USDOT Talking Freight Webinar

# ITS MARAD Truck Staging

Intelligent Transportation Systems Joint Program Office Maritime Administration Federal Motor Carrier Safety Administration Federal Highway Administration

March 20, 2019



U.S. Department of Transportation

## Agenda

- Introductions
- Project Background
- Research Process & Overview
- Port Stakeholder Outreach
- Port Authority Perspective
- Summary of Findings
- Questions & Answers
- Closing

## **Webinar Presentation Group**

- Kirk Claussen, U.S. Maritime Administration (MARAD)
- Tom Kearney, Federal Highway Administration (FHWA)
- Brian Routhier, Federal Motor Carrier Safety Administration (FMCSA)
- Elina Zlotchenko, ITS Joint Program Office (ITS JPO)
- Doug Pape, P.E. Senior Research Engineer (Battelle)
- Thomas Phelan, P.E. Principal Investigator (Gannett Fleming)
- Ryan Macdonald Georgia Ports Authority
- Keith Chase Stakeholder Outreach Lead (Gannett Fleming)

#### **PROJECT BACKGROUND**

## **Challenges & Issues**

- Marine terminal congestion is an ongoing challenge in the U.S.
- Economic growth driving cargo volume growth.
- Exacerbated by larger container ships, infrastructure improvements – channel deepening, air draft clearance projects, Panama Canal expansion
- Chronic shortage of drivers in the trucking industry
- Maritime Administration Strategic Plan (2017-2021) ... Strategic Goal #5: Maritime Innovation.

# **Ongoing ITS JPO Initiatives**

Intelligent Transportation Systems Joint Program Office (ITS JPO) Mission Statement:

"Conduct research, development, and education activities to facilitate the adoption of information and communication technology to enable society to move more safely and efficiently."

• *ITS Strategic Plan (2015-2019)* ... One of two key strategic priorities:

"Advancing Automation: Shapes the ITS Program around the research, development, and adoption of automationrelated technologies as they emerge."

## **Business Case Analysis**

- Study completed in 2017.
- 20 ITS technologies used at U.S. ports identified; four analyzed in detail:
  - Port Community System (PCS)
  - Queue Detection (QD)
  - Truck Appointment System (TAS)
  - Advanced Transportation/Freight Information and Security Systems (ATMIS/FRATIS)





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## Current Effort: 2017-2019

• A fifth technology beyond the four from the Phase 1 study was analyzed in detail:

**Project Objective:** "To determine the state of the practice regarding truck staging, including access, queuing, and parking, at maritime ports and to identify port operators' and trucking industry needs; and to perform an economic feasibility study of automated truck queuing as a technology solution."

### Automated Vehicles 3.0: Preparing for the Future of Transportation (USDOT)



Photo courtesy of Georgia Ports Authority

### Can Automation Play a Role in Addressing Terminal Gate Queues?



Map data © Google (2019)

#### **RESEARCH PROCESS & OVERVIEW**

# **Project Approach**

- Background Research
- Port Stakeholder Interviews
- Stakeholder Questionnaire
- Economic Analyses
- Findings and Recommendations

### **PORT OPERATION OVERVIEW**

#### Ryan Macdonald, Georgia Ports Authority

## **Port Terminal/Drayage Operations**

• Port terminal and drayage operations involve a complex series of steps carried out by multiple industries.



## **Inefficiency of Multiple Processes**

 Individual steps may operate relatively efficiently, but the supply chain from start to finish is prone to be highly inefficient. For example ...

Ocean carrier and marine terminal can coordinate operations ...

... but the shipper/receiver is two steps removed from that process!

The drayage trucker is constrained at both ends ... by the terminal hours and the shipper/receiver hours.

## **Equipment Complications**

- The container and the chassis often have different owners, different contractual terms for the terminal operator, trucking firm, and shipper/receiver.
- Extra charges for extended use of this equipment (demurrage and per diem) may vary widely!



Photo credit: https://commons.wikimedia.org/wiki/File:APLcontainer.jpg (CartleR255)

# **Maximizing Efficiency of Handling**

 Terminal operations can be described as a "conveyor belt" model – which has advantages and disadvantages!



# **Responding to Volume Growth**

• The transition from terminal to drayage trucking firm to customer is often the weakest link when cargo volumes grow.



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### **PORT STAKEHOLDER OUTREACH**

#### Keith Chase, Gannett Fleming

## **Outreach Process: Questionnaire**

- Online questionnaire distributed to U.S. port authorities.
- 25 total respondents ... ports ranging from major coastal ports to Mississippi River and Alaska ports.
- 65% of respondents said their ports are facing challenges with delays/queues at terminal gates.
- Increasing cargo surges one of the primary causes of queuing and truck congestion.
- Even smaller ports are receptive to technology-based solutions to these challenges.

## **Outreach: Questionnaire (cont'd)**

- Some unique challenges related to non-containerized cargo (e.g., bulk terminals) and passenger ship operations (e.g., Port of Miami).
- Scalability of technology solutions is critical for smaller ports.
- Many ports have implemented staging areas to mitigate terminal congestion, but as cargo volumes increase the real estate adjacent to port terminals becomes more attractive for other related industrial uses (e.g., warehousing).

## **Outreach Process: Interviews**

- Industry stakeholder interviews conducted in six port regions:
  - New York / New Jersey
  - Savannah
  - Houston
  - Los Angeles & Long Beach
  - Seattle & Tacoma
  - Columbus, OH (Inland Port)



### Input from Key Port-Related Stakeholders for this Effort

- Port Authorities
- Marine Terminal Operators
- Drayage Trucking Firms
- Freight Railroads
- Industry Advocacy Groups
- State & Municipal DOTs
- Metropolitan Planning Organizations (MPOs)
- Freight Technology Developers

## **Sample Interview Questions**

- Descriptive information about port and region, including strengths and weaknesses.
- Operational constraints relating to truck access, queuing, staging, parking and terminal congestion.
- Coping strategies employed by terminal operators, carriers and shippers.
- Weaknesses and challenges across multiple industries (customers, partners, freight carriers, service providers, government agencies, etc.) that affect operations.

## **Sample Interview Questions**

- Current initiatives to improve efficiency in staging, parking and terminal gate operations.
- Potential strategies for implementation of solutions.
- Potential for implementing <u>technology</u> solutions, with a focus on automated vehicle technology.
- Institutional impediments to implementing improvements.
- Improvements tested or tried in the past but discontinued or eliminated from consideration.

# **Interview Highlights**

- Land use limitations are a constraint, especially for ports in large metro areas.
- Use of automated vehicles at marine ports likely limited to specific applications.
- Port markets and metro areas are critical considerations (local drayage moves vs. hinterland penetration).
- Increasing cargo surges were identified as one of the primary causes of queuing and truck congestion.
- Single-terminal ports and multiple-terminal ports can function very differently.

# **Interview Highlights**

- Cargo visibility is critical to efficient operations.
- Queues can sometimes be addressed through low-cost operational solutions.
- Minimizing container lifts is critical to any strategy for improving operations at port terminals.
- Labor agreements are a major consideration.
- The complexity of a port operation with multiple players affects the viability of solutions.

#### SUMMARY OF FINDINGS

#### **Tom Phelan, BHX/Gannett Fleming**



- 1. Minimizing turn times and maximizing the number of turns for a drayage trucker is a key to maximizing port efficiency.
- 2. Minimizing the number of lifts for any given container is an important part of accomplishing this.
- 3. Uniform Intermodal Exchange & Facilities Access Agreement (UIIA) generally governs all relationships!

## **4 Categories of Potential Solutions**

- General measures to expand port capacity or manage demand.
- Measures aimed at staging inbound (into the terminal) trucks and managing queues outside the terminal gate.
- Measures aimed at addressing inside-the-gate queuing and congestion for outbound (out of the terminal) truck moves.
- Measures aimed at automating the transportation process outside the terminal gate by moving cargo from the terminal to an external staging yard through some kind of automated process other than trucks (e.g., monorail or linear-induction technology).

## **Potential Solutions**

- **Group A:** Port Staging Technologies and Practices at Marine Terminals using Conventional Trucks
- Group B: Automated Truck Technologies

# **A – Staging Technologies/Practices**

- Expanded gate hours
- Appointment system
- Off-site staging/parking
- Appointment system + off-site staging/parking
- Off-site staging/parking with a "virtual gate"
- "Gray box" container system
- Modified chassis pool operations
- Other technology applications

## **A - Screened Solutions**

- Expanded gate hours
- Appointment system
- Off-site staging/parking
- Appointment system + off-site staging/parking
- Off-site staging/parking with a "virtual gate"
- "Gray box" container system
- Modified chassis pool operations
- Other technology applications

## **B - Automated Truck Technologies**

- Automated truck (Level 4) in queue
- Automated truck (Level 4) in queue + off-site staging
- Alternative transport mode to/from off-site staging



## **B - Screened Solutions**

- Automated truck (Level 4) in queue
- Automated truck (Level 4) in queue + off-site staging
- Alternative transport mode to/from off-site staging

## **Level 4 Automation**

#### **SAE Automation Levels**

#### Level Description

- *No Automation:* Human driver controls all aspects of the driving task.
- *Driver Assistance:* Execution of one driving task such as steering or acceleration/deceleration through a driver assistance system.
- *Partial Automation:* Execution of multiple driving tasks through driver assistance systems.
- *Conditional Automation:* Control of all driving tasks with the expectation that the human driver will respond to a request to intervene.
- *High Automation:* Control of all driving tasks even if a human driver does not respond to a request to intervene.
- *Full Automation:* Control of all driving tasks under all roadway and environmental conditions.

## **Typical Terminal Operation**



## **Off-Site Parking/Staging**



## **Off-Site Staging + Virtual Gate**



### **Automated Truck in Queue**



## **Automated Truck + Off-Site Staging**



## **Solutions Tested in 5 Scenarios**

- Generic Port (based on 2017 Business Case Analysis)
- Major Urban Port: Local Market (e.g., NY/NJ)
- Major Urban Port: Local/Hinterland Market (e.g., Los Angeles)
- Minor Urban Port: Hinterland Market (e.g., Savannah)
- Inland Port (e.g., Columbus)

## **Benefit-Cost Analysis**

#### <u>Costs</u>

- Land (capital)
- Improvements
  (capital + operating)
- Vehicles
  (capital + operating)
- Technology
  (capital + operating)
- Labor (operating)

#### **Quantified Benefits**

- Reduction in queue time
- Reduction in gate transaction time
- Reduction in idling emissions
- Fuel savings
- Drayage TMT and THT reductions

## **Qualitative Benefits**

- Congestion reduction
- Improved safety
- Community benefits (i.e., eliminating truck staging in neighborhoods)
- Free up truck parking capacity for longhaul truckers
- Productivity and reliability improvements across the supply chain



## **Relative Benefit-Cost Ratios**

#### **SCENARIOS**

SOLUTIONS	Generic Port	Major Urban to Local Market	Major Urban to Mixed Market	Minor Urban to Hinterland	Inland Port
Off-Site Staging/Parking	Moderate	Low	Low	Moderate	Moderate
Staging/Parking + Virtual Gate	High	High	High	Very High	High
Automated Truck in Queue	Moderate	Moderate	Moderate	Moderate	Moderate
Automated Truck + Off-Site Staging	Very High	High	High	High	Very High

(Assumes capital amortization at 3% discount)

## **Barriers to Implementation**

- Legal and jurisdictional hurdles
- Complexity of marine cargo supply chain
- Labor agreements
- Divergence of costs and benefits across the supply chain – ties to incentives to fund solutions!



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## Who Pays for Improvements?







- Intermodal Association of North America (IANA) outreach for UIIA issues.
- Research potential automated truck applications with similar constraints such as intermodal and bulk cargo handling.





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## **Next Steps**

- Continue industry and public agency stakeholder collaboration in automated vehicle technology development.
- Raise awareness among port owners and operators, State DOTs, and MPOs, as technologies continue to emerge.
- Enable prospective applicants to more effectively compete for USDOT grant opportunities (e.g., INFRA, BUILD, and ATCMTD).
- Continue to survey the global landscape of technology implementation.

## **Next Steps**

- Potential pilot projects at select U.S. ports
  - Major coastal port in large urban area
  - Major coastal port in small city
  - Secondary coastal port
  - Interior river port
  - Inland port



## **Questions?**

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