

Data Collection and Anticipated Analyses

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Analysis Themes

- UMTRI team
 - Exposure
 - System performance
 - Safety impacts & driver interactions
 - Driver acceptance

- Volpe Center/USDOT –
 - Similar themes, different emphases.

System Performance



- IVBSS alert events
 - Number and frequency
 - Characteristics, e.g.,
 - Driving scenario and ‘severity’
 - False or non-false alerts
- Possible missed alert events
- IVBSS lane-tracking availability

Safety impacts & driver performance - Examples

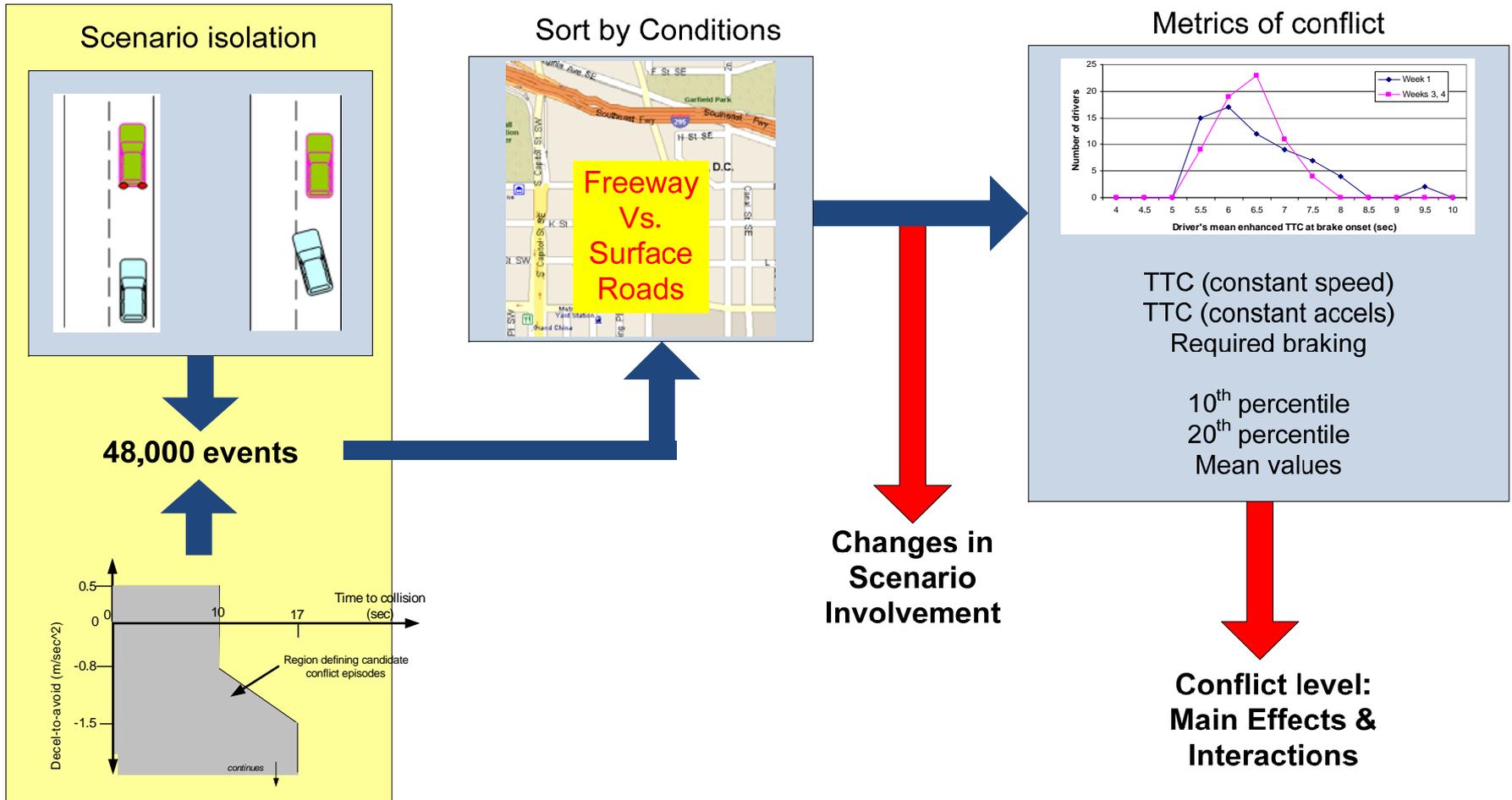


- Examine:
 - Driving pattern changes:
 - Involvement in scenarios, e.g., approaches to decelerating lead vehicles
 - Changes in pre-conflict and conflict distributions, e.g., headway times, forward conflict distributions, lane change metrics, curve-taking
 - Driver response to events
 - Unintended consequences
- Estimates of potential safety benefits - Volpe

Example - Forward conflict – analysis steps*



* ACAS FOT [USDOT HS 809 901]





Subjective Data

- Pre-drive questionnaires →
 - Post-drive questionnaires
 - On-site
 - Take-home
 - Driver debriefs
 - Focus groups
- Driver style
 - Focus
 - Calmness
 - Social resistance
 - Speed
 - Deviance
 - Planning
 - Driver behavior
 - Errors, lapses
 - Violations

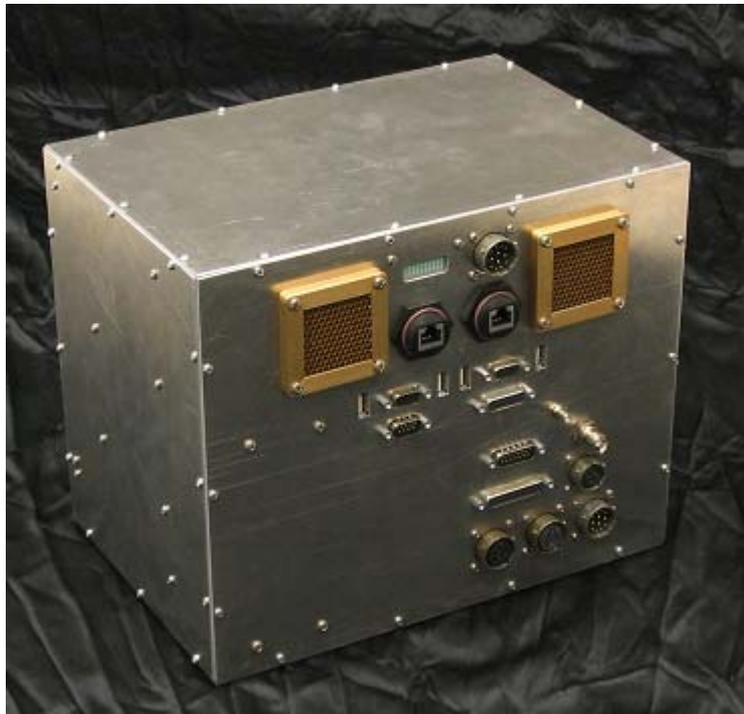


Subjective Data

- Pre-drive questionnaires
 - Post-drive questionnaires 
 - On-site
 - Take-home
 - Driver debriefs
 - Focus groups
- General Impression of IVBSS
 - Combinatorial Effects of the Warnings
 - Forward Crash Warning (FCW)
 - Lateral Drift Warning (LDW)
 - Lane Change/Merge Warning (LCM)
 - Overall IVBSS Warning Acceptance
 - Displays and Controls
 - Training and Ease of Learning



IVBSS Data Acquisition System



Data sources:

- CAN buses – IVBSS, OEM
- J1939 (heavy truck)
- 5 cameras with video capture & compression
- 6 or 7 radars
- Onboard map match (LV)

UMTRI Data acquisition system:

- Two CPU system
- Automotive-grade hard disks
- Second GPS
- Vehicle motion IMU
- Microphone.....ETC!
- GPRS/Edge cellular modem
- DAS power management system



Scope of Field Tests

Platform	Test	Drivers / usage period	Miles expected
Light vehicle	FOT	108 drivers @ 6 wks	250,000
	Ext. pilot	12 drivers @ 4 weeks	18,000
Heavy truck	FOT	40 drivers @ 22 wks	700,000
	Ext. pilot	8 drivers @ 1 wk	8,400

Onboard Data Archive



- Relational Databases plus video & audio files:
 - MPEG-4 compressed video with indexing for synching with numerical data
- Archive size: 2 to 5 TB per platform
 - Over half is video/audio
- Handling multi-rate, aperiodic, asynchronous sources:
 - Integrated on- and off-board database & analysis approaches



Off-Board Data Sources

- Driving records
- Highway information:
 - Michigan state base maps (e.g., intersections)
 - FHWA's HPMS roadway information
 - Southeast Michigan Council of Government maps (e.g., traffic signals)
 - Roadways mapped in previous FOTs
- Weather databases (optional)

Health measures, event counts, mileage, etc

System Health

Car:

driver	trip	Shutdow	Malfunction	DirtyRa	DasTempMin	DasTempMax	DasTempAve	EnclosureTem	EnclosureTe	EnclosureT	BatteryVMin	BatteryVMax	BatteryV	Target	Targets	Targets
87	68	0	0	0	0	10	4.4	-5	10	4	13	14	14	0	13	
87	67	0	0	0	0	5	5	0	5	4	13.5	14	13.9	0	12	
87	66	0	0	0	-15	5	-2.6	-15	10	-1	13	14	14	0	11	
87	65	0	0	0	0	0	0	-5	-5	-5	13.5	14	13.9	0	3	
87	64	0	0	0	-5	0	0	-5	0	-5	13.5	14	13.7	0	10	
87	63	0	0	0	0	0	0	-5	0	-2	13.5	14	14	0	14	
87	62	0	0	0	0	10	6.5	0	10	6	13.5	14	14	0	15	
87	61	0	0	0	0	5	3.1	0	5	0	13.5	14	14	0	10	
87	60	0	0	0	-10	5	-1.8	-10	5	-1	12.5	14	14	0	15	
87	59	0	0	0	-10	-10	-10	-10	-5	-9	14	14	14	0	12	
87	58	0	0	0	-20	-15	-17.8	-15	-10	-15	13.5	14	14	0	15	
87	57	0	1	0	10	10	10	5	5	5	10.8	10.8				
87	56	0	0	0	15	15	15	15	15	15	13.5	13.5	13.5	0	0	
87	55	0	0	0	10	15	11.5	5	15	10	12.5	14	13.5	0	12	
87	54	0	0	0	-5	15	5.8	-5	15	7	13	14	13.8	0	15	

Individual trips

driver	trip	miles	m	minutes	StartTime	CriticalOK	NonCriticalOK	Target	Threat	Vision	YawRate	DVI	Accel	Class2	Fusion	GPS	MapData	MapMatch	Radar	Scene	AtoD	LaneC
87	68	9.1	14.0	14.0	01-29 16:06	100.0	3.0	100.0	100.0	98.3	100.0	91.0	100.0	100.0	100.0	100.0	3.6	5.3	100.0	98.4	100.0	
87	67	2.1	8.0	8.0	01-29 14:10	100.0	96.0	100.0	100.0	97.1	100.0	91.0	100.0	100.0	100.0	100.0	66.8	100.0	100.0	97.2	100.0	
87	66	18.7	37.0	37.0	01-29 12:21	100.0	94.0	100.0	100.0	99.6	100.0	91.0	100.0	100.0	100.0	93.0	67.3	100.0	100.0	99.6	100.0	
87	65	0.0	0.0	0.0	01-28 21:33	100.0	0.0	100.0	100.0	0.0	100.0	90.0	100.0	100.0	100.0	100.0	70.4	100.0	100.0	0.0	100.0	
87	64	0.7	3.0	3.0	01-28 20:51	100.0	94.0	100.0	100.0	94.1	100.0	91.0	100.0	100.0	100.0	100.0	69.3	100.0	100.0	94.5	100.0	
87	63	1.1	5.0	5.0	01-28 19:01	100.0	95.0	100.0	100.0	95.9	100.0	91.0	100.0	100.0	100.0	100.0	67.8	100.0	100.0	96.2	100.0	
87	62	3.8	11.0	11.0	01-28 13:51	100.0	97.0	100.0	100.0	97.1	100.0	91.0	100.0	100.0	100.0	100.0	67.5	100.0	100.0	97.2	100.0	
87	61	0.3	2.0	2.0	01-28 13:06	100.0	87.0	100.0	100.0	87.6	100.0	91.0	100.0	100.0	100.0	100.0	68.1	100.0	100.0	88.1	100.0	
87	60	3.8	27.0	27.0	01-28 11:43	100.0	99.0	100.0	100.0	99.3	100.0	91.0	100.0	100.0	100.0	100.0	67.9	100.0	100.0	99.4	100.0	
87	59	0.7	2.0	2.0	01-25 14:30	100.0	0.0	100.0	100.0	0.0	100.0	90.0	100.0	100.0	100.0	100.0	67.5	100.0	100.0	0.0	100.0	
87	58	0.5	2.0	2.0	01-25 11:28	100.0	78.0	100.0	100.0	78.1	100.0	90.0	100.0	100.0	100.0	100.0	69.5	100.0	100.0	78.4	100.0	
87	57	0.0	0.0	0.0	01-23 17:33	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87	56	0.0	0.0	0.0	01-23 16:47	100.0	100.0	100.0	100.0	100.0	100.0	90.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	100.0	100.0
87	55	1.1	12.0	12.0	01-23 16:35	100.0	97.0	100.0	100.0	97.6	100.0	91.0	100.0	100.0	100.0	100.0	67.8	100.0	100.0	97.7	100.0	
87	54	7.9	33.0	33.0	01-23 15:18	100.0	88.0	100.0	100.0	99.4	100.0	91.0	100.0	100.0	100.0	67.6	67.7	100.0	100.0	99.4	100.0	

Record: 1 of 13

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