



## Software Tool Randomizes DHS Security Activities, Thwarting Terrorists and Criminals

The **Assistant for Randomized Monitoring Over Routes (ARMOR)** tool prevents criminals and terrorists from predicting where and when security patrols will conduct their rounds or set up checkpoints. The Los Angeles Airport (LAX) police, Federal Air Marshal Service (FAMS) and U.S. Coast Guard (USCG) are all using versions of ARMOR.

ARMOR uses game-theoretic algorithms to randomize security schedules and plans, making it difficult for adversaries to plan how they will avoid security forces when plotting illegal activities. It also enables security forces to maximize the effectiveness of their limited resources.

## First Airport Security, Then Harbor Security Managers Deploy Tool

In 2007, the Center of Excellence for Risk and Economic Analysis of Terrorism Events (CREATE), a Department of Homeland Security (DHS) Science and Technology (S&T) Center of Excellence, developed the first version of ARMOR with research funding from the DHS S&T Directorate's Office of University Programs.

ARMOR was piloted at LAX for police to randomize their vehicle checkpoints and canine unit patrols. ARMOR resulted in increased seizures of illicit drugs and weapons and significant reductions in overtime costs.

CREATE then customized the ARMOR program, developing:

- IRIS (Intelligent Randomization in International Scheduling) for FAMS
- GUARDS (Game-theoretic Unpredictable and Randomly Deployed Security) for the Transportation Security Agency (TSA)
- PROTECT (Port Resilience Operational Tactical Enforcement to Combat Terrorism) for USCG

## Homeland Security Operational Applications

- LAX police use ARMOR for scheduling security patrols.
- TSA/FAMS use IRIS for enhanced scheduling of air marshals.
- USCG is expanding the PROTECT pilot from Boston to New York and Los Angeles/Long Beach to enhance port patrols/coastal security.
- TSA's Office of Mass Transit and Passenger Rail and Los Angeles County Sheriff's Department are adapting ARMOR for mass transit rail security, which is being piloted in Los Angeles.

## Recognition of ARMOR

- 2009: Special commendation for "outstanding contributions to the security of our nation" from the City of Los Angeles
- 2009: DHS Science and Technology Impact Award
- 2011: Operational Excellence Award from the Commander, First Coast Guard District
- 2011: Certificate of Appreciation for Outstanding Achievement from the Office of Law Enforcement/FAMS
- 2011: Rist Prize for demonstrating the practical benefit operations research can have on "real life" decision making from the Military Operations Research Society
- 2012: Wagner Prize for Excellence in Operations Research Practice from the Institute for Operations Research and the Management Sciences



Provide Inputs, Constraints

Schedule Evaluation

ARMOR Knowledge Base

DOBSS: GAME THEORY ALGORITHMS

Weights for randomization

Randomized Schedule Generation

ARMOR v/s Non-weighted (uniform) Random for Canines

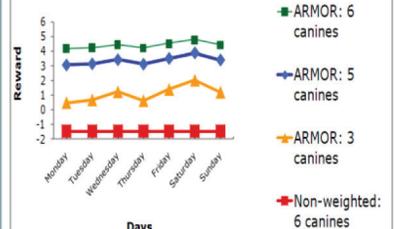


Diagram of how ARMOR is used to develop random schedules.