Evaluation of ITS Safety Support Services in Japan

13th ITS World Congress

SS24(AP) “Smartway - ITS strategy for safety in Japan”

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Keio University

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J-Safety in Japan

Objective

1.The Pursuit of IT Structural Reform Capabilities

(2) Realization of a Safe and Secure Society

The world's safest road traffic environment
-Reducing traffic fatalities to 5,000 or below-

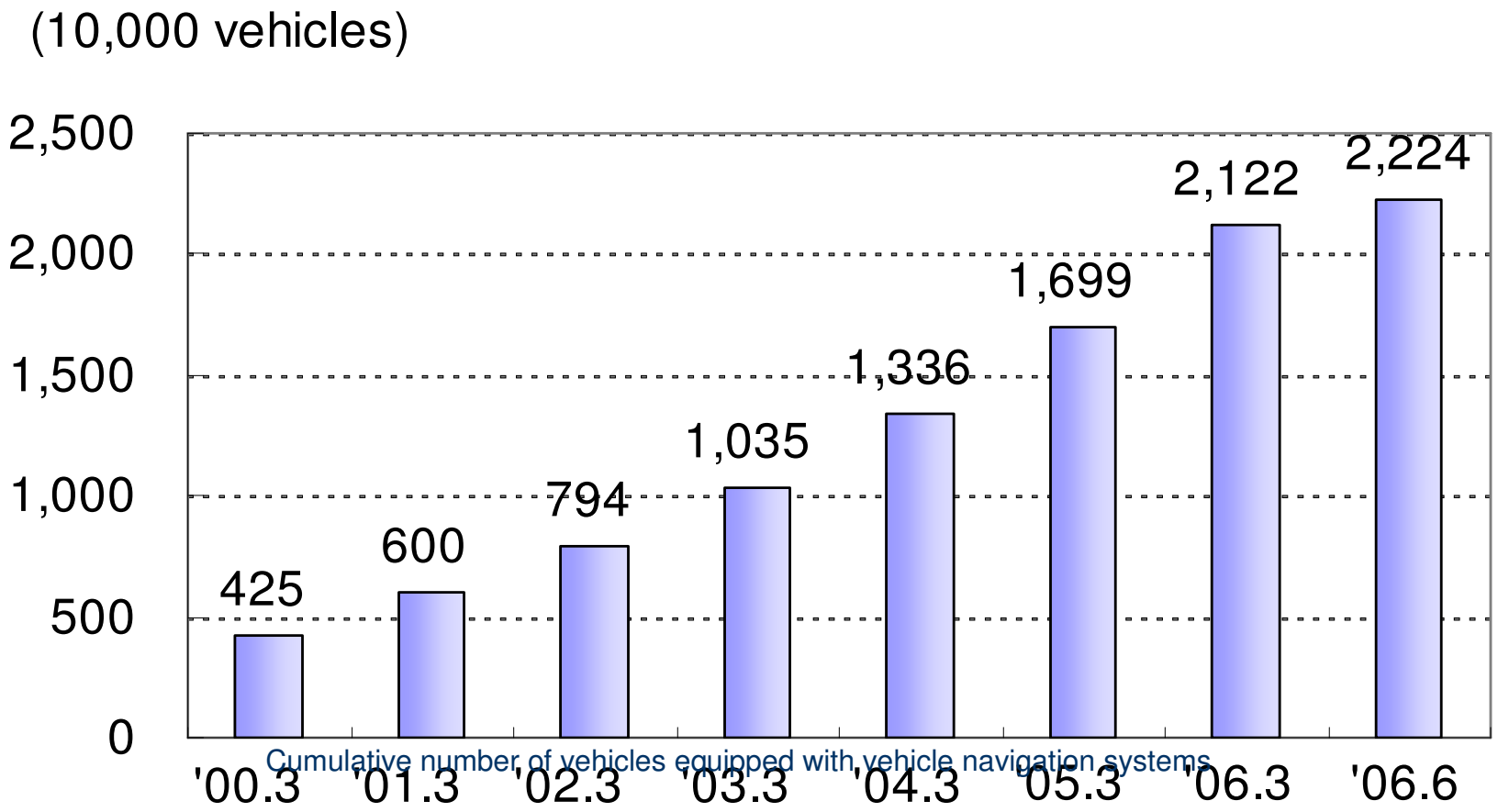
Concrete policy

Form a joint committee from the public and private sectors in early 2006 to work towards the realization of Cooperative Driving Safety Support Systems

Conduct large-scale verification testing, verification, evaluation, of Driving Safety Support Systems by FY 2008.

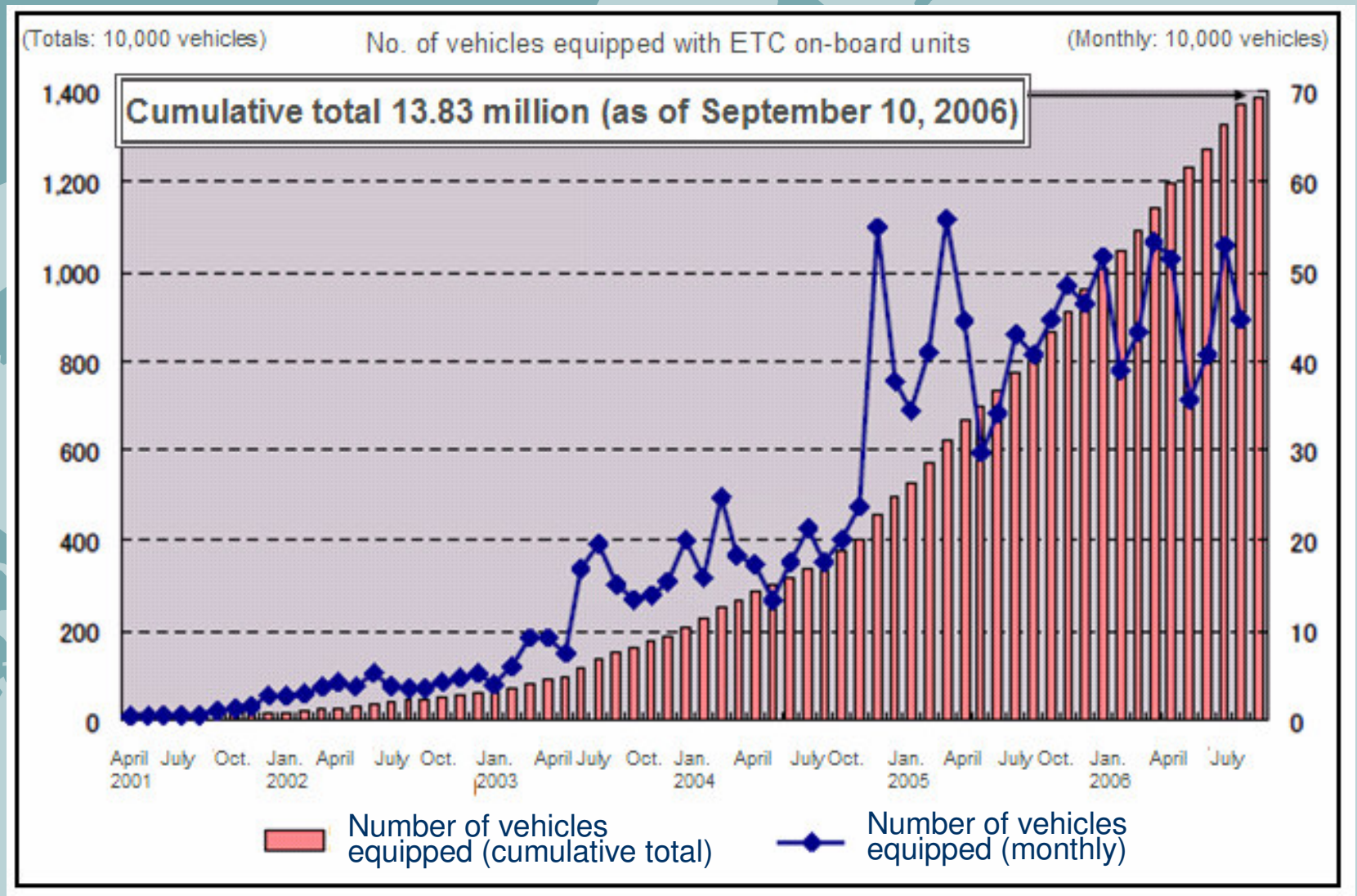
Deploy Driving Safety Support Systems throughout the country with a focus on sites where traffic accidents occur frequently

Penetration of Car Navigation System in Japan



Cumulative number of vehicles equipped with vehicle navigation systems

Penetration of ETC in Japan



Number of vehicles equipped with ETC on-board units

Vehicle Safety R&D Project in Japan

	Concept	VSC
ASV (Advanced Safety Vehicle) Since 1991	-2005 Autonomous Control 2005- Extension to Utilization of V-V communication	None Not yet Determine
AHS (Advanced Cruise-Assist Highway System) Since 1996	Infrastructure Cooperative systems	DSRC (mainly highway)
DSSS (Driving Safety Support Systems) Since 1998	Infrastructure Cooperative systems	IR and DSRC (mainly urban area) Since 2006

All the systems assume the use of car navigation systems

- Micro processors (3-6units per device)
- Multimedia terminal as HMI device (DVD, Cellular, VICS, Digital TV)

Platform for VSC Technology using DSRC

Communication Technology

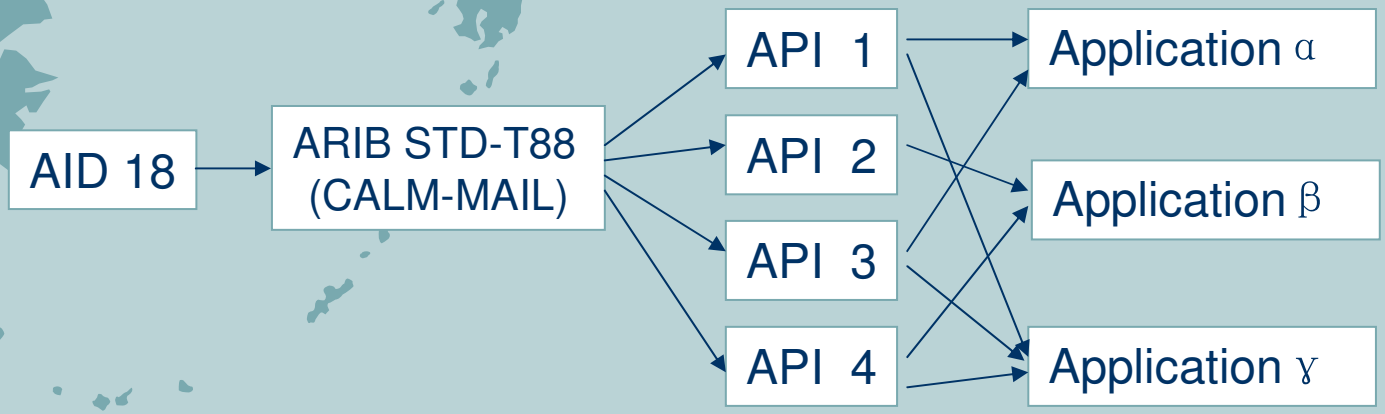
- Based on existing standards: ISO15628 and ARIB STD-T75,T-88
- Quick, secure and broadcasting to all the vehicles in the communication zone (No routing and dynamic allocation of communication address)
  ⇨ Desirable Configuration for VSC
- Realization of IP communication based on Non IP configuration (T-88)
- No communication cost

Concept of Platform

- **Basic configuration of DSRC (ISO15628)**

DSRC can be used in multiple applications but presumably, multiple units are needed to realize multiple applications

- **Basic configuration of API for the Platform**



AID:Application ID defined in DSRC L7(ISO15628)

Requirement for the Platform

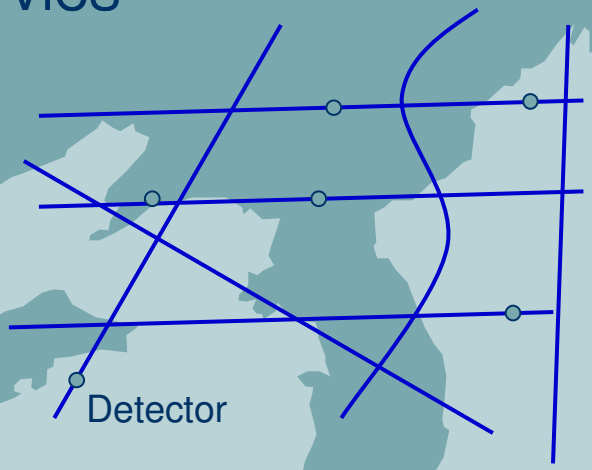
1. **Fostering ETC penetration**
   Systems based on the technology of ETC.
   Especially, applying fee payment functions to other usages.

2. **Enable Internet Connection at Parking area, etc**
   Disaster information, route guidance for taking refuge and for personal internet connection.

3. **Safety support information**
   Provision of location based safety support information.

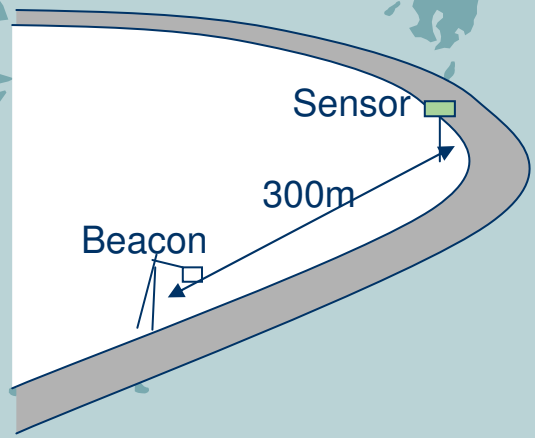
Difference between VICS Information

VICS



- Centerized Processing based on detector information
- Macroscopic network traffic flow information
- Reports of events such as congestion and accident, etc

Safety Services with DSRC



- Distributed Processing based on roadside sensor
- Microscopic location based information
- Transmission of incidents which might be the cause of congestion and accidents

Importance of Standardized Platform

- Certificate the inter-operability of devices
- Common framework for security and privacy protection
- Reducing the cost and the market risk of OBU
- Enhance road-traffic related businesses (Parking, Drive-through, etc)
- Reducing the cost of road-side infrastructure
- Establishment of Public-Private Partnership

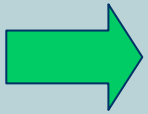
Technical Issue of Safety Support Services

- Location Oriented Technology
  - Where is the best place to install beacons?
- Driver Oriented Technology
  - What kind of messages are most understandable ?
  - What kind of media is easy to recognize ?

Timing, sequence, selection of media for providing messages

HMI Issues of Safety Information Provision

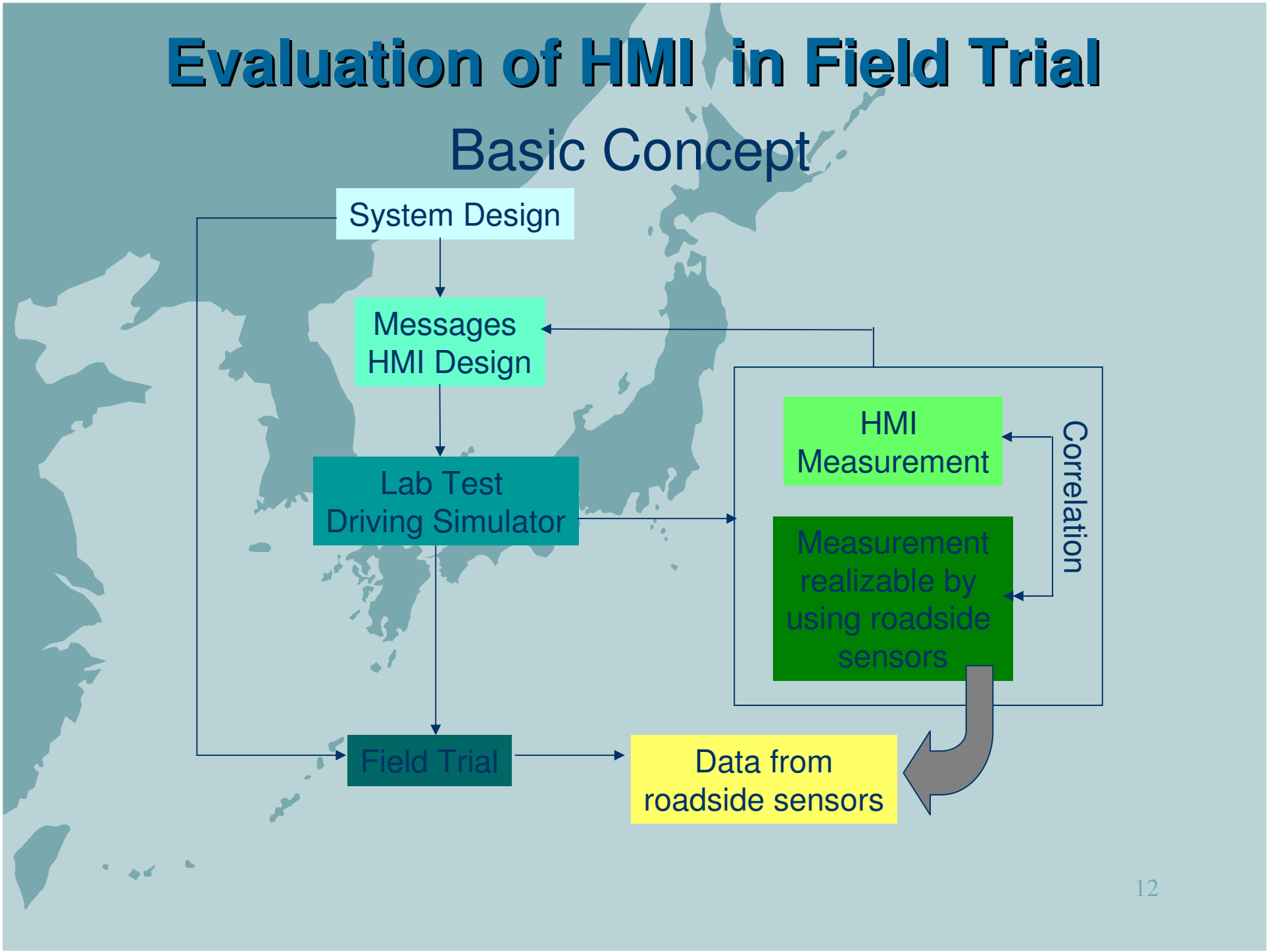
- Optimal combination of figure, sound, voice, still picture, etc
- Construction of basic messages and message structure
- Priority of safety information



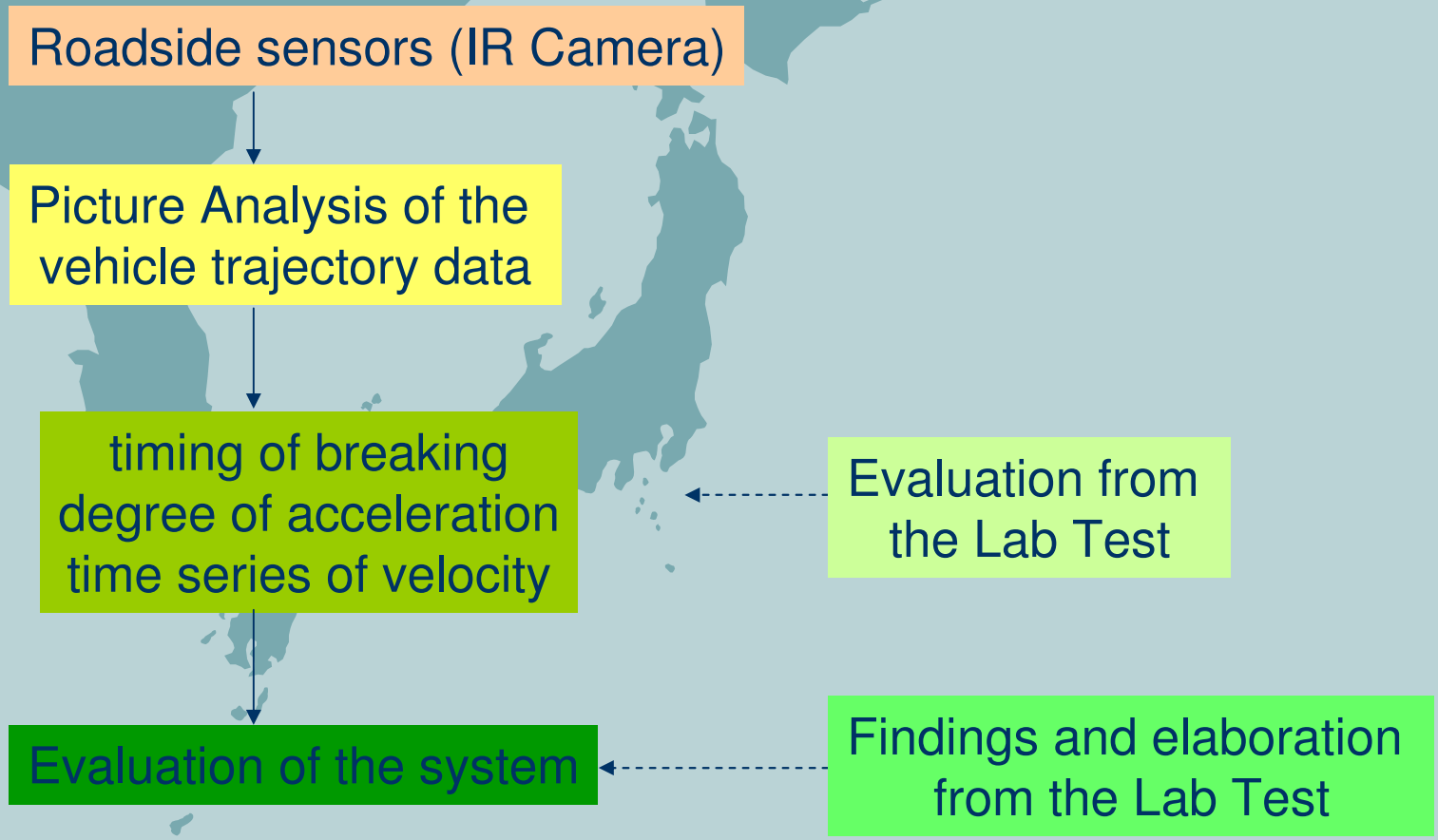
Further field test for HMI at merging points of the Metropolitan Express Way

Evaluation of HMI in Field Trial

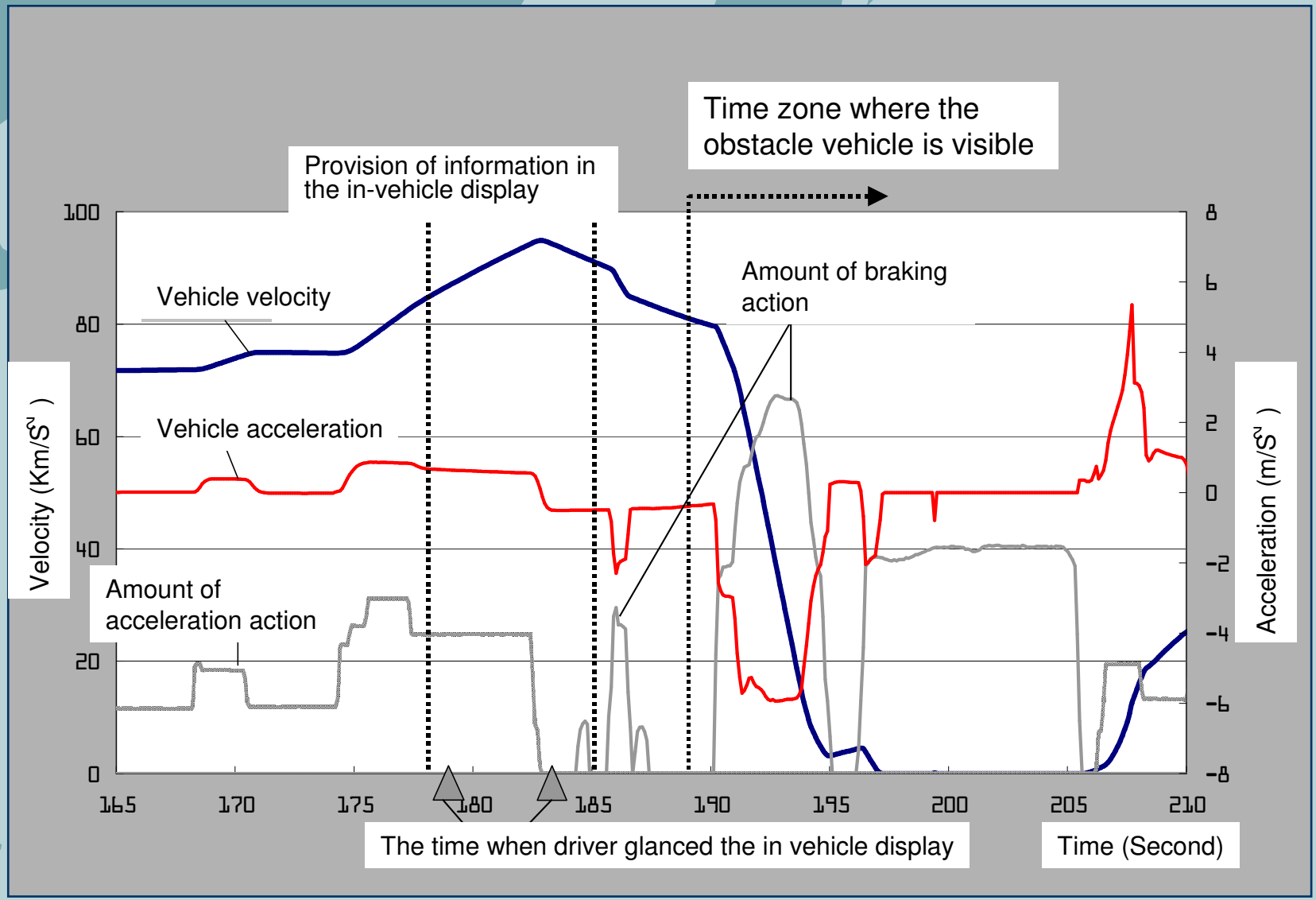
Basic Concept



Evaluation of HMI by using roadside sensors

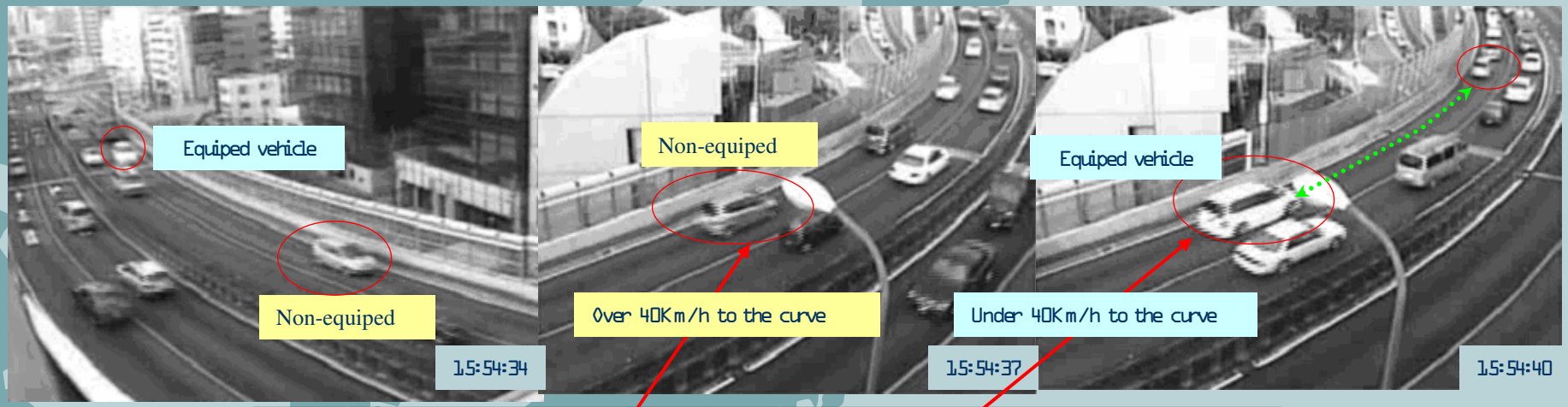


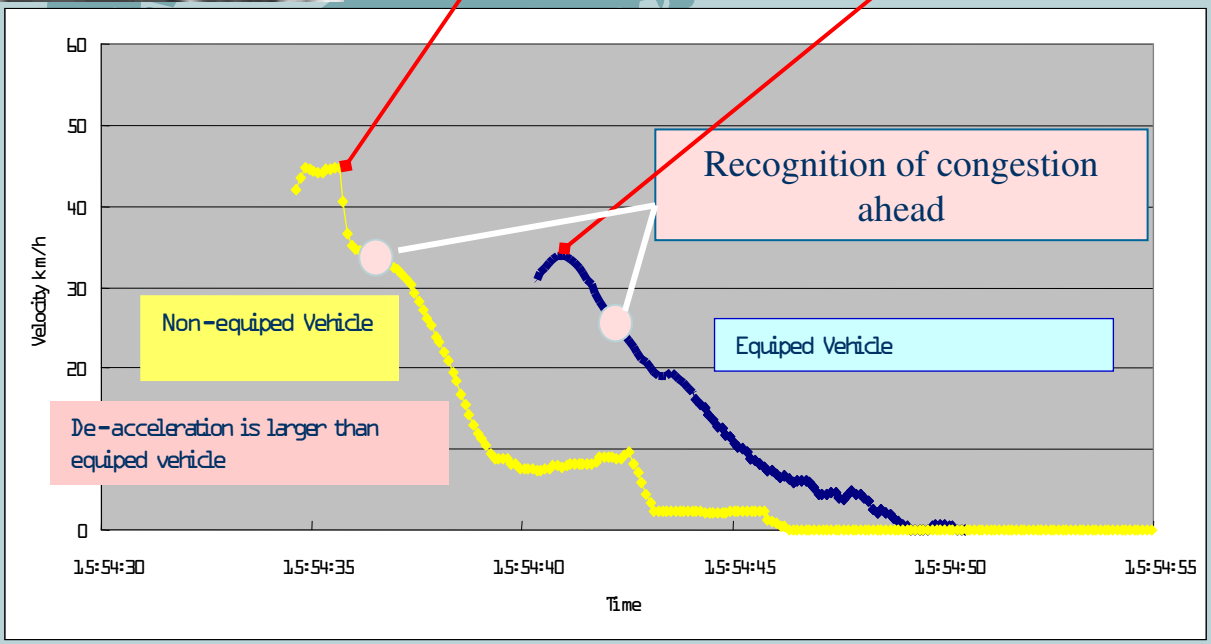
Driver's action and vehicle behavior observed in DS



Driver's action and vehicle behavior observed in Field Trial

23 April, 2005





Effects of the system implementation in the field test

	Number of Samples**	Percentage of risk taking vehicle within the sample+		
		Absolute value of negative acceleration		Over 60Km/h at the entrance of the blind curve
		Over 0.4G	Over 0.5G	
Before Implementation 19 days in the period of Oct.~Nov., 2005*	**8,507**	**29.3%**	**17.4%**	**4.9%**
After Implementation 19 days in the period of Mar.~Apr., 2005*	**9,705**	**27.1%**	**16.8%**	**4.4%**
Effect of the Implementation		**-8%**	**-4%**	**-10%**

* 14days, 5 wet days

** Samples are extracted from the images of CCD Video Camera under the following conditions
- •Certain obstacle exists beyond the blind curve
- •Cruising at over 30Km/h when the sample reached to the entrance of the blind curve where the roadside sensor is installed for detecting obstacles or congestion ahead.

\+ The velocity and the acceleration of sampled vehicles are estimated by picture analysis soft ware

Comparison of the Type of Accidents before and after the system implementation in the field test

	Accidents beyond the system requirements	Notification of the obstacles ahead by the system	Incidence of Secondary Accidents (B)/(A)
	Side wall collision by over speed (A)	Rear-end and/or side wall collisions cause by obstacles ahead (Secondary Accidents) (B)	
Before Implementation (28 days in 2003)	19	10	53%
After Implementation (92 days in 2005)	8	0	0%

Data source： Images of CCD camera recorded from 15 Oct to 12 Nov in 2003 and from 1 Mar to 31 May in 2005,respectively

Issues on HMI Design

To know how the drivers perceive when receiving short warning messages such as

tail end of congestion
congestion
accident
wreckage
vehicle breakdown
slow down

To know how the drivers act based on their understanding and perceived recognition

acceleration
de acceleration
steering
no-action

To know the driver's reaction at near-critical situation which might be the cause of accidents

(In Japanese Hiyari Hatto)


Thank you !