Driving performance on an expressway under fog conditions and its improvement use of a fog warning system

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CHAPTER 1

INTRODUCTION

1.1 Background

The problems associated with vehicle driving performance and safety in fog have been with us since the introduction of the motor car. As the community developed an awareness of the trauma of road accidents, so it developed an awareness that this trauma was significantly increased when accidents occurred during periods of reduced visibility, particularly when such restriction was due to fog.

A major reason for this increased concern is attributable in a large part to the phenomenon of the multiple vehicle nature of accidents which occurred during fog conditions.

With the development of the multi-lane limited access motorways, construction of which expanded dramatically throughout the world in the 1950s, the frequency of multiple vehicle accidents in fog and the number of vehicles involved in such accidents increased dramatically and considerable effort was spent throughout the world to try and determine the reason for these accidents and identify steps which could be taken to reduce the frequency and severity of these events.
number of systems were developed in order to improve driving performance during these conditions. Experiments were even carried out on the effectiveness of seeding the fog to improve visibility, and on dispersal techniques. Moreover research was carried out into the visibility of differing car colours during fog conditions (Kocmond & Perchonok, 1970).

Road Authorities in Australia were trying to keep abreast of these developments. In 1974, following examination by the Department of Main Roads in NSW into the overseas technology of the day, Australia made its own major contribution to the effort into dealing with the fog problem when a Driver Aid system was built for the F6 Southern Expressway on the Illawarra escarpment between Sydney and Wollongong (DMR, 1974).

However research into the effectiveness of these systems has been limited. Since the 1970s, general research into this area has continued to decline despite improved technological methods of investigation being available. Australian research has reflected this world-wide trend and little is known about the driving performance and behaviour of our own motorists in these conditions and how this compares to other known data.

This is despite the accepted need for research to determine safe driving performance on all facets of our road system. The 1982 Report of the Parliamentary Report on Education, Training and Licensing of Drivers stated:

"However, it is recognised that road user behaviour must be changed if there is to be a major impact in this area. Research is required to establish
how behaviour can be influenced and how motivational factors affect road

1.2 Aims

This research project aims to examine the behaviour of travel speed and headways of
drivers in the proximity of the Bulli Tops section of the F6 Waterfall Southern
Expressway. Heavy fog likely to affect motorists occurs over this section of the road at
a frequency, on average, of over 50 days per year. The predominance of the problem at
this location is demonstrated by the 66 vehicle accident which occurred in September
1986.

Areas examined include the visibility and nature of the fog which occurs in the area,
driver speeds and headways during varying visibility periods. Factors such as daytime,
dusk and darkness are considered as well as fog variability.

It should be noted that this investigation of driving characteristics was not an
analysis of the behaviour of individual drivers. Such a study would more directly
involves issues such as the psychological profile of the driver, vehicle characteristics
and even such issues as the cleanliness of an individual windscreen.

Rather the study relates to the extent to which reduced visibility generally influences
speed on a macro scale with the consequent effect on safety and how this may be
improved utilising the latest technology has to offer in terms of better signs and modern
speed warning systems.
Once the ‘normal’ driving performance in fog was known, consideration was made of the improvements to performance and safety offered by better signs and the provision of dynamic information which could provide advice to drivers of more appropriate travel speeds for particular conditions. A system incorporating visibility measurement, vehicle speed detection, vehicle monitoring and a dynamic ‘intelligent’ Variable Message Sign (VMS) capable of providing information on the changing conditions and the relative threat to the vehicle was developed and tried. An assessment has been made of what benefits or disbenefits such an approach offers.

Part of the research includes a search of relevant literature to examine what is known regarding all the areas associated with the problems of fog and its effect on driving conditions and safety. This includes fog formation, visibility, headways, known accident data and related information and the success or otherwise of systems which have been developed to improve driving performance in fog.

1.3 Scope of Study

As indicated earlier, the research was limited to a study of driving characteristics on a macro scale (all vehicles) giving consideration to variables of visibility, speed, headway, time of day, day of week, wet or dry conditions and travel lane. Analysis was generally restricted to cars although some consideration was given to heavy vehicles.
The research was carried out in three stages as follows:

**STAGE 1**

An evaluation of the driving performance and safety of motorists when driving in fog without other external influences.

**STAGE 2**

A short evaluation of the existing sign facility. This allowed an assessment to be made of the improvements offered by new facilities as provided in Stage 3.

**STAGE 3**

Provision of a new sign facility utilising current technological equipment and an evaluation of its effectiveness.

Benefits gained from the research include:

a) Development of techniques utilising modern technology to assess driver behaviour at a site.

b) A base knowledge of driving performance and safety in certain restricted visibility conditions.

c) A knowledge of the effectiveness of providing current fog condition information to modify driving performance.
d) A permanent site which can be used for future evaluation of road safety, either for other existing aspects of driving performance, or to assess the effect of techniques designed to improve such performance.

As a consequence of the research the NSW Roads and Traffic Authority (RTA) has been able to make a decision to replace the 1974 system knowing that the current available technology used at the trial site was able to provide a workable and more effective system.

Installation of a new system was completed in 1996 at a cost of $3.5M.