



NHTSA

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Testing of Forward Collision Warning in Response to Motorcycle Targets

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Background

- 2018: 5,115 fatal crashes involving motorcycles, with 2,881 involving a collision with another vehicle¹.
- 2018: Motorcycle fatality rate of 25.48 fatalities per 100 million miles (passenger car rate: 1.45 per 100 million miles)².

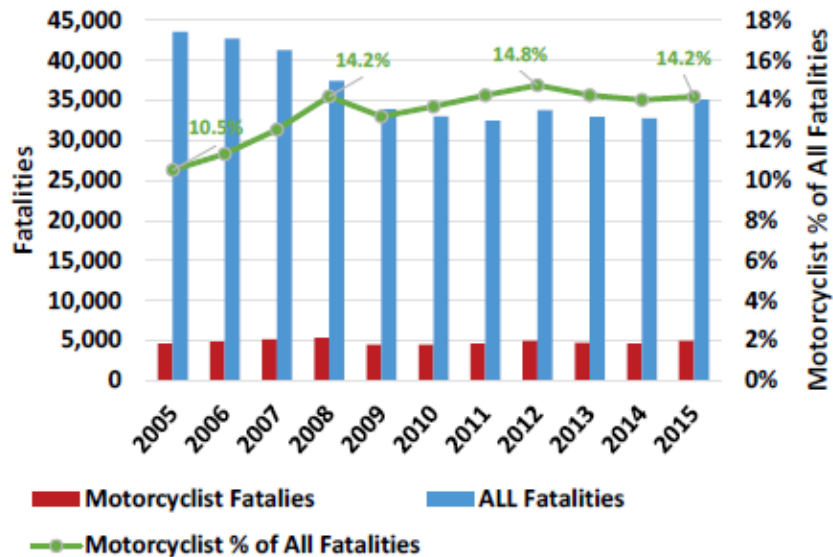


Figure 1. Statistical Trends of U.S. Motor Vehicle and Motorcycle Fatalities



NHTSA (2020). *Fatality Analysis Reporting System*.

1) <https://www-fars.nhtsa.dot.gov/Vehicles/VehiclesMotorcycles.aspx>

2) <https://www-fars.nhtsa.dot.gov/Trends/TrendsGeneral.aspx>

Purpose

Assess Forward Collision Warning (FCW) system performance using a motorcycle-based principal other vehicle

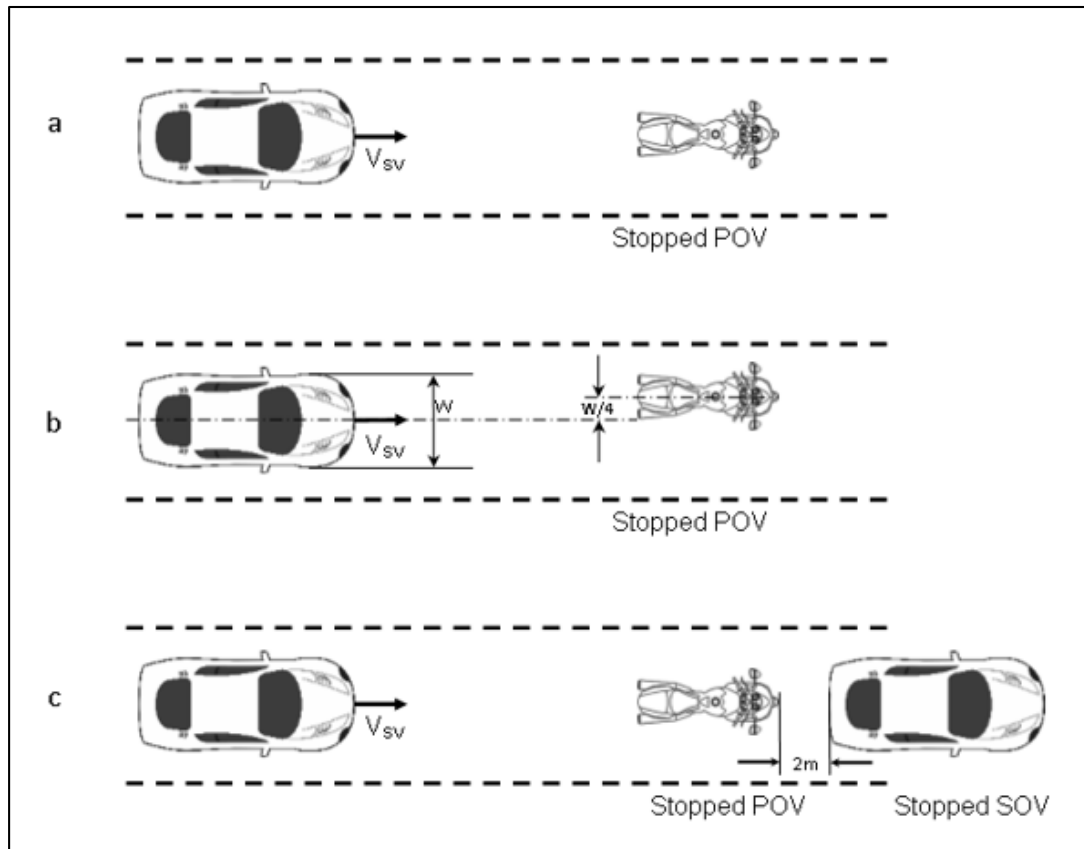


Methodology

- Subject vehicles (SV): Eleven MY2020 vehicles
 - 1 minivan
 - 6 passenger cars
 - 1 light truck
 - 3 crossovers/SUVs
- Principal other vehicle
 - Motorcycle with rider
 - Centered and offset 25% within the SV travel lane
- NHTSA FCW NCAP test scenarios and test conditions
 - Stopped POV
 - Decelerating POV
 - Slower moving POV



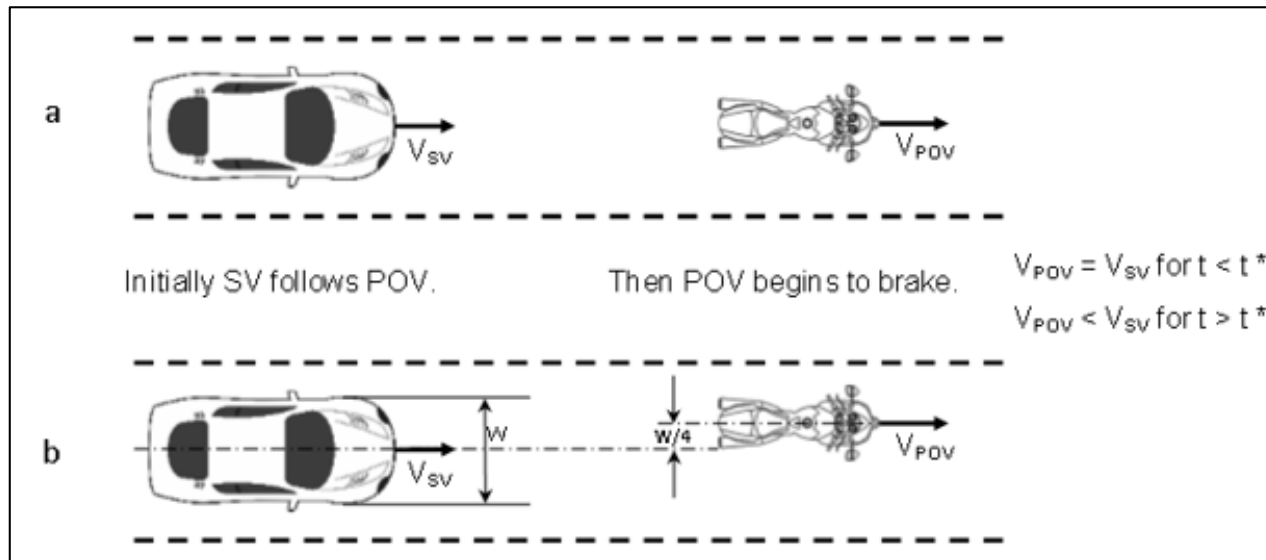
Scenario 1: Stopped POV



- SV: 45 mph
- FCW warning criteria: $TTC > 2.1$ s
- Variants:
 - a) POV parked, center of lane
 - b) POV parked, offset 25% of lane center
 - c) POV parked, center of lane, 2m behind a real mid-sized car

Trial aborted if no alert occurs by $TTC < 1.9$ s

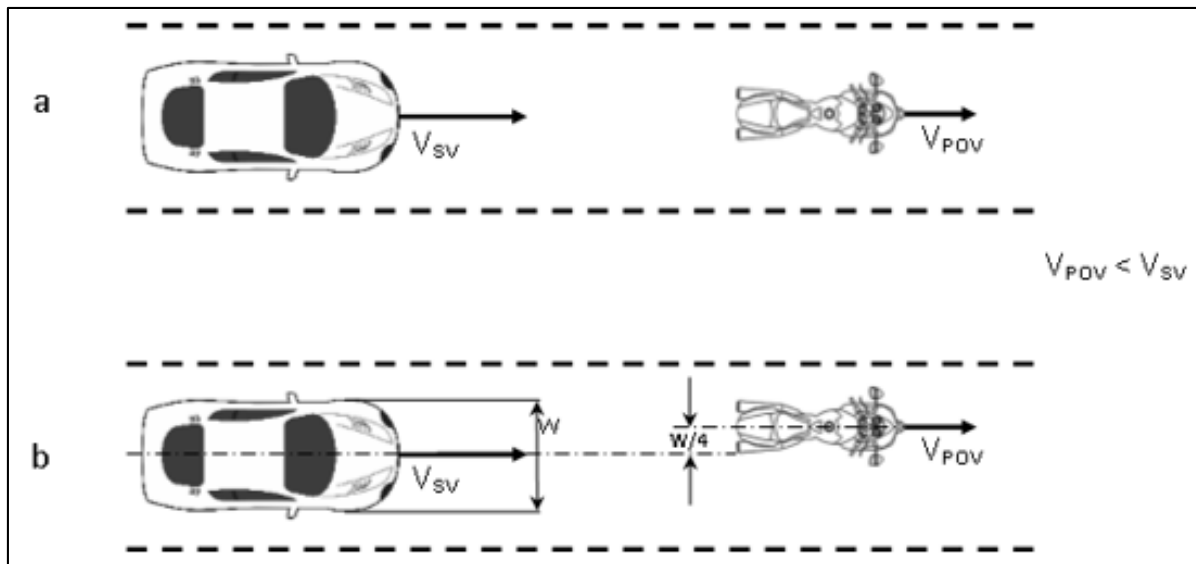
Scenario 2: Decelerating POV



- SV and POV: 45 mph
- SV-to-POV headway: 30 m
- POV deceleration: 0.3g
- FCW warning criteria: $TTC > 2.4$ s
- Variants:
 - a) POV motorcycle, center of lane
 - b) POV motorcycle, offset 25% of lane center

Trial aborted if no alert occurs by $TTC < 2.2$ s

Scenario 3: Slower Moving POV

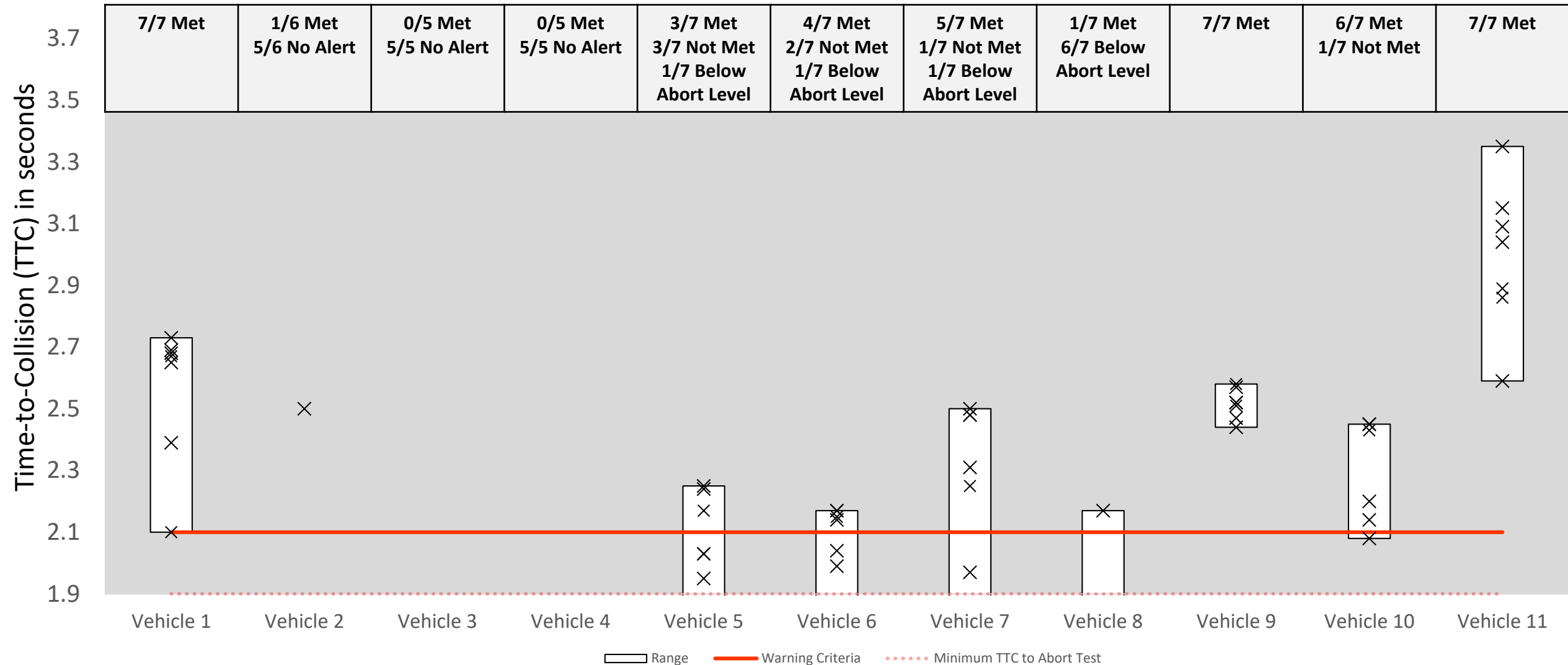


- SV: 45 mph
- POV: 20 mph
- FCW warning criteria: $TTC > 2.0$ s
- Variants:
 - a) POV motorcycle, center of lane
 - b) POV motorcycle, offset 25% of lane center

Trial aborted if no alert occurs by $TTC < 1.8$ s

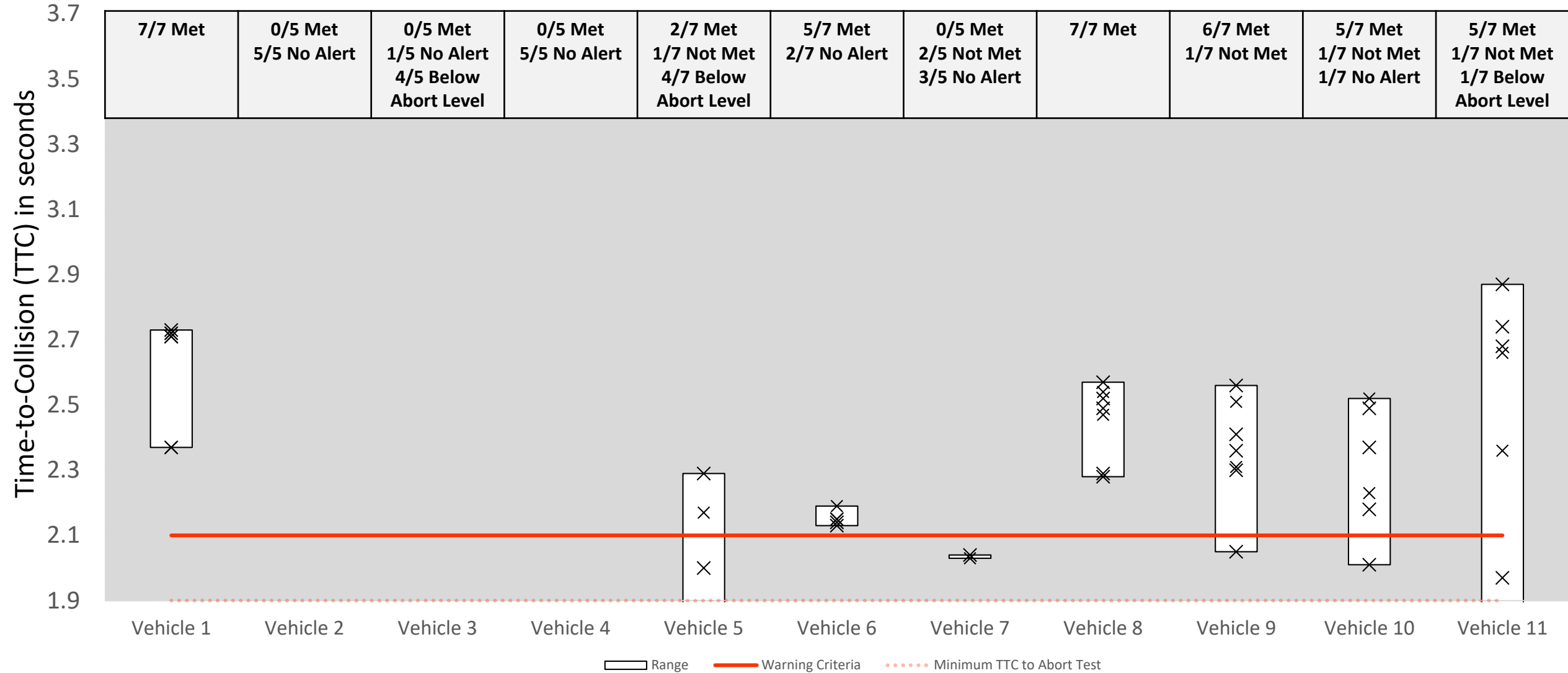
Scenario 1 Summary of Results

Test 1a: Stopped POV



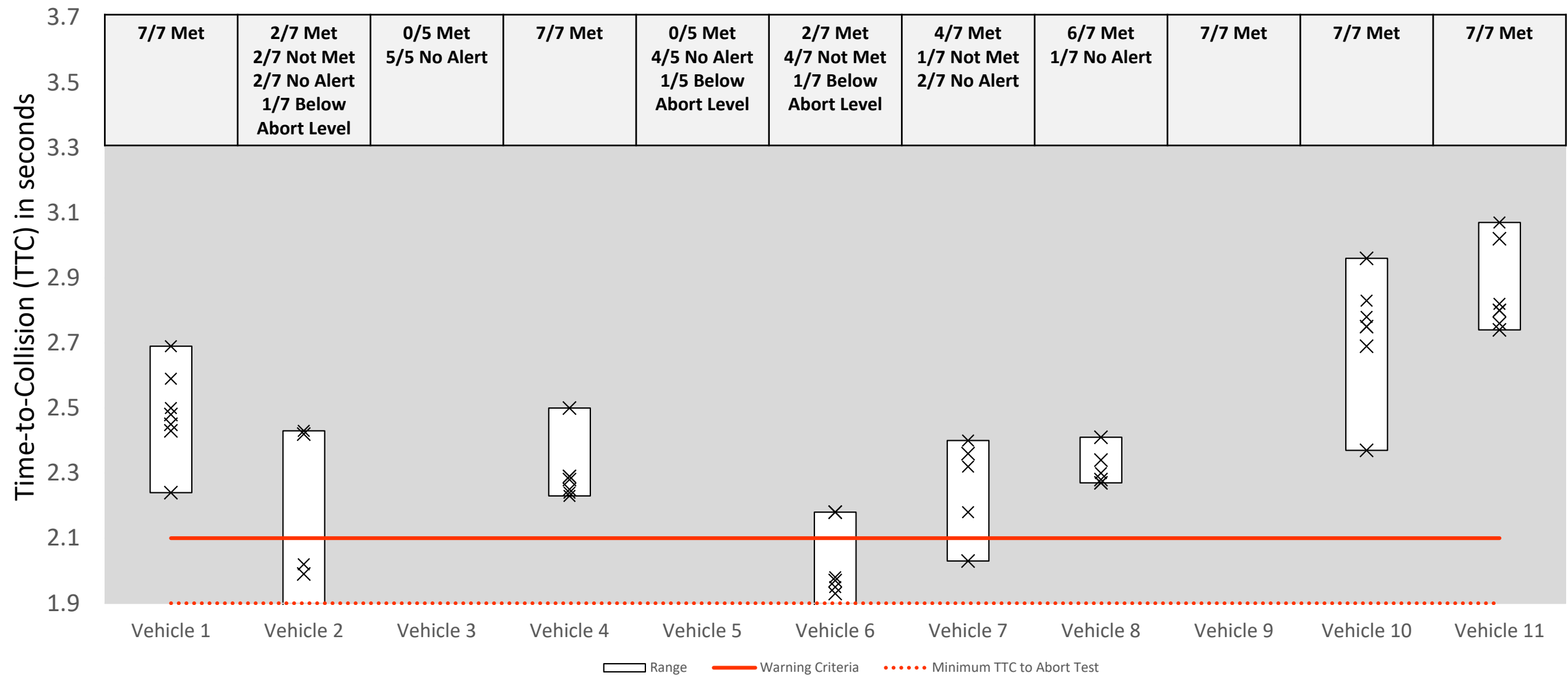
Scenario 1 Summary of Results

Test 1b: Stopped POV with 25% Offset



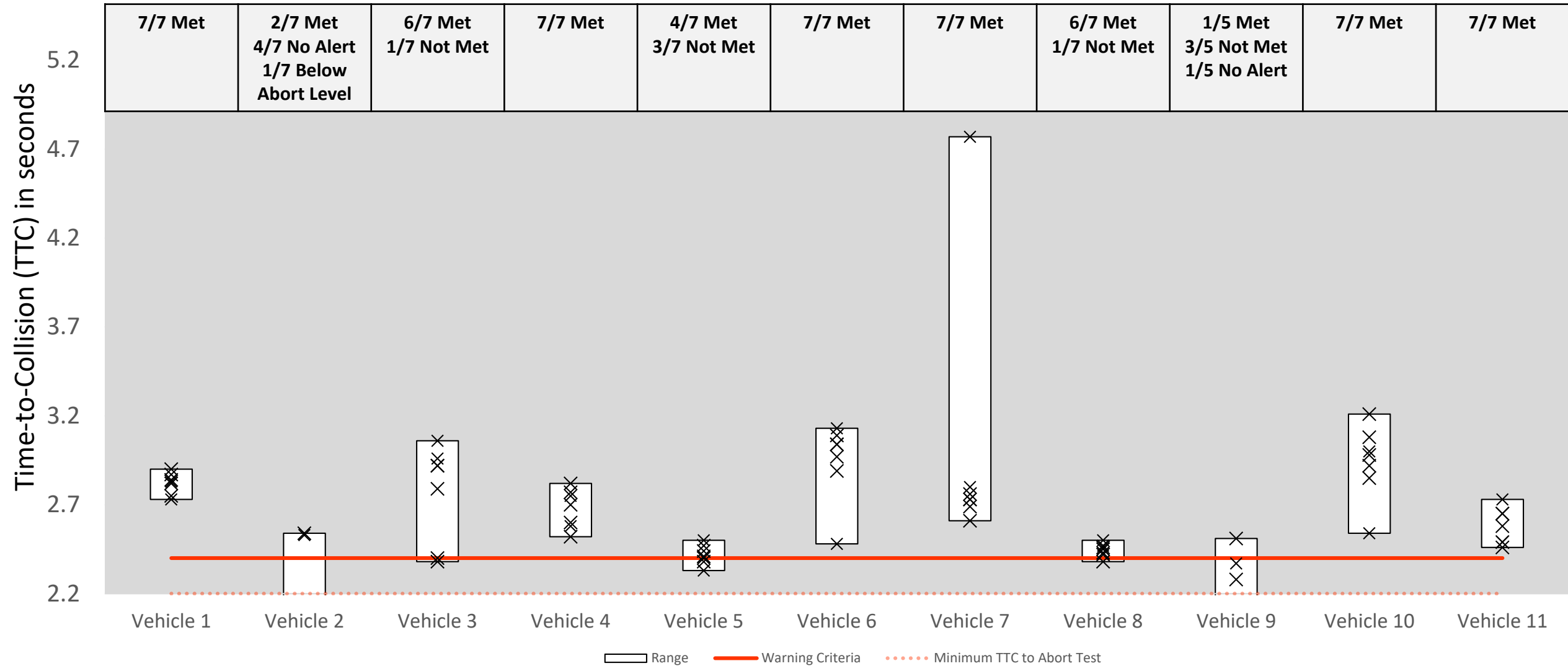
Scenario 1 Summary of Results

Test 1c: POV Stopped Behind Passenger Car



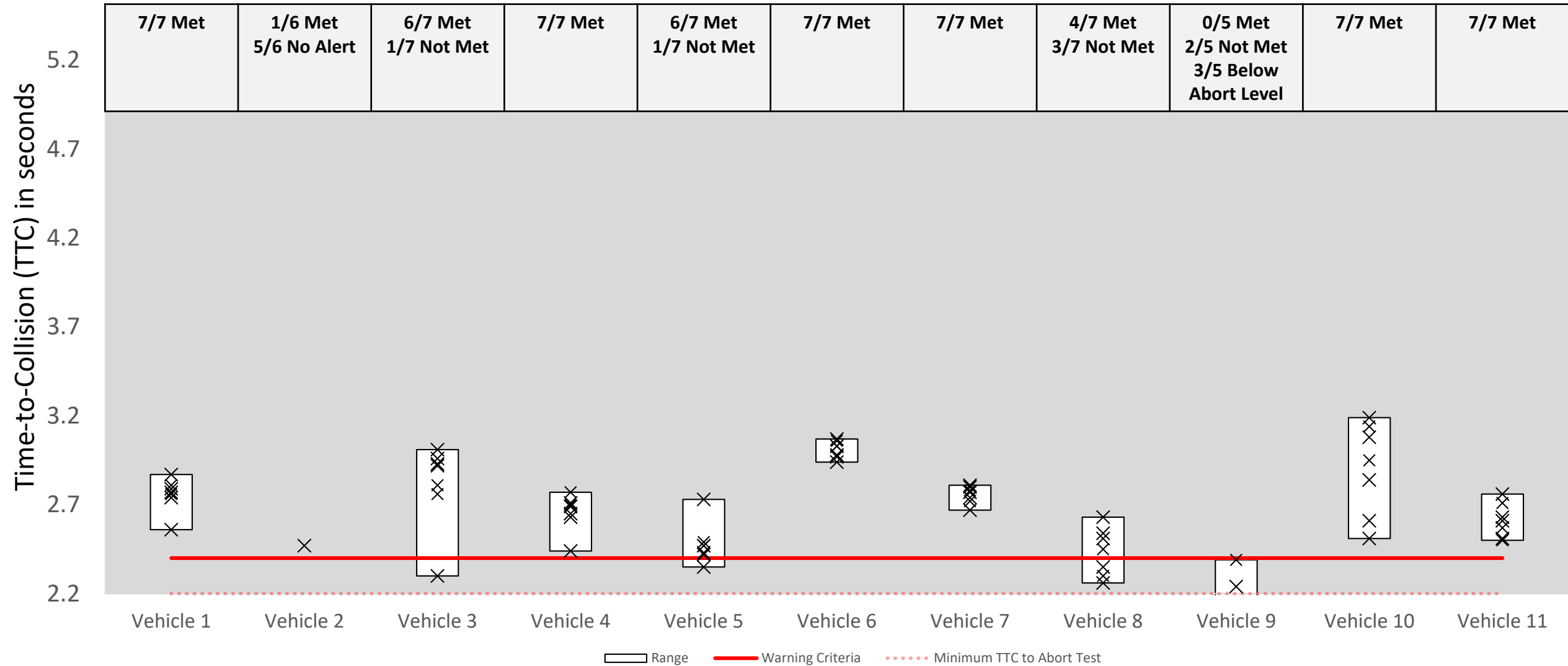
Scenario 2 Summary of Results

Test 2a: POV Decelerating



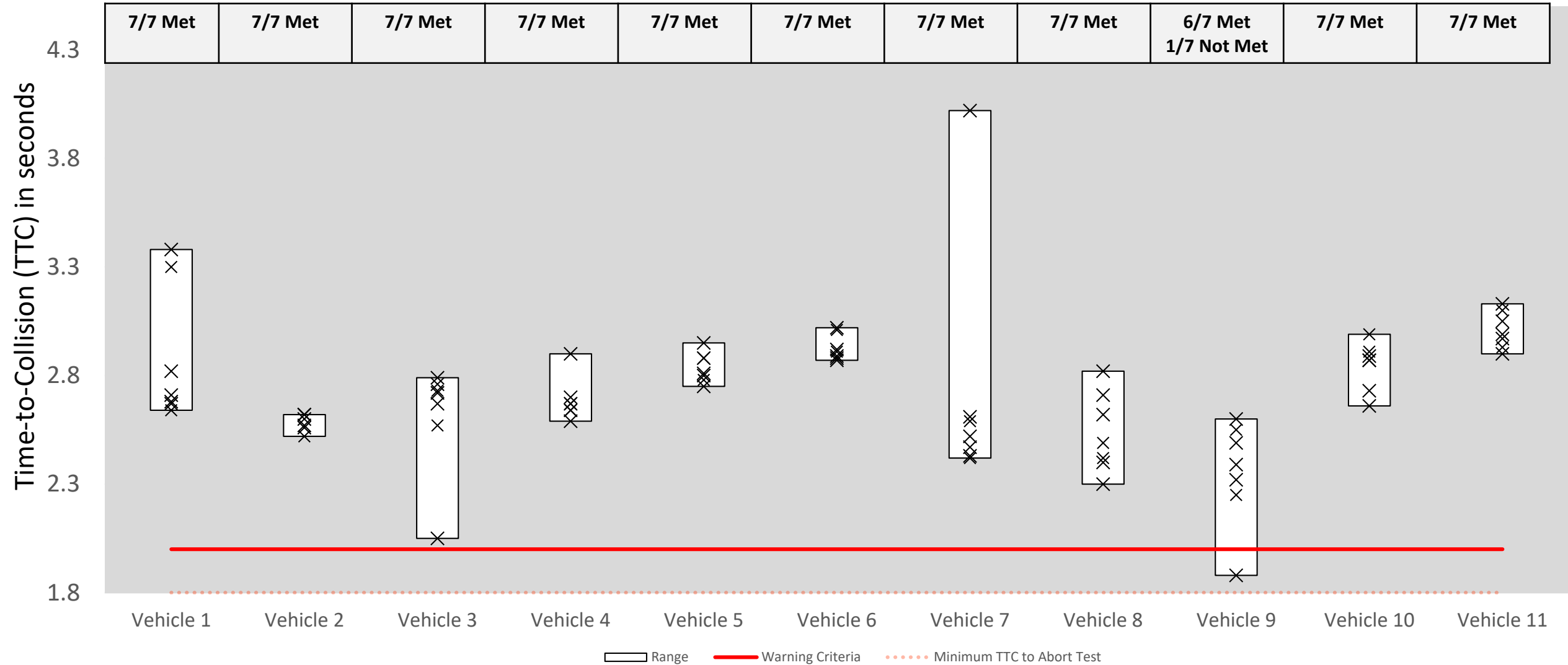
Scenario 2 Summary of Results

Test 2b: Decelerating POV 25% Offset



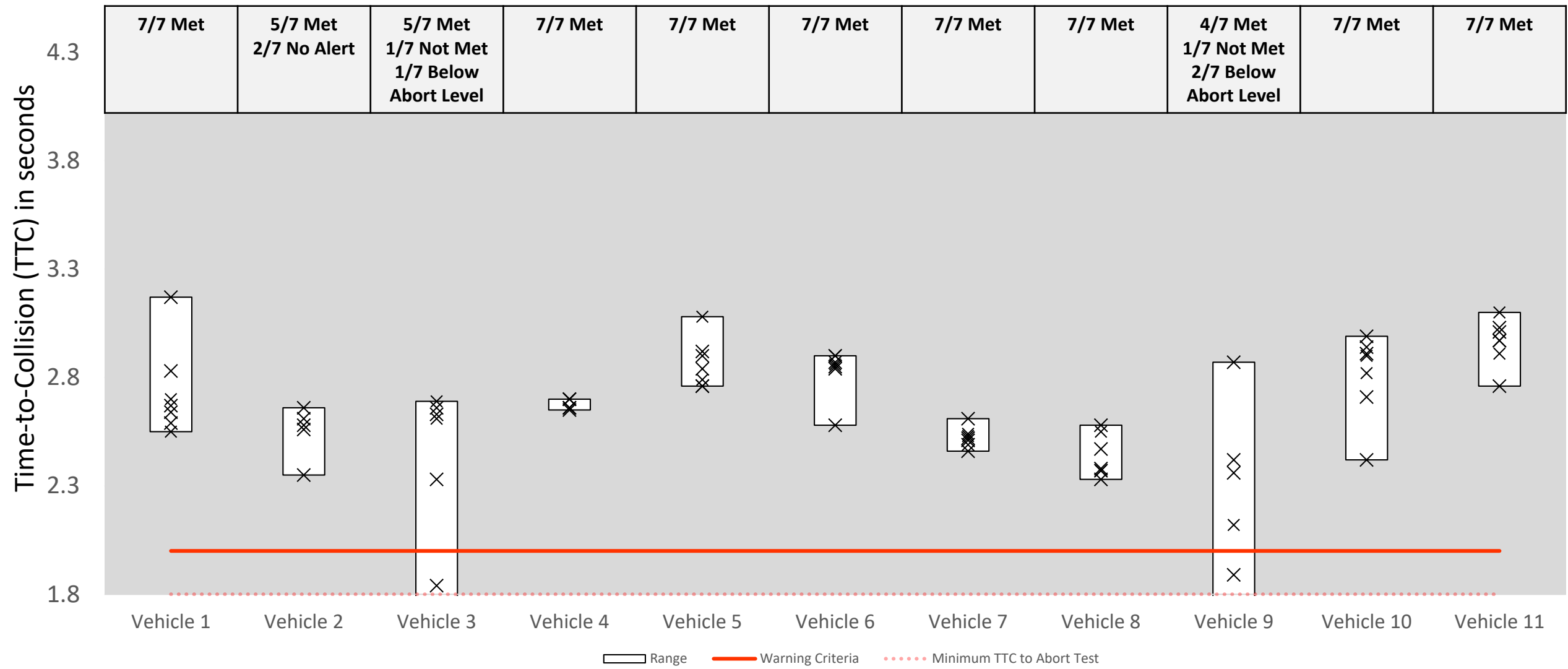
Scenario 3 Summary of Results

Test 3a: Slower POV



Scenario 3 Summary of Results

Test 3b: Slower POV with 25% Offset



Runs Meeting Warning Criteria

Vehicles	1a: Stopped Motorcycle Centered	1b: Stopped Motorcycle Offset	1c: Stopped Motorcycle Behind Mid-Size Automobile	2a: Decelerating Motorcycle Centered	2b: Decelerating Motorcycle Offset	3a: Slower Motorcycle Centered	3b: Slower Motorcycle Offset
1	7	7	7	7	7	7	7
2	1	0	2	2	1	7	5
3	0	0	0	6	6	7	5
4	0	0	7	7	7	7	7
5	3	0	0	5	6	7	7
6	4	5	2	7	7	7	7
7	1	7	6	6	4	7	7
8	7	6	0	1	0	6	4
9	5	0	4	7	7	7	7
10	6	5	7	7	7	7	7
11	7	5	7	7	7	7	7

Concluding Remarks

- Each SV issued an FCW alert in response to a motorcycle POV, however...
 - The scenario-based performance differed
 - The within-scenario performance differed
- Additional related research is presently underway

Questions?



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