Development and Implementation of an Optimization Model to Improve Airport Security

Kassandra Guajardo¹, Angela Waterworth², Robert Brigantic²

¹Sunnyside High School, 1801 East Edison Avenue, Sunnyside, WA 98944
²Pacific Northwest National Laboratory, 902 Battelle Boulevard, Richland, WA 99354

ARAM

Airport Risk Analysis Model

Modeling and Optimization Researchers at the Pacific Northwest National Laboratory are developing and implementing a model called ARAM (Airport Risk Analysis Model) for the Seattle-Tacoma International Airport. ARAM will recommend the optimal deployment of security assets to reduce risk to the airport subject to resource constraints and other limitations and restrictions. The model is based on a quantitative formulation of risk that considers consequences, vulnerabilities, and threat magnitudes at airports.

There are nine areas that are accounted for when using the ARAM model. When assets are optimal deployed, they are deployed in areas where they are able to have the best presence of deterrence.

In the ARAM model, sensitivity needs to be accounted for. When running a simulation in ARAM multiple times, it may not produce the exact same risk buy down percentage. The percentages may be within .1%, .2%, or more off of the original risk buy down percentage.

For the diagram on the right, the risk buy down is 5.0% for the POS PD Canine Team. It is 5.0% because ARAM has a sensitivity error when running the same hour for the same asset.

Currently, there are six different asset types that were used in the ARAM model:
1. TSA Playbook Team
2. TSA Canine Team
3. TSA VIPR Team
4. POS PD Canine Team
5. POS PD Patrol Team
6. POS Security Team

Results

Model

The red line is the maximum risk without any prevention action done. The blue line is the baseline risk. The green line is the optimized risk based on the available resources per hour.

Diagram 3 (above): The diagram describes the risk buy down for each asset type.

Conclusion

The Port of Seattle Police Department Canine Team had the greatest risk buy down of 5.1% during the shifts of 0300-1000 hours and 0400-1100 hours.

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Further Steps

The next steps for the ARAM model will be to translate the Microsoft Excel program into a web accessible software platform that runs the calculations in a timely manner for airport security teams to implement on a daily basis.

Since ARAM calculates the optimal asset assignment based on location, optimizing the asset type’s pathways during their shift should be integrated into the ARAM. Optimizing pathways may affect the presence of deterrence to the airport travelers, which may reduce the risk buy down percentage.

Word Bank

TSA: Transportation Security Administration
POS: Port of Seattle
PD: Police Department
VIPR: Visible Intermodal Prevention and Response
STEM: Science, Technology, Engineering, and Math