

## ITS Radar Helpdesk Query: Reaction to and Retention of Signal Information

Query no:	8	Query initiator:	Jo White
Date:	11 <sup>th</sup> January 2006	Compiled by:	Jo Fitzgerald – Jonathan.Fitzgerald@fabermaunsell.com
Query topic areas:	Driver reaction to and retention of signal information		
Categories and level of relevance:	Traffic Management Technology	Very relevant	
	Traffic & Travel Information	Some relevance	
	Driver Behaviour	Very relevant	
	Technology Solutions	Some relevance	
Transferability to Highways Agency:	Meets Policy Objectives	N/A	
	Cost/Benefits Information	N/A	
	Development status	Essentially Research	
	Innovative	Yes	
	UK legal issues	N/A	
Summary:	<p>No research precisely specific to the query topic could be found. The most relevant articles are research papers on the comprehension and retention of information presented in-vehicle and the legibility of motorway variable message signs (with pictogram capability). Three papers representative of the nature and stage of research undertaken are presented. It may be that the generic conclusions reached in these and related papers (regarding factors affecting recognition and retention) may be transferable to signalling, but no specific research could be found to substantiate this.</p> <p>A study carried out in the UK by two academics from Loughborough University (examined in a Literature Review for the US Department of Transportation) produced some generic conclusions which might be relevant to reaction to and retention of signal information. Unsurprisingly, the ability of drivers to recall messages was affected by the:</p> <ul style="list-style-type: none"> <li>• modality of message presentation (the symbolism used to convey the information).</li> <li>• length of 'messages'</li> <li>• length of the retention period</li> <li>• age of the driver</li> </ul> <p>A similar line of research was followed in the US. Memory retention of drivers was tested for 'messages' displayed on an in-vehicle information system. This study investigated:</p> <ul style="list-style-type: none"> <li>• how message format affects comprehension</li> <li>• how message format affects memory retention</li> <li>• how does driver age impact on the recall of visual messages</li> </ul> <p>Also within the UK, during the development of display parameters for the Motorway Signal Mark 4 (MS4), research was carried out into the comprehension of the signal by drivers.</p> <p>The direct value of the research conclusions is questionable.</p>		

## Introduction

This document is provided in response to the above query regarding Driver reaction to and retention of signal information. This has been interpreted to relate to signalling used on the Motorway and Trunk road network, as opposed to signalling within an urban (UTC) environment. No research specific to roadside/gantry based signalling could be found. Some representative research, identifying factors affecting comprehension and retention of messages is cited. The transferability of these conclusions to signalling is uncertain.

## Driver Memory Retention of In-Vehicle Information System Messages

A study was carried out into the factors affecting driver memory retention of information messages. The report centres on in-vehicle information systems, but the findings might possibly be extrapolated to cover signal information.

Three research questions were asked:

- How does in-vehicle visual message format affect comprehension?
- How does message format affect memory retention?
- What impact does driver age have on recall of in-vehicle visual messages?

Driver recognition scores on both text and symbol messages were similar (see Table 1).

Message Format	Percentage Correctly Recognised
High comprehension* symbol	95.6
Short† Text	95.7
Long‡ Text	95.8

**Table 1: Driver message recognition scores as a function of message format**

Message comprehension was also affected by question delay, with lower recognition scores for the longer delay conditions.

Question Delay (in seconds)	Percentage Correctly Recognised
0	94.6
50	90.1

**Table 2: Driver message recognition scores as a function of question delay**

Younger drivers (less than 30 years old) scored higher than older drivers (65 years old or older) in identifying the meaning of messages, particularly after a short period of time (fifty seconds).

Driver Age	Percentage Correctly Recognised
Younger drivers (less than 30 years old)	94.7
Older drivers (65 years old or older)	90.0

**Table 3: Driver message recognition scores as a function of driver age**

\* Measure of comprehension defined in previous research: high comprehension symbols defined as those recognised by 91.9% - 99.8% of people.

† Mean of 2.5 words per message

‡ Mean of 5.3 words per message

## **Evaluation of the Ability of Drivers to Assimilate and Retain In-Vehicle Messages**

The literature review carried out by the National Transportation Systems Center on behalf of the US department of Transportation includes a section concerning this study. The paper describes experiments evaluating the ability of drivers to assimilate, retain and act on information received while in transit. It then makes recommendations accordingly.

The task of receiving information is split into three stages:

- assimilation (consisting of detection, recognition and interpretation)
- consideration of relevance
- committing to memory

The assimilation process and the ability of drivers to recall information may be affected by the layout, legibility and complexity of the message. Subject variables, such as age and educational levels, also play a part.

The ability of drivers to recall messages was affected by the length and type of message and the length of the retention period. Recommendations were made concerning the amount of information that should be displayed and the presentation of the message.

## **MS4 off-road research summary report**

The report summarising the research trials for Motorway Signal Mark 4 (MS4) is not immediately relevant to the query, but does draw a number of conclusions related to the subject:

- recall rates of all text messages shown on MS4 were greater than 93%
- recall rates of all pictograms with text shown on MS4 were greater than 94%
- ambient lighting conditions (daylight/darkness) had little effect on recall rates

## **References**

- Driver Memory Retention of In-Vehicle Information System Messages, Richard J Hanowski & Barry H Kantowitz, Transportation Research Record No 1573, pp 8-16
- Understanding and Predicting Traveler Response to Information: A Literature Review, Jane Lappin & Jon Bottom, Document Review: "An Evaluation of the Ability of Drivers to Assimilate and Retain In-Vehicle Traffic Messages" by R Graham & VA Mitchell, pp105
- MS4 off-road research summary report, BR Cooper, M Freeman & JC Mitchell