2007 AHS Symposium

Research Report 2
AHS Field Tests on the Metropolitan Expressway

2. Driving Safety Support Service Linked to Digital Maps

Advanced Cruise-Assist Highway System Research Association (AHSRA)

Akira Kuno

AHSRA

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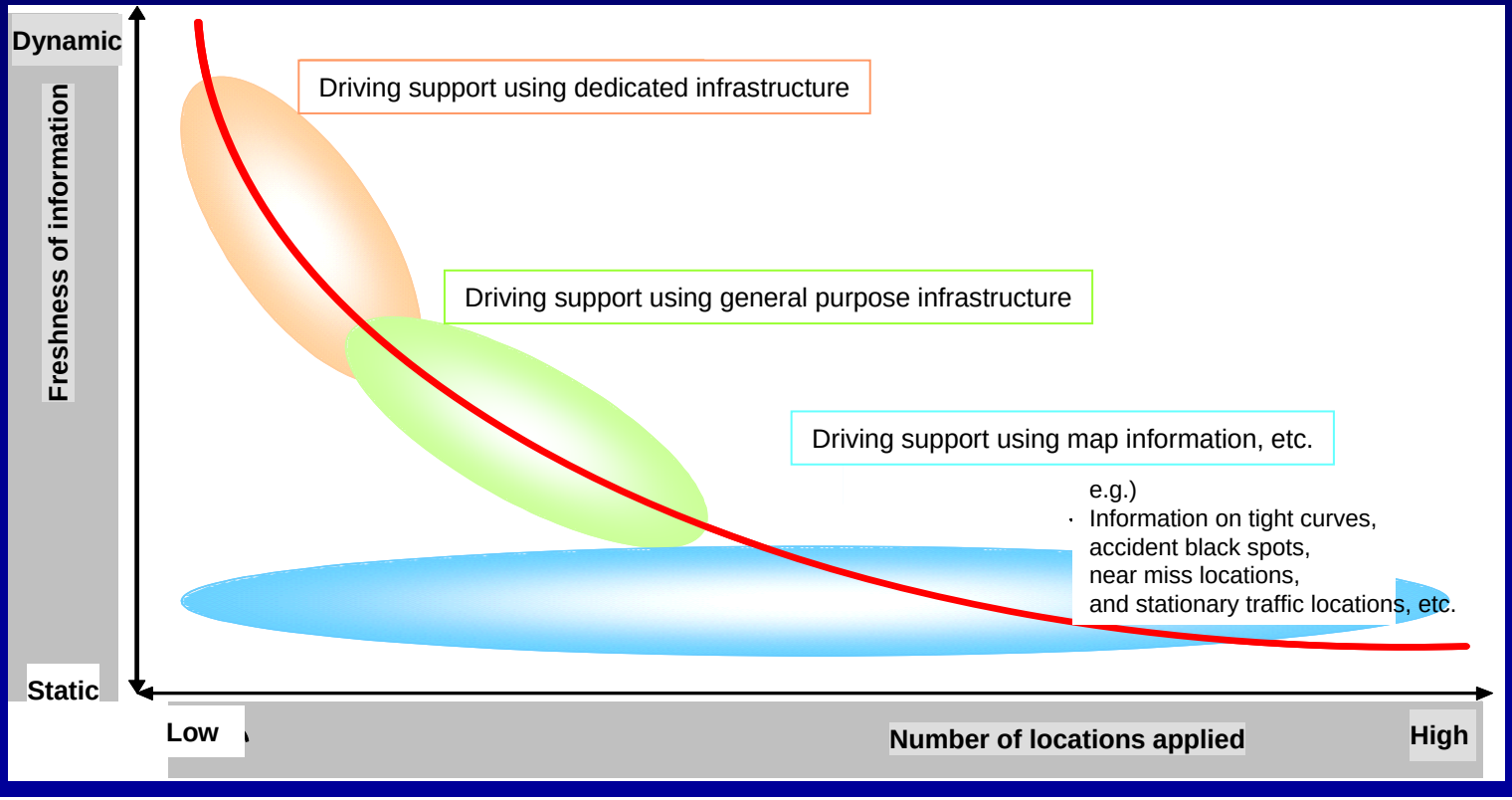
1. Overview of Coordinated Map Service
（1）Positioning

- In locations where there are multiple causes of accidents and where it is difficult to apply a dynamic information service due to cost-benefit considerations, a static information provision service is applied that utilizes a driving support service linked to maps that is speedy and also low costs



1. Overview of Coordinated Map Service
(2) Contents of Service

- Information on accident black spots is stored in advance in on-board equipment and using GPS data, when the vehicle enters such a location the on-board equipment recognizes this from the vehicle's location (service-in) and if the equipment judges it necessary , according to vehicle speed and position, it provides warning information through maps and sounds, thus supporting safe driving.

1．Overview of Coordinated Map Service
（3）Type of Service

Speed warning service when entering curve

Curve ahead, take care!

Curve ahead, take care!

Audio:
“Curve ahead, drive with care”

1．Overview of Coordinated Map Service
（3）Type of Service

Information provision service on accident black spots

Accident black spot, beware of collision

Audio:
“Accident black spot ahead, beware of collision”

2. Demonstrative Testing on Metropolitan Expressway
（1）Types of Testing

1. Preliminary Testing
   Test runs with publicly recruited test subjects

2. Testing on Public Roads
   Test runs with related manufacturers, experts and highway officials

2. Demonstrative Testing on Metropolitan Expressway
（2）Service Locations - Selection of Services

- Selection of service locations

  Selection of worst 50 accident black spots, on Line 4, Line 5, and Central Ring Route of Metropolitan Expressway

- Selection of services

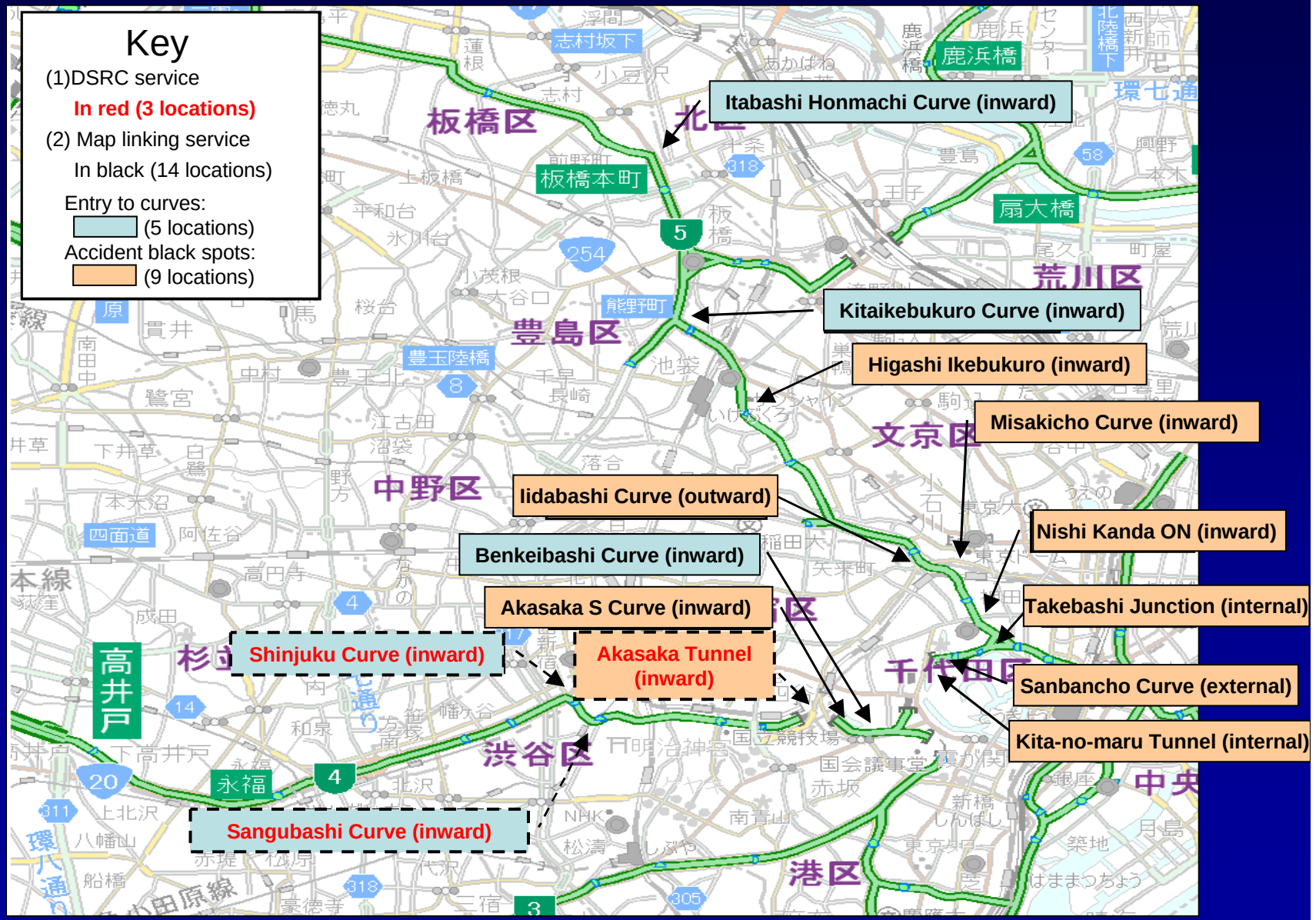
△ Speed warning service when entering curve

Locations where accidents involve impact with expressway facilities

△ Information provision service on accident black spots

All other locations

2. Demonstrative Testing on Metropolitan Expressway
（3）Service Locations



3. Preliminary Testing
（1）Testing Overview

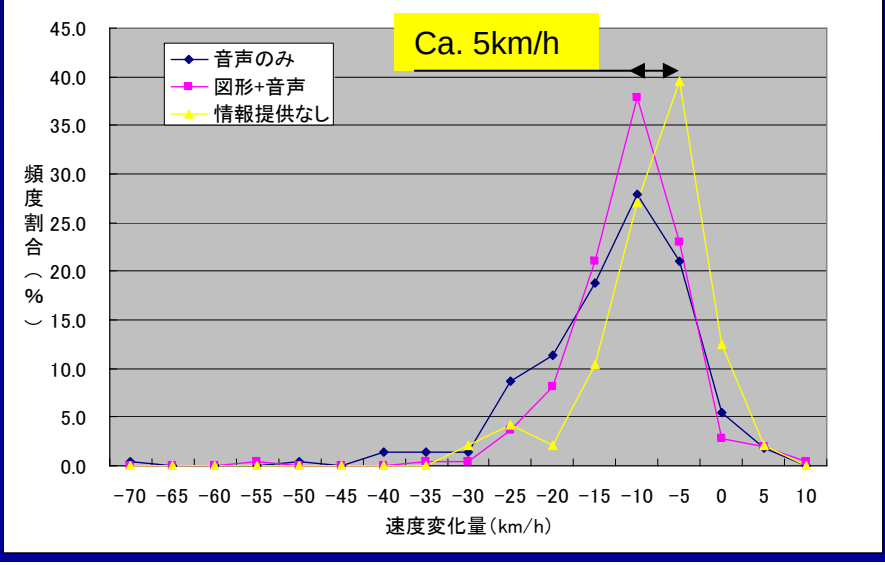
Items	Content
Period	January 29 to February 19 (three weeks)
Testers	(1)63 persons, men and women, between 20 and 69 (2) More than five years of driving experience (3) Persons with experience of driving on Metropolitan Expressway (once in several months, once a month, once a week) (4) Persons using car navigation equipment (including those with experience)
Driving Method	Three people make three return trips in the morning, lunchtime and evening of one day
Service Pattern	Combinations of the following patterns (1)No service (2) Information provision by audio, regardless of speed (3) Information provision by audio and charts, regardless of speed (4) Information provision by audio, only when speed is dangerously high (5) Information provision by audio and charts, only when speed is dangerously high
Collected Data	(1)Vehicle behavior data (time, position, speed, angular speed, acceleration rate before and after) (2)Questionnaire (per trip, and after completion) (3)Forward images (Recording of traffic environment) (4)Memos by those assisting tests (records of free flow of traffic, congestion, jams, etc.)

3. Preliminary Testing
（2）Testing Results

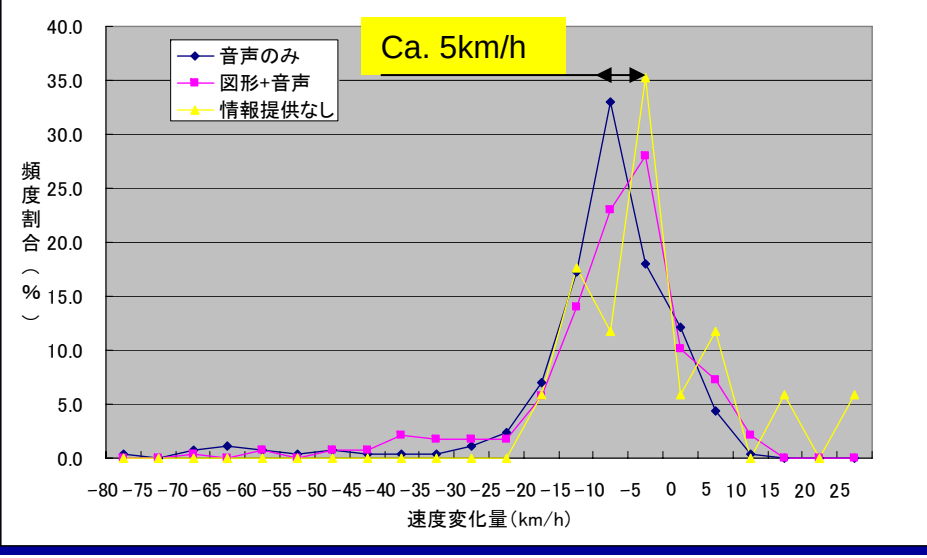
■ Compared to no service provision, with the service provided a drop in speed of approximately 5km/h was witnessed

■ There were no differences in behavioral data between “audio only” and “audio + charts”

Speed warning service when entering curve



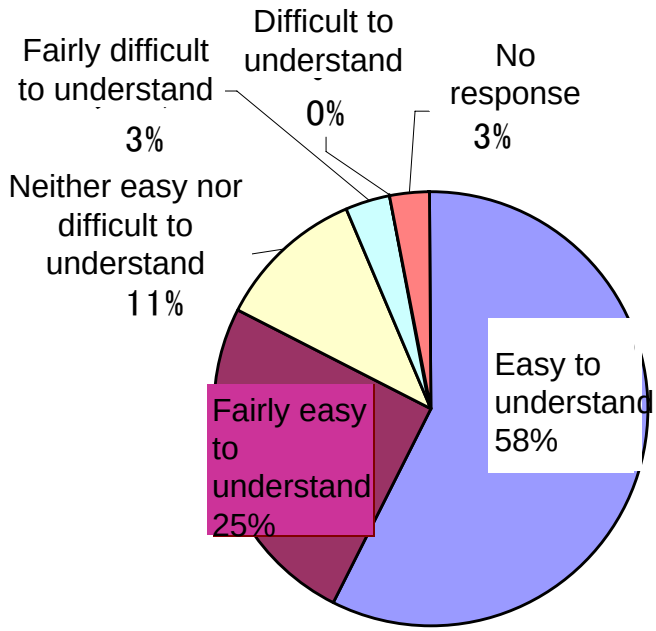
Information provision service on accident black spots



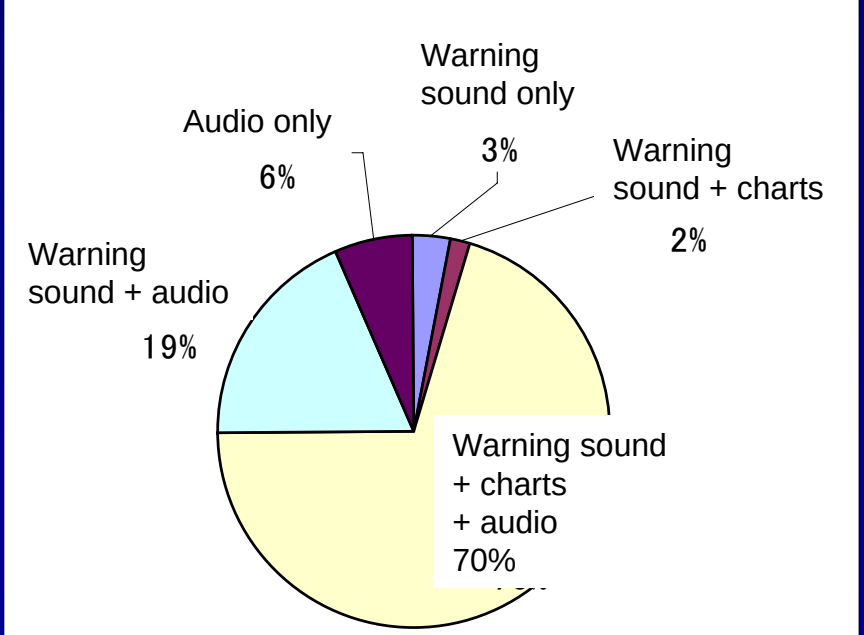
3. Preliminary Testing
（3）Survey Results - Comprehension

- 83% of respondents said information provided was “easy to understand”
- Although there were no differences in behavioral data for “audio only” and “audio + charts,” the preference in the questionnaire was for “charts + audio” (70%)

Was the information provided from the on-board equipment easy to understand?



What kind of method would you like to see information provided by?



3. Preliminary Testing
（3）Survey Results - Reaction

■ Approximately 80% of all respondents appraised the information provision positively.

■ Information provision at “certain speed limits” was better received than “constant provision.” in the question the provision of information at “certain speed limits” resulted in a reduction in the information being regard as “troublesome” among high frequency users (from 9.1 to 5.6%) and therefore receptivity improved.

3. Preliminary Testing
（3）Survey Results - Effectiveness

■ Approximately 80% of respondents indicated that information provision was “useful”

■ There was an upswing in the number of people responding that the service was useful in the evening (3rd test of day) rather than the morning

(Persons using the system on a number of occasions were more inclined to appraise it as “useful”)

■ Approximately 80% of respondents said the “want to use” the service

Therefore, there is receptivity to a service for driving support that is linked to maps

4. Testing on Public Roads

（1）Testing Overview

Participants

- Auto makers
- Electrical machinery makers
- Car navigation makers
- Universities
- Motor journalists
- Road managers

Period

Mon, May 15 to Fri, June 8, 2007

4. Testing on Public Roads
(2) Survey Results - Reaction

- There were hardly any negative responses that "I was surprised and shocked."
- More than half said that the information "prompted me to take care" and approximately 30% said "I thought it would be no problem to maintain my speed."

4. Testing on Public Roads
（2）Survey Results - Behavior

- There were no responses indicating “sudden braking” and no negative responses.
- The most frequent response was “I carried on driving as before (did nothing)” at approx. 60%, and the next most popular response was “I looked ahead.”
- There were few drivers who took immediate speed reduction measures after receiving the information, and they tended to assess the situation before acting.

4. Testing on Public Roads
（2）Survey Results - Effectiveness

- More than 40% responded that the service was “useful” or “more useful than not useful.”
- The most popular reason for this was because “It helped me prepare for what was ahead.”
- On the other hand, just under 40% of respondents gave their reason for the service not being useful as “there was no particular problem with continuing to drive as before.”

- More than 50% of respondents indicated that they would “like to use” or would “like to use rather than not use” the service.

5. Demonstrative Testing on Metropolitan Expressway- Results 1

(Pre-tests)

- Speed dropped by about 5km/h as a result of service provision
- Driver receptivity to the service was evident and there were no negative dangerous activities

(Public road tests)

- The necessity for the system compared to a DSRC system is relatively low.
- Evaluation was somewhat less positive than in pre-testing, but driver receptivity to the service was evident
- There were no negative responses
- There were a relatively high number of responses that timing of information was late

5. Demonstrative Testing on Metropolitan Expressway- Results 2

(1) For both services the driver is anticipating speedy information provision

(2) In order to optimize information provision timing it is necessary to consider driver tastes

(3) It is necessary to make it clear which roads and sections the services target

6. Conclusions and Future Challenges

1. The coordinated map service is effective in promoting safe driving with no resulting risky behavior.
2. Various elements identified during public road testing such as timing and HMI (Human Machine Interface) will be reflected in the implementation of trial service

Future Challenges

1. Determining criteria (standard) for selecting service locations, and the procedures (user manual) to implement service.
2. Examining the most suitable method for constructing a digital map database (accidents and the layout of roads).
3. Studying what form the HMI of other services should take.