UNTETHERED TRAILER TRACKING SYSTEM PILOT TEST

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FMCSA Technology Division

Tuesday, January 8, 2008

U.S. Department of Transportation

Federal Motor Carrier Safety Administration

FMCSA's Security Role

- DOT has a supporting role with DHS to improve the secure transportation of hazardous materials

- FMCSA Technology Initiatives

  - ♦ Hazardous Materials Field Operational Test

  - ♦ Untethered Trailer Tracking System Pilot Test

  - ♦ Expanded Satellite Communications Pilot Test

  - ♦ Truck Disabling Technology Study

Trailer Vulnerabilities to Theft

- Unattended Trailers

  - Trailer Stockpiling

  - Lengthy yard checks

  - Erroneous pickups

  - Increased opportunities for theft

- Lack of in-transit visibility

  - Subcontracting to trucking companies to haul certain loads, losing trailer visibility at the switch

  - Delays at shippers when trailers are empty

Untethered Trailer Tracking System Project Purpose

"…leverage existing technology and develop an untethered trailer tracking and control system that will provide real-time trailer identification, location, geo-fencing, unscheduled movement notification, door sensors, and alarms."

– Department of Transportation and Related Agencies Appropriations Bill, 2003

Project Partners

- Industry Expert Panel
  - Landstar
  - JB Hunt
  - Geologic Solutions
  - Skybitz

- Federal Agency Review Team
  - TSA
  - DOD
  - MARAD
  - FHWA
  - PHMSA

Pilot Test Overview

- 3-month pilot test

- 3 Scenarios:
    - ♦ Truckload Dry Van
    - ♦ High Value
    - ♦ Truckload Explosives

- 75 Trailers

Baseline Typical Operations

- Lengthy time of unknown status
  - Untethered: 2-7 days where its status was unknown to all carriers
  - Cargo In transit: 1-2 days where the visibility into cargo status was limited or non-existent
  - Not at company locations: Trailer locations or status related to cargo unknown to one carrier

- Site operations
  - 5-6 hours spent searching for one particular trailer
  - 3-10 days before trailers were picked up
  - Up to 25 trailers sitting idle and unavailable to the carrier

Trailer Mobile Communications and Sensors

- **Terrestrial UTT System**
  - GPS and cellular communications antennas
  - Rechargeable battery

- **Ultrasonic Cargo Sensor**
  - Detects cargo status change from empty to full and full to empty

- **Magnetic Door Sensor**
  - Monitors when a trailer door is opened or closed

Geo-fencing and Trailer Connection Status

- Geo-fencing

  - Notification of a trailer moving outside of its geo-fence

  - Capability to increase the position-polling rate after geofence violation

Kingman yard

- Trailer connection and disconnection status

Security Benefits

- Theft reduction
    - Notifications of door opening and cargo status changes
    - Ability to track and recover stolen trailers
- Improved unauthorized trailer movement detection
    - Information about unauthorized disconnections or connections
    - Visibility into trailer locations

Operational Efficiency Benefits

- Improved asset management

    ♦ Ability to find trailers and expedite deliveries through knowledge of trailer arrivals, unloading, and loading

    ♦ Collection of detention charges with system data

    ♦ Enhanced visibility of trailers and their cargo

    ♦ Less time needed to rotate trailers for deliveries, which prevents the use of trailers as storage

    ♦ Reduction of trailer to tractor ratios

New Systems Today

- Improved mapping (Google)

- Custom polygonal landmarks

- New trailer applications (flatbed, tanker, reefer, container)

- Solar charging system

- Smart sensor departure and arrival data

- Idle time reports

- Custom reporting

Thank you for your attention!

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Celadon Trucking Services

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(800) CELADON
www.celadontrucking.com

About Celadon

- Trucking Operations:
  - 2,900 tractors (including 350 Canadian, 250 Mexican)
  - 8,100 trailers
- 950 Miles Average Length of Haul
- 52% Domestic/U.S.
- 48% Crosses Mexican or Canadian border
- Strong Driver Base
- Safety Focus
- Technology Focus
- Non-Asset Based Businesses

Trailer Tracking Objectives

- Decrease in Trailer Idle Time Costs
- Decrease in Fuel Costs Searching for Trailers
- Increase in Trailer Detention Billing
- Improve Truck Productivity
- Increase Trailer and Cargo Security

Current Deployment

- Installed on 3,000 + units

- All units deployed with cargo sensor

- Full integration with operational system

Exception Based Integration

- Trailer Connect
- Trailer Disconnect
- Cargo Loaded
- Cargo Empty
- Geo-Fence
- Status Report (Pings)
- Low Battery
- Battery Replacement

Exception Based Alerts

- Connect
  - Tractor not assigned to trailer that it is being connected to

- Disconnect
  - Tractor disconnecting at an unauthorized location
  - Trailer disconnected at a customer location not identified as a drop location

Exception Based Alerts

- Loaded
  - Trailer loaded detected but order is not generated in system
- Empty
  - Tractor attached to trailer specified as a drop location
- Geo-fence
  - Trailer being pulled by non-Celadon equipment
  - Trailer departing geo-fence is not assigned on an order

Trailer Tracking Benefits

- Improved business operations and customer service
- Reduced wasted fuel
- Improved driver and tractor productivity
- Enhanced detention billing
- Increased trailer and cargo security
- Increased visibility of freight during third-party moves
- Optimized trailer inventory pools and reduced yard checks
- Provides mechanism for auto arrive and depart

Implementation Hurdles

- In order to recognize a connect or disconnect, the tractor must have a special in-line fuse.

- Coordination of equipment installations

- Quality control and diagnostic checks prior to trailer being released to the fleet

- Training of maintenance staff to troubleshoot potential hardware issues

- Systems integration

- Training of Operations staff in handling alert events

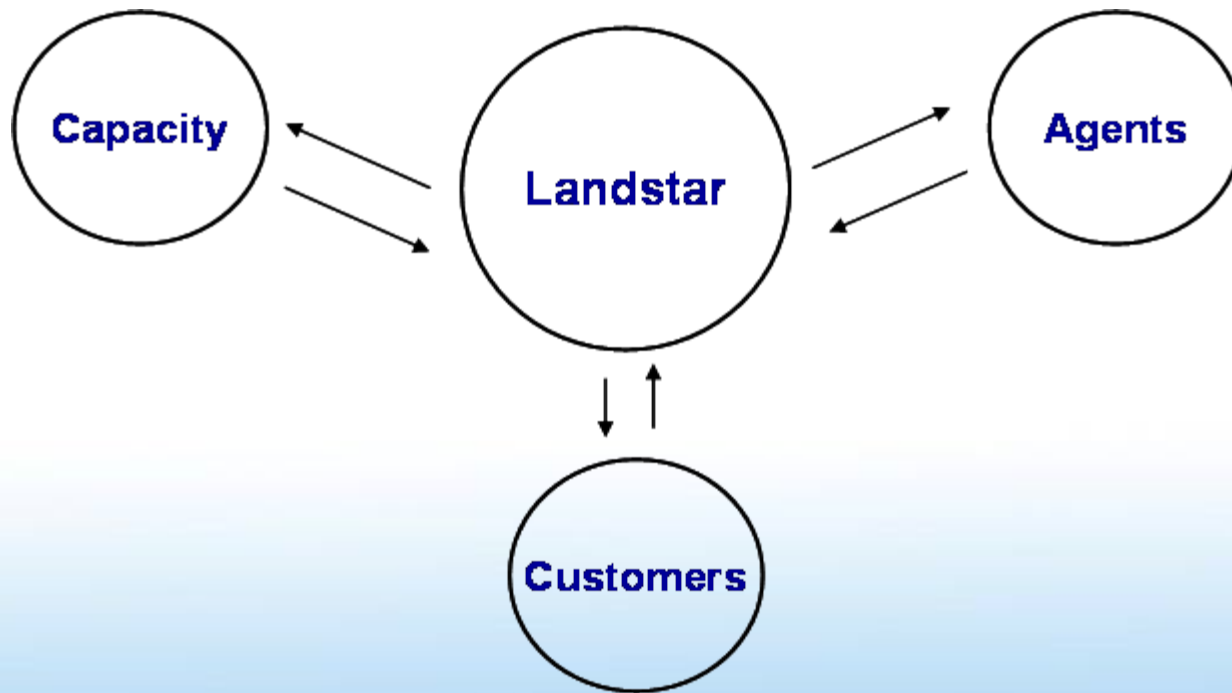*the road to success*

LANDSTAR

Model Definition

Landstar is a non-asset based provider of transportation capacity delivering safe, specialized transportation services to a broad range of customers utilizing a network of agents, third party capacity owners and employees.

Business Model
Network Connection
Information Flow

Business Model
Third Party Capacity Network

- Business Capacity Owners (BCOs)

- Broker carrier capacity

- Railroads

- Air cargo carriers

- Ocean cargo carriers
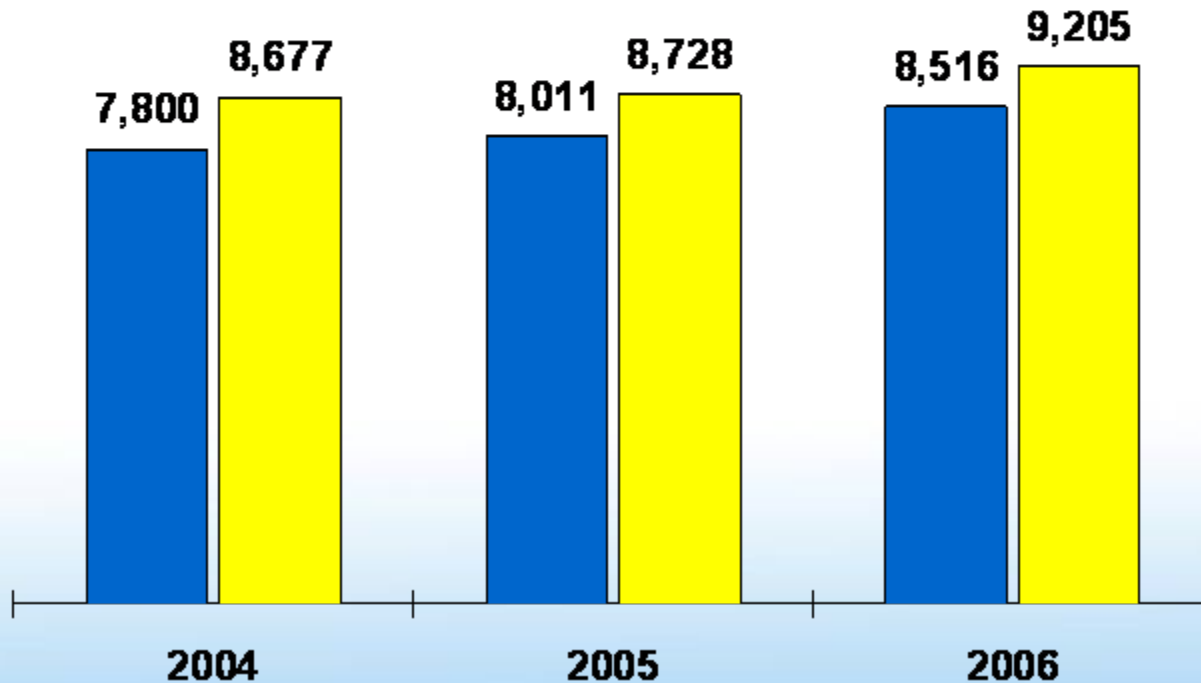
- Warehouse Capacity Owners (WCOs)

Business Model
Third Party Capacity Network
BCOs

Business Model
Third Party Capacity Network
Turnover Rate

■ **Turnover Rate - Trucks Supplied by BCOs**

34.9%

31.5%

27.5%

2004   **2005**   **2006**
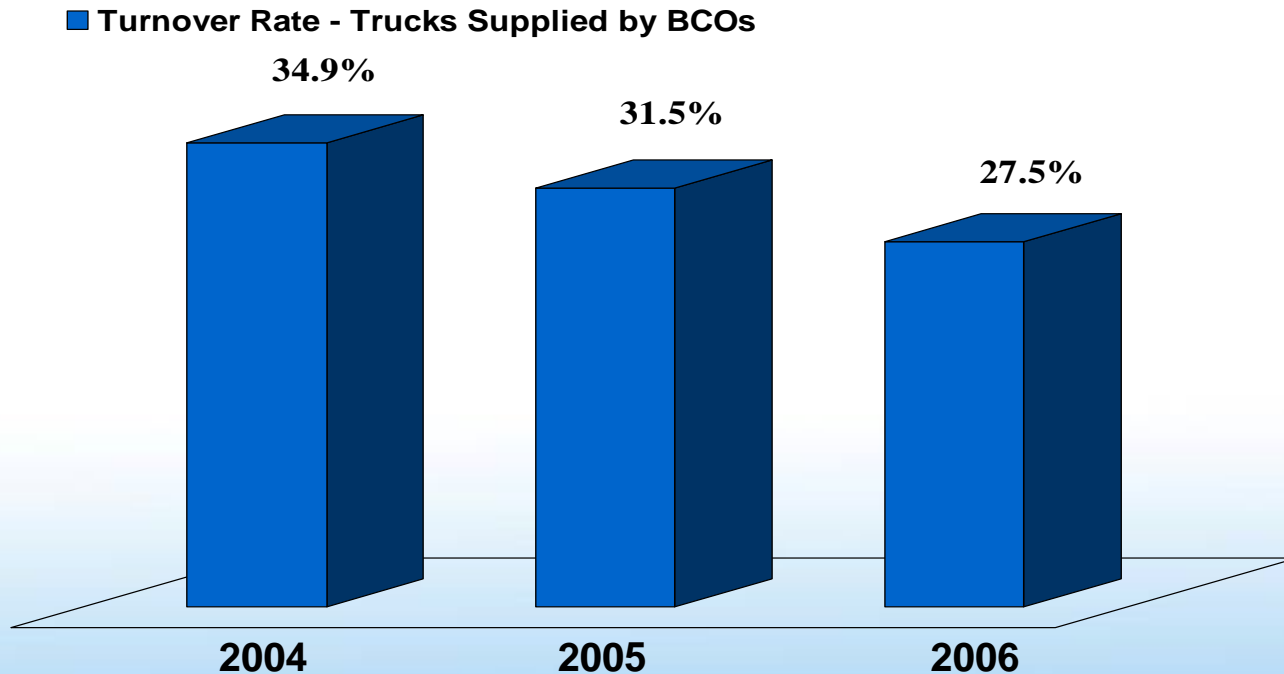
Business Model
DOT Recordable Accidents

Industry Frequency: 0.71 (2002), 0.75 (2003), 0.77 (2004), 0.74 (2005), 0.83 (2006)

All D.O.T.: 0.60 (2002), 0.64 (2003), 0.58 (2004), 0.51 (2005), 0.47 (2006)

Preventable D.O.T.: 0.22 (2002), 0.25 (2003), 0.18 (2004), 0.17 (2005), 0.16 (2006)

Legend: All D.O.T. | Preventable D.O.T. | Industry Frequency
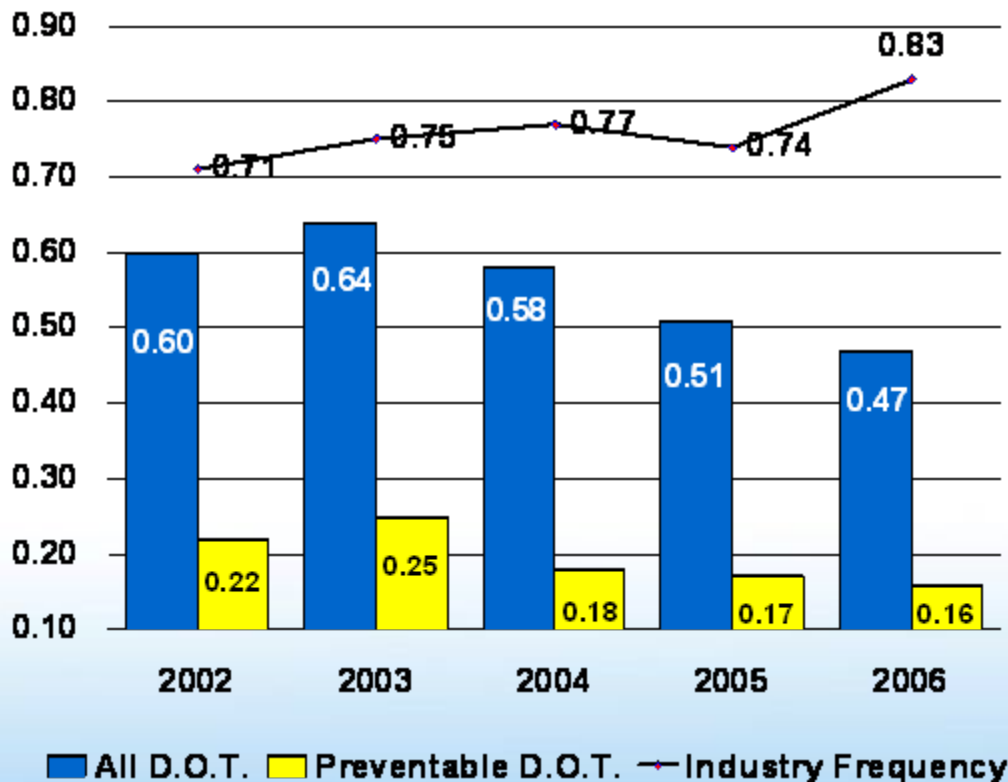
Business Model
Third Party Capacity Network
Truck Broker Carriers

2004	2005	2006
18,221	22,511	23,821
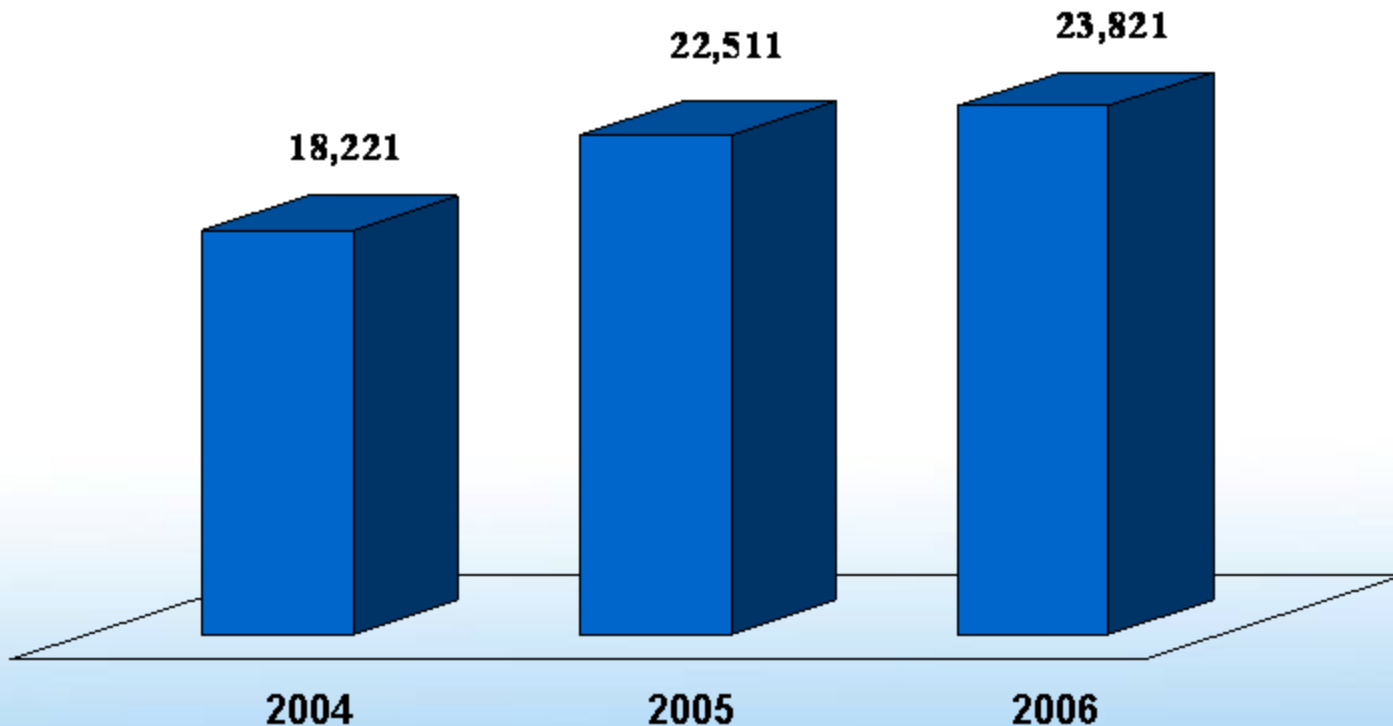
Landstar's Search for a Tracking System

- Helps improve safety and compliance
- Helps service our customers more efficiently
- Improves utilization of Landstar equipment
- Assists in the recovery of missing or stolen trailers
- Has allowed Landstar to utilize our Brokerage Capacity Partners
- Skybitz is a covert system
- Skybitz is an upgradeable system
- Has allowed Landstar to increase the loads per trailer, which has increase revenue through better utilization
- **Manage maintenance repairs and inspection schedules more efficiently**

Landstar's Search for a Tracking System

- Results of Landstar's Research:
  - In 2002, Landstar decided at that time that an untethered tracking system would fit our needs best. There were several reasons:
    - Make up truck fleet
      - Most model year tractors built around 1997 or before did not have constant power to the center pin on the seven way, which is necessary to recharge a tethered units battery.
    - At least half the fleet was to be retrofitted and we needed an application the could be installed easily on a loaded trailer.
  - Ease of install
  - Small and Covert
  - Preferred a device that limited warranty issues by manufactures such as penetrating the skin of the trailer with a tethered systems antenna.
  - Data from device must be able to be integrated into Landstar's system.
  - Landstar needed an upgradeable system which can change with our business environment

Benefits of Utilizing a Tracking System

- Increased revenue and loads per trailer due to improved utilization of equipment
- Allows Landstar to service their customers in an efficient manner
- Helps improve safety and compliance
- Assists in retention efforts with Business Capacity Owners
- Able to manage maintenance schedules of equipment
- Assists in theft prevention and recovery of lost or stolen equipment
- Skybitz System allows Landstar agents to utilize Brokerage Carrier Partners

Skybitz: Future Benefits

- Track and Trace; shows the tractor id when it is hooked and when it unhooks from a trailer

- Smart sensor tracking

- Door sensors; it allows Landstar to see when the trailer doors are opened or closed

- The use of cargo sensors

- Skybitz is able to be upgraded to help meet our changing business environment

- Customers will have the ability to track their shipments on their schedule

SKYBITZ TRACKING SYSTEM
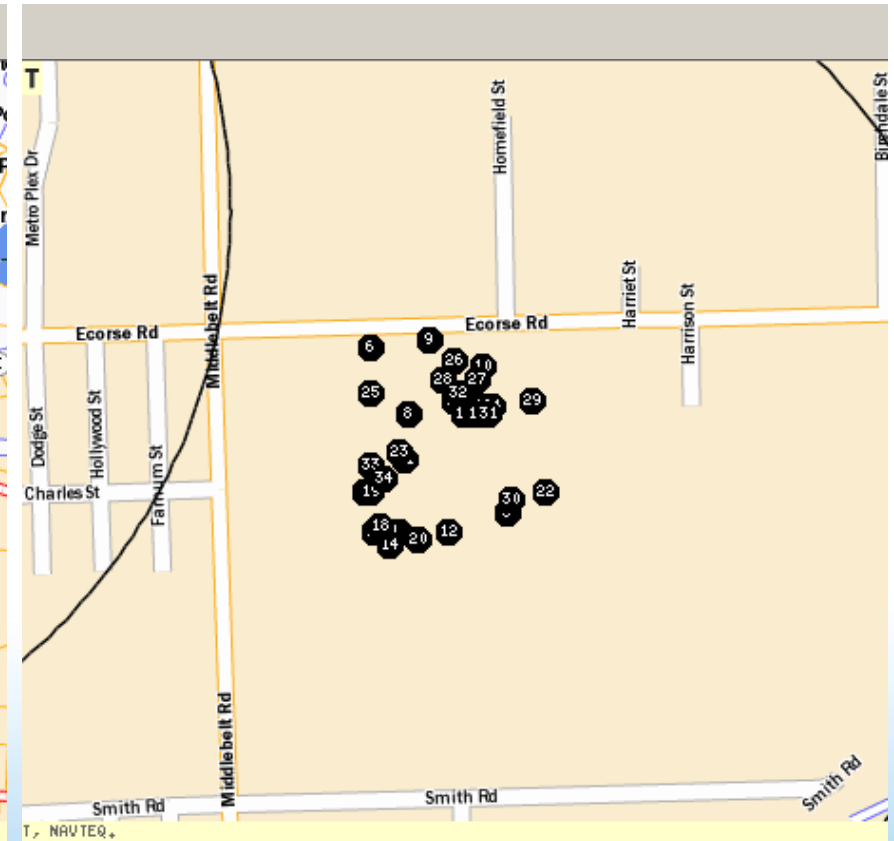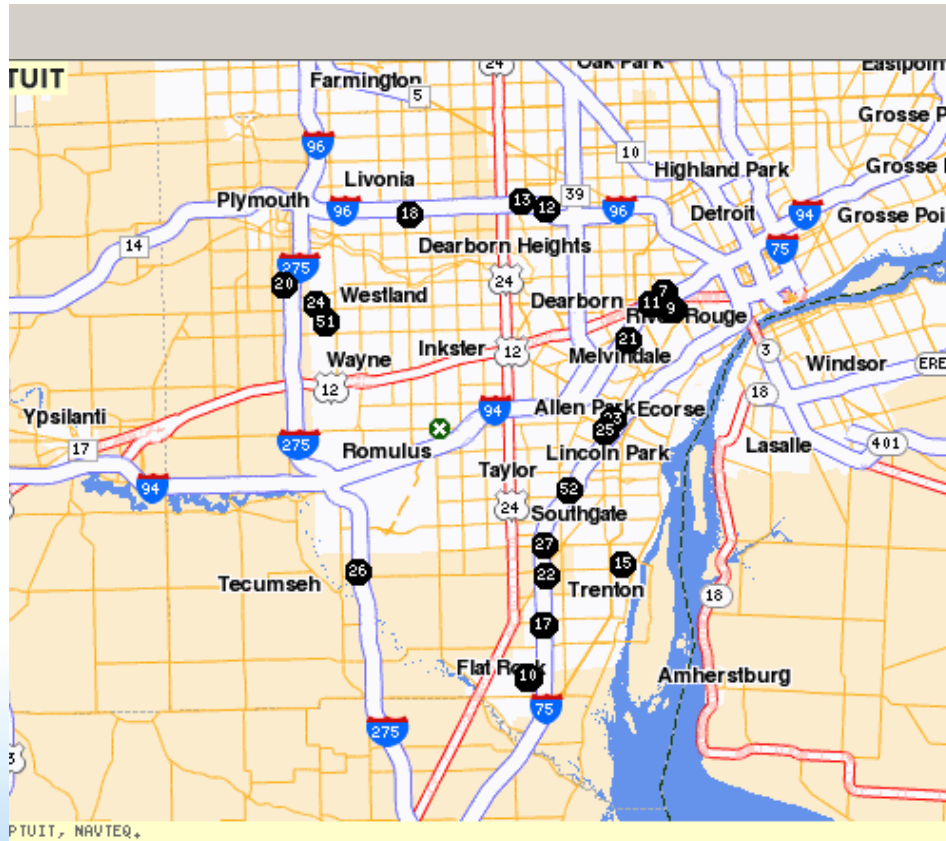
Presentation Summary

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the road to success

LANDSTAR

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FMCSA Office of Analysis, Research and Technology

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