



UNITED STATES
DEPARTMENT OF TRANSPORTATION

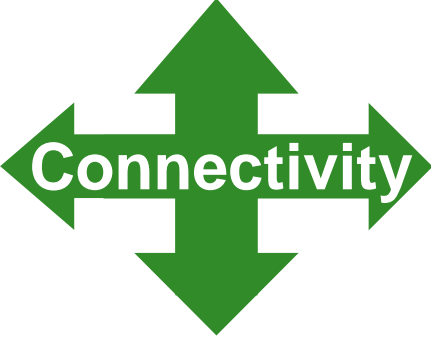
Safety Pilot: *Moving from Research to Implementation*

Mike Schagrin
ITS Joint Program Office
Research and Innovative Technology Administration

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SOLVING TRANSPORTATION ISSUES THROUGH GREATER SITUATIONAL AWARENESS

Drivers/Operators



Vehicles and Fleets



Wireless Devices

Infrastructure

OPPORTUNITY FOR SAFER DRIVING

- Greater situational awareness
 - Your vehicle can “see” nearby vehicles and knows roadway conditions you can’t see
 - 360 degree “visibility”
- Reduce or even eliminate crashes thru:
 - Driver Advisories
 - Driver Warnings
 - Vehicle Control

Connected vehicles have the potential to address approximately 80% of vehicle crash scenarios involving unimpaired drivers



RESEARCH TOWARDS IMPLEMENTATION



KEY SAFETY PROGRAM OBJECTIVES

- 2013 Decision on Vehicle Communications for Safety (light vehicles)
- 2014 Decision on Vehicle Communications for Safety (heavy vehicles)
- 2015 Infrastructure Implementation Guidance



TECHNOLOGY FOR SAFETY – 5.9 GHz DSRC

- **What it is**

- Wi-fi radio product
- Adapted for high speed environment
- Cheap to produce in quantity

- **How the technology works**

- Messages transmitted at 10 times/sec
 - Basic Safety Message (vehicle size, position, speed, heading acceleration, brake system status)
- Operating range of 300 meters (line-of-sight)

- **Benefits of the technology**

- Reduced Price
- Less False Alarms → Delayed warnings
- More Crash Scenarios → Increased performance
 - Can communicate “thru” other vehicles and blind intersections

- **Drawback of the technology** → Both vehicles need to be equipped





TRUCKS



TRANSIT



SAFETY



POLICY



TRAFFIC SIGNALS



TESTING



SAFETYPILOT

www.its.dot.gov/safety_pilot



AFTERMARKET DEVICE



DATA



SECURITY



STANDARDS

SAFETY PILOT OBJECTIVES

- User acceptance
- Estimating safety system effectiveness values
- How the system operates in a real world, concentrated environment
 - Applications
 - Security
- The role that aftermarket devices can play in accelerating benefits
- Any additional research gaps



US DOT OVERSIGHT



U.S. Department of Transportation
Research and Innovative Technology Administration



U.S. Department of Transportation
Federal Motor Carrier Safety Administration



U.S. Department of Transportation
**Federal Highway
Administration**



LIGHT VEHICLE CONSORTIUM

CAMP

Vehicle Safety Communications 3

Mercedes-Benz
Research & Development North America, Inc.



TOYOTA

HONDA
Honda R&D Americas



NISSAN



HYUNDAI · KIA MOTORS
Hyundai · Kia America Technical Center, Inc.

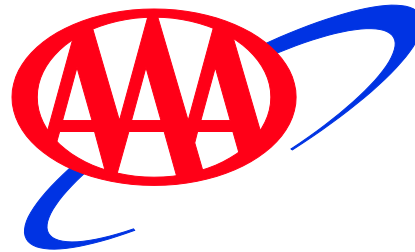
VOLKSWAGEN

GROUP OF AMERICA

Intelligent Transportation Systems



TEST CONDUCTOR TEAM



DRIVER ACCEPTANCE CLINIC VEHICLES

- 16 V2V equipped vehicles
 - 2 from each OEM
- 8 additional V2V equipped “template” vehicles
 - Available as spares for DAC if needed
 - Used for performance testing (have additional instrumentation)
- DAC vehicles are 16 of the 64 integrated vehicles that are deployed in Safety Pilot Model Deployment (Ann Arbor, MI)



USER ACCEPTANCE – DRIVER CLINICS

- 6 locations across the U.S. - began in August 2011

- Over 100 drivers per location

- Experienced crash warnings

- Forward Crash Warning
- Emergency Brake Light
- Blind Spot Warning
- Lane Change Warning
- Intersection Assist
- Do Not Pass Warning



- Feedback from drivers was overwhelmingly positive

- ~90% of drivers expressed desire for such a system



SUMMARY OF SURVEY RESULTS

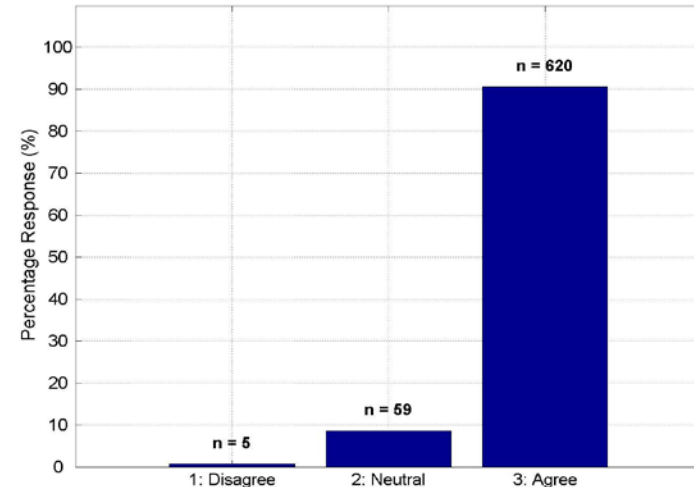
■ Desirability

- 91% of drivers surveyed would like to have this technology on their vehicles

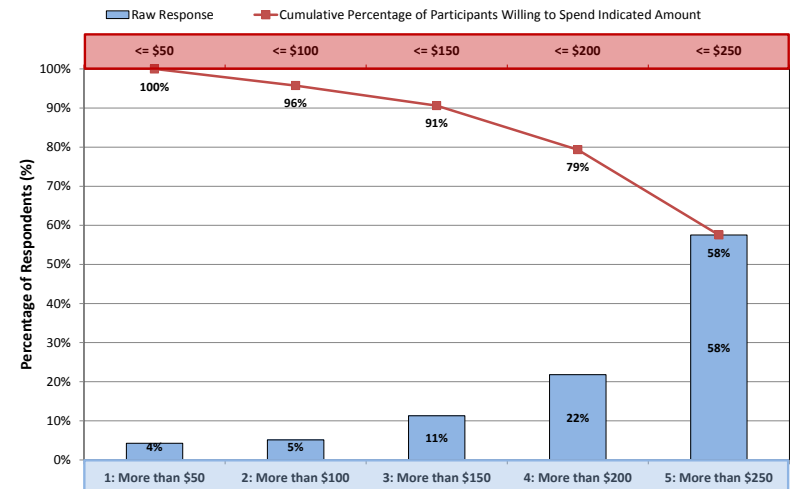
■ Willingness to Pay

- 58% of the drivers surveyed would pay more than \$250 to have this technology on their vehicles

I would like to have this Vehicle-to-Vehicle Communication safety feature on my personal vehicle.

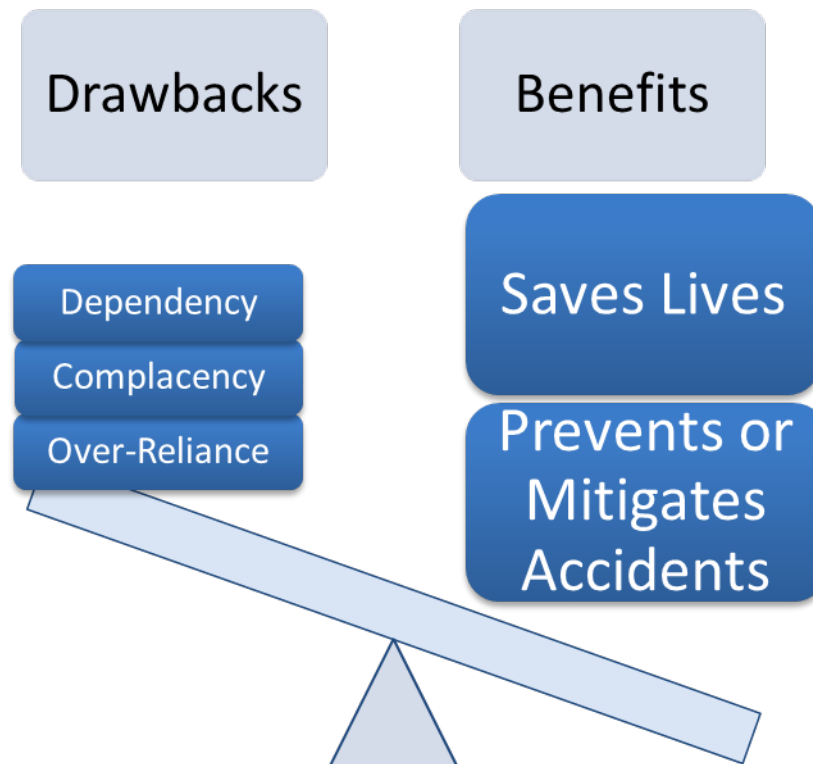


At what price level might you begin to feel this collective group of safety applications (Vehicle-to-Vehicle communications safety feature) is too expensive to consider purchasing? (select one)



INITIAL SUMMARY OF OVERALL REACTIONS

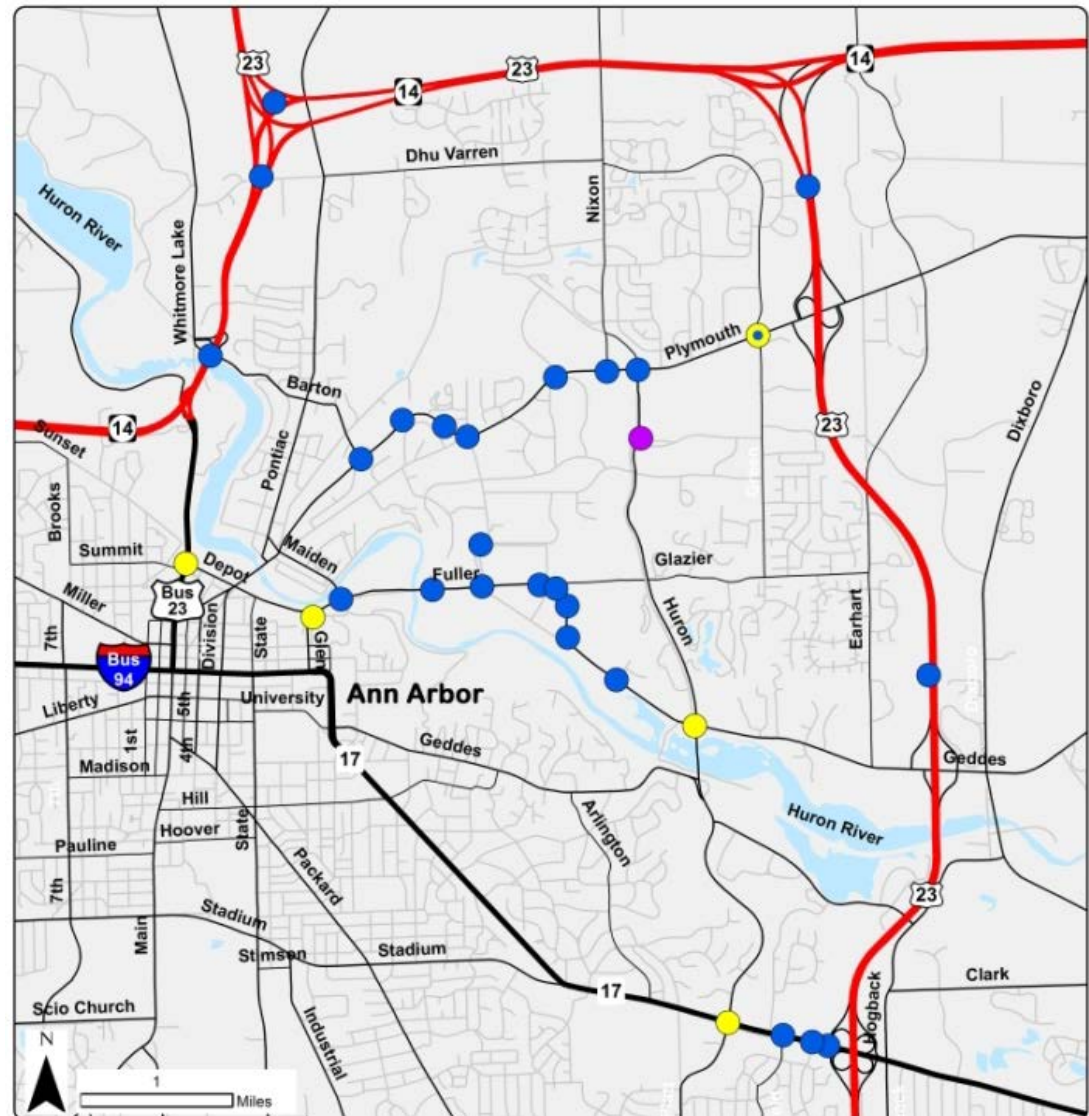
The illustration below demonstrates respondents' most common reactions to this technology ... that **saving a life or many lives, far outweighs the potential drawbacks:**



MODEL DEPLOYMENT SITE – ANN ARBOR, MI

Key Site Elements:

- 75 miles of instrumented roadway
 - 27 roadside units
- ~3000 vehicles
 - Cars, trucks, buses
 - Integrated, aftermarket, and retrofit
- 1 year of data collection



MODEL DEPLOYMENT FLEET

	Integrated Vehicles	Retrofit/ Aftermarket Devices	Vehicle Awareness Devices
Passenger Cars	64	300	2,215
Heavy Trucks	3	16	50
Transit		3	85
Medium Duty			100
Totals	67	319	2,450

MODEL DEPLOYMENT DATA

Numerical & Video Data

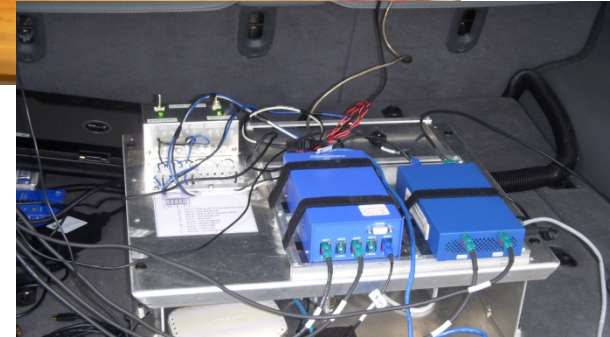
- In-vehicle dynamics
- GPS
- V2V (rel. positioning, alerts)
- External sensors



MODEL DEPLOYMENT ACCOMPLISHMENTS

INTEROPERABILITY ACHIEVED

- 3 Stages of Testing Completed
 - Including bench and field testing
- 8 Vehicle manufacturers (CAMP)
- Multiple vendors included
 - Savari
 - Denso
 - Cohda
 - Arada
- Multiple vehicle platforms
 - Light, heavy, and transit vehicles



Interoperability has been achieved across all devices and vehicles participating in the Safety Pilot Model Deployment!



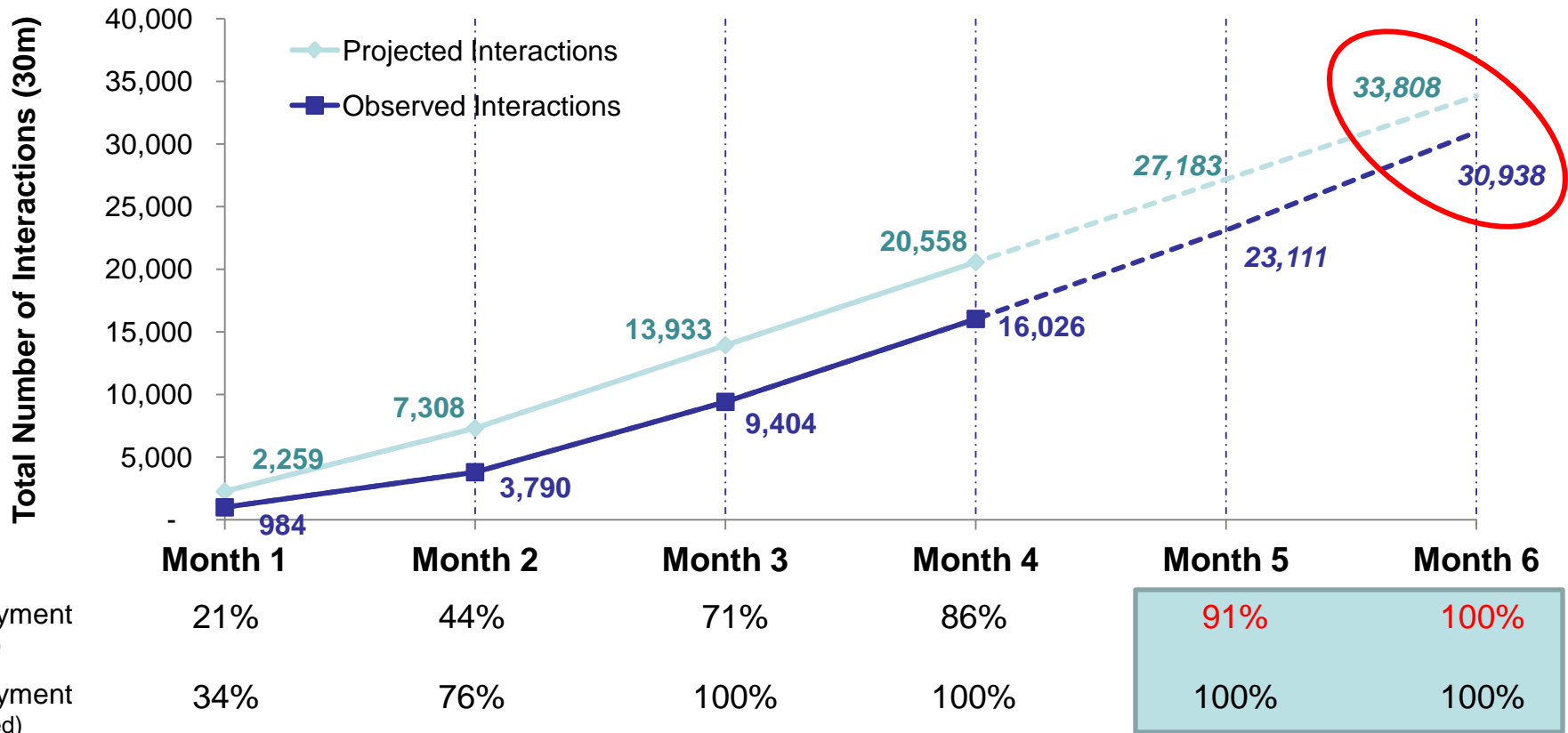
VEHICLES & DEVICES DEPLOYED

- 2,313 VADs
- 187 ASDs
- 64 Integrated Light Vehicles
- 19 Integrated / Retrofit Heavy Vehicles
- 3 Retrofit Transit Vehicles
- 27 RSEs



Over 91% of the vehicle fleet has been deployed and is operating in the Model Deployment!

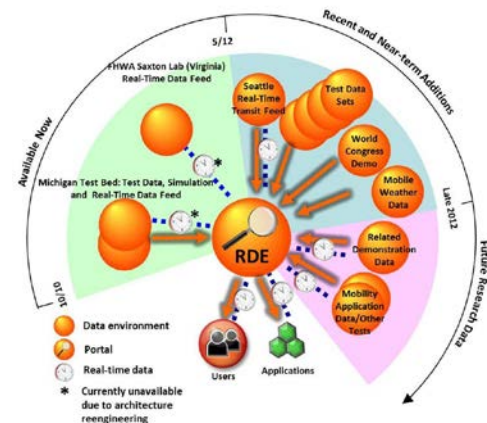
INTERACTIONS GENERATED



Even with the lower device deployment rate, still within 10% of the projected number of interactions by month 6.

DATA COLLECTED

- 3 Months of Data Collected
 - Integrated light vehicles
 - Light vehicle ASDs
 - Heavy vehicles
- Data Transferred to IE
 - Conducted preliminary analysis of system capabilities on dataset
- Data Transferred to Real-Time Data Capture Program
 - Archiving data for industry research – Research Data Exchange

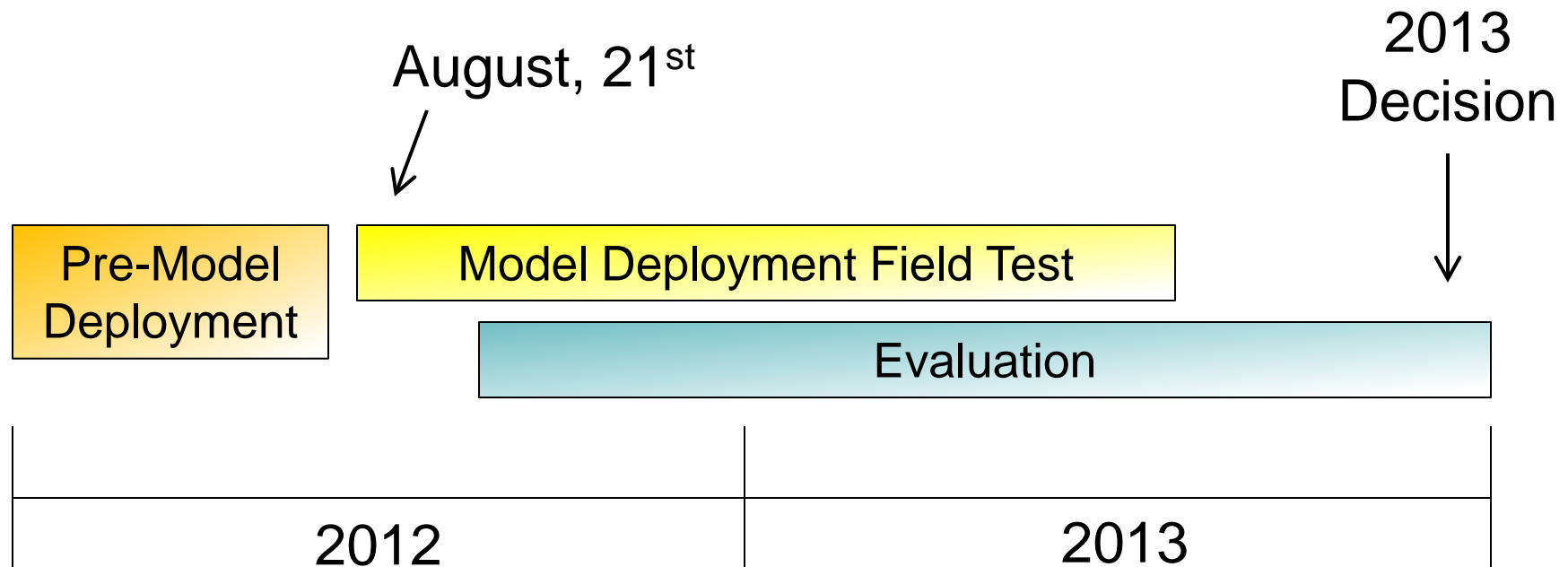


LESSONS LEARNED

- Allowing additional time for end-to-end system testing
 - Increased maturity level of device developers
 - Identified ambiguous parts of specifications
- GPS antenna placement had a major impact on the performance
 - Internal placement was not viable
 - Viable external locations identified (truck, roof)
- Monitoring the data collection in real-time allows for rapid risk response
 - Implemented risk response plans for interactions



NHTSA AGENCY DECISION



- NHTSA decision will consider all possible options
- Decision will be based on what the data can support

STRONG US DOT SUPPORT AT ALL LEVELS



“This research should bring us a step closer to what could be the next major safety breakthrough.”

- *U.S. Transportation Secretary Ray LaHood*



“With its potential to save lives and prevent injuries, connected vehicle technology could be a real game-changer for vehicle safety.”

- *NHTSA Administrator David Strickland*



“The past several decades of auto safety have been dedicated to surviving crashes, but the future will be about avoiding crashes. That is what connected vehicles are all about.”

- *RITA Deputy Administrator Greg Winfree*



Questions

- Mike Schagrin – ITS JPO
 - Program Manager, Connected Vehicle Safety and Automation
 - Mike.Schagrin@dot.gov
- For more information:
 - <http://www.its.dot.gov/presentations.htm>

