Pacific Northwest
NATIONAL LABORATORY

At What Cost? A Lifecycle Cost Calculator for Aviation Security Checkpoints

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Disclaimer: The views expressed in this presentation are solely those of the presenter and not necessarily those of DHS S&T.

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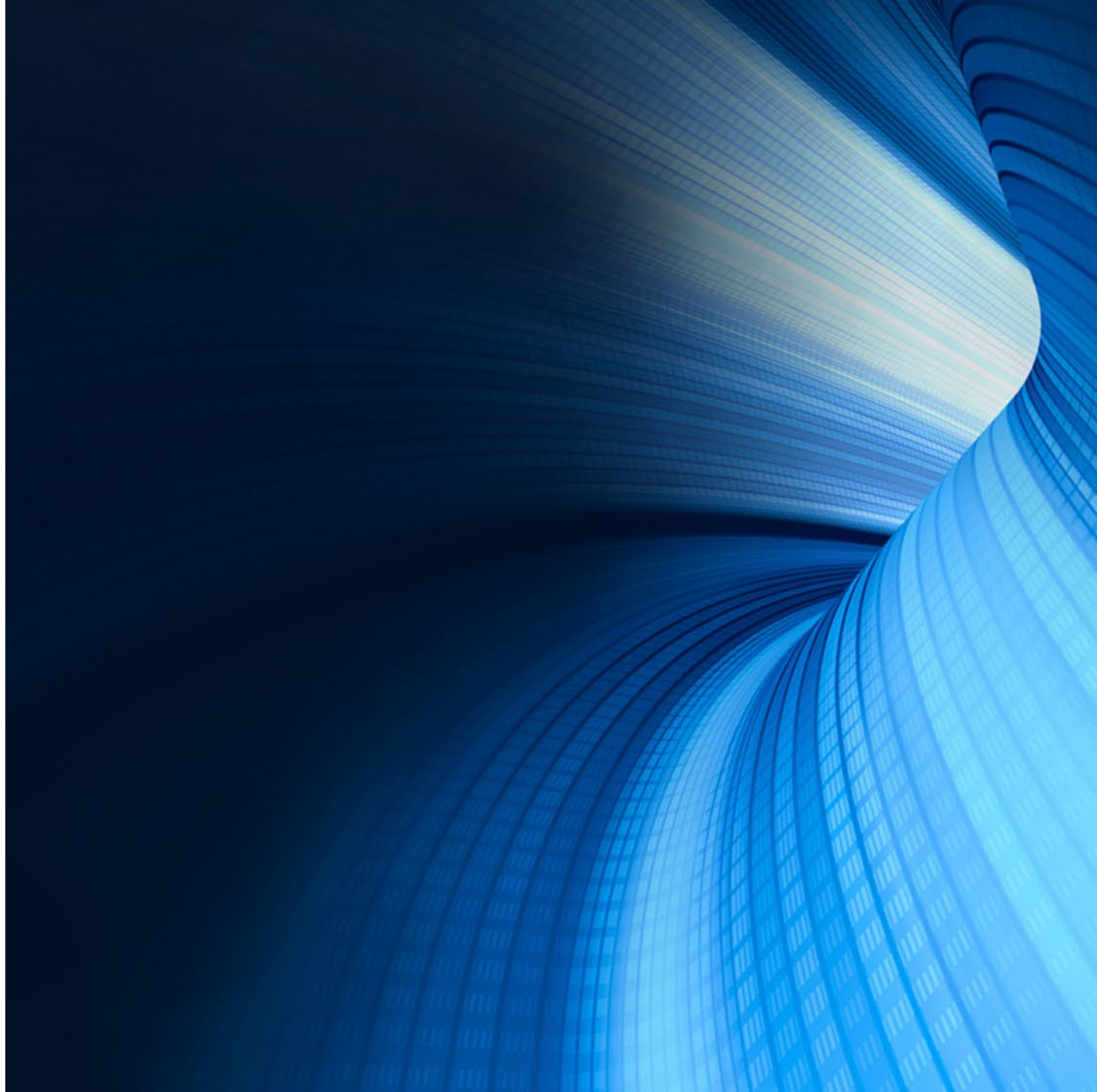


Aviation Security Screening Optimizer for Risk and Throughput (ASSORT)

- ✓ *Explore risk-based approach to screening and checkpoint operations*
  - *Risk mitigation benefits of new technologies, policies, and CONOPS*
  - *Resource requirements, both personnel and systems*
- ✓ *Employ DHS risk components: R = f (T, V, C)*
- ✓ *Opportunities for optimization and trade-off analysis*
  - *Increased risk mitigation*
  - *Reduced staffing and life cycle costs*
  - *Increased risk deterrence*
  - *Improved passenger experience*

ASSORT Checkpoint CONOPS

Checkpoint Configuration:
- Number of lanes for each passenger type
- Technologies utilized for each passenger type

Passenger Types:
- General: Passengers who do not provide information beyond what is required to book a flight
- Trusted: Passengers who participate in programs like TSA PreCheck™
- Trusted+: Passengers vetted beyond TSA PreCheck™

ASSORT *Cost Model Dashboard*

Setting	Lane Type: General	Lane Type: Trusted	Lane Type: Trusted+
Number of Lanes	3	2	1

Technology	General	Trusted	Trusted+
Camera/video	x	x	x
Biometrics	x	x	x
mmWave	x	x	
X-ray	x		
Pat down (if randomly selected)	x	x	x

Cost Methodology

Acquisition Cost:

- One-time procurement cost
- Dependent on technology type, does not vary by lane type

Operations & Maintenance Cost (O&M):

- General operation and maintenance for each technology
- Computed using 'golden ratio' of 70:30 for O&M:Acquisition
- Calculated over 10-year lifecycle

Labor Cost:

- Based on hourly wage and approximate hours worked/year
- Calculated over 10-year period

	Camera/Video	Biometrics	mmWave	X-ray	Patdown
Acquisition	$ 50,000.00	$ 20,000.00	$ 150,000.00	$ 153,628.00	X
O&M	$ 1,166,666.67	$ 466,666.70	$ 3,500,000.00	$ 3,584,653.30	X
Labor	$ 1,270,000.00	$ 1,270,000.00	$ 1,270,000.00	$ 1,270,000.00	$ 1,270,000.00

Cost Methodology: Assumptions

of units of technology per lane type (T)

	General	Trusted	Trusted+
Camera/Video	$\frac{\#\ of\ general\ lanes}{total\ lanes}$	$\frac{\#\ of\ trusted\ lanes}{total\ lanes}$	$\frac{\#\ of\ trusted+\ lanes}{total\ lanes}$
Biometrics	1	1	1
mmWave	1	1	1
X-ray	1	1	1
Patdown	1	1	1

of staff per technology (S)

	General	Trusted	Trusted+
Camera/Video	$\frac{\#\ of\ general\ lanes}{total\ lanes}$	$\frac{\#\ of\ trusted\ lanes}{total\ lanes}$	$\frac{\#\ of\ trusted+\ lanes}{total\ lanes}$
Biometrics	1	0.5	0.5
mmWave	1	1	1
X-ray	1	1	1
Patdown	2	2	2

Assumptions

Camera/video shared across all lanes and operated by one staff member

2 TSA agents (1 male, 1 female) needed for each lane to conduct patdowns

- Max # of lanes 2 TSA agents can cover is 3 lanes

Cost Methodology

N = # of lanes
T = # of pieces of technology per lane
S = # of staff required per technology

A = acquisition cost of technology
O = O&M cost of technology
L = labor cost of technology

	Camera/Video	Biometrics	mmWave	X-ray
Acquisition	$T \times A$	$N \times T \times A$	$N \times T \times A$	$N \times T \times A$
O&M	$T \times O$	$N \times T \times O$	$N \times T \times O$	$N \times T \times O$
Labor	$S \times L$	$N \times S \times L$	$N \times S \times L$	$N \times S \times L$

Labor Cost for Patdown

Patdown parameter (P) = 3
# of staff per lane (S) = 2

# of staff required for lane type =

$$(max\left(2, \left\lceil \frac{N \times S}{P} \right\rceil, 1\right) + mod(max\left(2, \left\lceil \frac{N \times S}{P} \right\rceil, 1\right), 2))$$

Ex 1: if N = 3,

$$(max\left(2, \left\lceil \frac{N \times S}{P} \right\rceil, 1\right) + mod(max\left(2, \left\lceil \frac{N \times S}{P} \right\rceil, 1\right), 2)) = 2 + 0 = \underline{\text{2 staff for lane type}}$$

Ex 2: if N = 4,

$$(max\left(2, \left\lceil \frac{N \times S}{P} \right\rceil, 1\right) + mod(max\left(2, \left\lceil \frac{N \times S}{P} \right\rceil, 1\right), 2)) = 3 + 1 = \underline{\text{4 staff for lane type}}$$

ASSORT Cost Model Dashboard

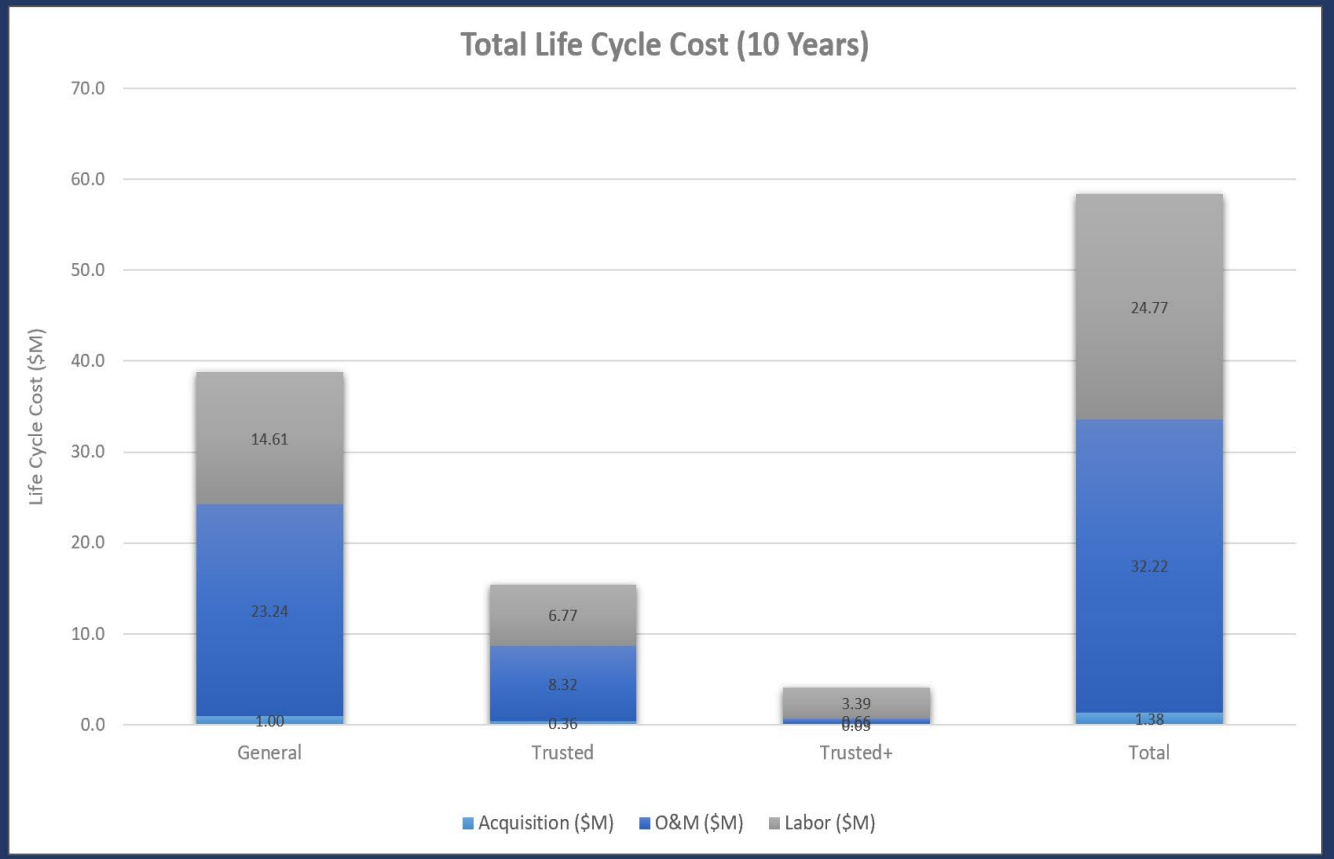
Auto-hide Ribbon

Setting	Lane Type: General	Lane Type: Trusted	Lane Type: Trusted+
Number of Lanes	3	2	1

Technology	General	Trusted	Trusted+
Camera/video	x	x	x
Biometrics	x	x	x
mmWave	x	x	
X-ray	x		
Pat down (if randomly selected)	x	x	x

Cost Category	General	Trusted	Trusted+	Total
Acquisition ($M)	1.00	0.36	0.03	1.38
O&M ($M)	23.24	8.32	0.66	32.22
Labor ($M)	14.61	6.77	3.39	24.77
Total Life Cycle Cost ($M)	38.84	15.45	4.08	58.37

$58,370,000 for 10 years of operation for this checkpoint



ASSORT Cost Model Dashboard

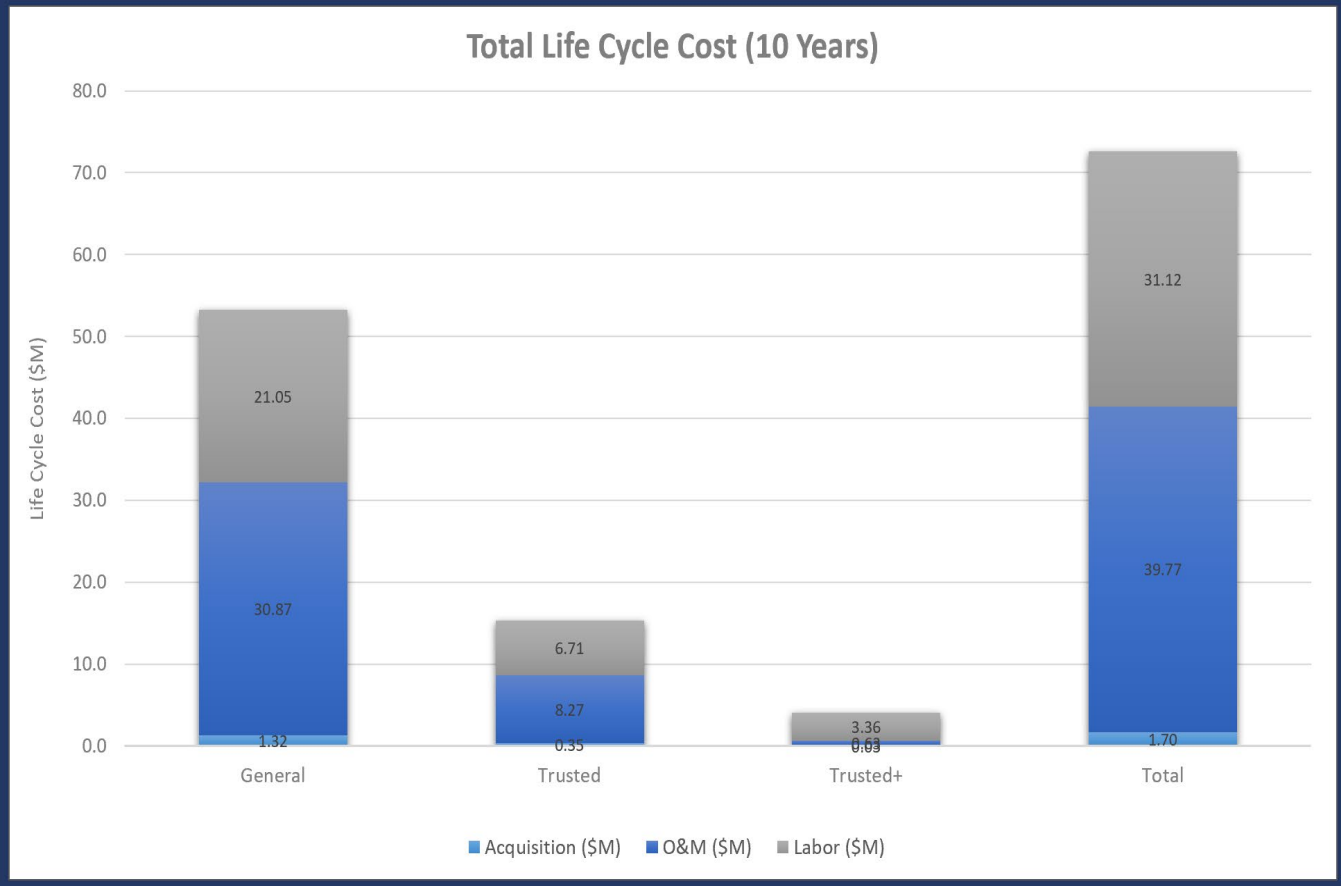
Auto-hide Ribbon

Setting	Lane Type: General	Lane Type: Trusted	Lane Type: Trusted+
Number of Lanes	4	2	1

Technology	General	Trusted	Trusted+
Camera/video	x	x	x
Biometrics	x	x	x
mmWave	x	x	
X-ray	x		
Pat down (if randomly selected)	x	x	x

Cost Category	General	Trusted	Trusted+	Total
Acquisition ($M)	1.32	0.35	0.03	1.70
O&M ($M)	30.87	8.27	0.63	39.77
Labor ($M)	21.05	6.71	3.36	31.12
Total Life Cycle Cost ($M)	53.24	15.33	4.02	72.59

$72,590,000 for 10 years of operation for this checkpoint



ASSORT Cost Model Dashboard

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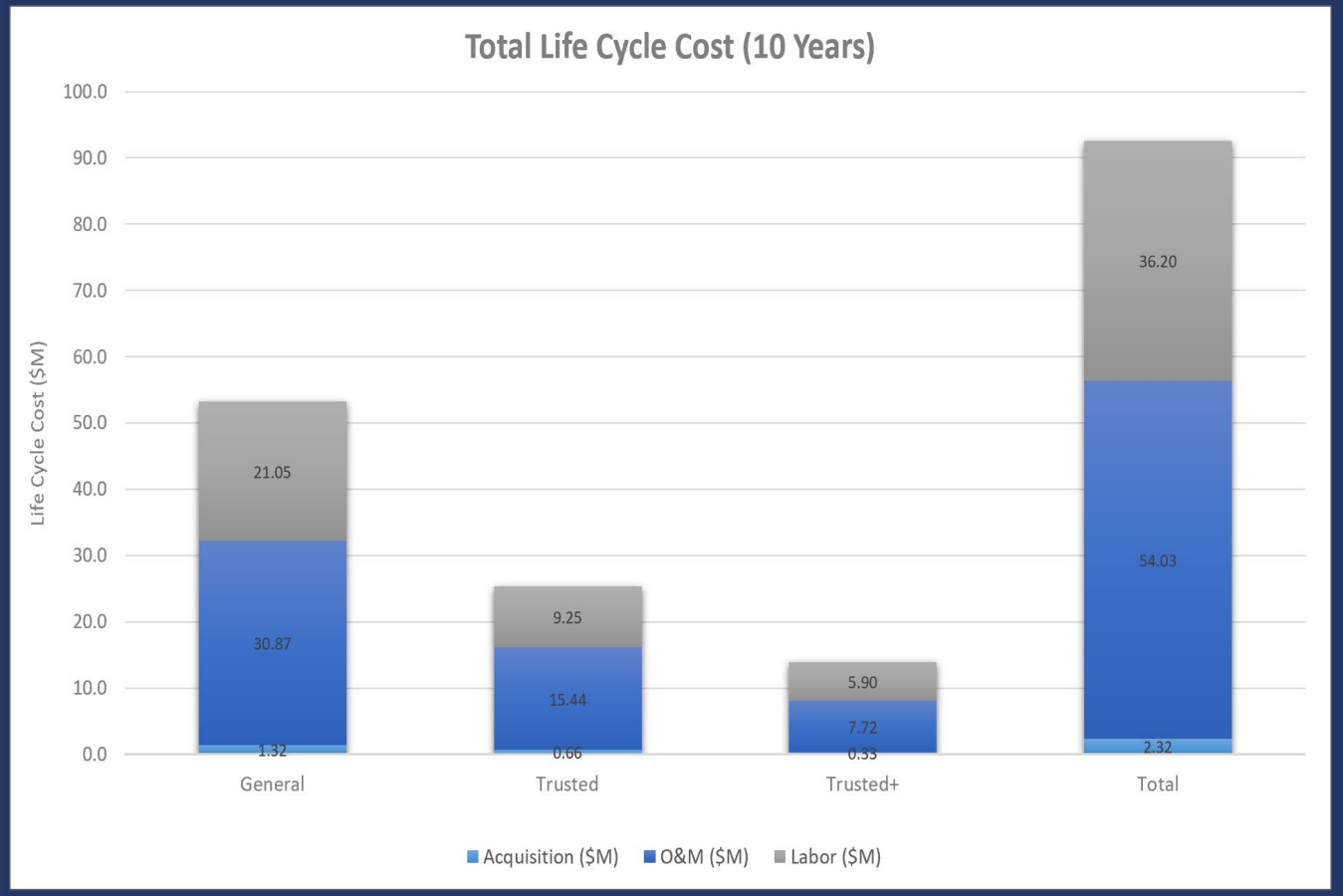
Setting	Lane Type: General	Lane Type: Trusted	Lane Type: Trusted+
Number of Lanes	4	2	1

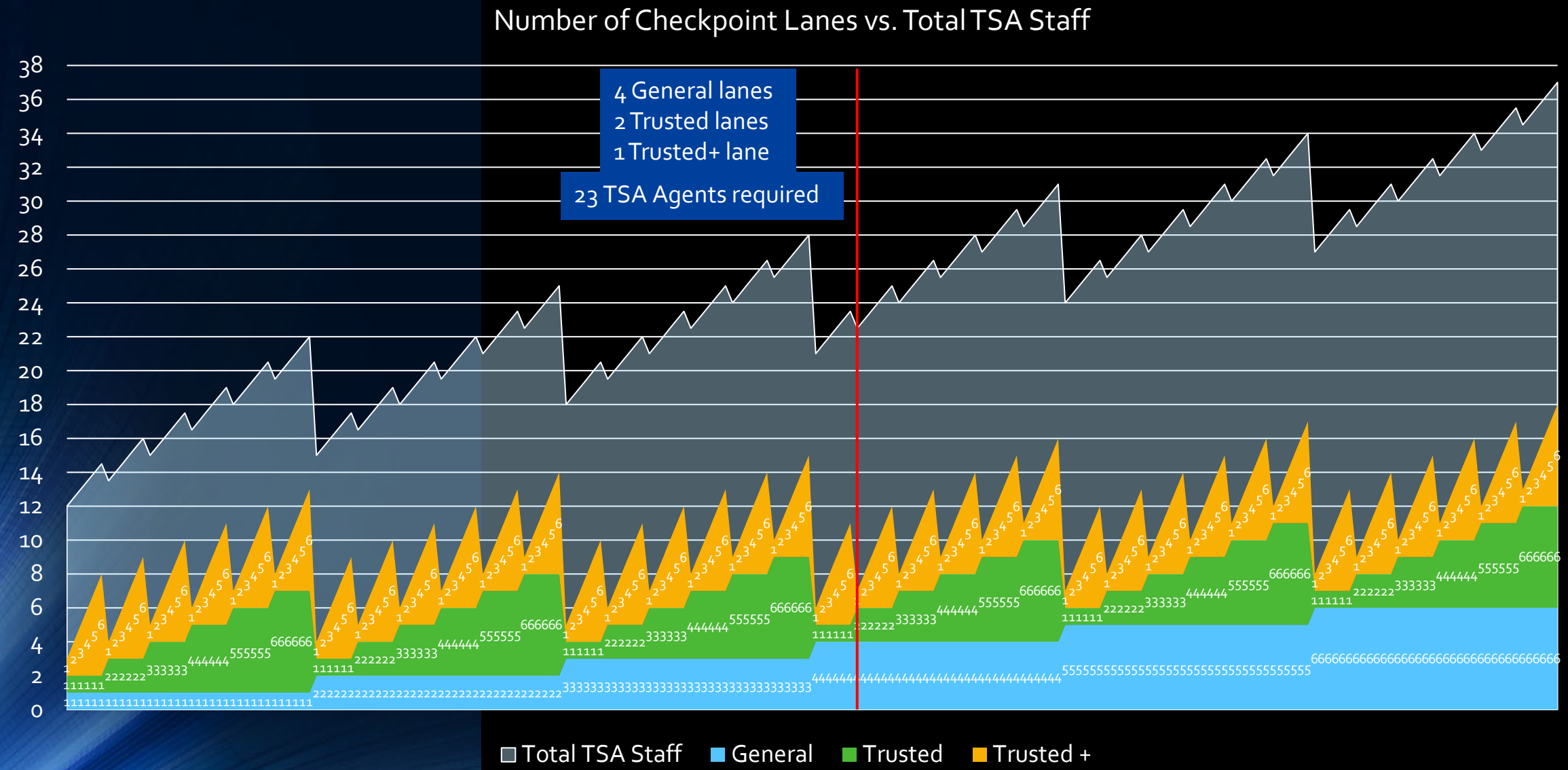
Technology	General	Trusted	Trusted+
Camera/video	x	x	x
Biometrics	x	x	x
mmWave	x	x	x
X-ray	x	x	x
Pat down (if randomly selected)	x	x	x

Cost Category	General	Trusted	Trusted+	Total
Acquisition ($M)	1.32	0.66	0.33	2.32
O&M ($M)	30.87	15.44	7.72	54.03
Labor ($M)	21.05	9.25	5.90	36.20
Total Life Cycle Cost ($M)	53.24	25.35	13.95	92.54

$92,540,000 for 10 years of operation for this checkpoint



TSA Resource Estimates from ASSORT Cost Model



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Extra slides: tbd where/which will be used

ASSORT

AVIATION SECURITY SCREENING OPTIMIZER FOR RISK AND THROUGHPUT

Checkpoint Definition

Number of Checkpoints

CHECKPOINT CONFIGURATION

Number and type of lanes for each checkpoint

- General
- Trusted
- Trusted+

Attack Scenario

ITEM OF CONCERN

- Knife
- Handgun
- Rifle
- Explosive (solid)
- Explosive (powder)
- Explosive (liquid)
- Chem / bio Agent

TARGET

- Checkpoint
- Aircraft

Countermeasures

- Camera / Video
- Biometrics
- mmWave
- X-Ray
- Transportation Security Officers
  - Random pat-down
  - Random bag screening

Data Driven Models

Effectiveness Against Attack Scenario

- SCREENING PROCESS
- DETERRENCE
- PROBABILITY OF DETECTION

Risk Components

TRUST
- Passenger Type

THREAT
- Scenario Likelihood
- System Threat Likelihood

VULNERABILITY
- Organic Security
- Target Hardness

CONSEQUENCE
- Death / Injury
- Economic Impact

Data Inputs

- Flights
- Passengers
- Realtime Data

Multiple Use Cases

System Trade-Offs

- Risk
- Passenger Experience
- Life Cycle Costs

What-Ifs

- New Technologies
- New CONOPS

1. Simulated Environment

Risk Engine

Optimal checkpoint settings to balance risk and passenger experience

2. Operational Environment

Realtime Mode

- Responsive to live conditions
- Automatic adjustments
- Alerts

Overview

- ✓ *Background*
- ✓ *ASSORT Checkpoint CONOPS*
- ✓ *Cost Methodology*
- ✓ *Example Calculations*