Missouri’s Current CAV Initiatives

- Autonomous TMA
- TTS
- HAAS/Makeway
- Predictive Analytics
- Policy
MoDOT TMA Crashes

- 2015: 30
- 2016: 20
- 2017: 30
- 2018: 35
What is the Goal?

Eliminate operator injuries when the rear protective vehicle is impacted by removing the operator from the vehicle.
Contract with Kratos Defense and Security Solutions

- $550K – retrofit two MoDOT trucks
  - Partially funded with SPR funds
  - International trucks with MASH TMAs

- No payment until it performs
  - Training, component testing and verification
  - 32 hr. closed road test
  - 250 hr. live work zone test
Functionality

What It Can Do:
- Leader-Follower system
- Follow at distances up to 1500’
- Pause and catch up
- Function in short duration GPS denied environments
- Provide redundant, secure communication link
- Arrow board and turn signals synced

What It Can’t Do:
- Platoon to project at highway speeds
- Follow through signals and intersections
- Laterally offset from the lead vehicle
32 Hour Testing
April/May 2019

- State Fairgrounds
- V2V dropouts – MoDOT retrofit issue
- Radar timeout E-STOP - sky data issue
- Entering Dead Reckoning too often – satellite issue
- Veered off course - excessive CPU usage
- Follow distance accuracy - hardware issue
- Delayed E-STOP – excessive CPU usage
- Lateral accuracy issue – code issue
250 Hour Testing
June 2019

- Live work zones
- Location accuracy issues driving under bridges
- GPS degradation/DR/follow accuracy issues

**Kratos Solutions:**
- GPS card upgrade – 2.5 X satellites
- GPS antennae upgrade - amplification
- Roof mounted warning LIDAR
TTS-Modot
Connected vehicle
Project
• TTS - information service provider for connected vehicle applications
• 2018 - agreement executed – provides no cost, data sharing platform for data innovation
• 2019 - TTS deployment
Suppliers own data
Provide real time signal data, as built drawings and signal timing plans

Partners deliver the data
from ATMS, based on TTS’ API

TTS delivers the product
connects the systems, develops the information, maintains systems, provides support

Customers integrate the product
develop connected vehicle applications

End users value the product
Consumers of the applications
Signal System: TransCore TransSuite TCS

Release Date: Q3 2019

Number of MoDOT Signals: 966
- 681 sending information
- 150 not emulating/old status
- 46 free-running
- 89 preempt

Comments:
Audi of America has released 321 intersections and is releasing signals as they meet the minimum number of crossings and error rates
Kansas City District

**Signal System:** TransCore TransSuite TCS  
**Release Date:** Q4 2019

**Number of MoDOT Signals:** 375
- 264 sending information
- 10 not emulating/old status
- 23 free-running
- 78 preempt

**Comments:**
TTS has been connecting with MARC and OGL signals, additional agreements with City of Merriam, KS and City of Fairway, KS
Southwest District

Signal System: McCain Transparity

Number of MoDOT Signals: 157

Comments: Since the City of Springfield and MoDOT share a signal system, the next step will commence once the City signs their agreement later this year.

Release Date: Q2 2020
What's next

TTS is collecting data to provide dashboards to MoDOT districts

Website access

**Signal Intelligence Reports**

Monthly summary by hourly aggregation

**Vehicle Intelligence Reports**

Same as above

- Pending system updates at OEM systems

**Release**

Signal Intelligence Reports

- KPI October 2019, Full Report November 2019

Vehicle Intelligence Reports

- Q1 2020
Why these technologies and
What are they?

• Alert the driving public of our field crews through
  crowdsourcing applications (increase awareness,
  slow down or move over, etc.).

• Equipment installed in our fleet and use of GPS and
  cloud based solutions.

• When fleet lights are activated a notification gets
  added to the Waze app. Takes about 30 seconds.
What is the DOT doing and How are we using the technology?

- Pilot in the KC District/KDOT – HAAS Alert
  - MoDOT ER and KDOT/KHP Motorist Assist will have 31 devices.
- Pilot in the SL District – Makeway
  - 18 ER vehicles in the SL area with additional devices slated to be tested on department maintenance vehicles.
HAAS Alert Pilot

- MoDOT Emergency Response - 1 truck
  - Alerted 9,706 drivers
  - 968 Incidents
- In June, July and August (MO side)
  - 68,760 drivers were alerted via WAZE
HAAS Alert Pilot

- Monthly Reports for fleet activity.
- On Demand Reports:
  - Spreadsheet with GPS coordinates and speed
  - Number of incidents vehicle responded to
  - Will show when the lights were on or off
Makeway Pilot
Vehicle 9359
Type
Roadside Assistance

Speed History

Vehicle Route History

Updates

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Car Stopped On Road

Emergency vehicle stopped, make way!

Reported by MakeWay2019
11 min ago

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Next Steps

• Continue pilots.
  • With possible expansions.
  • Enhancements.
• Evaluate benefits and accuracy.
• Research other technologies.
• Potential statewide deployment.
Leveraging predictive analytics generated from CVAV, and those data items produced by cellular network providers, provide benefits to law enforcement, public safety, and other industries and services associated with transportation activity.
Missouri law does not specifically address the operation of autonomous vehicles.

Platooning
Missouri has a provision in law that prohibits vehicles, including trucks, from following another vehicle any closer than 300 feet.