objective is to summarize what types of actors might choose to pursue / use CB weapons and why, with particular attention to factors contributing to the use of CB agents as opposed to conventional weapons.

RESEARCH SPONSORS

- DEPARTMENT OF HOMELAND SECURITY
- NATIONAL SCIENCE FOUNDATION
- DEFENSE THREAT REDUCTION AGENCY
- DEFENSE ADVANCED RESEARCH PROJECTS AGENCY
- DEPARTMENT OF STATE
- CHEMICAL AND BIOLOGICAL DEFENSE DIVISION
- SANDIA NATIONAL LABORATORIES
- CENTRAL INTELLIGENCE AGENCY
- NATIONAL COUNTERTERRORISM CENTER
- TRANSPORTATION SECURITY ADMINISTRATION
- NATIONAL NUCLEAR SECURITY ADMINISTRATION

DATABASES

- The **Profiles of Incidents involving CBRN Agents by Non-state Actors (POICN)** database includes information on terrorist plots, acquisitions, and attacks relating to CBRN agents. The database focuses on both international and domestic CBRN terrorism cases since 1990. This unique database uses 150 event-specific variables, 31 longitudinal organizational-level variables and 23 longitudinal weapons-level variables to record data on CBRN terrorism. This data will allow for comprehensive and powerful analyses of CBRN incidents, as well as the groups and technologies involved. POICN distinguishes itself from other CBRN and terrorist attack databases through its transparent classification of source validity and inclusion of variables that rate the uncertainty often present within and between sources.
- The **Chemical and Biological Non-State Adversaries Database (CABNSAD)** and **Radiological and Nuclear Non-State Adversaries Database (RANNSAD)** are perpetrator-level datasets derived from open sources that describe all previous non-state users and attempted users of CB and RN weapons or devices, respectively. Analysis of the datasets has allowed researchers to perform quantitative and qualitative analysis and to generate models of the types of events, agents, ideologies, and individual demographics associated with individual and group perpetrators.
- The **Nuclear Facilities Attack Database (NuFAD)** is a global database recording assaults, sabotages and unarmed breaches of nuclear facilities. The database emerged when several START researchers sought to explore the potential terrorist threat to nuclear facilities and discovered that there was a general lack of systematic open source data on the topic. What followed was a comprehensive attempt to identify the most relevant data from among the numerous historical anecdotes, unsubstantiated reports and vague references to attacks.
- The **RN Materials Out of Regulatory Control (MORC) Dataset** is a case-level, open source dataset that characterizes instances of radiological and nuclear material falling out of regulatory control, otherwise being situated in an unregulated disposition and or being returned to regulatory control. The dataset is designed to facilitate quantitative and qualitative analysis of broad, global trends in RN material proliferation and smuggling as well as analysis specifically of perpetrator characteristics in relation to said broader trends.



CAPABILITIES

UWT brings an interdisciplinary, multi-method approach to its research by employing a wide range of qualitative, quantitative and computational techniques drawn from across the social, behavioral and risk sciences. Since the prospect of unconventional weapons use is often characterized by high dynamism and small sample sizes, UWT has sought to develop particular expertise in judgmental and forecasting methodologies.

When deep technical expertise is needed to bolster its in-house subject matter expertise, UWT can also draw upon an extensive network of senior technical personnel, including physicists, microbiologists and chemical engineers. On average, UWT projects integrate techniques from three different research methodologies.

RESEARCH CAPABILITIES

- COMPARATIVE CASE STUDIES
- FIELD WORK / INTERVIEWS
- SCENARIOS / RED-TEAMING
- EXPERT ELICITATION & SURVEYS
- COMPUTATIONAL SIMULATION
- DATA INFRASTRUCTURE
- SOCIAL NETWORK ANALYSIS
- RISK ANALYSIS/THREAT ASSESSMENTS
- GEOSPATIAL ANALYSIS
- STATISTICAL ANALYSIS
- EMERGING TECHNOLOGIES HORIZON SCANNING