# Air Cargo Cost Estimating Project (ACCEP)

## ADSA11 – Explosive Detection in Air Cargo Part 2

**4 November 2014**
**Boston, MA**

**Terri Rose,**
**Oak Ridge National Laboratory**

**Todd Combs,**
**Argonne National Laboratory**

Argonne NATIONAL LABORATORY

OAK RIDGE National Laboratory

# Acknowledgements

This work was funded and supported by the Department of Homeland Security Transportation Security Administration Office of Security Technology.

Argonne NATIONAL LABORATORY

OAK RIDGE National Laboratory

# So What, Who Cares?

- Expanded cargo screening data base
  - Building on ACEDPP study, cargo screening cost estimates were determined for an additional top ten passenger cargo operations airports: ATL, DEN, DFW, HNL, IAH, JFK, LAS, LAX, MIA, ORD and top five cargo-only operations: LAX, SJU, BQN, PDX, MIA
- Independently verified and validated EMA
- Cost estimates for implementing screening systems as mandated in 49 U.S.C.§ 44901(g) using 12 ACEDPP cost categories
  - Screening resources for smaller, underutilized operations result in minimal cost increase; 7 of 16 passenger cargo operations would incur increases exceeding 100%
  - Labor costs varied from 65% to 85% of total screening costs
  - Screening resources for all cargo freighter operations are minimal with low unit costs $0.04 to $0.41

# Project Background: Original Tasking from House Report on Appropriations Bill (2006)

- **… conduct three cargo screening pilot programs - one at an all cargo airport and two at top ten passenger cargo airports. These pilots shall test different concepts of operation that TSA designs in coordination with the S&T. Testing shall consist of the following: (1) physically screening a significant percentage (e.g. six times more than today) of cargo at a passenger airport using TSA screeners during slack passenger and checked baggage screening periods; (2) physically screening a significant percentage (e.g. six times more than today) of cargo at a passenger airport using TSA or private screeners solely dedicated to cargo screening; and (3) using canine teams, supplemented as needed by technology, screening a similar percentage of cargo at an all cargo airport, specifically to detect explosives and hidden passengers. Based on results of each pilot, TSA will provide cost estimates (both non-recurring and recurring) of these different operational concepts if deployed to the top five air cargo only airports and top 10 passenger airports.**

# Project Objectives

- Identify major cost drivers for air cargo screening for passenger and freighter cargo traffic
- Provide rough order of magnitude (ROM) cost estimates for alternative screening technologies at the legislatively mandated 100% screening level for cargo on passenger aircraft
- Give insight into most cost efficient screening configurations for actual, large volume airports
- Utilize life cycle cost analysis methodology to optimize screening techniques

# Project Scope

- Expand data gathering beyond the 3 original DHS S&T ACEDPP Pilots to 15 sites chosen for this TSA cost study
- Utilize proven ORNL cost model and IV&V to ensure realistic cost projections
- Analyze costs only; benefits associated with screening efficiency and effectiveness were not considered
- Make no policy recommendations; study results are intended to be utilized in conjunction with other studies of secure supply chain programs as input to agency decision-making
- Provide findings, conclusions, and recommendations for future research based on ROM cost estimates comparing current screening requirements against future 100% screening requirements

# Key Study Assumptions

- Utilize EDS (primary) and ETD (secondary) for Screening Cargo on Passenger Aircraft
- Utilize CO2 Monitoring (primary) and Heart Beat Monitoring (secondary) for Screening Cargo on Freighter Aircraft

*Note: Both assumptions reflect regulatory interpretations for explosives screening current in the 2007/2008 timeframe)*

# Project Findings

The results generally show economies of scale for passenger cargo operations under the August 2010 Congressional mandate.

- Unit costs at the smallest three passenger operations in the study are projected to range from $19.93 to $28.76 per parcel, while the unit costs at the largest three passenger operations in the study are projected to range from $0.88 to $1.07 per parcel.
- 7 of 16 passenger cargo operations incur screening cost increases exceeding 100% (when compared to baseline operations).
- Because of economies of scale for passenger cargo operations, future research in large scale, centralized operations offering cargo screening as a central service to all shippers at or near an airport may be needed.

# Project Findings

Study results indicate the cost for cargo screening at freighter operations is significantly less than for passenger operations under the August 2010 Congressional mandate.

- Unit costs on a per 100 pound basis for passenger operation screening range from $1.20 to $56.70, while the unit costs for freighter operation screening range from $0.04 to $0.20 per hundred pounds.
- Future research to examine the feasibility of shifting air cargo that is more difficult to screen for explosives from passenger to freighter aircraft is warranted.

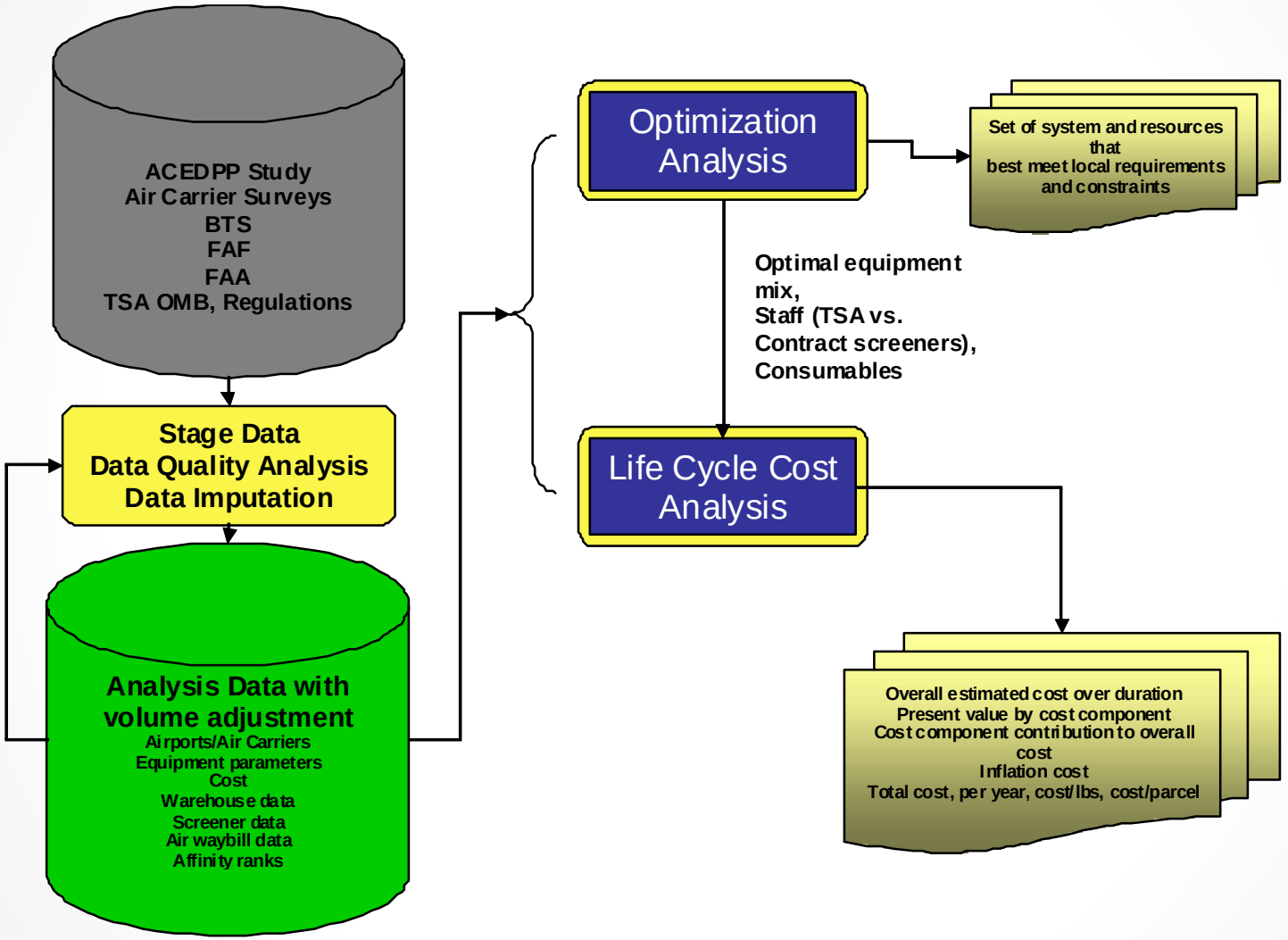
# Enterprise Modeling and Analysis (EMA)

EMA is the integrated study of organization, people, processes, systems, technology, and the environment in which they operate and their impacts

EMA integrates multiple modeling, analysis, and visualization tools

- Statistical analysis (data integration, filling gaps, relationships, assess effectiveness – ROC, etc.)
- Simulation (operations analysis and evaluations, efficiencies, )
- Optimization (alternatives analysis – cost, risk, affinity, design optimal system, etc.)
- Life cycle cost and economics (impact assessment - gainers and losers)
- Sustainment (long-term risk and vulnerability)
- Readiness and resiliency (transition)

# EMA as Applied to ACCEP




Argonne NATIONAL LABORATORY

OAK RIDGE National Laboratory

# EMA Data Input

- Data Standards
  - Airway bill, pallet, piece, parcel, etc.
- Data Category
  - Interviews with facility manager; Samples (5-10 days, 8 hours/day etc.) and 100% airway bill data for the sampling period
- Data Elements
  - Airport, air carrier, air waybill number, pieces, commodity, weight, estimated parcels, consolidation, packaging material, destination, service level etc.
- Other Data Sources to Augment/Fill in Gaps/Data Quality Checks
  - BTS – airport, air carrier, weight, freight assessment framework
- Data Structure/Organization – Databases
  - Infrastructure data, operational data, volume-adjusted data, model parameters and scenario
- Data Access – user via secure web
- Data Implementation – MS-SQL

# Actual Data

- 18 Airports Surveyed in 2007 and 2008 (Baseline)
- Number of Warehouses: 41
- Number of Air Carriers: 72
- Number of Air Waybills: 124,820
- Duration
  - ✓ 5-10 day for the 15 Airports
  - ✓ 6-9 months of data for 3 Airport (ACEDPP)
- BTS and FAF Data: National Level (all airport, all modes)

# Independent Verification and Validation of EMA

- IV&V Goals
  - Conceptual Model Validation
  - Computerized Model Verification
  - Sensitivity Analysis
  - Model Stability and Consistency
  - Stress Testing
- IV&V Conclusion
  - Model confirms observed processes at ORD
  - Validated responses to singular and multiple input parameters changes
  - Model stress and volume limits are far beyond the current operational requirements

# Recommendations for Future Research

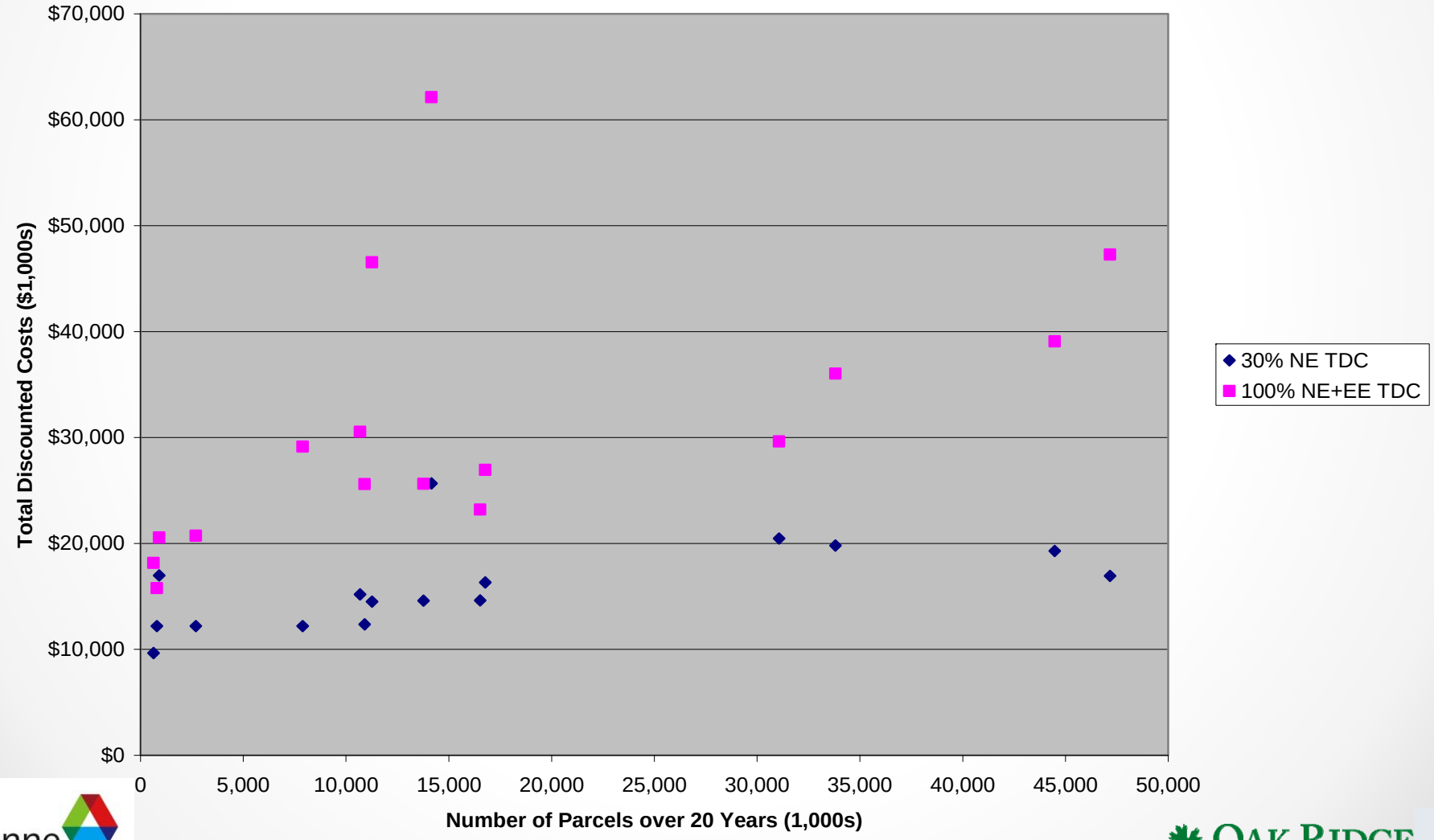
- Because of economies of scale found at larger carriers, future research in large scale, centralized operations may be warranted
- The study shows that costs for screening freighter operations is significantly less than screening passenger operations. Therefore, future research may examine feasibility of shifting air cargo that is difficult to screen for explosive from passenger to freighter aircraft
- Due to increased costs in passenger cargo operations, future research may examine the extent to which air cargo commerce is shifted to other modes of transportation and how that will impact small businesses
- Various options for cost sharing between the public and private sector should be examined

# Questions?

# BACK-UP SLIDES

# 20 Year Total Discounted Costs – Passenger Carriers

**Figure 1. Total Discounted Cost over 20 Years for Passenger Cargo Operations**

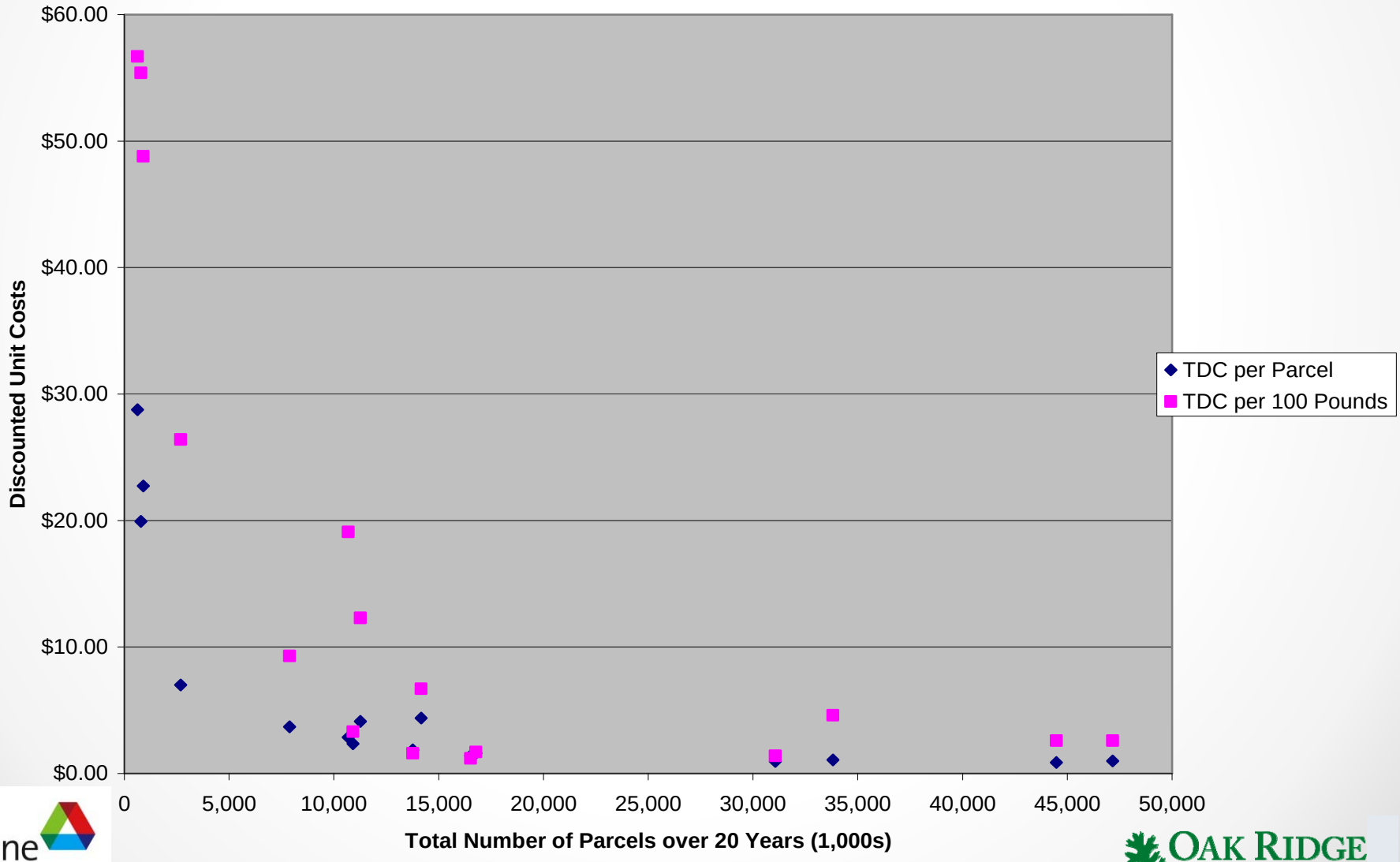



Argonne NATIONAL LABORATORY

OAK RIDGE National Laboratory

# 20 Year Total Discounted Unit Costs – Passenger Carriers

**Figure 2. Discounted Unit Costs over 20 Years for Passenger Cargo Operations**

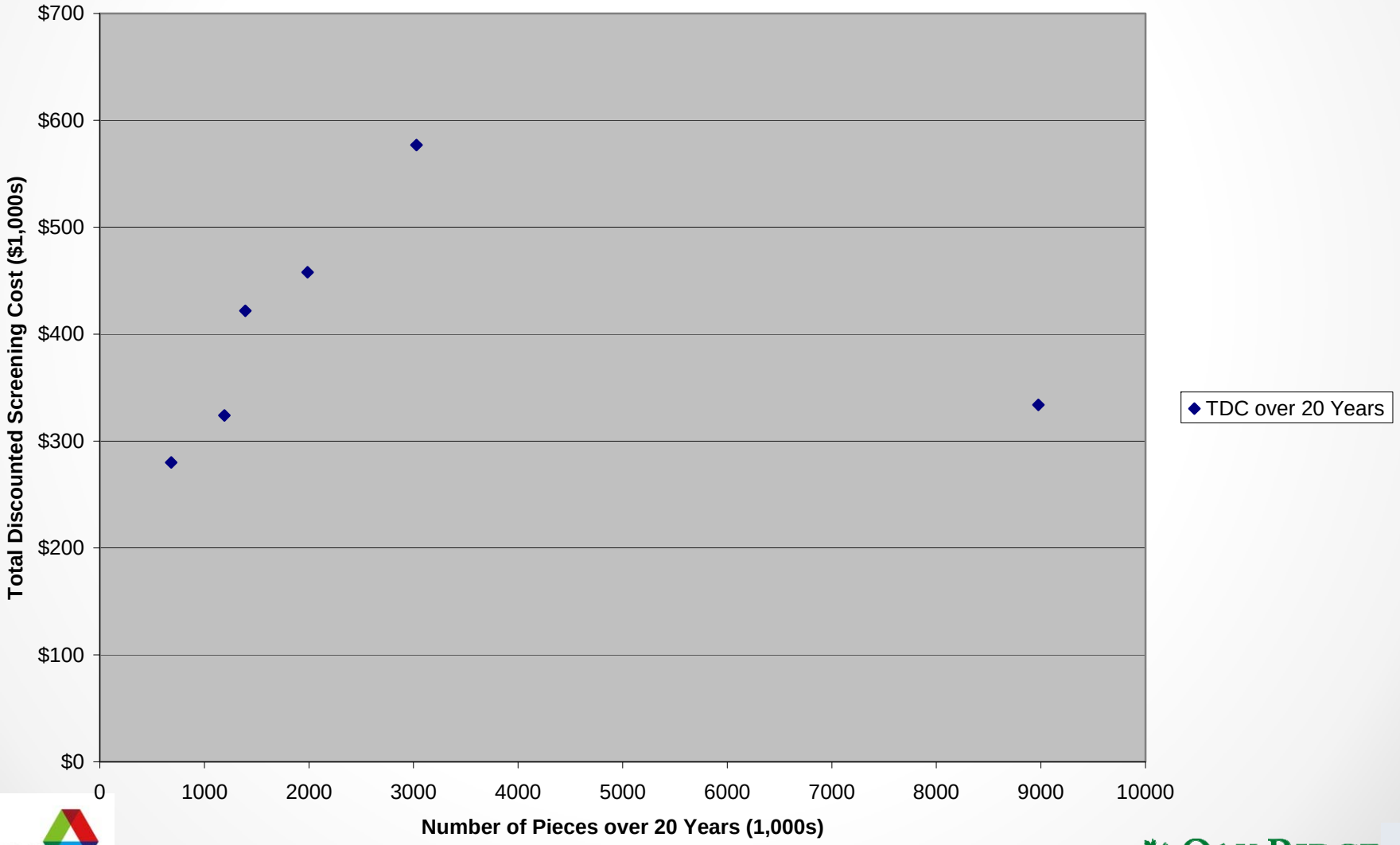



Argonne NATIONAL LABORATORY

OAK RIDGE National Laboratory

# 20 Year Total Discounted Unit Costs – All Cargo Carriers

**Figure 3. Total Discounted Cost for Freighter Operations over 20 Years**

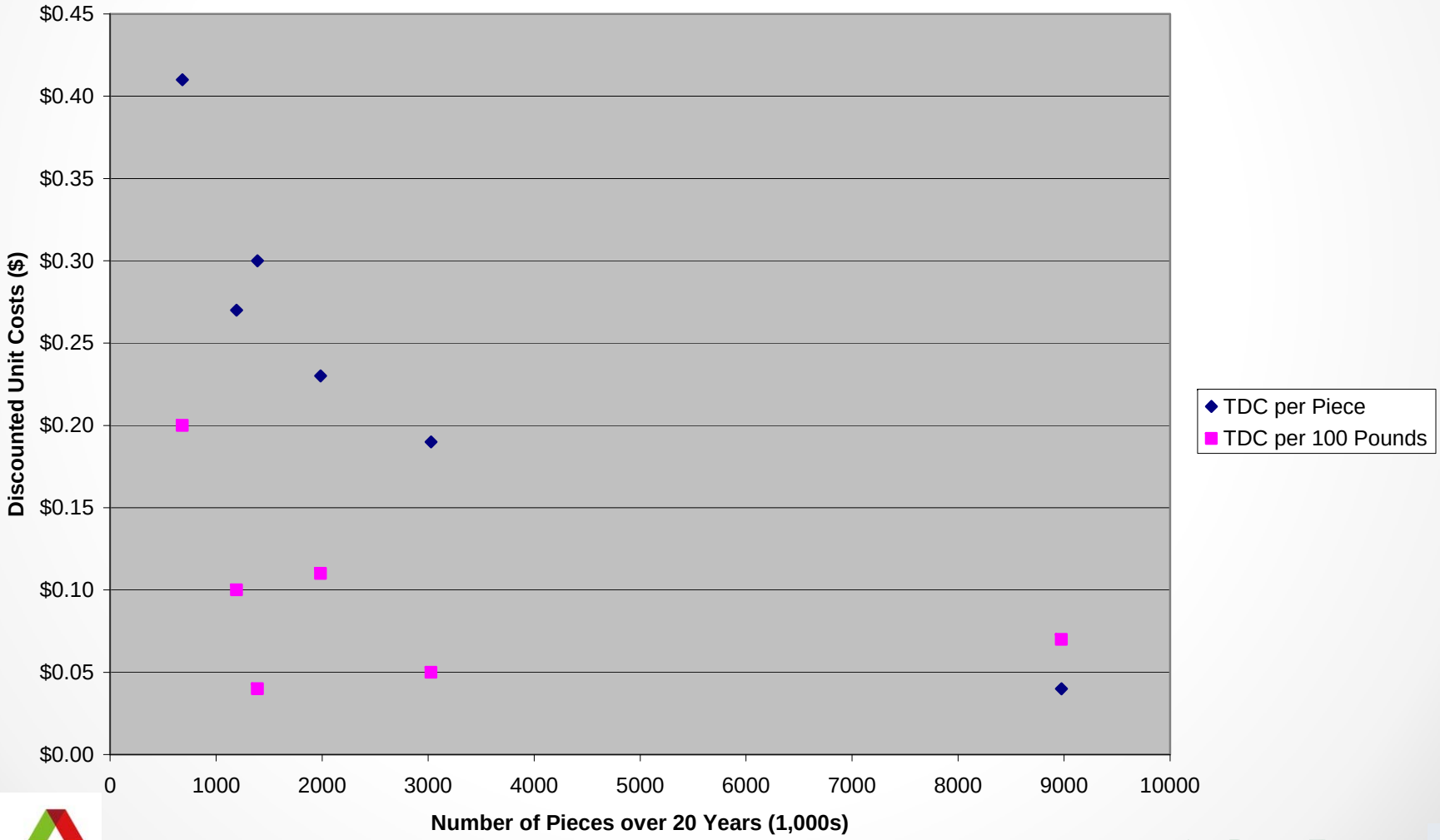



Argonne NATIONAL LABORATORY

OAK RIDGE National Laboratory

# 20 Year Total Discounted Unit Costs – All Cargo Carriers

**Figure 4. Discounted Unit Costs for Freighter Operations**




Argonne NATIONAL LABORATORY

OAK RIDGE National Laboratory

# Benefits of EMA

- Baseline analysis – characterizing infrastructure, flow, operations, efficiencies, business constraints, regulations, and effectiveness
- Trade analysis of alternatives systems
- Optimal design of screening system that maximize affinity and probability of detection and minimize cost while meeting stakeholder operations, business, and budget constraints
- Assess operational impacts and support the optimization of service time, business rules, throughput, delay, traffic pattern, resources, etc. for different ConOps
- Equipment Testing and data needs assessment to include both screening, operational, industry, and infrastructure data
- Human factors assessment (man-machine interface) and training requirements development
- Life cycle cost assessment
- Economic impacts assessments (industry/commerce tradeoffs)
- Sustainment (reliability, maintainability, supportability, logistics, periodic testing, etc.) requirements assessment
- Extrapolation assessment based technology attributes, performance, test and pilot analysis.
- Deployment and transition strategy assessment (what combination of technology mix, number, resources, infrastructure changes based on security, operational, financial, and other constraints.)