Emerging Trends in Airport Planning

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Session Overview

Discussion of trends & issues that will drive airport planning in the next decade:

- Four areas of focus
  - New types of vehicles in the airspace
  - Airfield/airspace capacity issues
  - Terminal design & development issues
  - Ground transportation/parking issues
- Interactive discussion addressing planning issues of specific interest to you

New Airspace System Users: UAS, UAM, Commercial Space, and Supersonics

Emerging Trends in Airport Planning

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December 6, 2019

New Vehicles in the Airspace

Unmanned aircraft systems (UAS)

Urban air mobility (UAM) systems

Supersonic private and commercial aircraft

Commercial space

UAS Issues at Airports

- Current focus is on small UAS operations near airports
  - Safety and security concerns
  - Jurisdictional and regulatory issues
  - Airport operator roles and responsibilities
- However, beneficial use of UAS is also of interest
  - Surveying and aerial photography
  - Site evaluation and inventory
  - Facility inspection
  - Perimeter security, especially at very large airports
  - Enhanced situational awareness
- In the longer term future, full UAS integration is a key concern
  - Integration of large UAS operations on airfields
  - Planning considerations associated with automation of commercial aircraft and ground support equipment

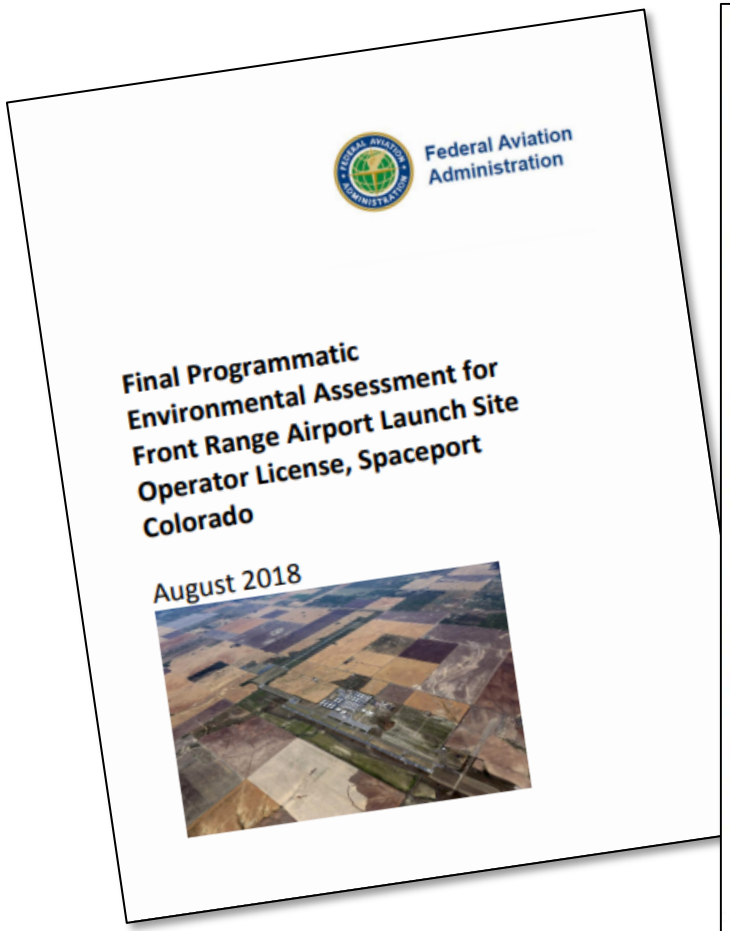
UAM Issues at Airports

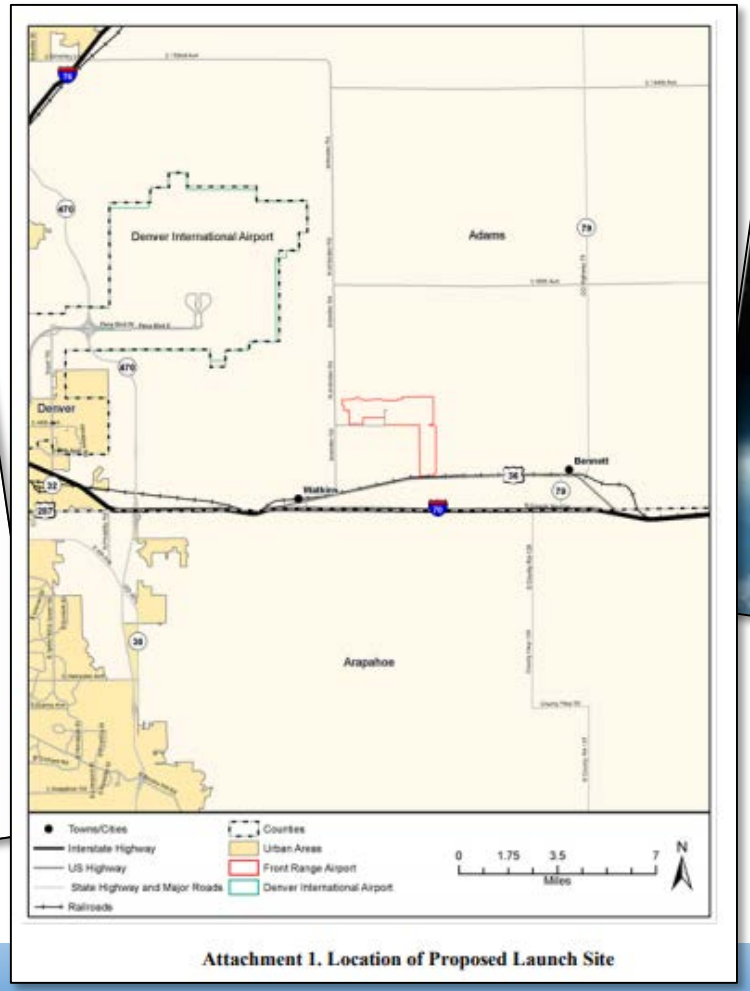
- Many of the same safety issues as UAS, but with the added issues of people being on the aircraft
- Integration with current airspace operations of critical concern
- If reality matches the hype, a whole new type of airfield/heliport infrastructure
- Upon introduction, much broader transportation and environmental planning considerations

Supersonics—The Next Generation

- Noise, noise, noise
  - What are the subsonic characteristics
  - When and where will supersonic transitions occur
  - What are the supersonic characteristics
- Airport/aircraft compatibility
  - Gate/parking position/loading bridge/ground handling concerns
  - Runway length considerations
  - Marking/lighting/signage visibility from the cockpit
- Eventually, possibilities for new air service patterns and markets

Commercial Space—The Final Frontier (for my presentation at least)





Attachment 1. Location of Proposed Launch Site

Planning & NEPA Issues Common Across these Vehicles

- Safety
- Noise and “metal” (carbon fiber?) overhead”
- Rapidly evolving and/or uncertain regulatory frameworks
- Integration with current aircraft operations in the airspace and on the ground
- Public curiosity mixed with public concern

Trends Impacting Airport Airfield & Airspace Planning—NextGen, Evolving FAA Guidance, and More

Emerging Trends in Airport Planning

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December 6, 2019

Session:
Emerging Trends in Airport Planning

Presented to: 2019 Airport Planning and NEPA Workshop

By: Kent Duffy, APP-400

Date: December 6, 2019

Federal Aviation Administration

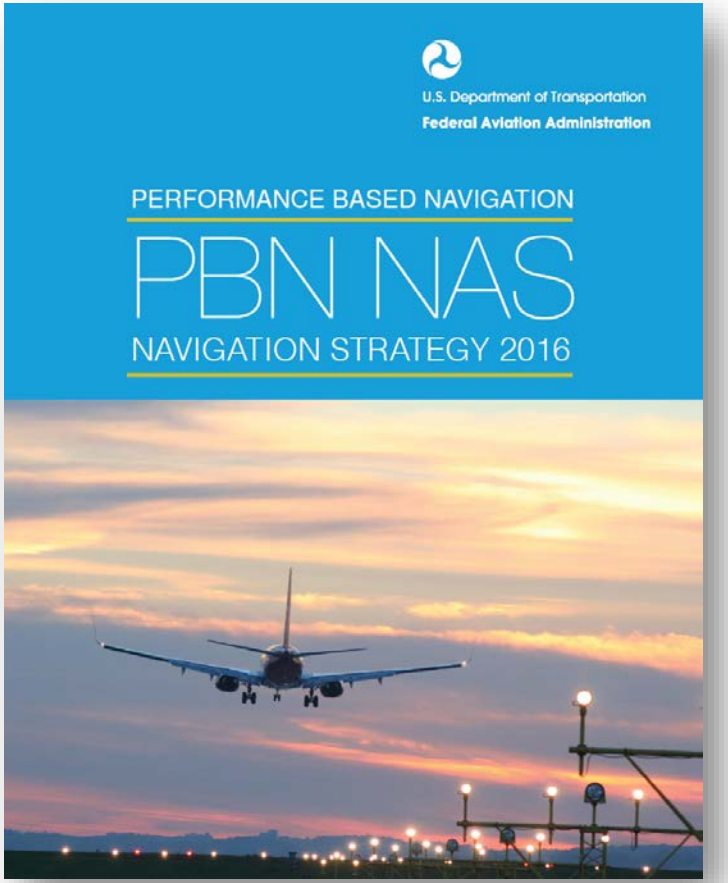
We are Airports

Interesting Topics of the Day:

- **Flight Procedures**
- **Surface metering (think: hold pads and bypass taxiways)**
- **Tools: Runway Exits and Runway length**
- **Non-Tower Counts**
- **Remote Towers**
- **Critical Aircraft and Secondary Runways**

Flight Procedures

- Daily operation with PBN throughout the NAS: RNAV everywhere and RNP where needed”
- Outlines strategy for transitioning to a PBN-Centric NAS
- Key NAS capabilities over the next 15 years
- Shift to time and speed-based air traffic management (TBFM)
- Expectations for evolution of aircraft operator fleet capabilities



PBN NAS Strategy

- Essential level of navigation service for all qualified instrument runway ends in the NAS:
  - LNAV/VNAV/LPV
- Navigation Service Groups aligned to NPIAS
- ILS network is mature and is not the focus for new development

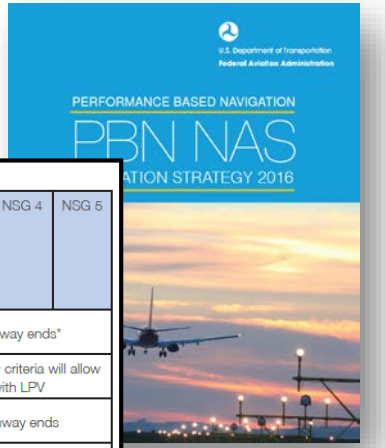
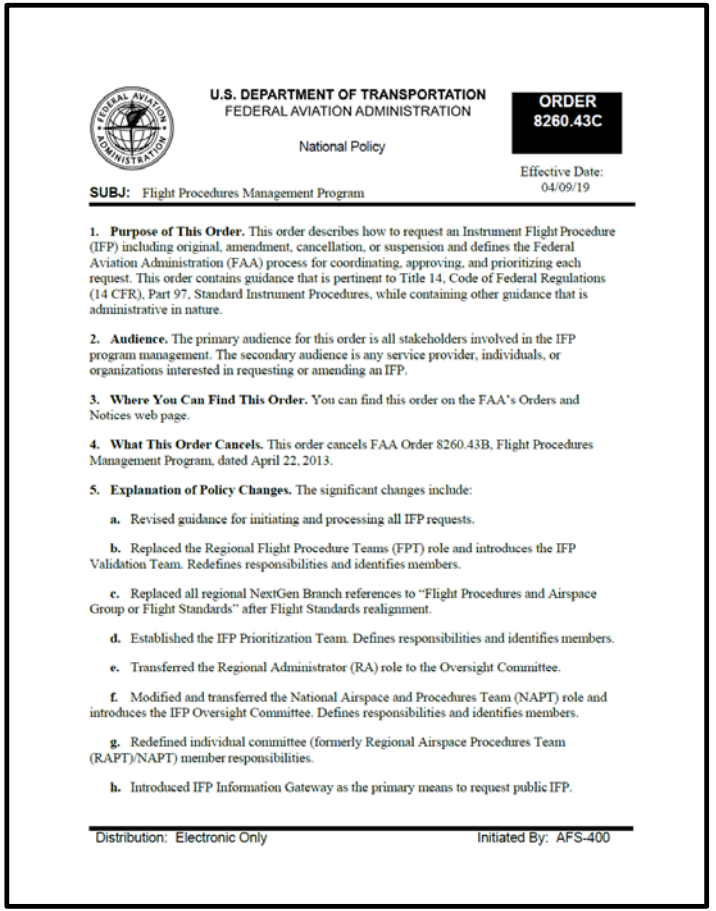


Table 3 – Availability of Approach Services Across Navigation Service Groups

PBN Operation	Near 2016–2020†	Mid 2021–2025	Far 2026–2030	Minimum ICAO Nav Spec to Qualify for PBN Operation (Allowable aircraft and operator qualification)	NSG 1‡	NSG 2	NSG 3	NSG 4	NSG 5
RNAV (GPS) with LNAV minima	>	>	>	A-RNP or RNP APCH A	Provided at qualifying runway ends*				
RNAV (GPS) with LP minima	>	v	v	RNP APCH B	LP added where beneficial; new criteria will allow many to be replaced with LPV				
RNAV (GPS) with LNAV/VNAV minima	^	^	>	A-RNP or RNP APCH A	Provided at qualifying runway ends				
RNAV (GPS) with LPV minima	^	^	>	RNP APCH B	Provided at qualifying runway ends				
RNAV (GPS) to RWY XX (RF and Scalable RNP)	N/A	^	^	A-RNP	May provide				
RNAV (RNP) to RWY XX (0.3 or lower needed)	^	>	>	RNP AR APCH	May provide				
RNAV (GPS) to RWY XX (RF outside FAF**)	^	^	^	A-RNP or RNP APCH A	May provide				
RNP (RF) initial and intermediate as part of an ILS approach procedure	^	^	^	RNP AR or A-RNP or RNP APCH	Recommended (NSG 1) May provide (NSG 2-5)				
ILS (CAT I)	>	v	v	N/A	May provide		No new ILS (CAT I)		Considered for reduction
ILS (CAT II, III)	>	>	>	N/A	Meets APS1 criteria (considers operations and weather)				
LOC only approach	>	v	v	N/A	Only if ILS does not qualify for vertical				Considered for reduction
VOR approach	v	v	v	N/A	Maintained only if there is no ILS and is also a VOR MON airport				

Flight Procedures

- **Flight Procedures development process is evolving…**
- **Emphasis on IFP Gateway**
- **Airport construction projects remain a priority, but 2+ years lead time needed**



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

National Policy

ORDER 8260.43C

Effective Date: 04/09/19

SUBJ: Flight Procedures Management Program

1. Purpose of This Order. This order describes how to request an Instrument Flight Procedure (IFP) including original, amendment, cancellation, or suspension and defines the Federal Aviation Administration (FAA) process for coordinating, approving, and prioritizing each request. This order contains guidance that is pertinent to Title 14, Code of Federal Regulations (14 CFR), Part 97, Standard Instrument Procedures, while containing other guidance that is administrative in nature.

2. Audience. The primary audience for this order is all stakeholders involved in the IFP program management. The secondary audience is any service provider, individuals, or organizations interested in requesting or amending an IFP.

3. Where You Can Find This Order. You can find this order on the FAA's Orders and Notices web page.

4. What This Order Cancels. This order cancels FAA Order 8260.43B, Flight Procedures Management Program, dated April 22, 2013.

5. Explanation of Policy Changes. The significant changes include:

a. Revised guidance for initiating and processing all IFP requests.

b. Replaced the Regional Flight Procedure Teams (FPT) role and introduces the IFP Validation Team. Redefines responsibilities and identifies members.

c. Replaced all regional NextGen Branch references to "Flight Procedures and Airspace Group or Flight Standards" after Flight Standards realignment.

d. Established the IFP Prioritization Team. Defines responsibilities and identifies members.

e. Transferred the Regional Administrator (RA) role to the Oversight Committee.

f. Modified and transferred the National Airspace and Procedures Team (NAPT) role and introduces the IFP Oversight Committee. Defines responsibilities and identifies members.

g. Redefined individual committee (formerly Regional Airspace Procedures Team (RAPT)/NAPT) member responsibilities.

h. Introduced IFP Information Gateway as the primary means to request public IFP.

Distribution: Electronic Only — Initiated By: AFS-400

DEN quads with Established on RNP (EOR)

Surface Metering

JFK on May 04, 2009

"First Come, First Served" sometimes does not achieve optimum results….

Surface Metering

- **TFDM: Terminal Flight Data Manager deploying with surface metering in 2021 through 2025 [CDM]**
  - Video: https://www.faa.gov/air_traffic/technology/tfdm/
- **Where: 27 large hub airports**
- **When: 2021 (PHX) through 2025**

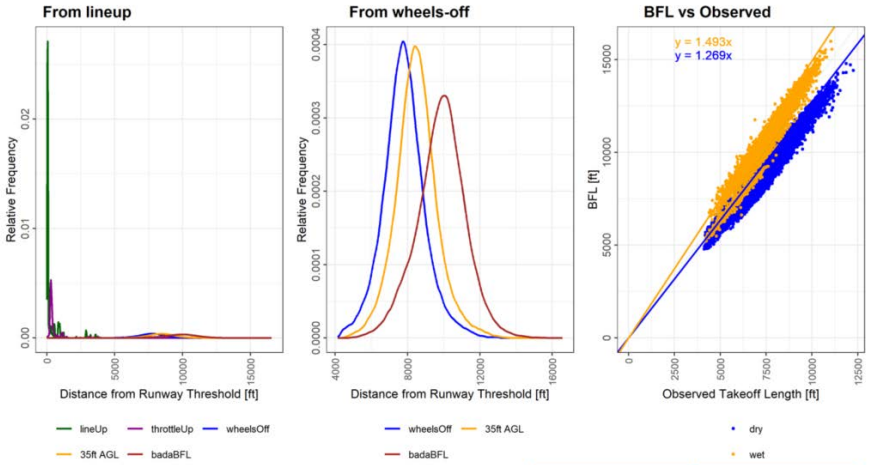
Bypass Taxiways

Hold Pads

Tools: Runway Length

- **FAA testing tool prototype**
- **Will replace Large aircraft charts in Runway Length AC; and supplement APMs**
- **Performance Engineering data remains preferred option**

A333 Takeoff Distances

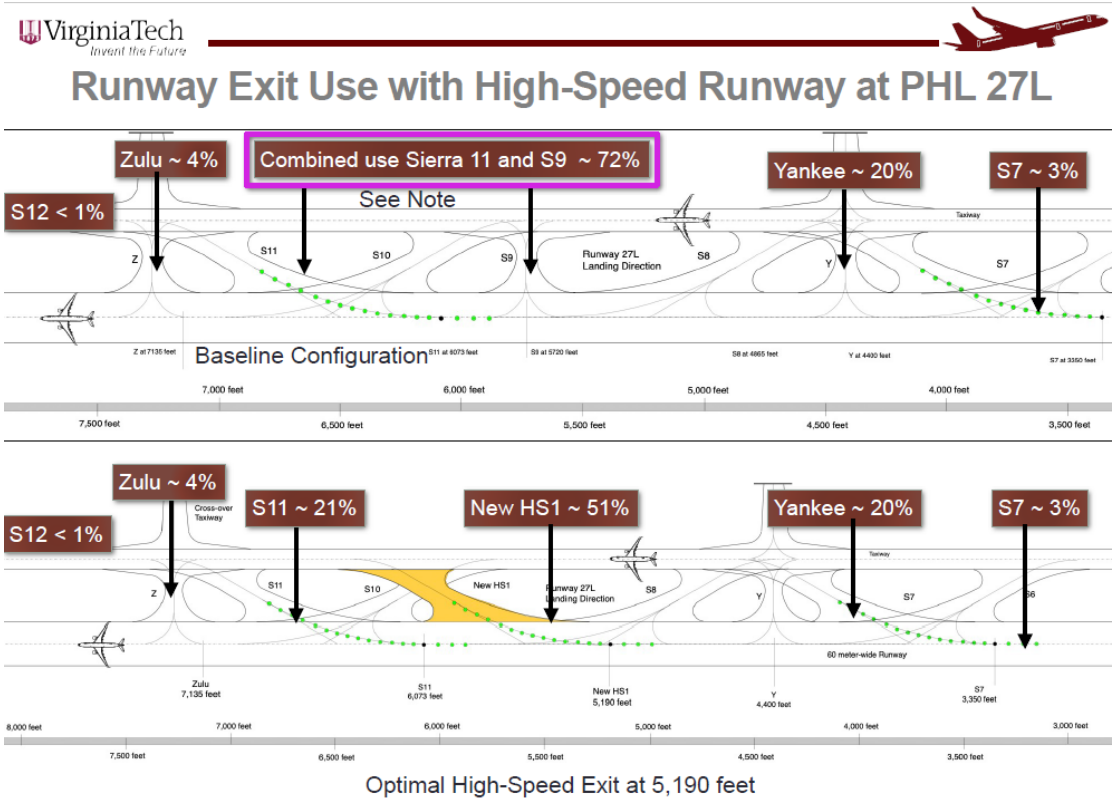


Sample Size	107563
Number of back taxiing	12

		Dry		Wet	
	d_{LP}	d_2+d_3	BFL	d_2+d_3	BFL
Mean (ft)	299	7969	9722	7726	10955
Std. Dev. (ft)	647	951	1214	1012	1542

Tools: REDIM

Runway Exit Design Interactive Model

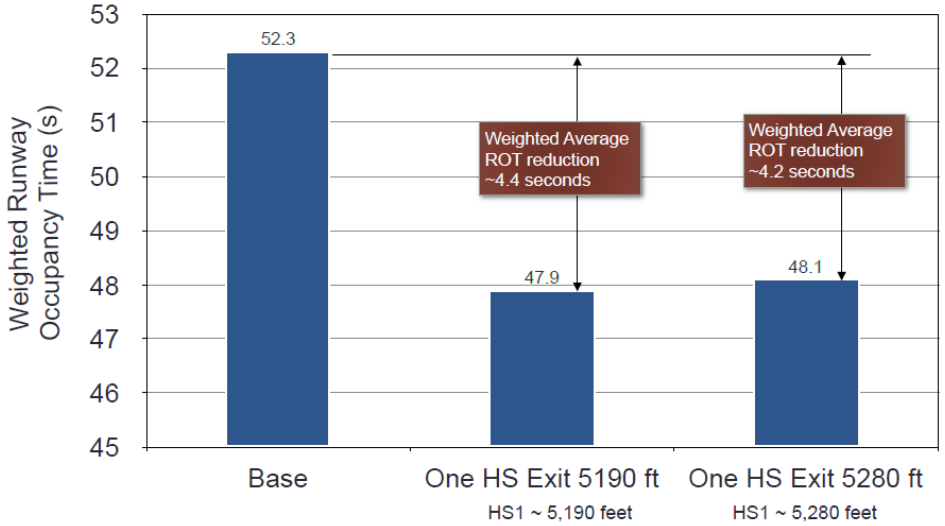


Optimal High-Speed Exit at 5,190 feet

Tools: REDIM

VirginiaTech
Invent the Future

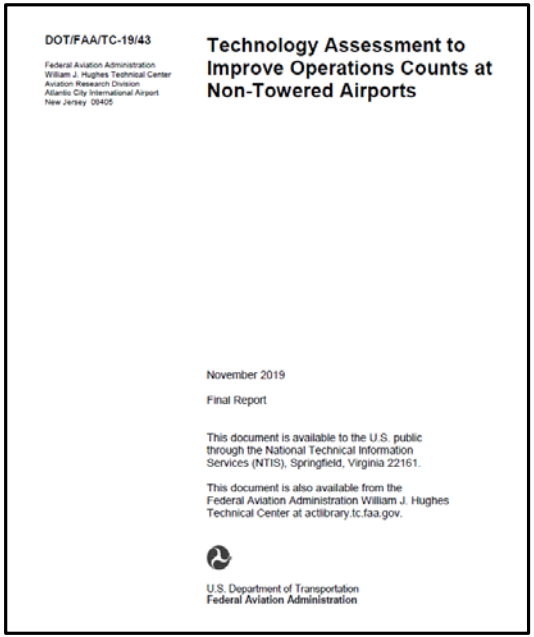
An Optimally Located High-Speed Runway Exit at PHL Runway 27L Could Reduce the Weighted Average Runway Occupancy Time by 4.4 to 4.2 Seconds



PHL Fleet Mix (Jan/2018 to Aug/2019) provided by FAA

Non-Tower Counts

- Purdue completed R&D accurate technology for accurate aircraft operations counts
- Algorithm uses transponder signals for counts
- *Caution: Ops per based aircraft can only be used at basic and local GA airports*



DOT/FAA/TC-19/43

Federal Aviation Administration
William J. Hughes Technical Center
Aviation Research Division
Atlantic City International Airport
New Jersey 08405

Technology Assessment to Improve Operations Counts at Non-Towered Airports

November 2019

Final Report

This document is available to the U.S. public through the National Technical Information Services (NTIS), Springfield, Virginia 22161.

This document is also available from the Federal Aviation Administration William J. Hughes Technical Center at actlibrary.tc.faa.gov.

U.S. Department of Transportation
Federal Aviation Administration

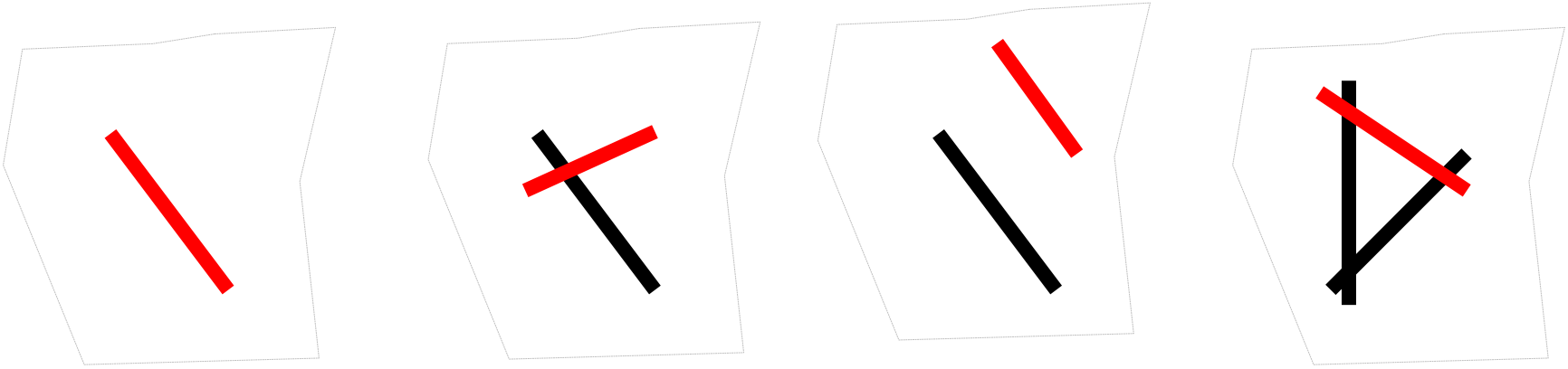
Remote Towers

Remote Towers: Status

- FAA will continue to apply systematic Safety Risk Management (SRM) approach to RT evaluations at pilot sites
  - Existing locations (JYO, FNL) are still developmental in nature
- Once developmental systems are locked down, FAA plans to expand envelope of use cases at additional pilot sites
- FAA simultaneously developing & validating performance standards/certification process/AC and business case for various airport applications

Emphasis on Data:
Critical Aircraft and Runway Types

Primary	Crosswind	Secondary	Additional



Questions?

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Trends Impacting Airport Ground Transportation & Parking Systems

Emerging Trends in Airport Planning

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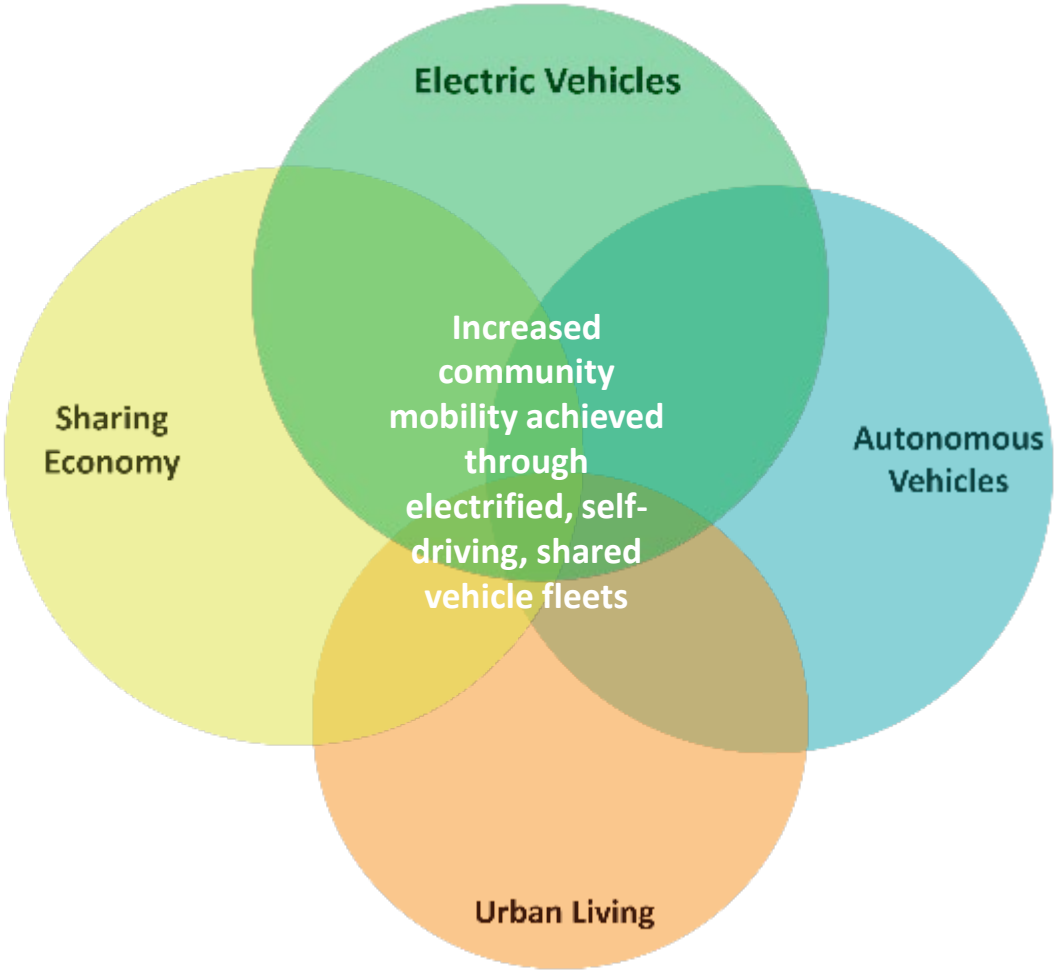
December 6, 2019

Many see a convergence of disruptive technologies and demographics happening….
and some project 90% of parking will disappear by 2030.



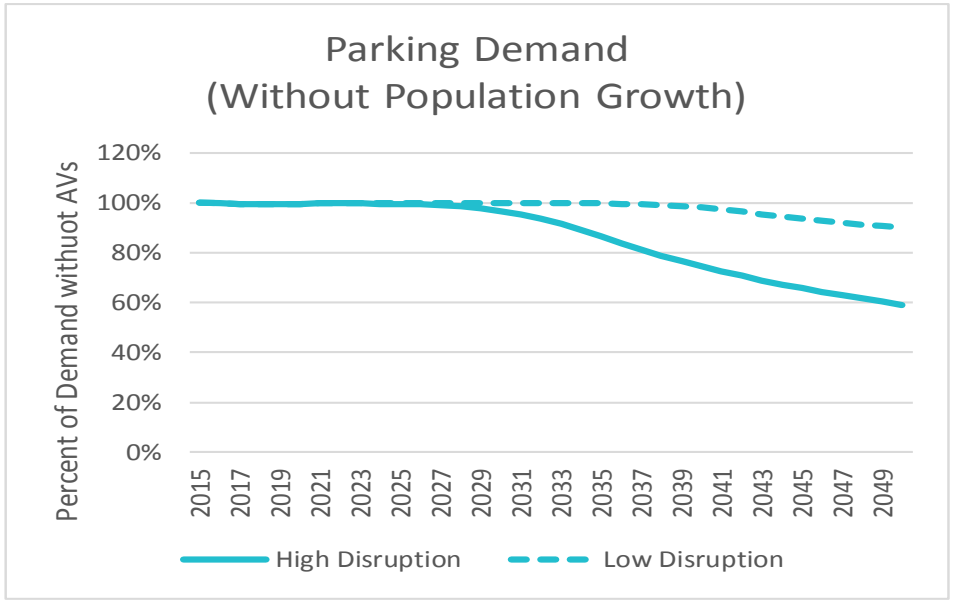
-90% parking won't happen, and certainly not by 2030

- Yes, **Electrification** likely will happen.. And sooner than Autonomous Vehicles (AVs).
- **Urbanization** argument is overblown and now disproven by numerous researchers.
  - Urban living is holding its own but not growing faster than overall US population growth.
  - Only 20% of US population lives in urban areas where shared rides are likely to be viable. 50% live in suburbs and smaller cities…. And 30% in rural areas and cities <50,0000.
- **Autonomous vehicles** will not reach Level 5 (able to be driverless anywhere, anytime) until at least 2030 and many think 2040 or later. L4 AVs are on the road now in very limited numbers, but can only operate driverless in a defined area, and under certain weather conditions.
- **Sharing Economy:** 90% reduction in parking is only possible with massive adoption of shared rides via TNCs. Many Americans can't (schlepping kids and gear, for example) or won't share rides.

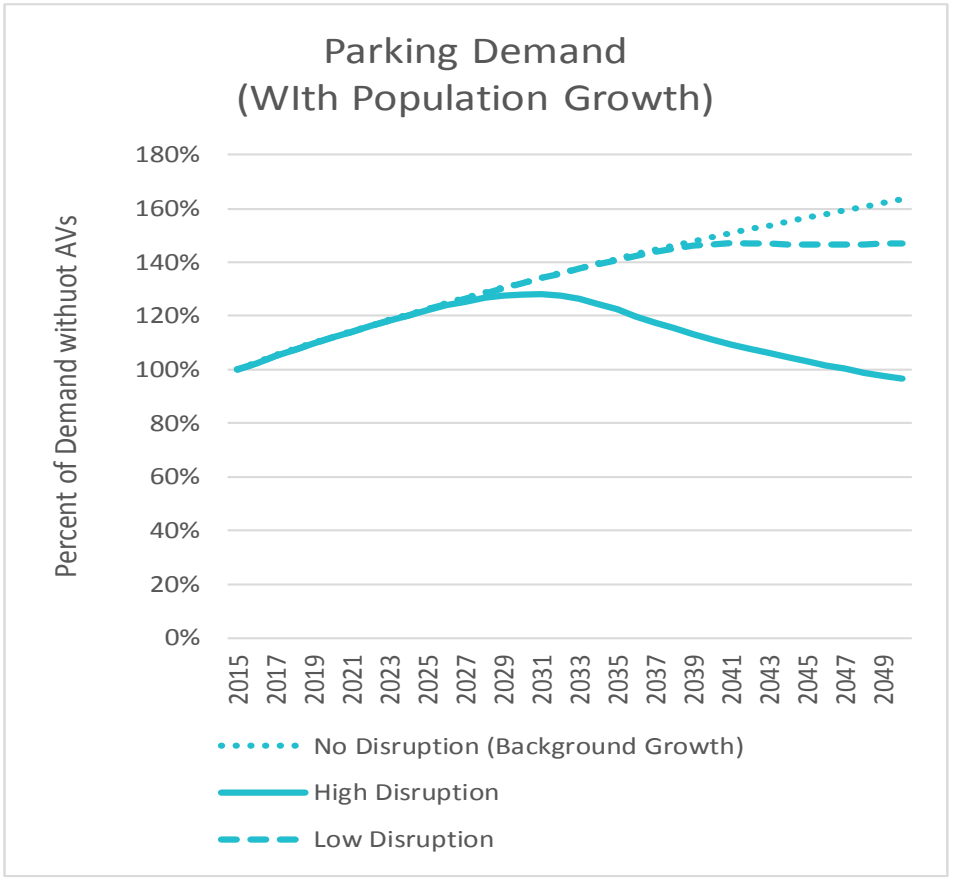
Deloitte 2019 re automotive mobility:

“There are a few “immutable truths” about consumer behavior:
(1)Consumers are unwilling to compromise,
(2)their usage patterns are difficult to change, and
(3)they don’t like sharing.”

Walker projections of future parking demand



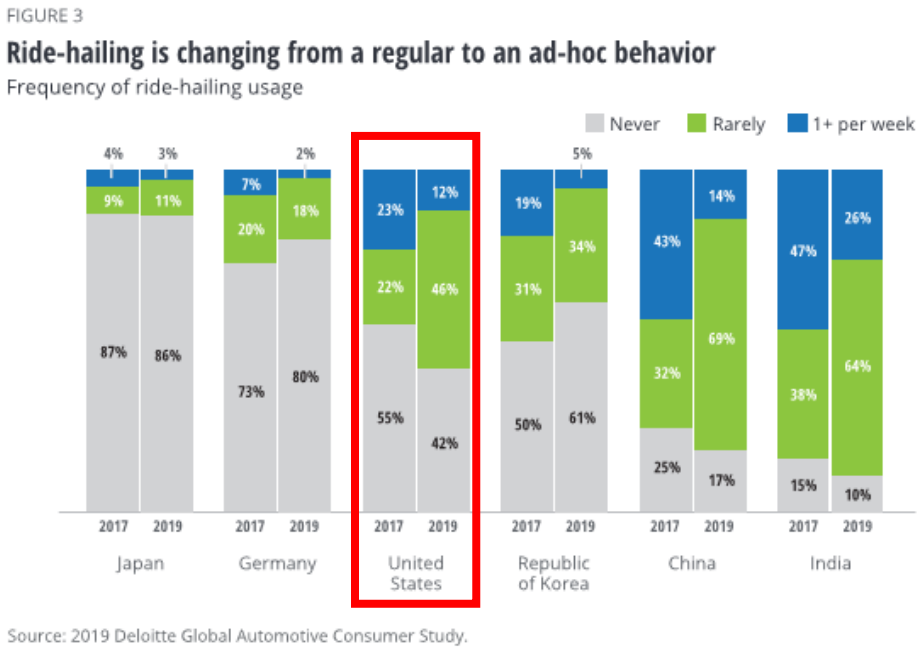
Site with fixed amount of land use



Use that grows with population, ie, airports

Has ride-hailing reached maximum penetration in the near term (until driverless TNC is common?

- ✈Pew Research
  - 36% of U.S. adults had used a ride-hailing service as of fall 2018 and only 3% have never heard of it.
  - Just 15% of Americans had used it in late 2015, and one-third had never heard of it.
  - Growth **rate** has slowed, but still growing.
- ✈While overall use is up, regular use is down (across entire world.)
  - People use it occasionally for specific trips rather than regular use i.e., supplementing transit with TNC trips for car-free lifestyle.



Source: 2019 Deloitte Global Automotive Consumer Study.

What does that mean for planning for TNCs, near and long term?

- ✈ At what level does market saturation/maximum TNC use occur?
- ✈ Once private L5 vehicles are common, will there be a much larger need for private passenger pickup and dropoff? Will this reduce/cap TNC?
- ✈ Lots of variables that will affect the maximum use at particular airport
  - Price of driving and parking vs price of TNC rides
    - Car goes and parks itself at remote lots?
  - Difficulty of parking
  - Rail transit access
  - Density of city/region as a whole (especially for airports)

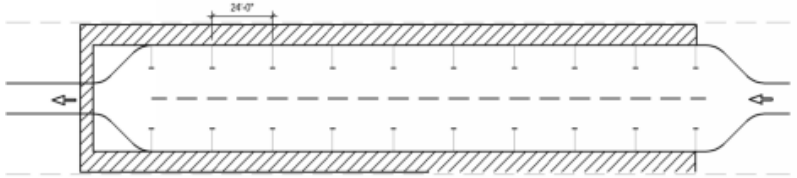
Unfortunately….it is unknown and unknowable today!
Just plan lots of flexibility in design!

Walker study in progress….

To Determine:

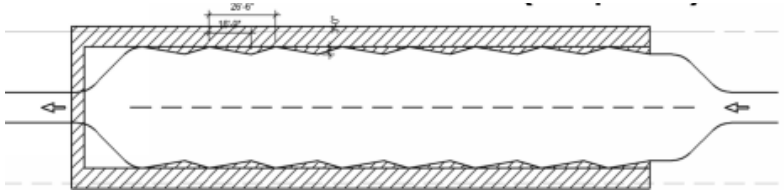
- Types of PLZ designs
- Dimensions
- Number of loading spots in a given length of area/curb.
- Vehicles per hour processed.
  - Used Vissim traffic simulation modeling.
- Turnover of each spot or vehicles per hour per spot
- Curb Productivity Index: What is the most efficient and highest capacity layout for a given area?
  - Used an area about 260’ long and 60’ wide (which is a 90 degree parking bay.)

So let's name the options

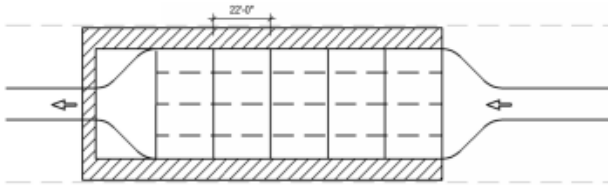


Parallel

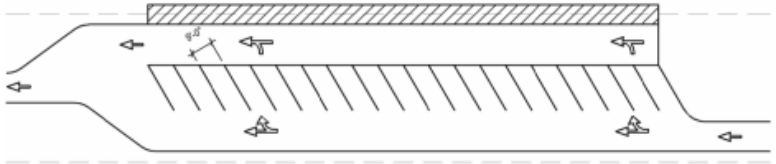
Stacked Single File



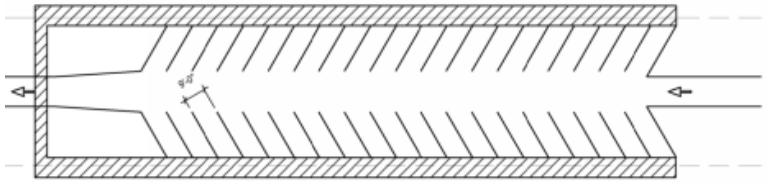
Sawtooth



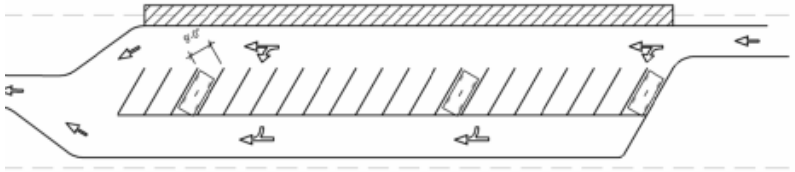
Stacked Multi Lane



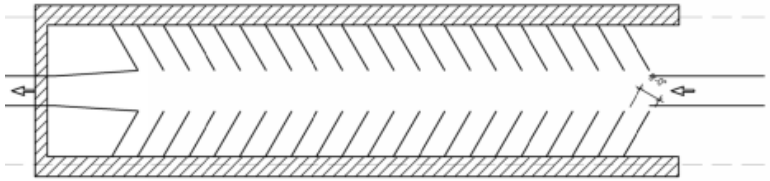
Pull Through – (peds cross) Exit



Back In Stalls

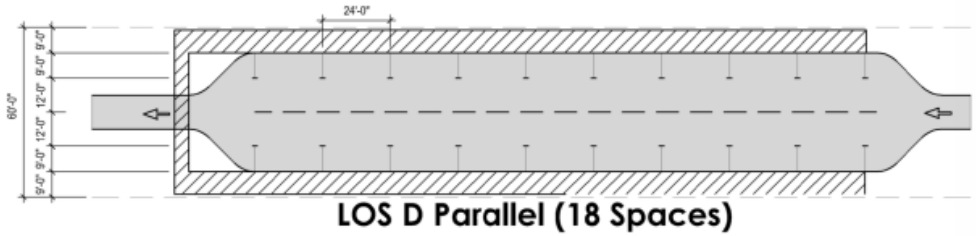


Pull Through – (peds cross) Entry

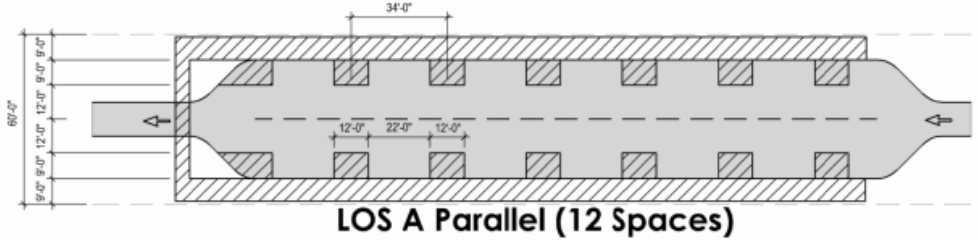


Pull In Stalls

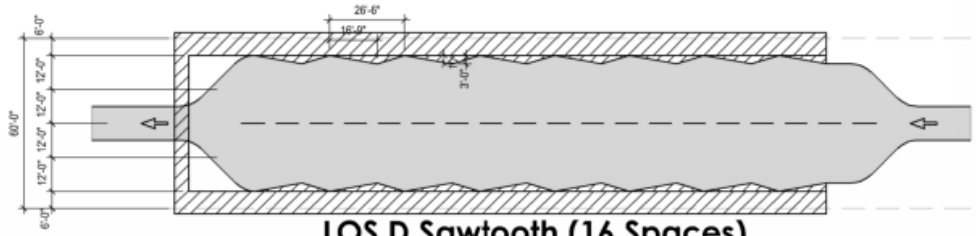
We used Autoturn to determine minimum dimensions and then set LOS A (generous) and LOS D (tight)



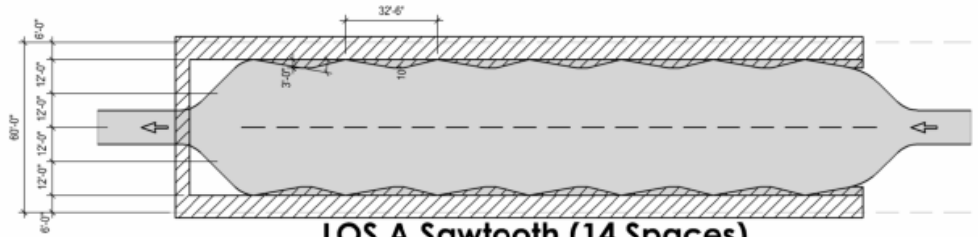
LOS D Parallel (18 Spaces)



LOS A Parallel (12 Spaces)



LOS D Sawtooth (16 Spaces)



LOS A Sawtooth (14 Spaces)

Dwell time is critical factor for flow capacity analysis not overall average time in system.

- Dwell time is the time the vehicle is **stopped** at the PLZ. Does not include pull in and pull out time which is what delays other traffic.
- What affects dwell time? We did study at SFO
  - Lots of gear (strollers and car seats).....family travel Sunday night.... Avg 40 seconds
  - No luggage was much higher Monday morning.... Avg dropped to 35 seconds
  - Multiple issues at International: Dwell time jumped to 67 seconds
    - Passengers with lots/large luggage
    - Difficulty/delay in locating passenger (saw a lot of cars wait more than two minutes)
    - Sidewalk too narrow for passengers to get to cars.
    - Difficulty merging back into traffic. In some cases, passenger loading in street/second lane rather than at curb increased dwell time significantly for vehicles at the curb.
- So we can adjust to determine capacity of a specific layout with specific user profile.

Preliminary results, based on 40 sec dwell time

With Pedestrian Crossing	Curb Length (Feet)	Available PUDO Spots	Total Cars Through	Turnover per spot/hr	PLZ Productivity Index
Sawtooth LOS A double lane	32.5	14	480	34	21
Sawtooth LOS D double lane	26.5	16	470	29	22
Sawtooth LOS A single lane	32.5	14	387	28	17
Sawtooth LOS D single lane	26.5	16	364	23	17
Parallel LOS A	34	12	388	32	19
Parallel LOS D	24	18	443	25	21
Stacked Single	22	6	104	17	16
Stacked 2 Lanes	22	16	183	11	10
Pull Thru Entry 60 LOS A	10.4	20	503	25	48
Pull Thru Entry 60 LOS D	9.5	22	522	24	50
Pull Thru Entry 45 LOS A	12.8	15	377	25	39
Pull Thru Entry 45 LOS D	11.7	16	380	24	41

Conclusions

- It is pretty clear that the most productive layout for TNC PLZs is the pull-through layout, if there is a good length/width of curb to wait on and enough width for turning movements.
  - We recommend having pedestrians wait and cross the entry route, not the exit route. They approach trunk of car to load luggage.
- But sawtooth PLZs have highest turnover per hour.
- To determine best layout in particular area, have to compare XX sawtooths at 34 vph vs YY pull through at 25 vph.
- There were a lot of assumptions in our analysis. Consider this an “apples to apples” comparison of schemes, not a definitive capacity standard.
  - But the numbers make sense with other studies of dwell time AND the time that parallel parking delays through traffic on public streets.

And…..

- We’d love to have some more airports let us study their turnover to further calibrate this model!

Passenger & Baggage Screening Developments

Emerging Trends in Airport Planning

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Requirements & Capabilities Office
Transportation Security Administration
December 6, 2019

Transportation Security Administration

TRANSPORTATION SECURITY ADMINISTRATION

ACI-NA/ACC Airport Planning & NEPA Workshop

★ ★ ★ ★ ★ ★

December 6, 2019

Threat to Global Civil Aviation Remains Significant

- Terrorists remain focused on causing mass casualties to spread panic, fear, and significant economic damage
- Terrorists continue to improve their capabilities in an attempt to circumvent traditional security measures
- The aviation community is a primary target for terrorist organizations and IEDs are weapons of choice for these groups
- Combining random and predictable screening techniques results in an effective layered detection capability that is key to deterring terrorist attacks

Aviation security screening must continue to adapt and improve to meet evolving threats.

Aviation Security Operations - TSA

Passengers a day.

2,500,000

Checked bags a day.

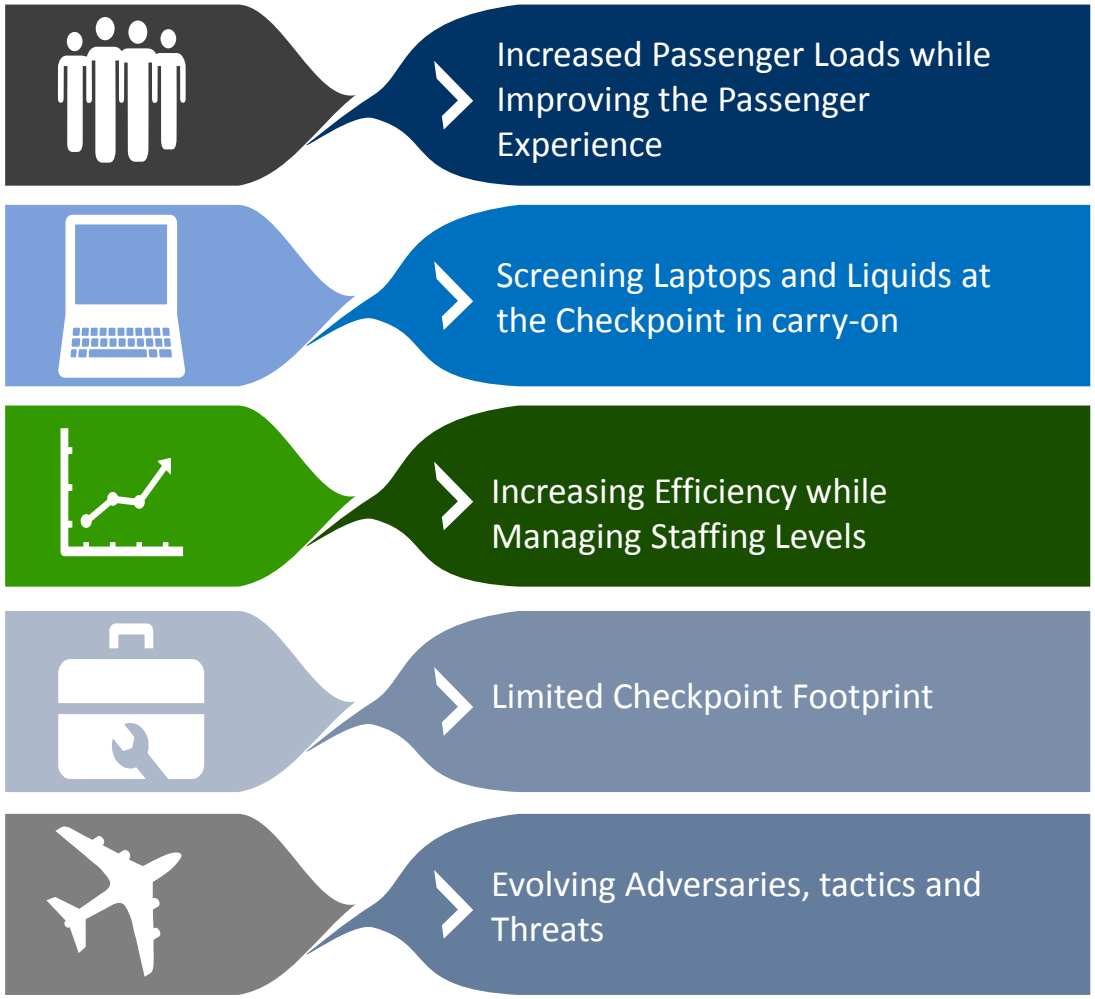
1,200,000

Carry-on items a day.

6,250,000

Screening Devices in Operations

14,500



TSA Technology Focus Areas

Identity Management	On-Person Screening	Accessible Property	Checked Baggage Screening	Cargo	Counter Unmanned Aerial Systems	Alarm Resolution	
							
Credential Authentication Technology	*Advanced Imaging Technology*	*Checkpoint X-Ray Screening Technology*	*Explosive Detection Systems*	*Computed Tomography Air Cargo Pilot*	*Unmanned Aerial Systems*	*Explosive Trace Detection*	*Bottled Liquid Scanner*

Capability Management is critical to TSA

The CM is responsible for providing the field the right set of solutions to defeat the threats of today and tomorrow. They direct the execution of capability analysis, requirements generation & management, and capability sustainment across TSA.

Capability Managers

Checked Baggage	**Identity Management**	**On-Person**	**Alarm Resolution**
Accessible Property	**Multimodal & Public Areas**	**Field Information Systems**	**C-UAS**

Checkpoint Property Screening System (CPSS)

Overview:

- TSA created the CPSS Program to support full-scale deployment of Computed Tomography (CT) to checkpoints to replace AT X-ray technology.
- The program will employ an incremental approach to rapidly deliver screening technologies in future acquisitions to increase efficiency, provide continuous control, and track divested property during the screening process.

Deployed Fleet:

- 8 APM CT systems
- 20 RCA CT systems

Key Activities

Acquisition Decision Events:

- Approval of Supporting Acquisitions in Q1 FY20
- Approval to Produce & Deploy Mid-size CPSS in Q4 FY20
- Approval to Produce & Deploy Full-size CPSS in Q4 FY21

AT/CT Deployment Events:

- Begin deployment of 300 AT/CT systems: Q1 FY20
- Complete deployment: Q4 FY20

Threat Detection Capabilities:

- Enhancing system detection to APSS Detection Standard 6.2, Level 0: Q1 FY20 (Certification)

FUTURE FOCUS

Detection Standard 6.2, L0 Certification (Q1 FY20)	Test Units Bailment (Q1 FY20)	Mid-size System Evaluation Report (Q4 FY20)	Full-size System Evaluation Report (Q4 FY21)	Increment 2 STIP Enabled (FY22)

Current ITF Portfolio

On-Person - *WTMD and AIT Combined System**
CEIA United States, Ltd.
Walkthrough Metal Detector (WTMD) that incorporates with existing L3 or Rohde & Schwarz AIT system, merging images from both systems.

On-Person - *Shoe Analyzer**
CEIA United States, Ltd.
ETD automatically detects the presence of metallic and non-metallic threats in passenger shoes.

On-Person - *Enhanced Advanced Imaging Technology (eAIT)**
Rohde & Schwarz
On-person screening technology that allows passengers to use a relaxed stance during screening and reduces false alarms relative to legacy systems.

Accessible Property - *Common GUI**
Vanderlande Industries, Inc.
Open platform and common GUI for x-ray and CT scanners that allow for the integration of 3rd party algorithms paired with existing hardware.

Accessible Property – *Automated Threat Recognition**
Synapse Technology Corp.
Automated Threat Recognition (ATR) technology flags threats through machine learning that adapts to TSO decisions over time.

Specialized- *Redefining the Passenger Experience**
Adobe Systems Federal, LLC
Combination of digital signage and interactive screens to deliver personalized experiences to all passengers on their own devices.

*Indicates that solution demonstration was sourced from the division's third annual Broad Agency Announcement (BAA), Innovative Demonstrations for Enterprise Advancement (IDEA).

Current ITF Portfolio

On-Person - *Detection at Range*
ThruVision
Enables screening authorities to detect concealed metals, non-metals, liquids, gels, and powders at a range of up to 25 feet

Specialized – *Customer Movement*
CrowdVision (previous LAS pilot)
Determining operational requirements for crowd movement solution to meet Congressional mandate that TSA provide information on wait times at each security checkpoint

Identity Management - *Enhanced Document Inspection (EDI)*
Zarbeco LLC
The Zarbeco Mi-Scope provides enhanced magnification capabilities to identify fraudulent identification during passenger screening

On-Person – *Walk-through On-Person Screening*
Rohde & Schwarz
Walk-through on-person screening system that utilizes ultra-wide band millimeter wave technology to facilitate the real-time detection of on-body concealed threats

Specialized - *Digital Signage*
Synect
Displays animated media content of divestment procedures, estimated wait times, and other information traditionally relayed by the TSO. After demonstration at SFO, United Airlines elected to maintain three of the units.

Alarm Resolution – *Mass Spectrometry Explosive Trace Detection (ETD)*
1st Detect
Mass spectrometry Explosives Trace Detection (ETD) that detects multiple peaks for distinct compound identification.

*Indicates that solution demonstration was sourced from the division's third annual Broad Agency Announcement (BAA), Innovative Demonstrations for Enterprise Advancement (IDEA).

ITF Advancing the Checkpoint Environment (ACE)

TSA is pioneering change in the transportation security ecosystem in collaboration with McCarran International Airport (LAS). LAS has dedicated an open checkpoint space to ITF for the purpose of **demonstrating innovative solutions** in a **live checkpoint security environment**. This will be accomplished through collaboration with local TSA and LAS to house and accelerate the demonstration of multiple innovative capabilities.

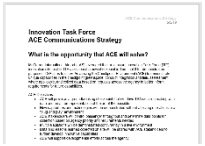
McCarran INTERNATIONAL AIRPORT

ACE Objectives

- To be a **groundbreaking** checkpoint; to drive **data-driven decision-making** for TSA; to represent the art of the possible
- To **demonstrate new capabilities** and technologies without affecting operations in a **"plug-and-play" environment**
- To support **agency-wide developmental efforts**
- To **concurrently demonstrate multiple solutions** in a live checkpoint environment
- To **share data and lessons learned** (collected onsite) with ACE stakeholders; to further **develop innovative capabilities**
- To **align with agency priority** and necessary requirements by strategically controlling passenger throughput and data collection efforts

Current Initiatives

Communications


Innovation Task Force
ACE Communications Strategy
What is the opportunity that ACE will solve?

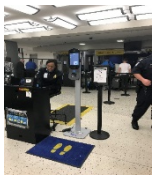
ITF is working with TSA SCPA, United Airlines, and LAS PA to determine the communications strategy

Stakeholder Outreach

FUTURE TRAVEL EXPERIENCE

ITF and local TSA would like to showcase ACE during Future Traveler Experience (FTE) in Sept. 2019

Demonstrations



ITF is planning for additional ACE demonstrations apart from those at regular checkpoints

ASL integrated with CT in the LAS security checkpoint

The following equipment is currently installed at ACE:

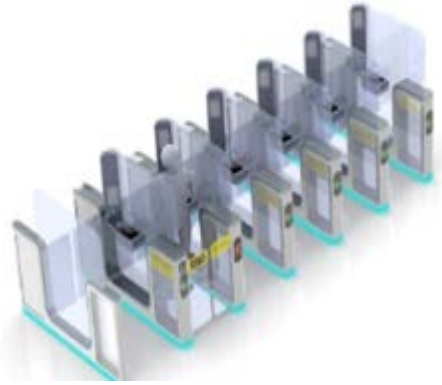
- IDSS Computed Tomography (CT)
- Analogic Computed Tomography (CT)
- Smiths Computed Tomography (CT)
- Walkthrough Metal Detector (WTMD)
- Rohde and Schwarz Advanced Imaging Technology (AIT)
- Synect Digital Signage Totem

Biometrics

CREDENTIAL AUTHENTICATION TECHNOLOGY (CAT)

BIOMETRIC AUTHENTICATION TECHNOLOGY (BAT)

eGATE



TSA Biometrics Capability Development Update

TSA is pursuing 1:1 facial matching, 1:N facial recognition, Mobile Drivers' License (mDL), program integration to enhance biometrics capabilities at the TSA checkpoint for identity verification.

1:1 Facial Matching	**Integrate biometric capture with Credential Authentication Technology (CAT) machines to verify a live image capture against the image on a credential** • Phase I (Unnetworked): Processed ~4,600 passengers at LAS from 8/27 – 9/27 • Phase II (Networked): Pilot planned for Q2FY20 • Phase III (Self-service/ E-gate): Pilot planned for Q1 FY21	Trusted/ General Travelers
1:N Facial Recognition	**Utilize CBP backend repository to compare a live image capture to gallery of enrolled references:** • Phase III (Token-less): Pilot in Q1 FY21 • SF data flow white boarding on Oct. 30 • CC Consent white boarding on Nov 22 • IT Leadership white boarding planned	Trusted Travelers with passport
mDL Capability	**Integrate mDL authentication capability with CAT machines to transmit digital identity :** • Contract to be awarded to CAT vendor for development in Q2 FY20 for dongle development • Updating the REAL ID regulations	Trusted/ General Travelers

CAT with Camera (CAT-C) Phase I Pilot @ LAS Overview

TSA conducted a short-term proof of concept at McCarran International Airport (LAS) for automating the identity verification portion of the Travel Document Checker (TDC) using biometric technology.

Pilot Objective

Inform TSA's understanding of: front-end capture requirements; biometric and ID verification performance; processing time; and evaluation of system accessibility, acceptability, usability, and ergonomics for users and operators.

Description

TSA assessed the CAT-C's capability to compare the passenger's live facial image at the checkpoint against an image taken from the passenger's identity document for passengers who opt to participate.

The CAT-C device performed the following operations:

1. Validated that the ID is authentic
2. Photographed the passenger
3. Compared the photograph of the passenger to the image from the passenger's identity document
4. Recorded the transaction data, including demographic data from the ID document, for S&T assessment of the system

Passenger Notification

To participate, passengers voluntarily chose to enter a separate lane dedicated to the proof of concept. Signs were posted and handouts were available so that individuals could make an informed decision about whether or not to participate.

The CAT-C unit (pictured above) was located in Terminal 3 Concourse E at the Upper TSA Pre✓® Lane Area before the TDC

Future Lane Experience (FLEx) Screening Pilot

The FLEx Screening team identified 40 airports that may experience operational challenges related to KTN-only TSA Pre✓® and is coordinating expansion of pilot operations to assess impact.

Fall Pilot

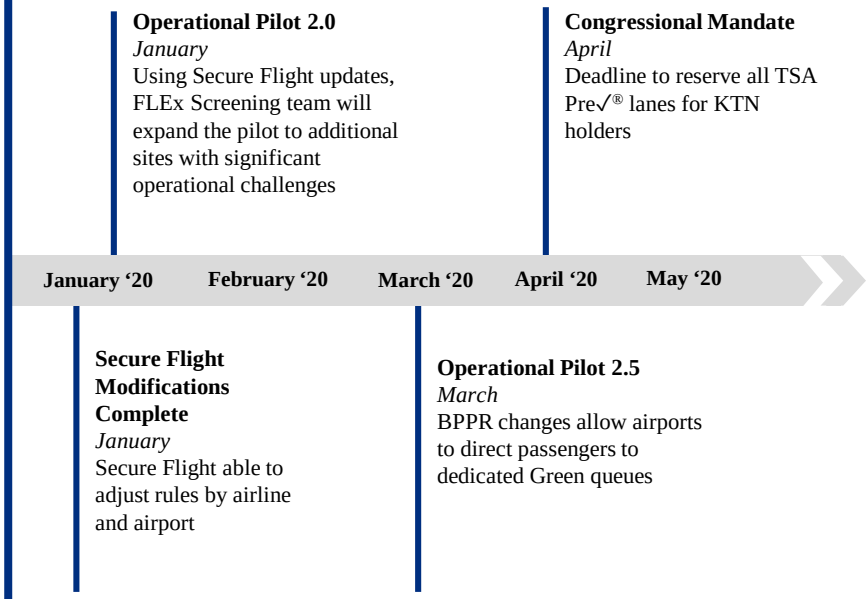
The FLEx Screening team resumed its pilot of Green Lane Screening at BOS in Fall 2019 with greater Green Lane volume to collect accurate data on Green Lane operations.

- Differentiated Screening of Passengers
- Processing Capacity
- Screening Effectiveness By Risk Type
- Preservation of the TSA Pre✓® Brand
- Operational Suitability

A return to pilot allows TSA and the FLEx Screening team to further test passenger communications and operational improvements such as dynamic load balancing between lanes.

2020 Pilot

The FLEx Screening team will expand pilots in 2020 based on completion of additional Secure Flight capabilities and Boarding Pass Print Result (BPPR) changes from airlines.



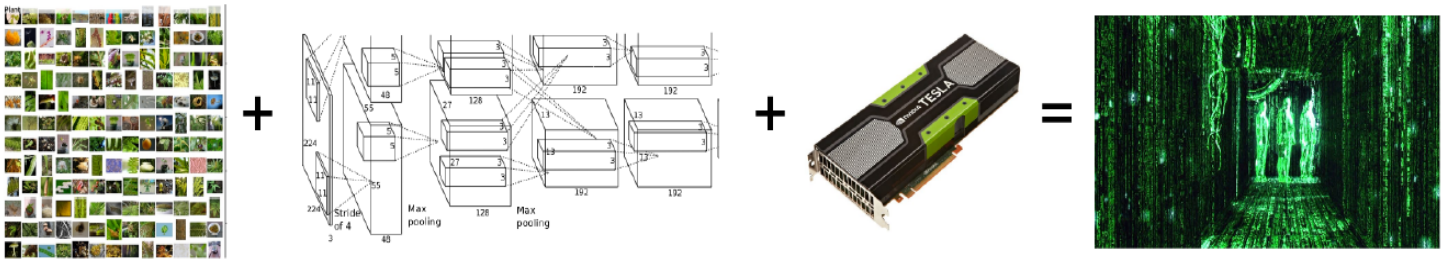
Deep Learning Advancements (Prohibited Items Detection)

Machine Learning has the potential to impact the aviation screening trade space

Deep Learning is a class of machine learning algorithms that:

- Uses many layers of processing units in the neural network cognition for feature extraction and transformation
- Each layer uses the output from the previous layer as input
- Aims to replace or augment user-defined features with ones automatically determined from the model
- Learns multiple levels of representations that correspond to different levels of abstraction
- Learns in different manners: supervised, semi-supervised, or unsupervised

The Deep Learning "Computer Vision Recipe"



Big Data: ImageNet | Deep Convolutional Neural Network | Backprop on GPU | Learned Weights

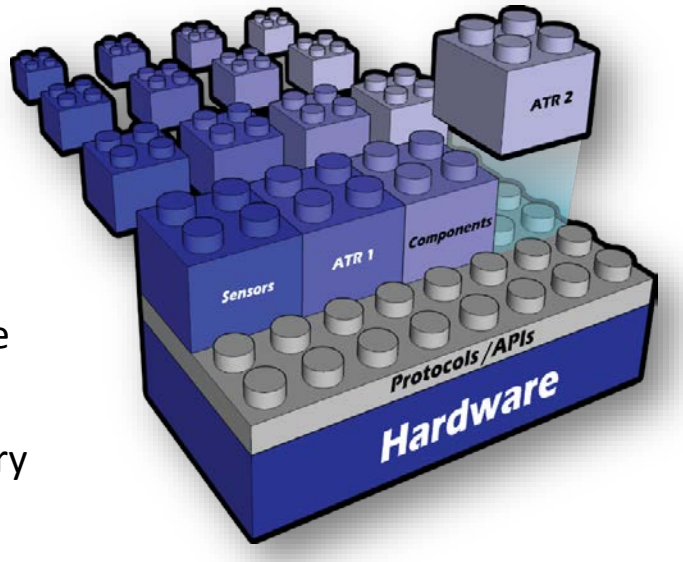
Deep Learning = Lots of training data + Smart algorithms + Parallel computing

Open Threat Assessment Platform (OTAP)

The OTAP project enables new solutions developed by industry (OEM and 3rd parties) by creating the tools to implement an open system architecture.

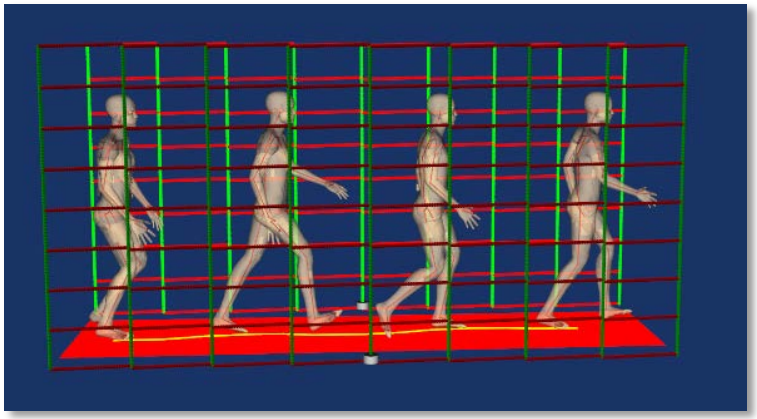
OTAP delivers the following:

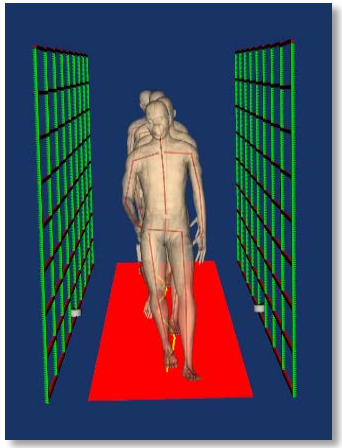
- **Open Platform Software Library (OPSL)**: A set of open, commonly available, and standardized data interfaces, exchanges, and formats to enable engineering of 3rd-party components for seamless integration into TSE.
- **Mature Requirements for Open Architecture TSE**
- **Prototypes and Demonstrations:** The open architecture approach must be validated through implementation to ensure it is operationally robust.
- **Passenger Baggage Object Database (PBOD):** A non-proprietary database of threat and SOC scans to enable 3rd parties and TSE OEMs to develop certifiable third-party ATRs and ATRs with improved detection capabilities.

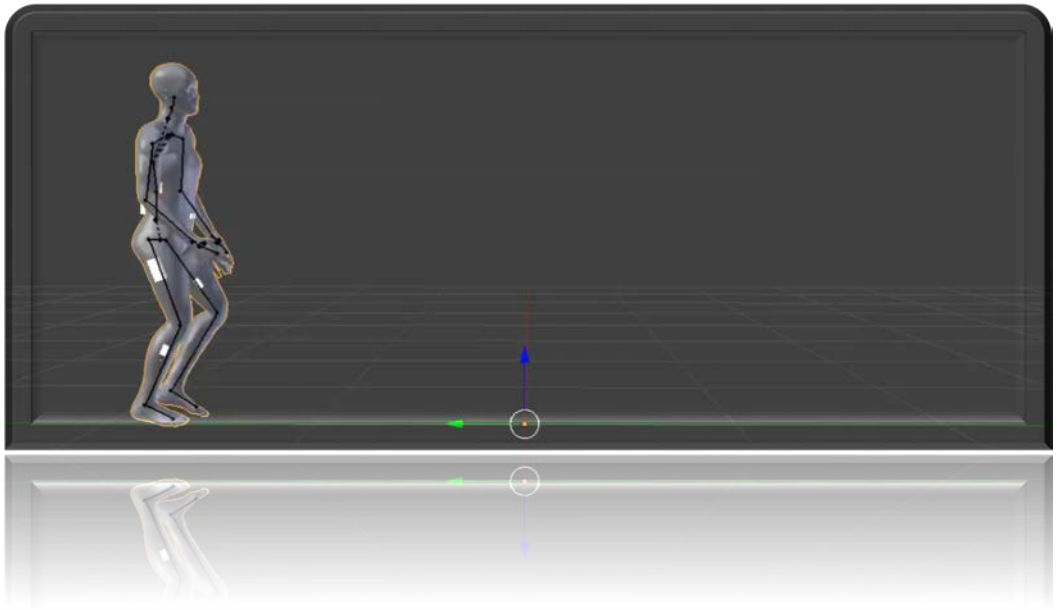


Walk-By Simulations

- HD-AIT technology can be reconfigured into a “walk-by” form factor
- Additional processing required for multiple views, reduce blur
- Support for multiple frequency bands depending on requirements
  - Cost
  - Threat mass
  - Divestiture requirements







US Department of Homeland Security
Science and Technology Directorate
Screening at Speed

Technology Investment Plan for Aviation Security

1-3 Years	3-5 Years
Enhancing Interoperability and Standardizing Systems Supports Standardization of Technology and Integration of Next-generation security Solutions, to include: • Advanced Systems Architecture • Credential Authentication Technology • Security Technology Integrated Program • Common Graphical User Interfaces	**Expanding and Integrating Risk Based Screening** Developing and Incorporating new technology and procedures to enhance risk based screening in the security screening environment, to include: • Dynamic and Risk Management Algorithms • Biometrics • Checked Baggage RBS Implementation • APEX Screening at Speed
Enhancing Algorithms Developing advanced algorithms that increase detection and reduce false alarm rate, to include • High Resolution On-Screen Alarm Resolution Protocol • Enhanced Reconstruction Algorithms • Advanced Imaging Technology Algorithm Enhancement	**Signature Characterization** Developing new techniques and procedures to enhance screening processes and detection capabilities, to include: • Improved Threat Characterization and Prioritization • Stream of Commerce Characterization
Improving Current Technology Enhancing current technology in the field, to include: • Enhanced Advanced Imaging Technology • High Resolution Trace Detection • ETD Quality Assurance • ETD Sampling	**Developing New Screening Technology** Developing new screening technology, to include: • Walkthrough Screening Concepts • Next Generation X-ray • Standoff Trace Detection • High Resolution Trace Detection