Development of Test Procedures for Intersection Movement and Left Turn Assist Applications

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NHTSA
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Scope

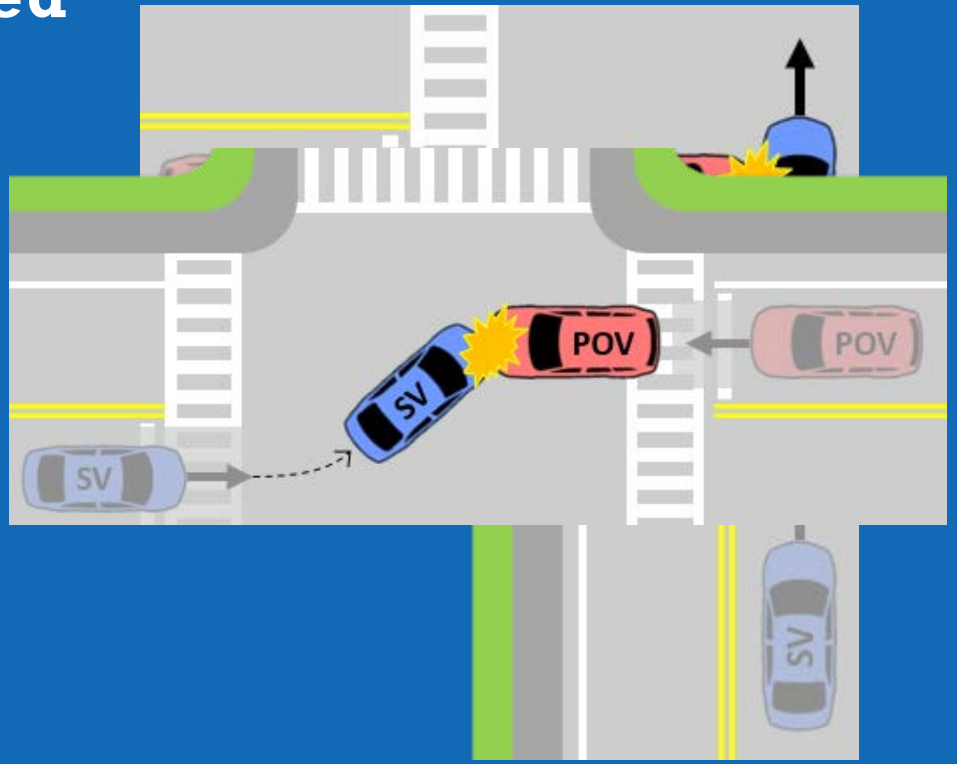
- Goal
  - Develop test procedures for intersection movement assist (IMA) and left turn assist (LTA) safety applications.
- Focus
  - Design procedures that are relatable to naturalistic driving characteristics
- Steps
  1. Determine target test scenarios.
  2. Analyze naturalistic driving data and crash data to determine performance criteria and testing speeds.
  3. Design new test procedures using results of analysis.
  4. Run the test procedures and use data to refine/improve.
  5. Finalize test procedures

What are IMA and LTA?

- IMA and LTA are safety applications that address crash-imminent crossing-path scenarios
  - Usually occur at intersections
  - LTA involves left turns from one or more vehicles involved

Pre-Crash Scenarios Used

- Straight Crossing Paths (SCP)
  - 53% of crossing-path crash comprehensive costs*
- Left Turn Across Path/Opposite Direction (LTAP/OD)
  - 31% of crossing-path crash comprehensive costs*



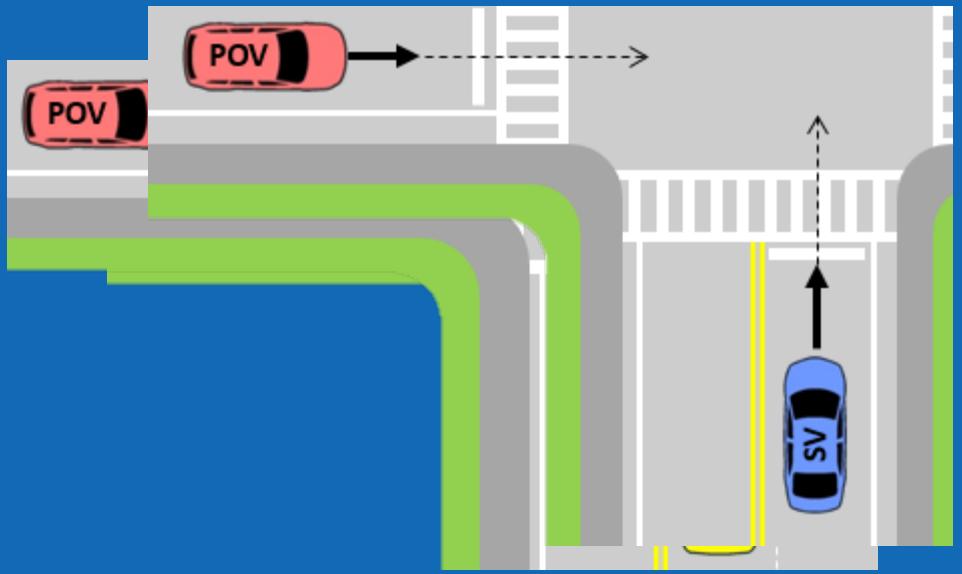
SV≡Subject Vehicle

POV≡ Principal Other Vehicle

* Based on 2011-2012 Fatality Analysis Reporting System (FARS) and National Automotive Sampling System's General Estimates System (GES)

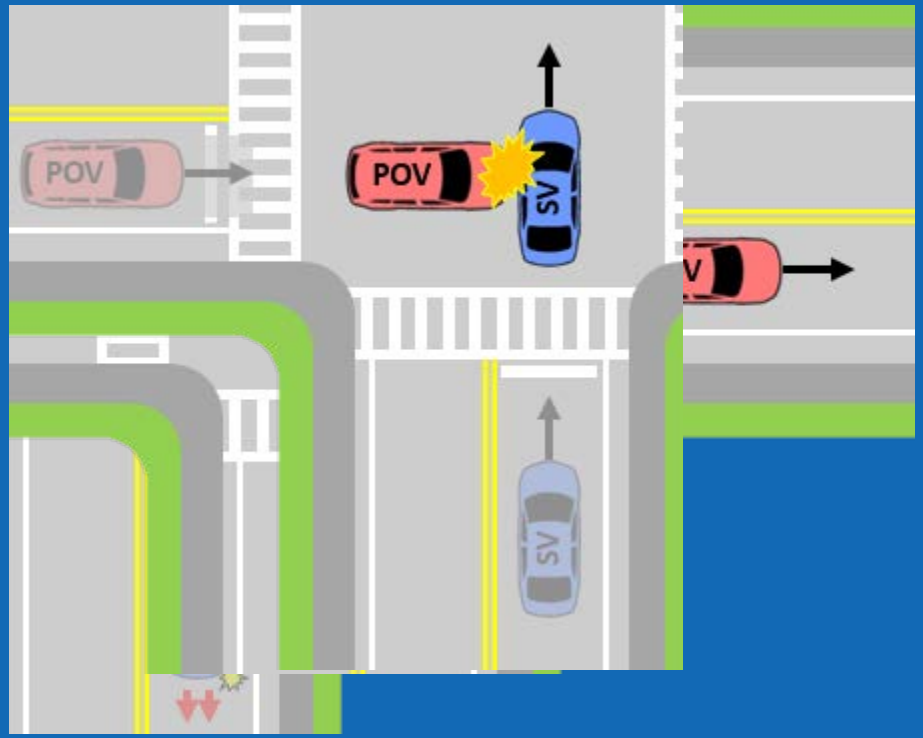
Initial Conditions

- Three sets of initial conditions:
  1. SV is moving
  2. SV is stopped
  3. SV is stopped and view is obstructed



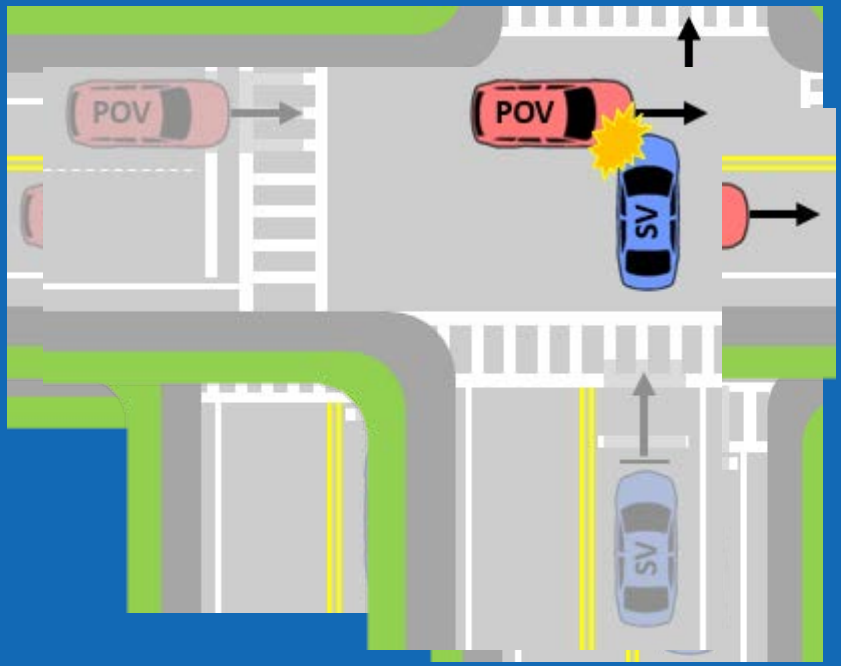
Warning Conditions

- Three types of warning conditions:
  1. Must Warn
  2. Suppress Warn
  3. No Warn



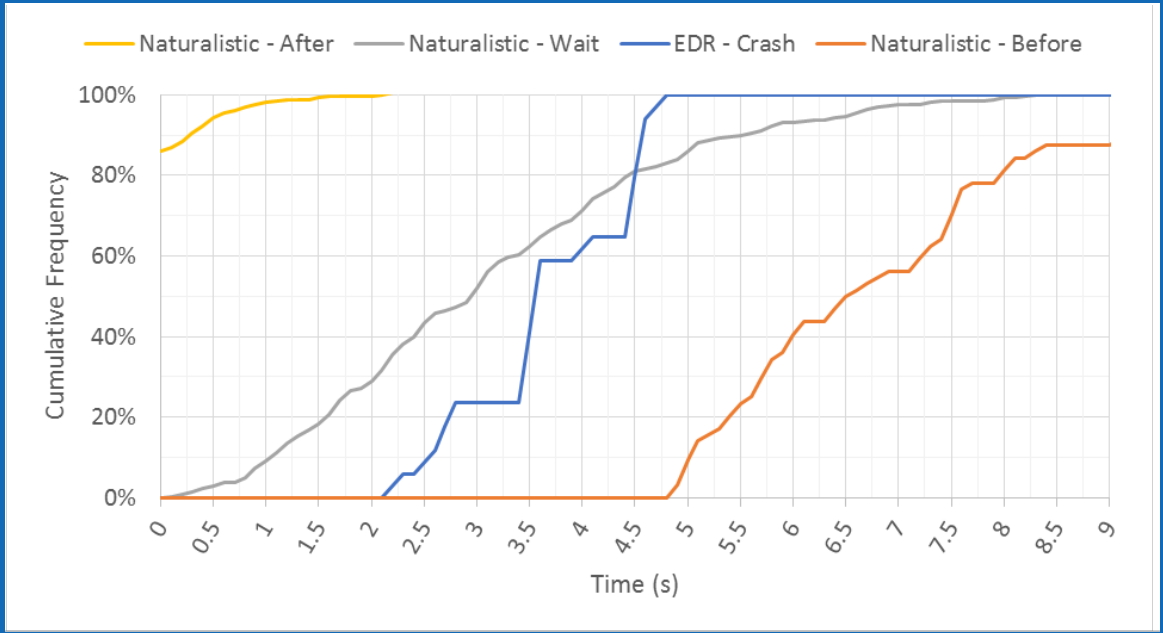
Application Performance Criteria

- Information taken from:
  - Naturalistic driving data; and
  - Crash event data recorders (EDRs)
- Looked at when:
  - SV went before POV
  - SV crashed into POV
  - SV went after POV



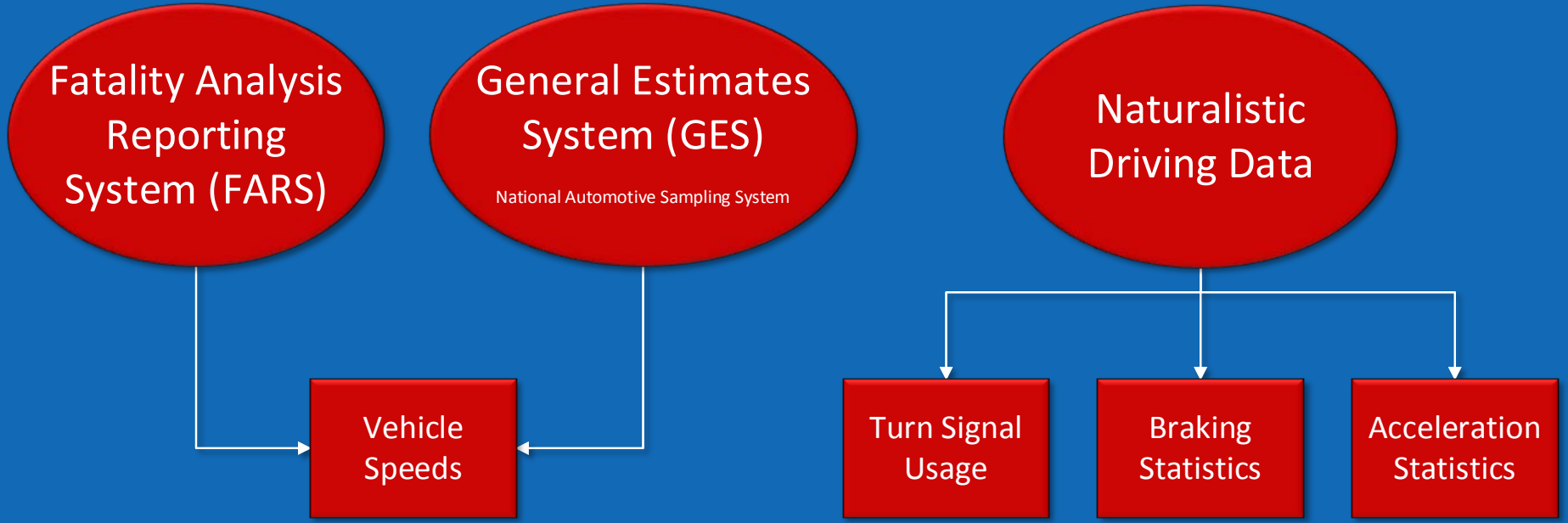
Suggested Performance Criteria

- Define time-range when system must warn (MW)
- Define two time-ranges when system may or may not warn (MNW)
- Suppress warning at all other times



Example is of an SCP where the SV is initially stopped.

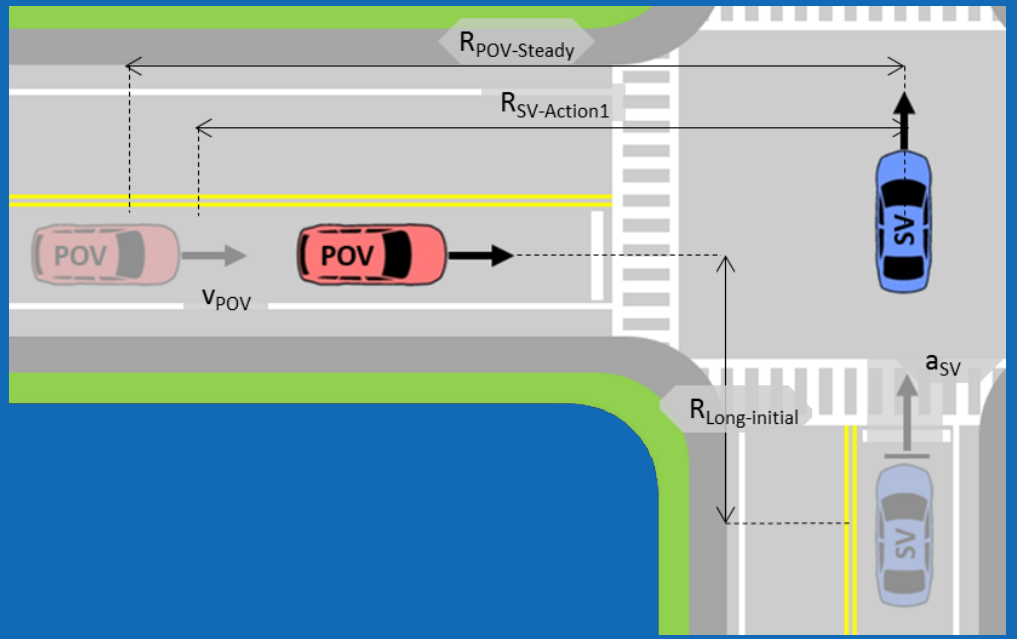
Test Validity Criteria and Kinematics



Putting it together

Example SCP-Stopped

- Define:
  - SV's distance to intersection
  - POV's speed
  - When POV is at steady speed
  - Timing of SV brake release and acceleration
  - SV's acceleration level



Basic Test Scenarios

- IMA/LTA – Moving
  - SV is initially moving

- IMA/LTA – Stopped
  - SV is initially stopped

- IMA/LTA – Obstructed
  - SV is initially stopped
  - View is obstructed

Concluding Remarks

- Completed Steps:
  - Conducted initial round of testing of the procedures
  - Collected test data from round of testing
- Next Steps:
  - Review test data from initial testing of the procedures
  - Use initial test data to refine/improve and re-run test procedures
  - Document final test procedures

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QUESTIONS?

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