



Light Vehicle and Heavy Truck On-Road Test Results

Ryan Harrington

IVBSS 2008 Public Meeting

Ypsilanti, MI

April 10-11, 2008



Outline

- Introduction
- Light Vehicle On-Road Test Results
- Heavy Truck On-Road Test Results



Objectives of On-Road Tests

Objectives:

1. Measure system's ability to deal with false/nuisance alerts
2. Assess alerts in perceived crash situations
3. Evaluate system availability
4. Develop a mental model and an understanding of system alert logic

Heavy Truck - Road

- LWDR**
- Driver #243
Trip #476-(397) [00:00:18]
Alert Starts @ 208520
LWDR
 - Driver #243
Trip #478-(399) [00:00:18]
Alert Starts @ 212290
LWDR
 - Driver #243
Trip #479-(402) [00:00:18]
Alert Starts @ 239600
LWDR
 - Driver #243
Trip #481-(414) [00:00:18]
Alert Starts @ 32370
LWDR
 - Driver #243
Trip #483-(420) [00:00:18]
Alert Starts @ 120110
LWDR
 - Driver #243
Trip #483-(421) [00:00:18]
Alert Starts @ 250050
LWDR
- LWDL**
- Driver #243
Trip #477-(398) [00:00:18]
Alert Starts @ 167170
LWDL
 - Driver #243
Trip #478-(400) [00:00:18]
Alert Starts @ 268590
LWDL

- Heavy Truck - Track
- Heavy Truck - Road**
- Light Vehicle - Track
- Light Vehicle - Road



Data Analysis Tool

Table: FCW1 (Row: 238640)

	Tractor	Trip	Time	AccelPedal	LdwCurvature	BoundaryLeft	BoundaryRight	Brake	BSLeftFront	BSLeftRear	BSRightFront	BSRightRear	Cu
	243	479	238600	78	0	1	2	0	2	1	14	0	0.0
	243	479	238610	76.8	0	1	2	0	2	1	0	0	0.0
	243	479	238620	76.4	6.3E-05	1	2	0	1	1	0	0	0.0
	243	479	238630	76.4	0.000126	1	2	0	1	1	0	0	0.0
	243	479	238640	72	0.000126	1	2	0	1	1	0	0	0.0
	243	479	238650	71.2000046	0.000189	1	2	0	1	1	0	0	0.0
	243	479	238660	70.8	0.000189	1	2	0	1	1	0	0	0.0
	243	479	238670	64	0.000252	1	2	0	1	1	0	0	0.0
	243	479	238680	62.8	0.000189	1	2	0	1	1	0	0	6.3
	243	479	238690	57.2	0.000189	1	2	0	1	1	0	0	-0.0
	243	479	238700	50	0.000126	1	2	0	1	1	0	0	-0.0

Light Vehicle On-Road Test Results



Number of On-Road Tests

Two On-Road Tests:

1. October 2007
2. February 2008 – Phase I Extension

System Changes from October 2007 test to February 2008:

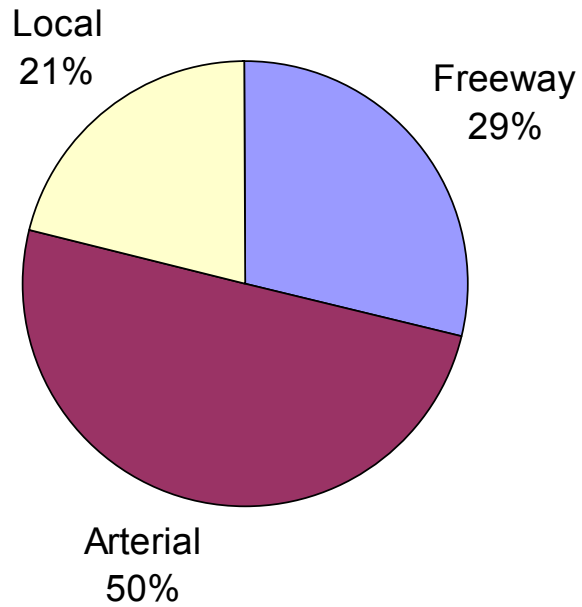
- Modified Lane Change Warning (LCW) alert logic
- Extended Forward Crash Warning (FCW) range to stopped vehicles
- Hardware and software upgrades

Light Vehicle Test Route

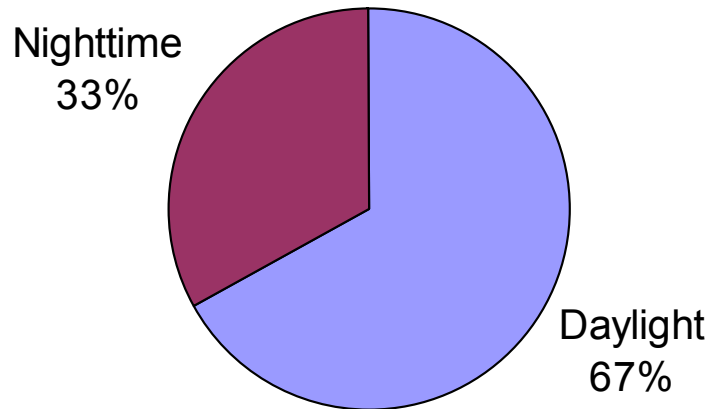


Microsoft Corporation and/or its suppliers. All rights reserved. Portions ©1990-2005 InstallShield Software Corporation. All rights reserved. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. ©2005 Tele Atlas North America, Inc. All rights reserved. ©2005 Tele Atlas, Inc.

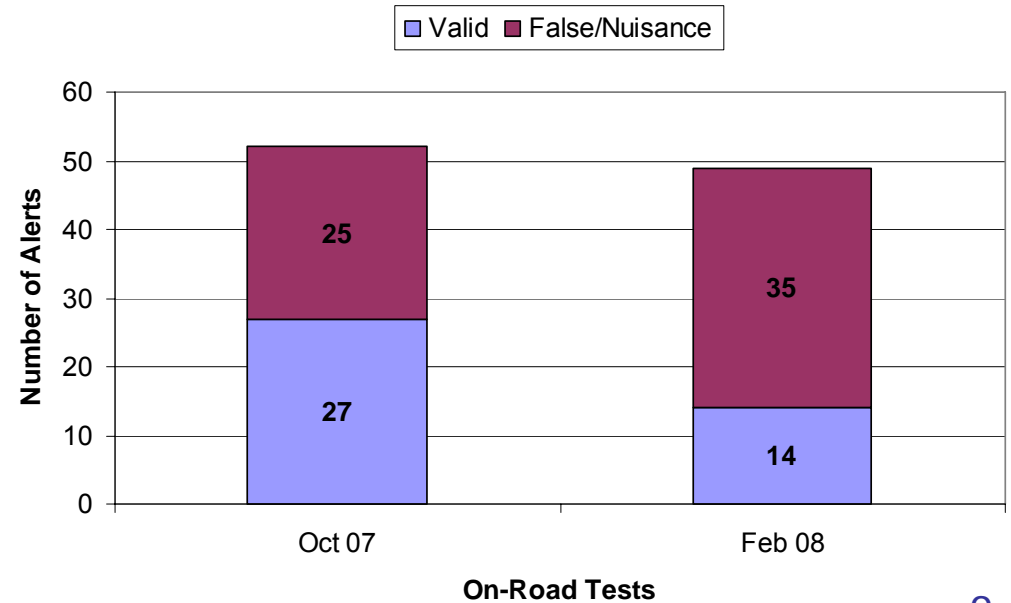
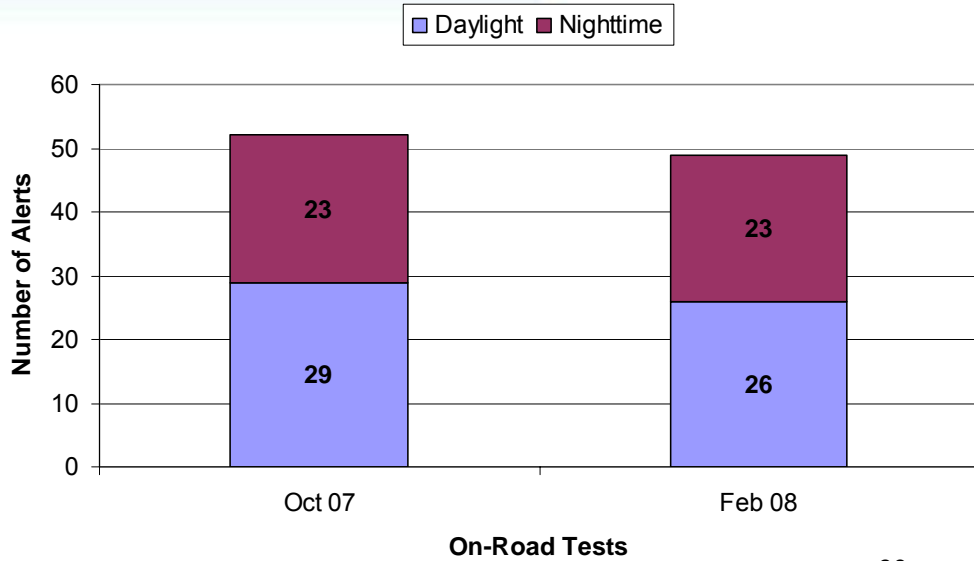
Exposure – Mileage Distribution



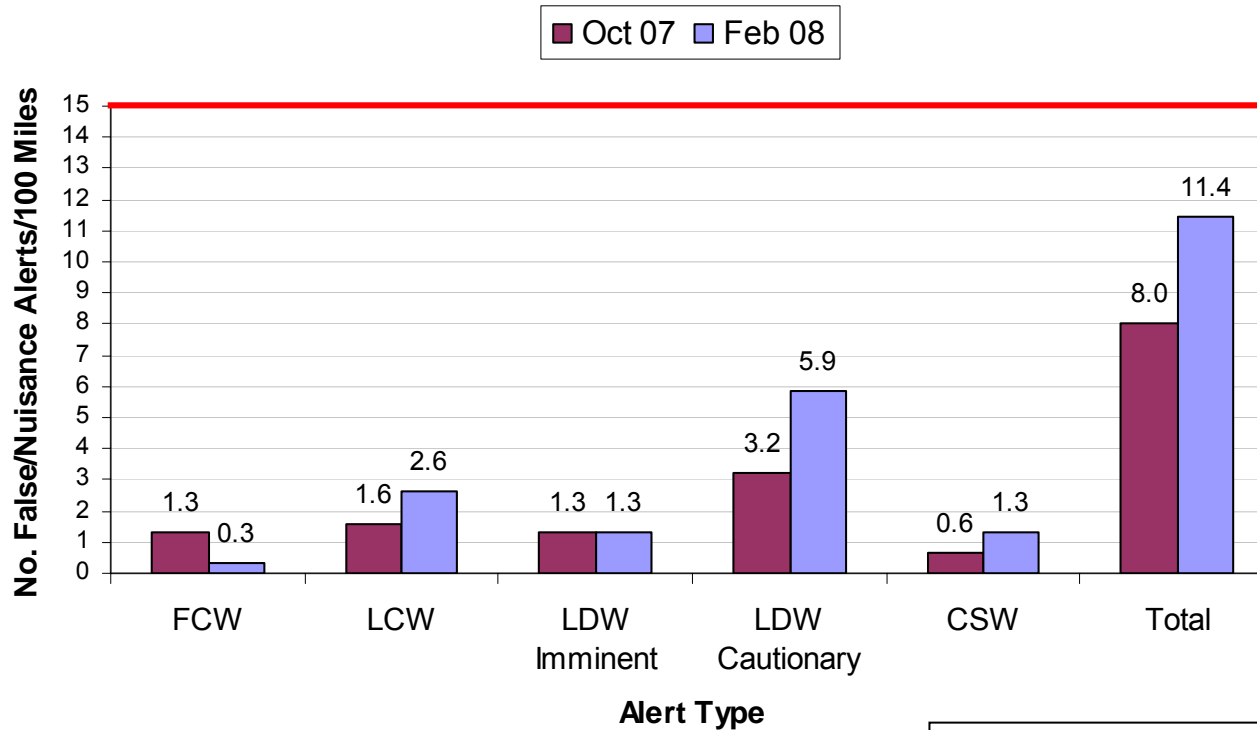
~ 310 miles total



Breakdown of All Alerts



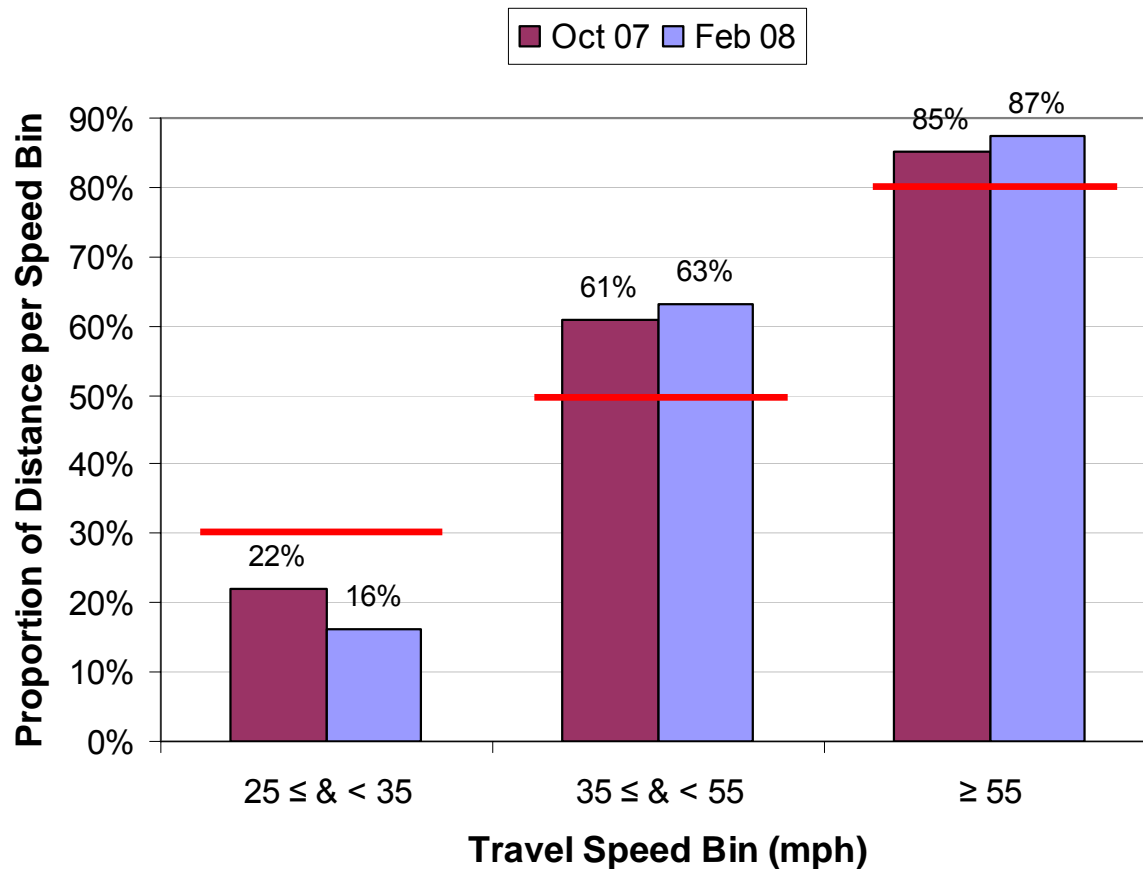
Breakdown of False/Nuisance Alerts



Red bar refers to maximum allowable rate

FCW: Forward Crash Warning
 LCW: Lane Change Warning
 LDW: Lane Departure Warning
 CSW: Curve Speed Warning

LDW Availability



Red bars refer to desired minimum performance

Example of Alert in Light Vehicle

IVSS Verification Test Build (Version: 1.1.1.0)

Video Data Windows

Heavy Truck - Road

LWDR

- Driver #243
Trip #476-097 [00:00:18]
Alert Starts @ 206520
LWDR
- Driver #243
Trip #478-096 [00:00:18]
Alert Starts @ 212200
LWDR
- Driver #243
Trip #479-092 [00:00:18]
Alert Starts @ 239600
LWDR
- Driver #243
Trip #481-014 [00:00:18]
Alert Starts @ 32370
LWDR
- Driver #243
Trip #483-020 [00:00:18]
Alert Starts @ 120110
LWDR
- Driver #242
Trip #483-021 [00:00:18]
Alert Starts @ 250050
LWDR

LWDL

- Driver #243
Trip #477-098 [00:00:18]
Alert Starts @ 167170
LWDL
- Driver #243
Trip #478-000 [00:00:18]
Alert Starts @ 262590

Heavy Truck - Track

Heavy Truck - Road

Light Vehicle - Track

Light Vehicle - Road

Camera: Forward

Camera: Side

Demo!

Table: FCW1 (Row: 238640)

Tractor	Trip	Time	AccelPedal	LdwCurvature	BoundaryLeft	BoundaryRight	Brake	BSLeftFront	BSLeftRear	BSRightFront	BSRightRear	Cu
243	479	238600	70	0	1	2	0	2	1	14	0	0.0
243	479	238610	76.8	0	1	2	0	2	1	0	0	0.0
243	479	238620	76.4	6.3E-05	1	2	0	1	1	0	0	0.0
243	479	238630	76.4	0.000126	1	2	0	1	1	0	0	0.0
243	479	238640	72	0.000126	1	2	0	1	1	0	0	0.0
243	479	238650	71.2000046	0.000189	1	2	0	1	1	0	0	0.0
243	479	238660	70.8	0.000189	1	2	0	1	1	0	0	0.0
243	479	238670	64	0.000252	1	2	0	1	1	0	0	0.0
243	479	238680	62.8	0.000189	1	2	0	1	1	0	0	6.3
243	479	238690	57.2	0.000189	1	2	0	1	1	0	0	-0.1
243	479	238700	50	0.000126	1	2	0	1	1	0	0	-0.1

Subject.Trip.AlertID.Type : (243-479-002)LWDR Alert Starts @ 239600 Current Time: 238640

Speed - 00:00:00
00:00:18

Heavy Truck

On-Road Test Results



Number of On-Road Tests

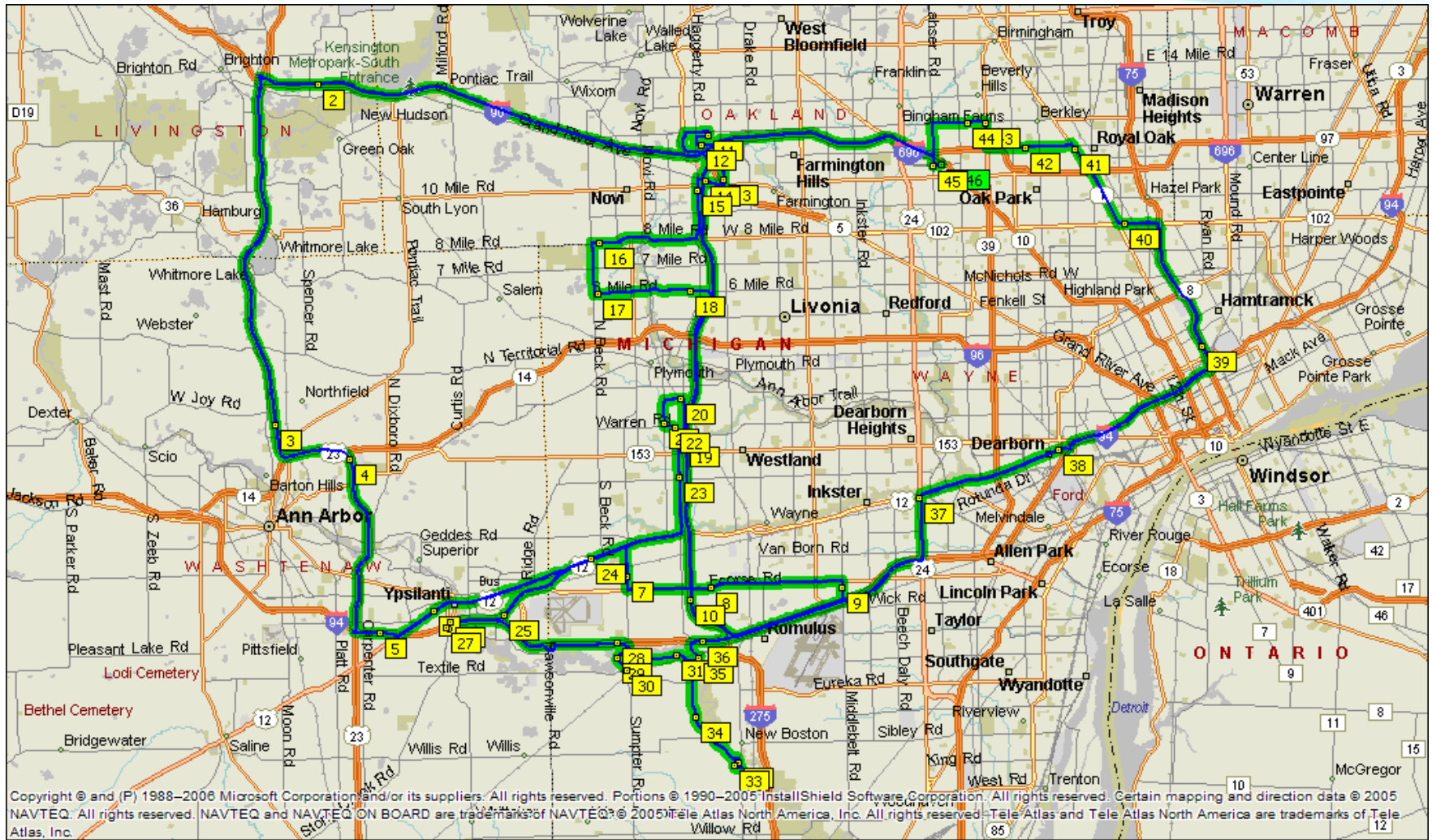
Three On-Road Tests:

1. September 2007
2. November 2007 - Retest
3. March 2008 – Phase I Extension

System Changes from September 2007, November 2007, to March 2008 tests:

- Modified alert suppression techniques
- Adjusted Lane Departure Warning (LDW) alert timing
- Improved true hazard detection and tracking

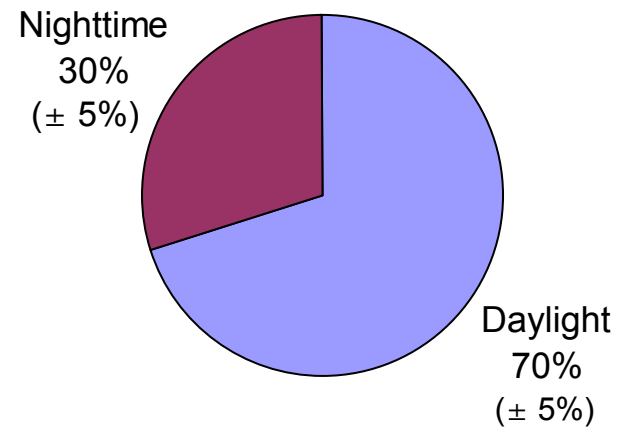
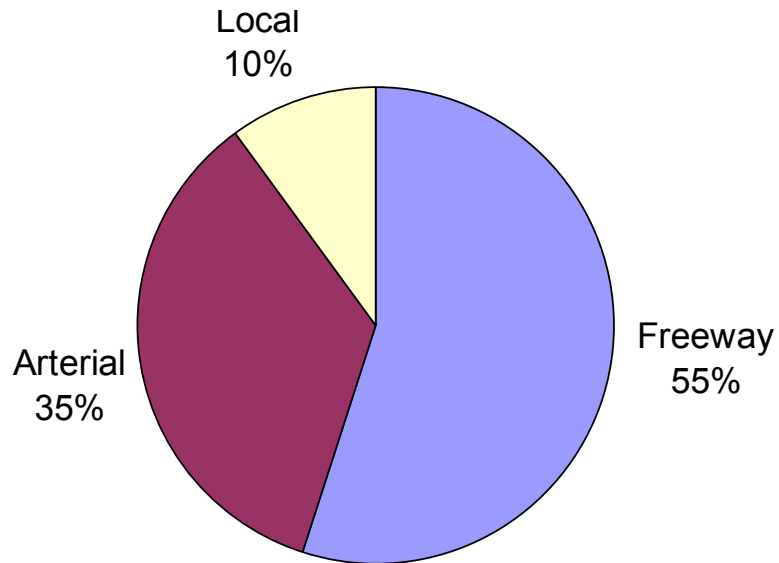
Heavy Truck Test Route



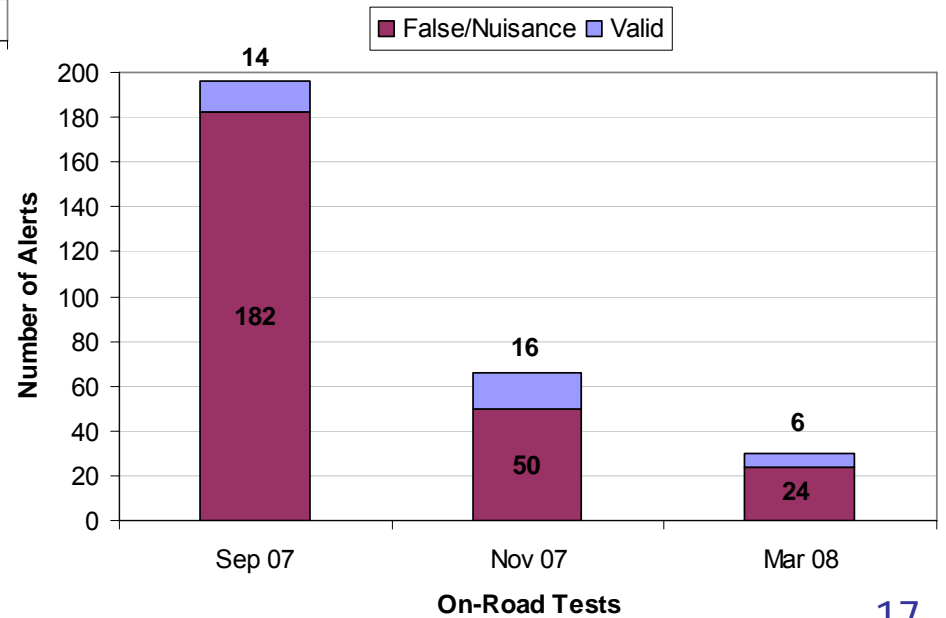
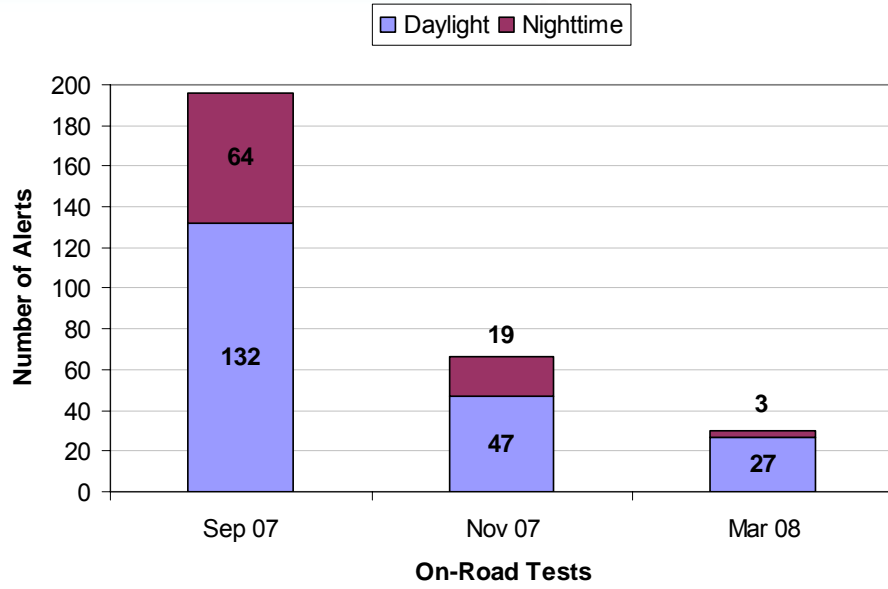
Copyright © and (P) 1988–2008 Microsoft Corporation and/or its suppliers. All rights reserved. Portions © 1990–2005 InstallShield Software Corporation. All rights reserved. Certain mapping and direction data © 2005 NAVTEQ. All rights reserved. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ © 2005. The Atlas North America, Inc. All rights reserved. TeleAtlas and TeleAtlas North America are trademarks of TeleAtlas, Inc.

Exposure – Mileage Distribution

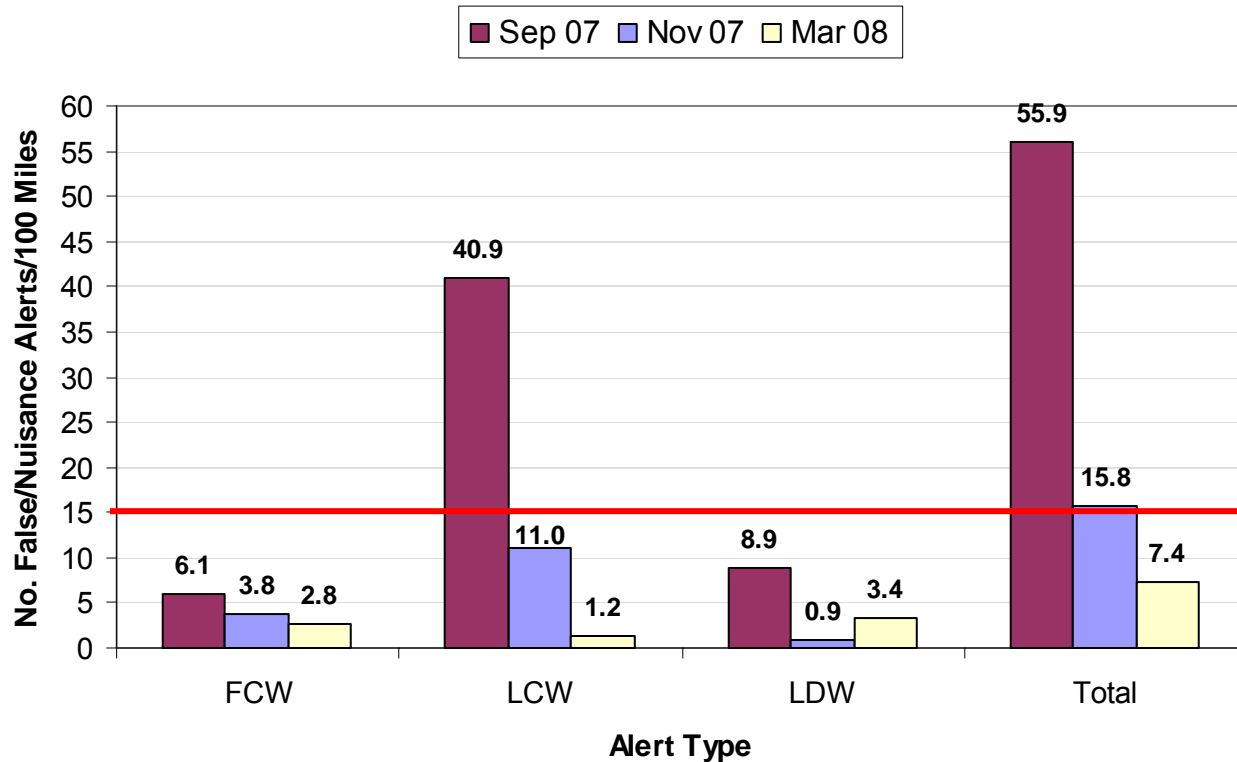
~ 317 miles total



Breakdown of All Alerts



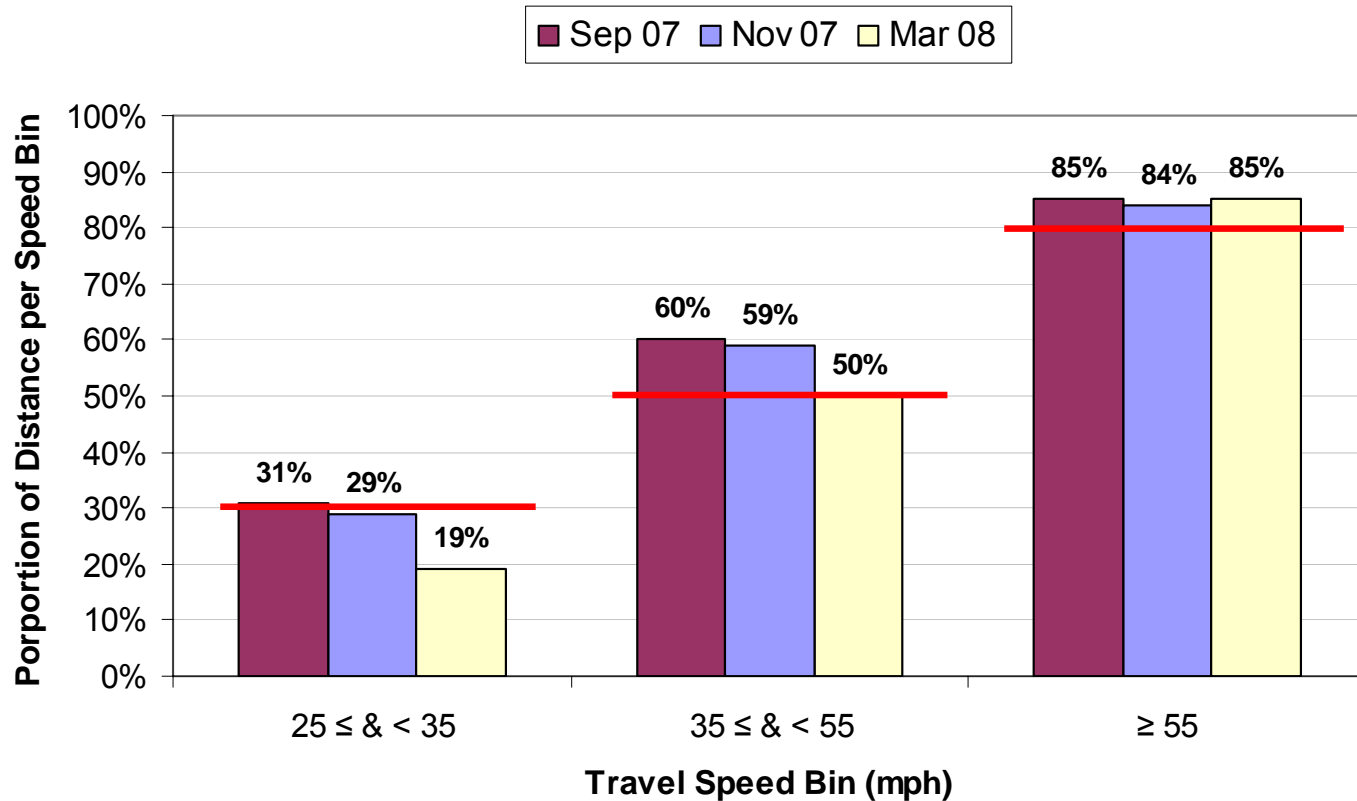
Breakdown of False/Nuisance Alerts



Red bar refers to maximum allowable rate

FCW: Forward Crash Warning
 LCW: Lane Change Warning
 LDW: Lane Departure Warning

LDW Availability



Red bars refer to desired minimum performance

Example of Alert in Heavy Truck

IVSS Verification Test Build (Version: 1.1.1.0)

Video Data Windows

Heavy Truck - Road

LWDR

- Driver #243
Trip #476-097 [00:00:18]
Alert Starts @ 206520
LWDR
- Driver #243
Trip #478-096 [00:00:18]
Alert Starts @ 212200
LWDR
- Driver #243
Trip #479-002 [00:00:18]
Alert Starts @ 239600
LWDR
- Driver #243
Trip #481-014 [00:00:18]
Alert Starts @ 32370
LWDR
- Driver #243
Trip #483-020 [00:00:18]
Alert Starts @ 120110
LWDR
- Driver #242
Trip #483-021 [00:00:18]
Alert Starts @ 250050
LWDR

LWDL

- Driver #243
Trip #477-098 [00:00:18]
Alert Starts @ 167170
LWDL
- Driver #243
Trip #478-000 [00:00:18]
Alert Starts @ 262590

Heavy Truck - Track

Heavy Truck - Road

Light Vehicle - Track

Light Vehicle - Road

Camera: Forward

Camera: Side

Demo!

Table: FCW1 (Row: 238640)

Tractor	Trip	Time	AccelPedal	LdwCurvature	BoundaryLeft	BoundaryRight	Brake	BSLeftFront	BSLeftRear	BSRightFront	BSRightRear	Cu
243	479	230600	70	0	1	2	0	2	1	14	0	0.0
243	479	238610	76.8	0	1	2	0	2	1	0	0	0.0
243	479	238620	76.4	6.3E-05	1	2	0	1	1	0	0	0.0
243	479	238630	76.4	0.000126	1	2	0	1	1	0	0	0.0
243	479	238640	72	0.000126	1	2	0	1	1	0	0	0.0
243	479	238650	71.2000046	0.000189	1	2	0	1	1	0	0	0.0
243	479	238660	70.8	0.000189	1	2	0	1	1	0	0	0.0
243	479	238670	64	0.000252	1	2	0	1	1	0	0	0.0
243	479	238680	62.8	0.000189	1	2	0	1	1	0	0	6.3
243	479	238690	57.2	0.000189	1	2	0	1	1	0	0	-0.1
243	479	238700	50	0.000126	1	2	0	1	1	0	0	-0.1

(Subject.Trip.AlertID.Type) : (243-479-002)LWDR Alert Starts @ 239600 Current Time: 238640

Speed - 00:00:00
00:00:18