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Preventing driver error and motorcycle accident causation: An empirical investigation

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Abstract

Driver error rather than rider error has been highlighted as a major factor in powered-two wheeler (PTW) accidents. However, little work on understanding and preventing these driver errors has taken place. Previous research which has addressed the issue of driver involvement has focused upon increasing the conspicuity of the PTW or rider and has tended to ignore issues associated with car driver behaviour.

A framework is presented which facilitates an understanding of driver error in interactions with PTWs. The concepts of *Technical Awareness* and *Social Awareness* are used to describe conditions which may predispose drivers to errors when interacting with PTWs. An empirical examination of the framework is presented, examining the relationship between lack of Technical and/or Social Awareness and accident involvement. Relevant information was obtained from over 700 drivers involved in accidents with PTWs within 9 police divisions in England. This information was compared with responses to a random survey of over 1500 drivers sampled from the same area.

The results indicate that some of the most important factors in PTW accidents may be accounted for by lack of driver Technical and Social Awareness. These findings have specific implications for the direction of future research and countermeasure development and indicate where previous accident reduction efforts have been lacking. In particular, current emphasis on rider performance and rider conspicuity should be supplemented with direct consideration of drivers. It is concluded that using training and education to increase the Technical and Social Awareness of drivers would be an area of high potential effectiveness.

Contents

1. Introduction and Overview of Report

This report summarises an empirical investigation of car drivers involved in a road traffic accident with a powered two-wheeler (PTW). The investigation was conducted with the assistance of Bedfordshire, Lincolnshire, Northamptonshire and Thames Valley Police Forces and provides recommendations for future accident countermeasure development.

The need for this work is described on the basis of the involvement and responsibility of other vehicle drivers in PTW accidents and the inadequacy of the predominant 'conspicuity approach' to driver involvement. In order to extend an understanding of driver error beyond that of the visibility problem associated with PTWs a new framework is introduced and provisional support from previous research described.

This new approach formed the basis of the study to be reported, in which levels of awareness for PTWs were examined within accident-involved and non-accident-involved drivers and its importance for accident avoidance assessed. The results are discussed on the basis of the proposed framework for driver error and the need for the systematic development, implementation and evaluation of a driver awareness campaign.

2. PTW Accidents: The problem of other vehicle driver error

Many statistical summaries of PTW accidents have revealed a large involvement of other vehicle drivers. Moreover, there is a predominant assignment of responsibility to the motorist involved in the encounter. Taking one of the most recent comprehensive examples from an investigation of accidents in the United States, Hurt *et al.* (1981) found that in as few as 20% of cases only motorcyclists were involved. Three out of every four of the reported accidents involved a collision with another vehicle and the opposing motorist was judged to be at fault in 65% of the cases. In Britain, Whitaker (1980) and Minter (1984) have emphasised that rider injuries arise primarily through interaction with other traffic. Also, from the evidence of Coroner's inquests Whittington (1981) concluded that the errors of other road users were the most significant individual cause of fatal PTW accidents.

Despite conclusions of this nature there is a marked lack of research on driver error in relation to PTW accident causality and corresponding countermeasure development. This is because the majority of PTW safety work in which the involvement of the motorist is recognised has been carried out on the conspicuity of PTWs and their riders. In conspicuity research the role of the motorist is generally seen to be passive in nature; i.e., the motorist does not see the PTW prior to accident involvement and so the rider must become more conspicuous. As a result, safety work on the involvement of motorists has been directed away from the driver and towards the PTW and rider. Little attention has been given to the fact that driver ultimately caused the conflict situation and that this

driver was an active, decision-making participant. Furthermore, there is evidence that inappropriate driver behaviour can often occur after detection has actually taken place (e.g., Nagayama *et al.*, 1980). Indeed, there is now growing realisation that the basic concept of motorcycle inconspicuity lacks empirical support (e.g., Olson, 1989).

3. Understanding driver error in terms of lack of awareness

Research is therefore required which considers reasons in addition to one of lack of visibility for driver involvement in accidents with PTWs. Given this requirement, previous interpretations of driver error which appear in the PTW safety literature were integrated with current knowledge of decision making and driver behaviour. This provided a theoretical framework with which to examine driver decision making about, and interaction with, PTWs in the traffic stream and the development of effective countermeasures (Brooks, 1988a).

This framework consists of two concepts. One is the concept of *Technical Awareness.* This relates to motorists' knowledge of PTWs and their operating characteristics, motorists' knowledge of the complexities involved with riding a PTW, and motorists' appreciation of the vulnerability of motorcyclists - particularly in certain road and traffic conditions. Much of the background to this concept has come from previous authors who advocated increased attention to the issues of driver awareness and the 'complexities of motorcycling' (e.g., Johnson, 1969; Nagayama, 1984).

The second concept is that of *Social Awareness.* This relates to the need for motorists to have appropriate beliefs and values, positive attitudes towards PTWs and to take adequate cognisance of PTWs in traffic. It therefore addresses motivational qualities, such as the active thought about the existence of PTWs in the traffic steam and certain problems in the interpersonal relations between motorcyclists and other road users on and off the road. Once again, several interpretations of accident causality which conform to this concept are available in the PTW safety literature (e.g. Reiss and Haley, 1968; Buchanan *et al.*, 1982).

As a result of this framework it can be argued that certain motorists are lacking in Technical and/or Social Awareness and that this lack of awareness predisposes a driver to a greater likelihood of error when interacting with PTWs in the traffic stream. This lack of awareness can contribute to the failure to detect a PTW and can also contribute to inappropriate behaviour once detection has taken place.

3.1. Provisional empirical support

To initially explore the suitability of this approach an examination of motorcyclists' opinions on the causes and prevention of PTW accidents was conducted. Riders were surveyed on the street and via two British motorcycling magazines (n = 1,823). The sampling technique enabled obtaining the opinions of a large proportion of experienced motorcyclists who also had car driving experience (Brooks, 1988b). On average 98% of

the respondents were in favour of the improvement of driver awareness of PTWs and their riders. Along with rider training, the motorcyclists surveyed considered the improvement of driver awareness to have the greatest chance of preventing accidents. This was in comparison with other possible countermeasures which were listed in the questionnaire. Furthermore, the awareness of drivers was considered to be lacking in two main ways: (a) a lack of knowledge of the complexities of motorcycling and rider vulnerability and (b) a lack of respect for motorcyclists. It was therefore found that these interpretations of driver culpability could be encompassed, respectively, within the concepts of lack of Technical Awareness and lack of Social Awareness.

In another study a survey of motorists was conducted in order to determine whether some car drivers would indeed be found to be lacking in some aspects of Technical and Social Awareness. The major finding of the survey (n = 219) was that motorists who had never ridden a PTW and who did not know anyone who was a motorcyclist tended to have less basic PTW knowledge and less favourable, more stereotyped opinions of motorcycling. This was in comparison with motorists who had over 18 months of either past or current PTW operating experience. It was concluded that the various discriminations which could be made between motorists with or without PTW operating experience were consistent with proposed aspects of Technical and Social Awareness (Brooks & Guppy, 1990).

3.2. The need for further empirical information

In view of these results a major requirement became knowing whether Technical Awareness and/or Social Awareness is related to actual driver performance and, if so, whether the relationship is important enough to justify countermeasure development in this area. Acquiring this knowledge thus formed the primary objective of the study reported below. Before describing this study, however, it is necessary to consider how 'driver performance' and 'Technical Awareness and Social Awareness' can be measured.

3.2.1. Criterion measures of driver performance

The merits of various possible criterion measures of driver performance have frequently been addressed in relation to research on driver and rider training due to the variety of methods which have been used in order to assess effectiveness. For example, Strang *et al.* (1982) have classified the methods according to whether they measure the short-term, medium term or long-term effects of training. Whilst both short-term and medium-term effects can be assessed by tests of knowledge, driver attitudes and driving skill, long-term effects can be determined by the "ultimate criteria" of accident and violation rates. However, only accident involvement with a PTW was considered to be a suitable criterion measure in a study specifically related to driving performance in the vicinity of a PTW. This therefore imposed the specific requirement of obtaining information from motorists who had been involved in an accident with a PTW.

3.2.2. *Motorcycling experience as a contributor to Technical Awareness and Social Awareness*

In order to obtain information on motorists' level of Technical Awareness and Social Awareness a seven-group breakdown of the motoring population was derived for expressing the range of motorcycling experience that exists in any population. The groups are summarised in Figure 1. It can be seen, for example, that motorists who have never ridden a PTW and who do not have a close acquaintance who is a motorcyclist can be assumed to be lacking in both Technical Awareness and Social Awareness. These motorists have been called *Group 1* motorists. At the other extreme, motorists who also currently operate a PTW (and who have done so for over 18 months) can be expected to have full Technical Awareness and Social Awareness (and are depicted here as *Group 7*). *Group 2* motorists would be likely to have some Social Awareness because they have a close acquaintance who is a motorcyclist; whereas the additional pillion experience of *Group 3* could also contribute to a certain level of Technical Awareness. Like *Group 7*, *Group 5* motorists would be likely to have both Technical Awareness and Social Awareness, although a distinction can be made here on the basis of past and current PTW usage. For example, one might expect a possible degradation of awareness as the number of years since PTW operation increase.

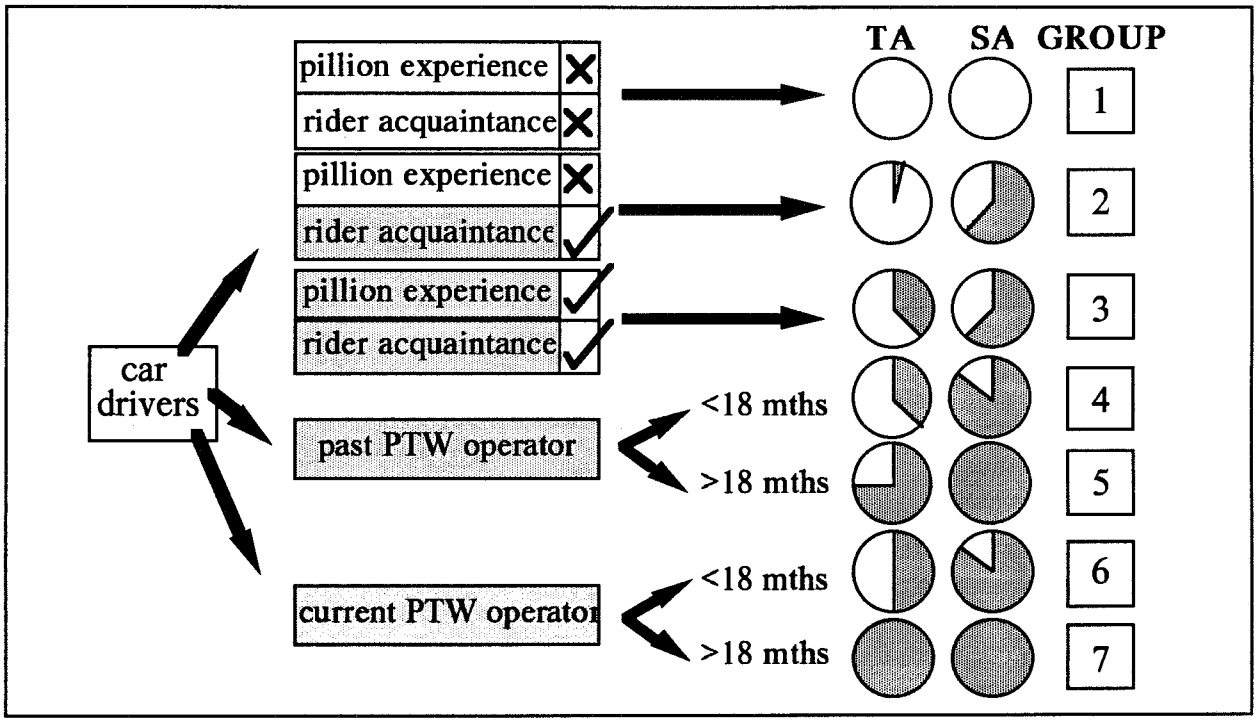

Figure 1: Mutually exclusive and exhaustive categories of motorcycling experience as predictors of levels of Technical Awareness (TA) and Social Awareness (SA)

4. Study Objectives

As introduced above, the primary study objective was to test for a possible relationship between driver involvement in PTW accidents and a lack of the experience which is thought to give rise to Technical Awareness and Social Awareness.

A second objective was to assess the individual importance of Technical Awareness and Social Awareness on driver performance. This was to be assessed by means of comparisons between the groups of motorists having varying types and amounts of motorcycling experience. For example, Group 2 motorists were assumed to have Social Awareness only, whereas Group 3 motorists were assumed to have a certain level of Social Awareness and Technical Awareness. Therefore, the extent to which Group 2 and Group 3 motorists are involved in accidents with PTWs should only be equal if Technical Awareness has no additional beneficial influence over Social Awareness.

A third objective was to assess the influence of both past and current PTW operating experience. For example, it was anticipated that a strong relationship between PTW operating experience and non-accident-involvement would be found for past as well as current PTW users. However, should this only be the case for current PTW operators, then the long-term effectiveness of educational and training materials designed to impart Technical Awareness and/or Social Awareness would be seen to be extremely limited.

5. Procedure and Sampling Techniques

Data collection consisted of surveys of accident-involved and randomly selected motorists. The procedure and sampling technique used for both populations of motorist differed in a number of aspects and are therefore reported separately.

5.1. Surveying the Accident-Involved Motorists

Surveying a population of accident-involved motorists was achieved through the assistance of four Police Forces: Bedfordshire Police, Lincolnshire Police, Northamptonshire Police and Thames Valley Police. Three separate sampling techniques were employed due to differences in the nature of assistance which each Police Force was able to provide. The assistance provided by Bedfordshire Police and Thames Valley Police was identical and therefore enabled a joint survey procedure. On the other hand, two separate procedures were adopted in conjunction with Northamptonshire Police and Lincolnshire Police. In total, therefore, three different surveys of accident-involved motorists were performed and are described separately below. The essential difference between the three approaches was the manner in which contact was made with the motorists so that the necessary information could be collected.

5.1.1. Accidents Reported to Bedfordshire and Thames Valley Police

The names and addresses of accident-involved motorists were obtained from records of injury accidents involving a car and a PTW for the three year period 1 January 1982 to 31 December 1984. From information available in the records, motorists were only selected if they were assessed to be solely or primarily at fault, or if the behaviour of the motorist failed to reduce the risk of accident (see Section 5.1.5). Due to the centralised nature of the records kept by Bedfordshire Police, all accidents in each of the three police divisions comprising the Force (Bedford, Dunstable and Luton) could be easily accessed at Police Headquarters. However, the detailed records produced by Thames Valley Police were not centralised and so just one police division (Milton Keynes) was selected for the study.

A self-completion questionnaire (Appendix 3) was sent to the motorists with a covering letter from either the Chief Constable of Bedfordshire Police (Appendix 1) or the Chief Superintendent of Milton Keynes Division of Thames Valley Police (Appendix 2) . The envelope which was enclosed for returning the questionnaire was addressed direct to Cranfield. A week after the mail-out of this package, all of the motorists were sent a brief letter from the Police (Appendix 4). This letter served as a reminder for those motorists who had not yet responded to the survey. All of the motorists were sent a copy because of the anonymity of the survey and the inability to identify which persons had returned their questionnaire.

This procedure will be termed the Bedfordshire/Thames Valley survey (or *Beds/TV survey*) in the remainder of this report.

5.1.2. Accidents Reported to Lincolnshire Police

For the six month period 1 July 1985 to 31 December 1985, Police Officers who were investigating a road traffic accident involving a PTW and a three or four-wheeled vehicle conducted a short interview which was additional to their routine enquiry. This interview consisted of administering a structured questionnaire (Appendix 5) carried with the normal accident booklet.

This procedure will be termed the Lincolnshire survey (or *Lincs survey*) in the remainder of this report.

5.1.3. Accidents Reported to Northamptonshire Police

Northamptonshire Police sent a self-completion questionnaire (Appendix 7) to any motorist reported as being involved in a road traffic accident with a PTW during the 12 month period 1 April 1985 to 31 March 1986. The questionnaire was posted to the motorist about one month after the actual incident. The questionnaire was accompanied by an explanatory letter from the Chief Constable (Appendix 6) and an addressed envelope for returning the completed form direct to Cranfield.

This procedure will be termed the Northamptonshire survey (or *Northants survey*) in the remainder of this report.

5.1.4. Assessment of the Culpability of the Accident-Involved Motorists

An important advantage of the Beds/TV and Lincs surveys was that information on the culpability of each accident-involved motorist was available. The same basic criteria for making these judgements were incorporated in both surveys (Brooks, 1988a). However, an important distinction must be made between the nature of the assessment performed in the two surveys. This is because in the Beds/TV survey the assessment of culpability was part of the sampling process itself; i.e., drivers were only selected for receipt of a questionnaire if they were judged to have made an error in their driving which contributed to their accident involvement.

On the other hand, no prior judgement on, or selection of, the accident involved motorists was made in the Lincs survey. As was the case in the Northants survey, any motorist involved in a road traffic accident with a PTW during the survey period was a potential respondent. However, from information provided by the reporting Police Officer in the Lincs survey, a judgement could be made on the relative responsibility of both rider and driver involved in the encounter. Therefore, a similar classification of culpability as used in the Beds/TV survey could be introduced to enable further exploration of the data.

The derivation of a classification of culpability was made on the basis of information obtained on accidents reported to Bedfordshire and Thames Valley Police. All motorists were assigned to one of the categories of culpability as shown in Table 1.

Category I	Both motorist and motorcyclist contributed to the conflict situation.
Category II	No rider error. The motorist was solely responsible for creating the conflict situation.
Category III	No rider error, but culpable driver behaviour was not of present relevance.
Category IV	No driving error made by the motorist (either responsibility of rider or road surface).
Category V	No decision regarding culpability could be made due to insufficient information.

Table 1: Five categories of decision regarding culpability for accident causation

5.2. Surveying the Non-Accident-Involved Motorists

The aim of this survey was to obtain a control sample of motorists for which it was also possible to define a sample of non-accident-involved motorists. The sampling technique and procedure employed is outlined below.

5.2.1. Sampling Technique

A random sample of motorists was required in order to estimate the non-accident-involved population and to generate a control sample of motorists. By collecting information on the accident history of each driver in the control sample, accident-involved motorists could be omitted in order to obtain a sample of non-accident-involved motorists.

The most efficient sampling frame was the records of vehicle registrations held at the Department of Transport Driver and Vehicle Licensing Centre[1] (DVLC). Two-thousand car owners were sampled on an equal-interval basis from these records in October 1985. Restrictions were applied to the sampling as shown in Table 2 in order to maximise their applicability. For example, in order to increase consistency with the sampling of accident-involved motorists drivers were sampled from the four counties of Bedfordshire, Buckinghamshire, Lincolnshire and Northamptonshire. From the known addresses of accident-involved motorists selected from the records kept by Bedfordshire Police it was found that 81% of the motorists having an accident in Bedfordshire actually resided in this county. Buckinghamshire was selected as being the major county represented by Milton Keynes division of Thames Valley Police. Indeed, of the motorists having an accident in Milton Keynes division, 78% lived in Buckinghamshire.

- The information was sampled from the DVLC vehicle record (rather than the record of the holders of driving licences)
- Only records with the current keeper details were included (to sample currently licensed vehicles)
- Only currently licensed private and light-goods vehicles were included (i.e., not PTWs, Heavy Goods Vehicles, Public Service Vehicles, etc).
- Records were excluded if the vehicle had been scrapped or exported (although stolen or seriously damaged vehicles were included)
- Records showing commercial or government ownership of the vehicle were excluded
- Only records for persons living in the counties of Bedfordshire, Buckinghamshire, Lincolnshire and Northamptonshire were included

Table 2: Sampling restrictions applied to the DVLC sampling frame

[1]Now the Driver and Vehicle Licensing Authority (DVLA)

5.2.2. Procedure

A postal survey was necessary in order to obtain information for a sample of 2,000 motorists and had the additional advantage of maintaining compatibility with the postal surveys of accident-involved motorists. However, for this survey the package containing the questionnaire (Appendix 9), covering letter (Appendix 8) and return envelope came from Cranfield rather than from the police.

A maximum of two follow-ups were used for non-respondents. The first simply consisted of a short letter (Appendix 10) whilst the second consisted of another short letter (Appendix 11) together with the original covering letter, a second copy of the questionnaire and another return envelope.

This procedure will be termed the *DVLC survey* in the remainder of this report.

6. The Questionnaires

As can be seen in the appendices, the postal questionnaires used in the Northants, Beds/TV and DVLC surveys were very similar. Each asked for essentially the same information, with occasional differences in wording and item order to best suit the particular selection of motorists involved. In each questionnaire and the Lincs survey interview schedule information was obtained on three main aspects:

- Basic demographic details of the respondent
- The respondent's motorcycling experience
- The respondent's driving experience (e.g., the motorist's exposure to risk of accident).

7. Sample Sizes

7.1. Bedfordshire/Thames Valley Survey

The use of injury accidents which had been reported in four police divisions over a three year period produced a potential sample size of 661 motorists. This was the number of motorists who could be assigned to either Category I or Category II of responsibility. Of this potential sample, 96 of the motorists were not sent a questionnaire because, for example, the accident led to the death of the motorcyclist or the motorist failed to stop at the scene. The total number of potential respondents to the Bedfordshire/Thames Valley survey was therefore 565. Usable data for a total of 285 accident-involved motorists was obtained. On allowing for known non-receipt of the questionnaire in 26 cases, the overall response level was 53%.

7.2. Lincolnshire survey

Over the 6 month period Lincolnshire Police forwarded 139 completed questionnaires to Cranfield. Only seven of these questionnaires were unusable (due to the officer interviewing the rider involved in the accident rather than the driver). Total sample size was therefore 132.

7.3. Northamptonshire survey

Over the 12 month period Northamptonshire Police despatched a total of 553 questionnaires. Of these, 300 were returned by the recipient and only 12 were non-usable returns. Hence, the response level for usable returns was 52%, giving a sample size of 288.

7.4. DVLC Survey

For each of the four counties of interest 500 car owners were selected at random from DVLC records. Usable survey returns were obtained for 1,564 of these owners. Thirty of the 61 non-answered returns could be distinguished as known non-receipt of the questionnaire rather than non-response to the survey. Correcting for this, the response level to the DVLC survey was 79%.

These 1,564 respondents thus represented the control population of car owners. However, 100 (6%) of the respondents reported having been involved as the driver in a road traffic accident with a PTW. Therefore the sample size for the non-accident-involved population was 1,464.

7.5. Checking for Sample Bias

Statistical comparisons of known sample attributes revealed that considerable confidence could be placed in the representativeness of the respondents to the Beds/TV survey. In addition, relatively few discrepancies also existed between the Northants, Lincs and Beds/TV samples of accident-involved motorists. This offered further confidence as to the suitability of the response which was obtained.

The DVLC respondents were found to be suitably representative of the car owners sampled from licensing records. This representivity also existed at the national level on the basis of comparisons with national figures on driver sex and vehicle engine capacity. Although a possible sampling or response bias was identified with respect to the age of the respondents, a lack of suitable national data prevented firmer conclusions to be drawn on this issue.

8. Results

8.1. Analysis technique

With the data available many ways of exploring the study postulates were possible. An initial analysis is reported below in which the three different samples of accident-involved motorists were treated as different data sets. Each of these data sets were combined with the relevant non-accident-involved sample on the basis of county of residence. For each data set standard multiple regression analyses (MRAs) were performed for Group 1 motorists pooled with each of the other groups (i.e., Group 1 + Group 2, Group 1 + Group 3, etc.).

The standard MRAs were performed between the dependent variable of accident-involvement/non-accident-involvement (ACC) and the independent variables of motorcycling experience (GROUP), AGE, SEX, frequency of driving (FREQ), miles driven in a typical week (MILES), type of area in which driving predominated (AREA), and engine capacity of the vehicle driven (CC). Depending on the results of each standard MRA, a subset of these independent variables were sometimes also analysed by means of hierarchical MRA.

8.2. Summary of results

Statistical summaries of the results of the standard and hierarchical MRAs conducted are presented in Appendix 12 and 13.

8.2.1. The Northants and Beds/TV data sets

Only two variables were found to reliably contribute to the prediction of accident involvement in the Northants data set. These were sex of motorist and number of miles driven in a typical week (MILES). The proportion of variation in the dependent variable (ACC) which could be explained by the regression model averaged only 5% in the hierarchical analyses with SEX and MILES entered, and only 11% in the standard analyses with all independent variables simultaneously entered into the equation.

For the Beds/TV data set, only the type of area in which driving predominated (AREA) contributed significantly to the prediction of accident involvement. When only Category I motorists were considered the frequency of car driving (FREQ) was found to also contribute to a significant increment in R^2 in some of the group comparisons. However, as in the case of the Northants data set, the proportion of explained variance was low. Taken as an average for the five group comparisons, R^2 for the standard MRAs was 0.03 for the Category II motorists and 0.09 for the Category I motorists. These proportions increased to 0.05 and 0.14, respectively, for the hierarchical MRAs.

Hence, no relationship between motorcycling experience (GROUP) and accident-involvement (ACC) was found for the Northants data set, and only slight and unreliable indications of a relationship between motorcycling experience and accident involvement were found for the Beds/TV data set.

8.2.2. The Lincs data set

In contrast to the results of the Northants and Beds/TV data sets, a predictive relationship between motorcycling experience and accident involvement was found with the Lincs data. Furthermore, on average as much as 19% of the variation in accident involvement could be explained by the regression solutions of the standard MRAs performed for the Category II motorists. AREA was also found to contribute significantly to the prediction of accident involvement in some of the comparisons. However, subsequent hierarchical analyses confirmed that motorcycling experience added significantly to the prediction of accident involvement even after AREA (and other exposure and demographic variables) was held statistically constant.

The predictive relationship between motorcycling experience and accident involvement also existed when Category I and Category II motorists were pooled. Indeed, average R^2 for the group comparisons increased to 0.22 for the hierarchical analyses. These analyses revealed significant increases in R^2 when motorcycling experience was added to each regression solution after controlling for variables such as age, sex, frequency of driving, number of miles driven and area of driving.

9. Discussion

The analysis of the Lincs data set has shown that motorists' motorcycling experience was the most important individual contributor to the prediction of accident involvement for the majority of the group comparisons made. Even after controlling for certain demographic and exposure variables the addition of motorcycling experience to the regression solution resulted in a significant increment in R^2, with up to 25% of the variation in accident involvement explained by a regression model. Such results therefore support the proposed framework for understanding driver error in PTW accidents and have various implications for continued research in this area and countermeasure development.

However, before these implications are discussed it is necessary to reconcile the results for the Lincs data set with the results of the Northants and Beds/TV data sets. This is because no predictive relationship between motorcycling experience and accident involvement was found for the Northants data and, at best, only a low level of relationship was indicated in the Beds/TV data. It will be seen below that an understanding of this discrepancy is readily available and actually strengthens the confidence which one can place in the results.

9.1. Methodological issues

One of three major sources of bias could have existed in the present study if failure to identify a real relationship between motorcycling experience and accident involvement took place with the Northants and Beds/TV data sets:

(i) the proportion of accident-involved motorists with motorcycling experience was overestimated in the Northants and Beds/TV surveys;

(ii) the proportion of non-accident-involved motorists with motorcycling experience was underestimated in the DVLC survey;

(iii) some combination of (i) and (ii).

It is unlikely that bias (ii) could have occurred, since information on non-accident-involved motorists in the Northants, Beds/TV and Lincs data sets was obtained from the same (DVLC) survey. Rather, any differences in survey methodology between the three data sets only occurred for the accident-involved motorists. Therefore, to explain the discrepant results bias (i) should have occurred in the Northants and Beds/TV surveys but not in the Lincs survey. Indeed, a particular caveat of the Northants and Beds/TV survey were that they were postal surveys in which response bias could have occurred. It is generally accepted that it is the people most interested in a given questionnaire who will be most likely to respond (e.g., Blumberg *et al.*, 1974) and the current questionnaires contained a high proportion of items on motorcycling. Thus, any bias was more likely to lead to an overrepresentation of motorists with motorcycling experience.

In addition to the survey methodologies employed, the actual sampling techniques also differed between the three surveys of accident-involved motorists and were open to different systematic errors. In the Lincs survey all accident-involved motorists were included, but information provided by the interviewers enabled inclusion of only Category I and Category II motorists in the analyses. The retrospective nature of the Beds/TV survey enabled the sampling of only Category I and Category II motorists from the very start. However, the Northants survey invited response from any motorist involved in an accident with a PTW, regardless of their level of responsibility for the incident. Furthermore, unlike the Lincs survey, no decision could be made as to whether the respondent belonged to Category I, Category II or a category irrelevant to the present study. Indeed, motorists who were not responsible for the accident may have felt less threatened by the postal survey and therefore more willing to complete the questionnaire. Since these motorists would not have committed a driving error, no relationship between the level of their motorcycling experience and their involvement in an accident with a PTW would be expected.

Thus, considering these differences in the survey methodology and sampling techniques, the Northants survey was the least likely to obtain a true representation of the motorcycling experience of culpable motorists in PTW accidents. For the Lincs survey there was no reason to expect any bias, whereas the Beds/TV survey was likely to suffer bias in response although no bias in the sampling technique. Indeed, the results of the

main analyses do support this view. Whereas no relationship between motorcycling experience and accident involvement was identified by the Northants data set, the contribution of motorcycling experience to the prediction of accident involvement was indicated in some of the analyses of the Beds/TV data set and definite predictive association was found for the Lincs data set.

9.2. The role of Technical Awareness and Social Awareness in error-free driving

Given the support offered for a predictive relationship between lack of motorcycling experience and accident involvement with a PTW, an examination of the Lincs data set in terms of the group breakdown of the motoring population provides particularly interesting and important information. For example, the only comparison in which motorcycling experience was not indicated to be an important contributor to the prediction of accident involvement was Group 1 + Group 2. Hence, this analysis considered motorists who differed only with respect to having a close acquaintance who was a motorcyclist (i.e., neither Group 1 nor Group 2 motorists had PTW riding experience). The indication from this result, therefore, is that having Social Awareness does not reliably reduce a motorist's chances of accident-involvement with a PTW when this motorist does not also have Technical Awareness.

The group comparisons which did yield motorcycling experience as a significant contributor to the prediction of accident involvement have particularly favourable implications for the potential effectiveness of a driver awareness programme. It was found, for instance, that even motorists with only pillion experience and motorists with less than 18 months operating experience were less likely to be involved as culpable motorists in an accident with a PTW. This indicates that pillion experience or less than 18 months riding experience is sufficient to impart Technical Awareness and reduce the likelihood of driver error. It would therefore appear that Technical Awareness can be gained somewhat easier than might otherwise have been expected.

The findings also indicate that Technical Awareness, once gained, can continue to contribute to accident-free driving on a long-term basis. This conclusion can be drawn from the finding that it was not just current motorcycling experience (Group 7) but also past motorcycling experience (Group 4 & Group 5) which contributed to the prediction of accident involvement. Furthermore, of the Group 5 motorists in the Lincs data set, 63% had last operated a PTW over 10 years ago. Only 4% had operated a PTW within a year of the survey, 11% had last operated a PTW 1 to 2 years prior to the survey, and for 22% it had been 3 to 10 years. Hence, for the majority of Group 5 it had been many years since they had been a motorcyclist.

Another interesting result was that the relationship between lack of motorcycling experience and accident-involvement was maintained and sometimes actually increased when Category II motorists were pooled with Category I motorists. The importance of this finding is that the beneficial influence of motorcycling experience on driver performance was witnessed for an even larger proportion of accident types than just those where the motorist was solely responsible for accident causation. The results indicate that motorists with PTW riding experience are not only less likely to cause an accident with a PTW, but are also less likely to allow a situation caused by inappropriate

rider behaviour to develop into a conflict situation. This therefore emphasises the importance of appropriate decision making and response from motorists when interacting with PTWs and the beneficial influence of motorcycling experience on these interactions.

9.3. Lack of Technical and Social Awareness in the driving population: The size of the problem

A final area of the results which is of particular importance is the actual proportion of motorists in the general population who can be expected to be lacking in Technical Awareness and/or Social Awareness and who are therefore of greater likelihood of error when encountering PTWs in the traffic stream.

The DVLC survey has provided an estimate of the motorcycling experience held by drivers in the four counties surveyed. This motorcycling experience is in terms of the allocation of respondents to the seven-group breakdown of the motoring population and is shown in Table 3. It can be seen that 33% of the control sample were assigned to Group 1. Indeed, this was the largest of the seven groups. Hence, the indication is that one third of owner drivers in these regions have never operated a PTW, have never ridden pillion on a PTW and do not have a close acquaintance who rides a PTW. It is these motorists who are therefore likely to be lacking in both Technical Awareness and Social Awareness and who are believed to have the greatest likelihood of accident-involvement as a culpable driver. In all, 43% of drivers were estimated as having no Technical Awareness (Group 1 + Group 2). This figure rises to 66% if one also considers drivers with only pillion experience or less than 18 months of PTW operating experience. Although 30% of drivers have operated a PTW for over 18 months in the past, only 4% of drivers also currently operate a PTW.

	Absolute Frequency	Relative Frequency (%)
Group 1	490	33.3
Group 2	135	9.2
Group 3	163	11.1
Group 4	176	12.0
Group 5	439	29.8
Group 6	7	0.5
Group 7	61	4.1
All Groups	1471	100.0

Table 3: The breakdown of the control sample in terms of motorcycling experience

Hence, a very high proportion of motorists can be expected to be lacking in Technical Awareness and/or Social Awareness. The target population for any countermeasure directed towards reducing driver error would therefore comprise the majority of motorists. In the absence of any such countermeasure, not enough drivers currently have sufficient experience for interacting with PTWs.

9.4. Implementation and evaluation of a driver awareness campaign

The development of the concepts of Technical Awareness and Social Awareness has integrated existing knowledge and facilitated a much greater understanding with which to approach the problem of driver error in PTW accidents. Furthermore, the distinction between the need for Technical Awareness and Social Awareness highlights the distinction between a role for education/training and a role for the enforcement of suitable driving behaviour as PTW accident countermeasures. For example, an argument currently in existence is that enforcement through placing a greater duty of care on motorists will improve their behaviour towards PTWs. However, this argument makes the assumption that motorists do already have the knowledge and ability to interact with PTWs but need additional motivation to do so. On the other hand, no matter how motivated a motorist may be to drive safely, it is possible that lack of relevant knowledge or experience may lead to a wrong decision. This could therefore lead to an accident even though the motorist thought that particular manoeuvre was the best course of action to take. Thus, this would indicate the need for Technical Awareness over and above Social Awareness.

Indeed, in the current study it was found that pillion experience (Group 3) contributed to the prediction of accident involvement, whereas having a close acquaintance who was a motorcyclist but having no riding experience (Group 2) did not contribute to the prediction of accident involvement. This result indicates that Social Awareness on its own does not improve driver performance, whereas Technical Awareness gained through pillion experience does. Consequently, it would seem unlikely that a countermeasure aimed at increasing a driver's level of motivation (e.g., enforcement or threats of punitive action) will be effective (at least in any absence of a measure to also increase the driver's level of Technical Awareness).

This need for Technical Awareness also indicates where previous attempts to improve driver behaviour may have been lacking. In Britain, for example, the only major educational campaign directed to improve driver behaviour and reduce PTW accidents has been the *Think Bike* television commercial. Due to an absence of any published reports on this campaign, little is known about any preliminary work during the development of the campaign or any possible assessment of the success with which the message was received, interpreted and remembered by the target population. Nevertheless, the Department of Transport monitored the accident rate during several of these campaigns and concluded that no success could be attributed to the publicity (DTp, 1984). However, knowledge of the concept of Technical Awareness indicates why the *Think Bike* campaign did not effect a reduction in accident figures. It can be seen that informing motorists to 'think bike' does little to aid their interactions with PTWs. It may sometimes help to ensure that extra surveillance and detection of a PTW takes place, but it does not help motorists make judgements of the kind which are necessary for an error free response after detection. Therefore, what would appear to be more beneficial to motorists is being informed *how* to 'think bike'.

Indeed, in the United States Howells *et al.* (1980) have emphasised the need for greater knowledge of motorcycles in order to specifically counter the typical junction accident as demonstrated in the *Think Bike* commercial. Howells *et al.* conducted a study of gap

acceptance behaviour in which a driving simulator enabled numerous controlled manipulations of motorcycling experience and vehicle type. Howells *et al.* (pp. 1607-1608) found that:

> "Motorcycling experience, on the part of the entering driver, appears to contribute to safer accepted gaps when the oncoming vehicle is a motorcycle. Thus, one means of reducing the number of motorcycle intersection entry accidents is to provide at least minimal level of knowledge about the operating characteristics of a motorcycle to all drivers ... Further research is needed to both determine the optimal experience level for safety improvement and to compare the effects of passively acquired knowledge (films, books, etc.) with on-the-road driving experience before a recommendation on motorcycle knowledge can be made".

The current investigation provided a large amount of the information requested above by Howells *et al.* The current study was an investigation of the influence of *actively* acquired motorcycling experience on motorists' involvement in PTW accidents. Furthermore, in accordance with the findings obtained by Howells *et al.*, an improvement in driver performance was found in the Lincs data set for motorists with motorcycling experience. Moreover, the *level* of experience which led to this safety improvement was assessed and indicated that one can be very optimistic about the ability to impart Technical Awareness, the potential for reducing accidents, the long-term effectiveness of this increased awareness and the wide range of accidents which could be prevented.

On the basis of these results the need now is for research on the means and effectiveness of improving driver awareness. As discussed above, imparting Technical Awareness would seem to be the primary goal of any driver awareness programme. Therefore, the alternatives open would appear to be driver education and/or training rather than driver enforcement. As suggested by Howells *et al.*, the pre-driver training stage of all road users presents an opportunity for incorporating actual riding experience. However, it is apparent that only the passive acquirement of awareness is currently feasible in any education campaign directed to present road users. Nevertheless, it is quite possible that the passive acquirement of awareness would have a beneficial influence on driver behaviour. Clearly, this would be easier and more economical to administer on a long-term basis and also more politically viable. Furthermore, the amount of actual riding experience which would be necessary in order to actively impart Technical Awareness may be quite considerable and would probably need to include riding in adverse and potentially dangerous conditions. Epidemiological evidence has indicated that approximately four years of PTW operation are required as the learning and experience gathering period for riders to significantly reduce their chances of accident-involvement (e.g., Foldvary, 1973; Hurt *et al.*, 1981). Thus, riding a PTW for a brief period and in an unrealistic situation would seem to have little potential for imparting true awareness of the complexities and limitations of PTW operation. Nevertheless, the results of the current study have indicated that even less than 18 months PTW operating experience can improve driver performance. Also, past or current pillion experience can have a beneficial influence. Any extension of this study should aim to obtain more specific information on the amount of active motorcycling experience which contributes to significantly improved driver performance.

There are already indications that exposure to educational material promoting PTW awareness would be widely accepted and appreciated by the target population of motorists (Lincolnshire Police, 1979; Brooks, 1988a). Although publicity campaigns

have been conducted in the United States (e.g., Harper, 1990) little, if any, objective research has been conducted in order to assess the necessary content of any campaign. The current programme of research has revealed aspects of Technical Awareness and Social Awareness which may well be lacking in some motorists and have indicated the need to give priority to imparting Technical Awareness rather than Social Awareness. However, further research on the influence of motorcycling experience on driver performance would be desirable before one attempted to implement a driver awareness programme. As emphasised by the lack of success of the *Think Bike* campaign, without first fully understanding the problem one is trying to counter one is unlikely to succeed in developing a thorough and cost-effective measure.

Once a driver awareness programme is developed its success (or lack of it) should be strictly monitored. Even the publicity campaigns implemented in the United States have lacked research on the success of the initiative (e.g., Buchanan *et al.*, 1982). Thus, although there remains a major need to help motorists in their interactions with the PTWs encountered in traffic, no comprehensive driver awareness campaign has been systematically developed and researched to date, whether at the local or national level. Consequently, there is a major need to assess the potential which public information and education efforts have in reaching the driving population, increasing driver awareness and effecting a reduction in driver error.

10. Summary and Conclusions

A framework has been developed with which to approach issues associated with the problem of driver error in the vicinity of a PTW. This framework focuses on a relative absence of Technical Awareness and/or Social Awareness and a predisposition for driver error when interacting with PTWs in the traffic stream. The framework is argued to have immense potential for obtaining the understanding which is needed if one is to attempt to effectively counter driver causation of PTW accidents and has been supported by a number of empirical studies. In particular, an examination of the relationship between lack of Technical and Social Awareness and accident involvement with a PTW indicates the importance of Technical Awareness over and above Social Awareness and the need to address such issues in a carefully developed and monitored education campaign.

The current study revealed that drivers' motorcycling experience was the single most important variable for predicting accident involvement. Even past or current pillion experience was a predictor when the effects of car driver age, sex and exposure were controlled. The results indicate the need for optimism regarding the ability to successfully impart the driver awareness which is required and that, once attained, such a measure would have significant effectiveness.

11. Acknowledgements

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Appendices

Appendix 1

Covering letter from Bedfordshire Police

Bedfordshire Police

Road Traffic Division,
Police Headquarters,
Woburn Road,
Kempston,
Bedford MK43 9AX

ALL COMMUNICATIONS TO BE ADDRESSED TO "THE CHIEF SUPERINTENDENT"

Telephone: (0234) 855222

Our Ref: RTD/TM/LB/SS

Your Ref:

Dear Sir/Madam,

Mr. BROOKS of Cranfield Institute of Technology is currently conducting detailed research into road accidents involving motor cycles. The area of research involves several counties and is spread over a three year period.

Motor cycle accidents are a matter of concern to us all and as you were involved in an accident with a motor cycle during the study period I am writing to you to seek your assistance in the research programme.

Mr. BROOKS has prepared a questionnaire which you are asked to complete. I should however point out that you are of course under no obligation to do so but if you are willing to assist in the study anonymity is guaranteed as the questionnaire contains no identifying marks on it.

The questionnaire should take only a few minutes to complete as the main areas of interest to the researchers are:

(a) the extent to which you were exposed to risk at the time of the accident in terms of your usage of the roads;

(b) the nature of your means of transport, including the kind of vehicle(s) you have used and are now using.

There is one further point I should emphasise. If you complete the questionnaire the information contained in it is solely for the use of the researchers, and should be sent direct to Mr. BROOKS at Cranfield, who will treat it as totally confidential. Whatever you say, therefore, in the questionnaire cannot influence our decision about any possible Court action arising from the accident, or affect the information that we normally supply to interested parties in respect of possible civil claims.

I should point out that it is not my usual policy to become involved with privately organised road safety research projects. However, more than 1000 road accidents involving motor cyclists have occurred in this County in the past three years. Therefore, in the interests of road safety I have decided that the particular area of research is of sufficient importance for me to make a special exemption. For this reason alone I have agreed to give my support to the research programme.

If you decide to complete the questionnaire and thereby assist in this extremely worthwhile accident research project please use the enclosed stamped addressed envelope and forward it direct to Mr. BROOKS.

Yours faithfully,

Assistant
Chief Constable

Appendix 2

Covering letter from Milton Keynes Police

Telephone: 0908-678787

My Ref: SGC/MN

Your Ref:

THAMES VALLEY POLICE,
POLICE STATION,
302 North Row,
Witan Gate East,
Central Milton Keynes
MK9 2DS

Dear Sir/Madam,

Mr. BROOKS of Cranfield Institute of Technology is currently conducting detailed research into road accidents involving motor cycles. The area of research involves several counties and is spread over a three year period.

Motor cycle accidents are a matter of concern to us all, and as you were involved in an accident with a motor cycle during the study period I am writing to you to seek your assistance in the research programme.

Mr. BROOKS has prepared a questionnaire which you are asked to complete. I should, however, point out that you are, of course, under no obligation to do so, but if you are willing to assist in the study, anonymity is guaranteed as the questionnaire contains no identifying marks on it.

The questionnaire should take only a few minutes to complete as the main areas of interest to the researchers are:

(a) the extent to which you were exposed to risk at the time of the accident in terms of your usage of the road,

(b) the nature of your means of transport, including the kind of vehicle(s) you have used and are now using.

There is one further point I should emphasise. If you complete the questionnaire, the information contained in it is solely for the use of the researchers, and should be sent direct to Mr. BROOKS at Cranfield, who will treat it as totally confidential. Whatever you say, therefore, in the questionnaire cannot influence our decision about any possible Court action arising from the accident, or affect the information that we normally supply to interested parties in respect of possible civil claims.

If you decide to complete the questionnaire, and thereby assist in this extremely worthwhile accident research project, please use the enclosed stamped addressed envelope and forward it direct to Mr. BROOKS.

Yours faithfully,

TIMOTHY J HILL
Chief Superintendent

Appendix 3

Questionnaire used in the Beds/TV survey

Survey of motorists by Cranfield Institute of Technology in conjunction with Bedfordshire Police

Thank you for beginning to read this questionnaire. We hope very much that you will continue and complete the questions as you go. The information which you could provide would be of immense value to our work on road safety.

As you go through the questionnaire please either place ticks in the appropriate boxes, ring the answers which apply to you, or write your replies in the spaces provided by dotted lines.

As indicated, the space on the far right hand side of the questionnaire is for our office use when taking information from completed questionnaires. The numbers which are in this column and which are in the boxes <u>are not "scores"</u>, they are simply code numbers for entering the results into a computer. They will enable us to work directly from the questionnaires when they are returned, and there is no other meaning attached to the particular numbers which are used.

As with most questionnaires, some questions may appear rather irrelevant. However, the questionnaire has been made as short as possible and each item has been included for specific use within a particular research objective.

We hope that all of the questions will be answered by everyone receiving a questionnaire. If, however, you are unable or unwilling to answer certain questions, we are anxious that your replies to the others will still be returned to us. To return the questionnaire simply use the envelope which we have provided. Remember that your answers will remain absolutely confidential and cannot be associated with your identity at any stage.

<u>For Office Use</u>

The first three questions ask for some basic details about yourself

Q1 Please ring which ever is applicable : MALE / FEMALE 1

Q2 What was your age last birthday? 2

Q3 For which of the following classes of vehicle have you passed the test to hold a full driving licence? (Please tick the appropriate box(es)).

CAR [5] MOTORCYCLE (not moped) [4] HEAVY GOODS VEHICLE [3] PUBLIC SERVICE VEHICLE [2] NONE [1]

(a,1) 3-6

The next four questions refer to the road accident in which your vehicle was involved with a two-wheeled motor vehicle (i.e. either a motorcycle, a motor scooter or a moped).

Q4 In which year did this accident occur? 1984 [4] 1983 [3] 1982 [2] 7

Q5 What type of motor vehicle were you driving when in this accident?

3-WHEELED CAR [6] 4-WHEELED CAR [5] LIGHT GOODS VEHICLE [4] HEAVY GOODS VEHICLE [3] PUBLIC SERVICE VEHICLE [2] 8

Q6 What size engine did/does this vehicle have?
(If you do not know, please write "DON'T KNOW") .....cc/litre

9

Q7 Were/are you the owner of this vehicle? YES [3] NO [2]

10

The next selection of questions (Q8-Q15) refer to your driving experience AT THE TIME OF THIS ACCIDENT. IF FOR ANY OF THESE QUESTIONS YOU FEEL THAT THIS WAS TOO LONG AGO FOR YOU TO REMEMBER THE DETAILS WE ASK, PLEASE INDICATE THIS BESIDE THE PARTICULAR QUESTION(S) BY WRITING "CAN'T REMEMBER".

The first four of these questions refer to your driving of the type of vehicle which you ticked in Q5 (i.e. the type of vehicle which you were driving in the accident).

Q8 At the time of this accident, roughly how frequently did you drive this type of vehicle? (i.e. either a car, goods or public service vehicle, depending on your answer to Q5.)

EVERY DAY [7] 3-5 TIMES A WEEK [6] 1-2 TIMES A WEEK [5] 2-3 TIMES A MONTH [4] ONCE A MONTH [3] LESS OFTEN [2]

11

Q9 At this time, roughly how many miles of driving with this type of vehicle did you do during a typical week?

LESS THAN 25 MILES [7] 25-50 MILES [6] 51-100 MILES [5] 101-150 MILES [4] 151-300 MILES [3] OVER 300 MILES [2]

12

Q10 At this time, did your driving mainly take place in towns, in the country, or was it about equal for both town and country?

MAINLY TOWN [4] MAINLY COUNTRY [3] EQUAL AMOUNT OF BOTH [2]

13

Q11 At this time, during which parts of the day in a typical week did you drive the type of vehicle which you ticked in Q5?
(For the days shown below, please tick the time(s) of the day when you usually drove.)

	ON A MON, TUES, WED OR THURSDAY	ON A FRIDAY	ON A SATURDAY	ON A SUNDAY
2.01 a.m - 7.00 a.m				
7.01 a.m - 10.00 a.m				
10.01 a.m - 4.00 p.m				
4.01 p.m - 7.00 p.m				
7.01 p.m - 10.00 p.m				
10.01 p.m - 2.00 a.m				
DID NOT USUALLY DRIVE ON THIS DAY OF WEEK				

The next six questions refer to any experience which you may have had with motorcycles, motor scooters or mopeds.

Q12 At around the time of the accident, did you also use any of the following vehicles as either the DRIVER OR PASSENGER?
(Please place a tick in the box next to the vehicle(s) used. If you were not using any of these vehicles, please tick "NONE".)

MOTORCYCLE [4] MOTOR SCOOTER [3] MOPED [2] NONE [1] (a,1) 38-40

If you answered "NONE" please go on to Q13.
If you were using at least one of these types of vehicle at that time, please miss out Q13 and Q14 and go on to Q15.

Q13 Have you ever used any of the following vehicles as either the DRIVER OR PASSENGER at any time in the past?
(Please place a tick in the box next to the vehicle(s) which you have used. If you have not ever used any of them, please tick "NONE".)

MOTORCYCLE [4] MOTOR SCOOTER [3] MOPED [2] NONE [1] (a,1) 41-43

If you answered "NONE" please go on to Q16 on page 4.
If you have used at least one of these vehicles as a driver or passenger, please answer Q14 and Q15.

Q14 Roughly how many years (or months) has it been since you used a two-wheeled motor vehicle as a driver or passenger? ..... (x) 44

Q15 (a) Did/do you mainly use a two-wheeled motor vehicle as the driver or as the pillion passenger?
(Please tick the appropriate box for each of the 3 types of vehicle.)

	USED MAINLY AS THE DRIVER	USED MAINLY AS THE PILLION	HAVE NEVER USED	
MOPED	3	2	1	45
MOTOR SCOOTER	3	2	1	46
MOTORCYCLE	3	2	1	47

(b) For how long had you been the driver/passenger of a two-wheeled motor vehicle? (either at the time of the accident or when you had used one in the past.)

LESS THAN 2 MONTHS [6] 2-11 MONTHS [5] 12-18 MONTHS [4] 19 MONTHS to 5 YEARS [3] OVER 5 YEARS [2] 48

(c) How frequently did you use (as driver or passenger) a two-wheeled motor vehicle (either at the time of the accident or when you had used one in the past):

(i) between April and October? (i.e. during the better weather)

EVERY DAY [6] 3-5 TIMES A WEEK [5] 1-2 TIMES A WEEK [4] 2-3 TIMES A MONTH [3] LESS OFTEN [2] 49

(ii) between October and April? (i.e. during the poorer weather)

EVERY DAY [6] 3-5 TIMES A WEEK [5] 1-2 TIMES A WEEK [4] 2-3 TIMES A MONTH [3] LESS OFTEN [2] 50

Q16 At the time of the accident, did you have a close friend or anyone in the immediate family who OWNED a motorcycle, motor scooter or moped? YES [3] NO [2] 51

Q17 At the time of the accident, did you have a close friend or anyone in the immediate family who USED a motorcycle, motor scooter or moped, either AS THE DRIVER OR AS THE PILLION PASSENGER? YES [3] NO [2] 52

The next three questions refer to your driving experience SINCE THE ACCIDENT referred to in Q4. The first two are concerned with your driving of the type of vehicle ticked in Q5.

Q18 Since this accident has your usual frequency of driving:

GREATLY DECREASED [6] SLIGHTLY DECREASED [5] STAYED ABOUT THE SAME [4] SLIGHTLY INCREASED [3] GREATLY INCREASED [2] 53

Q19 Since this accident, has the mileage you drive in a typical week:

GREATLY DECREASED [6] SLIGHTLY DECREASED [5] STAYED ABOUT THE SAME [4] SLIGHTLY INCREASED [3] GREATLY INCREASED [2] 54

Q20 Have you been using any of the vehicles shown below?
(Please tick the appropriate box(es). If you have not used any of these, please tick "NONE")

PEDAL-CYCLE [5] MOPED [4] MOTOR SCOOTER [3] MOTORCYCLE [2] NONE [1] (a,1) 55-56

The next question refers to any previous road accidents (NO MATTER HOW MINOR AND EVEN IF NOT REPORTED TO THE POLICE OR TO AN INSURANCE COMPANY) in which you may have been involved BEFORE the more recent accident with a two-wheeled motor vehicle.

Q21 Have you ever been involved in any other traffic accident while driving the type of vehicle referred to in Q5? YES [3] NO [2] 59

If you answered "NO", please go on to Q22 on page 5.
If you answered "YES", please continue with part (a) & (b) of Q21.

(a) In how many other road accidents have you previously been involved while driving? (not counting the one with a two-wheeler) ..... (n) 60

(b) Other than your own vehicle, did the accident or accidents involve any of the following:
(Please tick the appropriate box(es) for each previous accident.)

	Accident 1	Accident 2	Accident 3	Accident 4	Accident 5	Accident 6
NO OTHER VEHICLE						
A CAR						
A TWO-WHEELED MOTOR VEHICLE						
A PEDAL-CYCLE						
A PEDESTRIAN						
TWO OR MORE CARS						
SOME OTHER COMBINATION						

(a,1) 61-67

Q22 Finally, other road users have commented on what they consider to be the "unpleasant aspects" of two-wheeled motor vehicles and motorcycling. A list of the most common aspects given by them is presented below.

Please would you tick up to four which you think are the most unpleasant aspects. If you feel, for example, that only two are relevant or accurate, just tick these two; if you consider none to be, tick "NONE". However, even if you consider more than four to be of relevance, please select from these only the FOUR MOST IMPORTANT OR UNPLEASANT in your opinion.

11	Speed	11.
10	Noise	10.
9	Their manoeuvres and approach speeds are sometimes difficult to predict	9.
8	Motorcyclists often provoke accidents	8.
7	It is difficult to distinguish between various types of two-wheeled motor vehicle	7.
6	Riders' vulnerability	6.
5	There are a lot of motorcycle accidents	5.
4	They are not always visible on the roads	4.
3	There are many complexities involved with driving a motorcycle and they are often limited by weather and road conditions	3.
2	Riders' behaviour	2.
1	NONE	1.

12.

(1..13) 68-71

If you have completed all of the parts to the questionnaire that are relevant to you it is now ready to send back to us using the stamped envelope provided. The address is: Peter Brooks, Research Organiser, T.A.A.P., Cranfield Institute of Technology, Cranfield, Bedford MK43 0AL (tel: 0234-750111 Ext2235).

You may feel strongly about possible causes of accidents involving two-wheeled motor vehicles and how they might be prevented, especially as a result of your experience. If so, we would be most grateful if you would let us know of your opinions in the space provided below (or overleaf if necessary).

You may also wish to comment on the questionnaire in general, or on any particular aspect of it.

THANK YOU VERY MUCH. YOUR CO-OPERATION AND HELP GIVEN IS GREATLY APPRECIATED

Appendix 4

Reminder letter used in the Beds/TV survey

Bedfordshire Police

Road Traffic Division,
Police Headquarters,
Woburn Road,
Kempston,
Bedford MK43 9AX

ALL COMMUNICATIONS TO BE ADDRESSED TO "THE CHIEF SUPERINTENDENT"

Telephone: (0234) 855222

Our Ref:

Your Ref:

Dear Sir/Madam,

About a week ago I wrote to you to ask for your help with some road safety research being carried out at Cranfield Institute of Technology.

Many of the people who were sent a questionniare have already replied to Mr. BROOKS at Cranfield and if you are one of these please consider this a special 'thank you' for your promptness.

If you have put the questionnaire aside to finish later it is hoped that you will be able to complete and return it as soon as possible.

As I emphasised in my earlier letter, all survey returns to Mr. BROOKS are totally anonymous and the work being done is most worthwhile and dependent upon your assistance.

Yours faithfully,

Assistant
Chief Constable

Appendix 5

Interview schedule used by Lincolnshire Police

LINCOLNSHIRE POLICE
In conjunction with Cranfield Institute of Technology

SURVEY OF MOTORISTS IN ACCIDENTS INVOLVING POWERED TWO-WHEELERS

This pro-forma should be completed by officers dealing with road traffic accidents which involve a motorcycle, motor scooter or moped and a three or four-wheeled motor vehicle. The survey is concerned with obtaining certain details of the other party involved in an accident with a powered two-wheeler, and is not concerned with details about the motorcyclist.

Accident Report No.: Sub-Division: Officer: Date: / /85

Date of Accident: / /85 Sex of driver: Male/Female Date of birth of driver: / /

cc of driver's vehicle ..... Did accident take place in an area which was primarily urban or rural? Urban/Rural

Description of how accident happened .....

.....

THE FOLLOWING QUESTIONS SHOULD BE READ OUT TO THE DRIVER OF THE THREE OR FOUR-WHEELED VEHICLE AND COMPLETED FROM THE ANSWERS GIVEN BY THIS MOTORIST. Q1-Q3 REFER TO THE MOTORIST'S EXPERIENCE OF DRIVING THE TYPE OF VEHICLE HE/SHE WAS IN DURING THE ACCIDENT - FOR EXAMPLE, A CAR RATHER THAN AN HGV OR PSV. IN Q4, Q5 & Q7 THE "USER" OF A POWERED TWO-WHEELER REFERS TO ANYONE WHO IS/HAS BEEN THE PILLION OR DRIVER OF A POWERED TWO-WHEELER.

Q1 How frequently do you drive the type of vehicle you were driving in the accident? every day [1] | 3-5 times a week [2] | 1-2 times a week [3] | 2-3 times a month [4] | less often [5]

Q2 Roughly how many miles do you drive in a typical week? less than 25 miles [1] | 25-50 miles [2] | 51-100 miles [3] | 101-150 miles [4] | 151-300 miles [5] | over 300 miles [6]

Q3 Does this driving mainly take place in towns, in the country, or is it about equal for both town and country? mainly towns [1] | mainly country [2] | equal amount of both [3]

Q4 Do you presently use a motorcycle, motor scooter or moped either as the driver or as the pillion passenger? Yes/No [1] [2] IF YES →

(4a) Have you mainly used a ...(READ OUT)...motorcycle, [1]
...motor scooter, [2]
...or moped? [3]

(4b) Is this mainly as the driver or as the pillion? Driver [1] Pillion [2]

(4c) What cc machine have you used the most? (RECORD HERE) .....

(4d) For how long have you been the user of a powered two-wheeler?

less than 2 months [1] | 2-11 months [2] | 12-18 months [3] | 19 months to 5 years [4] | over 5 years [5]

(4e) How frequently do you use a powered two-wheeler...

...between April and October? (MAYBE PROMPT: during the better weather)

every day [1] | 3-5 times a week [2] | 1-2 times a week [3] | 2-3 times a month [4] | less often [5]

...between October and April? (MAYBE PROMPT: during the poorer weather)

every day [1] | 3-5 times a week [2] | 1-2 times a week [3] | 2-3 times a month [4] | less often [5]

IF NO, GO TO Q5 (OVERLEAF) ↓

(cont ...)

END OF INTERVIEW (if answer to Q4 was YES)

1

Q5 In the past, have you ever used a motorcycle, motor scooter or moped either as the driver or as the pillion passenger?

Yes/No [1] [2] → IF YES

(5a) Did you mainly use a ...(READ OUT)...motorcycle, [1]
...motor scooter, [2]
...or moped? [3]

(5b) Was this mainly as the driver or as the pillion? Driver [1] Pillion [2]

(5c) What cc machine did you use the most? (RECORD HERE) .....

(5d) For how long were you the user of a powered two-wheeler?

less than 2 months [1] | 2-11 months [2] | 12-18 months [3] | 19 months to 5 years [4] | over 5 years [5]

(5e) How frequently did you use a powered two-wheeler...

...between April and October? (MAYBE PROMPT: during the better weather)

every day [1] | 3-5 times a week [2] | 1-2 times a week [3] | 2-3 times a month [4] | less often [5]

...between October and April? (MAYBE PROMPT: during the poorer weather)

every day [1] | 3-5 times a week [2] | 1-2 times a week [3] | 2-3 times a month [4] | less often [5]

(5f) How long has it been since you used a powered two-wheeler?

less than a year [1] | 1-2 years [2] | 3-5 years [3] | 6-10 years [4] | over 10 years [5]

IF NO, GO TO Q6 ↓

NOW GO TO Q6

Q6 Do you have a close friend or anyone in the immediate family who owns a motorcycle, motor scooter or moped?

Yes/No [1] [2] → IF YES

(6a) Do you know anyone who owns a ...(READ OUT)...motorcycle? [1]
...motor scooter? [2]
...moped? [3]
Not sure what type of vehicle it is. [4]

(MORE THAN ONE CODE MAY BE RINGED FOR Q6a)

IF NO, GO TO Q7 ↓

END OF INTERVIEW (if answer to Q6 was YES)

Q7 Do you have a close friend or anyone in the immediate family who regularly uses a motorcycle, motor scooter or moped either as the driver or as the pillion passenger?

Yes/No [1] [2] → IF YES

(7a) Do you know someone who uses a...(READ OUT)...motorcycle? [1]
...motor scooter? [2]
...moped? [3]
Not sure what type of vehicle it is. [4]

(MORE THAN ONE CODE MAY BE RINGED FOR Q7a)

(7b) Do you know someone who is tha...(READ OUT)...driver? [1]
...pillion? [2]
Not sure whether driver or pillion. [3]

(MORE THAN ONE CODE MAY BE RINGED FOR Q7b)

IF NO, END OF INTERVIEW

END OF INTERVIEW

Appendix 6

Covering letter from Northamptonshire Police

From: Maurice Buck OBE QPM CBIM

CHIEF CONSTABLE'S OFFICE
POLICE HEADQUARTERS
WOOTTON HALL
NORTHAMPTON
NN4 0JQ

TELEPHONE 0604 63111

Dear

Motorcycle accidents are a matter of concern to us all, and as you were recently involved in an accident with a motorcycle I am writing to seek your assistance in some research that is being undertaken by a Mr. Brooks at the Cranfield Institute of Technology.

The researchers do not of course yet know of your involvement in any accident and I wish to make it clear the police have not, and will not in any event divulge any information to them. I do, however, ask you to consider completing the enclosed questionnaire but stress that YOU ARE UNDER NO OBLIGATION TO DO SO. If you do complete the questionnaire, anonymity is guaranteed as there are no identifying marks on it.

The questionnaire should only take a few minutes to complete as the main areas of interest to the researchers are:

(a) the extent to which you were exposed to risk at the time of the accident in terms of your usage of the roads;

(b) the nature of your means of transport, including the kind of vehicle(s) you have used and are now using.

There is one further point I should emphasise. If you complete the questionnaire the information contained in it is solely for the use of the researchers, and indeed it should be sent direct to Mr. Brooks at Cranfield who will treat it as totally confidential. Whatever you say, therefore, in the questionnaire cannot influence our decision about possible prosecution arising from the accident, or affect the information that we normally supply to interested parties in respect of possible civil claims.

Thank you for reading this letter. If you decide to complete the questionnaire please use the enclosed stamped addressed envelope to forward it to Mr. Brooks.

Yours sincerely,

M. Buck
Chief Constable

Appendix 7

Questionnaire used in the Northants survey

PRIVATE AND CONFIDENTIAL. COMPLETED QUESTIONNAIRES ARE FOR THE USE OF CRANFIELD INSTITUTE OF TECHNOLOGY AND NOT NORTHAMPTONSHIRE POLICE

Survey of motorists by Cranfield Institute of Technology in conjunction with Northamptonshire Police

Thank you for beginning to read this questionnaire. We hope very much that you will continue to do this and complete the questions as you go. The information which you could provide would really be of immense value to our work on road safety. If you do continue, as you go through the questionnaire please either place ticks in the appropriate boxes, ring the answers which apply to you, or write your replies in the spaces provided by dotted lines.

As indicated, the space on the far right hand side of the questionnaire is for our office use when taking information from completed questionnaires. The numbers which are in this column and which are in the boxes are not "scores", they are simply code numbers for entering the results into a computer. They will enable us to work directly from the questionnaires when they are returned, and there is no other meaning attached to the particular numbers which are used.

As with most questionnaires, some questions may appear rather irrelevant. However, the questionnaire has been made as short as possible and each item has been included for specific use within a particular research objective.

We hope that all of the questions will be answered by everyone receiving a questionnaire. If, however, you are unable or unwilling to answer certain questions, we are anxious that your replies to the others will still be returned to us. Remember that your answers will remain absolutely confidential and cannot be associated with your identity at any stage.

For Office Use

The first three questions ask for some basic details about yourself

1 Please ring which ever is applicable : MALE / FEMALE

1

Q2 What was your age last birthday? .....

2

Q3 For which of the following classes of vehicle have you passed the test to hold a full driving licence? (Please tick the appropriate box(es)).

CAR [6] MOTORCYCLE (not moped) [4] HEAVY GOODS VEHICLE [3] PUBLIC SERVICE VEHICLE [2]

(a,1) 3-6

The next three questions refer to the road accident in which your vehicle was involved with a two-wheeled motor vehicle (i.e. either a motorcycle, a motor scooter or a moped).

4 In which month did this accident occur? .....

(1..12) 7

5 What type of motor vehicle were you driving when in this accident?

3-WHEELED CAR [6] 4-WHEELED CAR [5] LIGHT GOODS VEHICLE [4] HEAVY GOODS VEHICLE [3] PUBLIC SERVICE VEHICLE [2]

8

Q6 What size engine does this vehicle have?
(If you do not know, please write "DON'T KNOW") .....cc/litre

(H) 9

The next four questions refer to your driving of the type of vehicle which you ticked in Q5 (i.e. the type of vehicle which you were driving in the accident).

Q7 Roughly how frequently do you drive this type of vehicle? (i.e. either a car, goods or public service vehicle, depending on your answer to Q5.)

EVERY DAY [7] | 3-5 TIMES A WEEK [6] | 1-2 TIMES A WEEK [5] | 2-3 TIMES A MONTH [4] | ONCE A MONTH [3] | LESS OFTEN [2]

10

Q8 Roughly how many miles of driving with this type of vehicle do you do during a typical week?

LESS THAN 25 MILES [7] | 25-50 MILES [6] | 51-100 MILES [5] | 101-150 MILES [4] | 151-300 MILES [3] | OVER 300 MILES [2]

11

Q9 Does your driving mainly take place in towns, in the country, or is it about equal for both town and country?

MAINLY TOWN [4] | MAINLY COUNTRY [3] | EQUAL AMOUNT OF BOTH [2]

12

Q10 In a typical week, during which parts of the day do you drive the type of vehicle which you ticked in Q5?
(For the days shown below, please tick the time(s) of the day when you usually drive.)

	ON A MON, TUES, WED OR THURSDAY	ON A FRIDAY	ON A SATURDAY	ON A SUNDAY
2.01 a.m - 7.00 a.m				
7.01 a.m - 10.00 a.m				
10.01 a.m - 4.00 p.m				
4.01 p.m - 7.00 p.m				
7.01 p.m - 10.00 p.m				
10.01 p.m - 2.00 a.m				
DO NOT USUALLY DRIVE ON THIS DAY OF WEEK				

(2,1) 13-40

The next six questions refer to any experience which you may have with motorcycles, motor scooters or mopeds.

Q11 Do you currently also use any of the following vehicles as either the DRIVER OR PASSENGER?

(Please place a tick in the box next to the vehicle(s) used. If you do not use any of these vehicles at present, please tick "NONE".)

MOTORCYCLE [4] MOTOR SCOOTER [3] MOPED [2] NONE [1]

(a,1) 41-43

If you answered "NONE" please go on to Q12.
If you do use at least one of these types of vehicle at the moment, please miss out Q12 and Q13 and go on to Q14.

Q12 Have you ever used any of the following vehicles as either the DRIVER OR PASSENGER at any time in the past?

(Please place a tick in the box next to the vehicle(s) which you have used. If you have not used any of them, please tick "NONE".)

MOTORCYCLE [4] MOTOR SCOOTER [3] MOPED [2] NONE [1]

(a,1) 44-46

If you answered "NONE" please go on to Q15 on page 4.
If you have used at least one of these vehicles as a driver or passenger, please answer Q13 and Q14.

Q13 Roughly how many years (or months) has it been since you used a two-wheeled motor vehicle as a driver or passenger? .....

(x) 47

Q14 (a) Did/do you mainly use a two-wheeled motor vehicle as the driver or as the pillion passenger?

(Please tick the appropriate box for each of the 3 types of vehicle.)

	USED MAINLY AS THE DRIVER	USED MAINLY AS THE PILLION	HAVE NEVER USED	
MOPED	3	2	1	48
MOTOR SCOOTER	3	2	1	49
MOTORCYCLE	3	2	1	50

(b) For how long have you been, or were you, the driver/passenger of a two-wheeled motor vehicle?

LESS THAN 2 MONTHS [6] 2-11 MONTHS [5] 12-18 MONTHS [4] 19 MONTHS to 5 YEARS [3] OVER 5 YEARS [2]

51

(c) How frequently do you, or did you, use a two-wheeled motor vehicle as the driver or the passenger:

(i) between April and October? (i.e. during the better weather)

EVERY DAY [6] 3-5 TIMES A WEEK [5] 1-2 TIMES A WEEK [4] 2-3 TIMES A MONTH [3] LESS OFTEN [2]

52

(ii) between October and April? (i.e. during the poorer weather)

EVERY DAY [6] 3-5 TIMES A WEEK [5] 1-2 TIMES A WEEK [4] 2-3 TIMES A MONTH [3] LESS OFTEN [2]

53

Q15 Do you presently have a close friend or anyone in the immediate family who OWNS a motorcycle, motor scooter or moped?

YES [3] NO [2]

Q16 Do you presently have a close friend or anyone in the immediate family who USES a motorcycle, motor scooter or moped, either AS THE DRIVER OR AS THE PILLION PASSENGER?

YES [3] NO [2]

The next question refers to any previous road accidents (NO MATTER HOW MINOR AND EVEN IF NOT REPORTED TO THE POLICE OR TO AN INSURANCE COMPANY) in which you may have been involved BEFORE the more recent accident with a two-wheeled motor vehicle.

Q17 Have you ever been involved in any other traffic accident while driving the type of vehicle referred to in Q5?

YES [3] NO [2]

If you answered "NO", please go on to Q18 on page 5.
If you answered "YES", please continue with part (a) & (b) of Q17.

(a) How many other road accidents have you previously been involved in (not counting the one with a two-wheeler)? .....

(b) Other than your own vehicle, did the accident or accidents involve any of the following:
(Please tick the appropriate box(es) for each previous accident.)

	Accident 1	Accident 2	Accident 3	Accident 4	Accident 5
NO OTHER VEHICLE					
A CAR					
A TWO-WHEELED MOTOR VEHICLE					
A PEDAL-CYCLE					
A PEDESTRIAN					
TWO OR MORE CARS					
SOME OTHER COMBINATION					

Q18 Finally, other road users have commented on what they consider to be the "unpleasant aspects" of two-wheeled motor vehicles and motorcycling. A list of the most common aspects given by them is presented below.

Please would you tick up to four which you think are the **most unpleasant aspects.** If you feel, for example, that only two are relevant or accurate, just tick these two; if you consider none to be, tick "NONE". However, even if you consider more than four to be of relevance, please select from these only the FOUR MOST IMPORTANT OR UNPLEASANT in your opinion.

11	Speed
10	Noise
9	Their manoeuvres and approach speeds are sometimes difficult to predict
8	Motorcyclists often provoke accidents
7	It is difficult to distinguish between various types of two-wheeled motor vehicle
6	Riders' vulnerability
5	There are a lot of motorcycle accidents
4	They are not always visible on the roads
3	There are many complexities involved with driving a motorcycle and they are often limited by weather and road conditions
2	Riders' behaviour
1	NONE

(1..12) 65-68

If you have completed all of the parts to the questionnaire that are relevant to you it is now ready to send back to us using the envelope provided. **WE WILL PAY THE POSTAGE FOR THIS.** The address is: Peter Brooks, Research Organiser, T.A.A.P., Cranfield Institute of Technology, FREEPOST, Cranfield Bedford, MK43 7BR (tel: 0234-750111 Ext2235).

You may feel strongly about possible causes of accidents involving two-wheeled motor vehicles and how they might be prevented, especially as a result of your experience. If so, we would be most grateful if you would let us know of your opinions in the space provided below (or overleaf if necessary).

You may also wish to comment on the questionnaire in general, or on any particular aspect of it.

THANK YOU VERY MUCH. YOUR CO-OPERATION AND HELP GIVEN IS GREATLY APPRECIATED

Appendix 8

Covering letter used in the DVLC survey

Applied Psychology Unit
College of Aeronautics
Cranfield Institute of Technology
Cranfield Bedford MK43 0AL England
Telephone Bedford (0234) 750111
Telex 825072 CITECH G

Cranfield

Dear Sir or Madam

Road Safety

I am writing to ask for your help with some road safety research being sponsored by a Government Research Council and carried out at Cranfield Institute of Technology.

To carry out our work we need to know certain aspects about all road users, how much and when they use their vehicles, what kinds of vehicle they are using at the moment and what they have used in the past. At present we are asking the drivers of cars for this information.

We can only get this information by writing to car owners. To save expense we are not writing to all, but to a relatively small number, chosen at random from the registration records kept at the Driver and Vehicle Licensing Centre (DVLC), Swansea. In order to be sure that all possible answers are taken into account we are anxious to get a reply from every person we write to.

The questionnaire which is enclosed should take only a few minutes to complete. Would you please fill in the answers and post the quesionnaire back to us using the enclosed envelope. There is no need for a stamp.

Please note that it is *your* reply we want even if at present you do not drive the car registered at the DVLC. Please do not ask anyone else to fill in the form instead of you, or we will not have a true cross-section of owners.

Your reply will be kept strictly confidential, and will only be used for counting how many people give each different answer. Names will never be associated with responses, and the serial number on the questionnaire is solely so that we can identify those drivers who we do not hear from. That way we can find out who may not have received their copy and a reminder or another questionnaire can be sent to them. Indeed, your prompt reply will save us troubling you again with reminder letters.

I would be extremely grateful for your help. May I wish you very safe and happy driving.

Yours faithfully

Peter Brooks

Peter Brooks

Research Organiser

Appendix 9

Questionnaire used in the DVLC survey

PLEASE DO NOT PASS THIS FORM ON TO SOMEONE ELSE

IT IS YOUR ANSWERS THAT WE NEED

Serial Number

Survey of motorists selected at random from DVLC records of car owners

Thank you for beginning to read this questionnaire. We hope very much that you will continue and complete the questions as you go. The information which you could provide would be of immense value to our work on road safety.

As you go through the questionnaire please either place ticks in the appropriate boxes, ring the answers which apply to you, or write your replies in the spaces provided by dotted lines.

As indicated, the space on the far right hand side of the questionnaire is for our office use when taking information from completed questionnaires. The numbers which are in this column and which are in the boxes are not "scores", they are simply code numbers for entering the results into a computer. They will enable us to work directly from the questionnaires when they are returned, and there is no other meaning attached to the particular numbers which are used.

As with most questionnaires, some questions may appear rather irrelevant. However, the questionnaire has been made as short as possible and each item has been included for specific use within a particular research objective.

We hope that all of the questions will be answered by everyone receiving a questionnaire. If, however, you are unable or unwilling to answer certain questions, we are anxious that your replies to the others will still be returned to us. Remember that your answers will remain absolutely confidential and will not be associated with your identity at any stage.

For Office Use

The first three questions ask for some basic details about yourself

Q1 Please ring which ever is applicable : MALE / FEMALE

1

Q2 What was your age last birthday? .....

2

Q3 In which COUNTY do you live? .....

3

Q4 For which of the following classes of vehicle have you passed the test to hold a full driving licence? (Please tick the appropriate box(es)).

CAR [5] MOTORCYCLE (not moped) [4] HEAVY GOODS VEHICLE [3] PUBLIC SERVICE VEHICLE [2] NONE [1]

(a,1) 4-7

The next two questions refer to any motor vehicles which you own.

Q5 Do you own any of the following types of motor vehicle?
(Please tick the appropriate box(es). Tick "NONE" if you no longer own even a car.)

TWO-WHEELED MOTOR VEHICLE (i.e. motorcycle, scooter, moped) [7] 3-WHEELED CAR [6] 4-WHEELED CAR [5]

LIGHT GOODS VEHICLE [4] HEAVY GOODS VEHICLE [3] PUBLIC SERVICE VEHICLE [2] NONE [1]

(a,1) 8-13

If you are the owner of at least one car or van/light goods vehicle, please continue with the next series of questions starting with Q6 on page 2.
If you did not tick either "CAR" or "LIGHT GOODS VEHICLE" in Q5, please go on to Q11 on page 3.

Q6 What size engine does each vehicle you own have?
(Please enter the engine size(s) in the appropriate box for each of the 3 types of vehicle shown below. If you do not know the engine size(s), please tick "DON'T KNOW".)

	ENGINE SIZE(S) (please enter)	DON'T KNOW (tick if appropriate)	DON'T OWN THIS TYPE OF VEHICLE	
3-WHEELED CAR(S)				14
4-WHEELED CAR(S)				15
LIGHT GOODS VEHICLE(S)				16

The next four questions refer to your driving of a car or van. If you own both a car and a van please answer these questions in terms of your car driving rather than van driving. If you own both a 3 and a 4-wheeled car, please answer in terms of your driving of a 4-wheeled car.

Q7 Roughly how frequently do you drive this type of vehicle? (i.e. either a car or van.)

EVERY DAY [7] | 3-5 TIMES A WEEK [6] | 1-2 TIMES A WEEK [5] | 2-3 TIMES A MONTH [4] | ONCE A MONTH [3] | LESS OFTEN [2] — 17

Q8 Roughly how many miles of driving with this type of vehicle do you do during a typical week?

LESS THAN 25 MILES [7] | 25-50 MILES [6] | 51-100 MILES [5] | 101-150 MILES [4] | 151-300 MILES [3] | OVER 300 MILES [2] — 18

Q9 Does your driving mainly take place in towns, in the country, or is it about equal for both town and country?

MAINLY TOWN [4] | MAINLY COUNTRY [3] | EQUAL AMOUNT OF BOTH [2] — 19

Q10 In a typical week, during which parts of the day do you drive this type of vehicle?
(For the days shown below, please tick the time(s) of the day when you usually drive.)

	ON A MON, TUES, WED OR THURSDAY	ON A FRIDAY	ON A SATURDAY	ON A SUNDAY
2.01 a.m - 7.00 a.m				
7.01 a.m - 10.00 a.m				
10.01 a.m - 4.00 p.m				
4.01 p.m - 7.00 p.m				
7.01 p.m - 10.00 p.m				
10.01 p.m - 2.00 a.m				
DO NOT USUALLY DRIVE ON THIS DAY OF WEEK				

(3,1) 20-4

The next six questions refer to any experience which you may have with motorcycles, motor scooters or mopeds.

Q11 Do you currently also use any of the following vehicles as either the DRIVER OR PASSENGER?
(Please place a tick in the box next to the vehicle(s) used. If you do not use any of these vehicles at present, please tick "NONE".)

MOTORCYCLE [4] MOTOR SCOOTER [3] MOPED [2] NONE [1]

(a,1) 44-46

If you answered "NONE" please go on to Q12.
If you do use at least one of these types of vehicle at the moment, please miss out Q12 and Q13 and go on to Q14.

Q12 Have you ever used any of the following vehicles as either the DRIVER OR PASSENGER at any time in the past?
(Please place a tick in the box next to the vehicle(s) which you have used. If you have not used any of them, please tick "NONE".)

MOTORCYCLE [4] MOTOR SCOOTER [3] MOPED [2] NONE [1]

(a,1) 47-49

If you answered "NONE" please go on to Q15 on page 4.
If you have used at least one of these vehicles as a driver or passenger, please answer Q13 and Q14.

Q13 Roughly how many years (or months) has it been since you used a two-wheeled motor vehicle as a driver or passenger? .....

(x) 50

Q14 (a) Did/do you mainly use a two-wheeled motor vehicle as the driver or as the pillion passenger?
(Please tick the appropriate box for each of the 3 types of vehicle.)

	USED MAINLY AS THE DRIVER	USED MAINLY AS THE PILLION	HAVE NEVER USED	
MOPED	3	2	1	51
MOTOR SCOOTER	3	2	1	52
MOTORCYCLE	3	2	1	53

(b) For how long have you been, or were you, the driver/passenger of a two-wheeled motor vehicle?

LESS THAN 2 MONTHS [6] 2-11 MONTHS [5] 12-18 MONTHS [4] 19 MONTHS to 5 YEARS [3] OVER 5 YEARS [2]

54

(c) How frequently do you, or did you, use a two-wheeled motor vehicle as the driver or the passenger:

(i) between April and October? (i.e. during the better weather)

EVERY DAY [6] 3-5 TIMES A WEEK [5] 1-2 TIMES A WEEK [4] 2-3 TIMES A MONTH [3] LESS OFTEN [2]

55

(ii) between October and April? (i.e. during the poorer weather)

EVERY DAY [6] 3-5 TIMES A WEEK [5] 1-2 TIMES A WEEK [4] 2-3 TIMES A MONTH [3] LESS OFTEN [2]

56

The next question refers to any road accidents (NO MATTER HOW MINOR AND EVEN IF NOT REPORTED TO THE POLICE OR TO AN INSURANCE COMPANY) in which you may have been involved.

Q15 Have you ever been involved in any traffic accident while <u>driving</u> a motor vehicle?

YES [3] NO [2] 57

If you answered "NO", please go on to Q16.
If you answered "YES", please continue with part (a) (b) & (c) of Q15.

(a) In how many road accidents have you been involved while driving? ..... (x) 58

(b) What type(s) of motor vehicle were you driving in this/these accident(s)?
(Please tick the appropriate box(es). If you were driving a type not given below, tick "OTHER".)

TWO-WHEELED MOTOR VEHICLE (i.e. motorcycle, scooter, moped) [7]
3-WHEELED CAR [6]
4-WHEELED CAR [5]
LIGHT GOODS VEHICLE [4]
HEAVY GOODS VEHICLE [3]
PUBLIC SERVICE VEHICLE [2]
OTHER [1]

59-65

(c) Other than your own vehicle, did the accident or accidents involve any of the following:
(Please tick the appropriate box(es) for each previous accident.)

	Accident 1	Accident 2	Accident 3	Accident 4	Accident 5	Accident 6
NO OTHER VEHICLE						
A CAR						
A TWO-WHEELED MOTOR VEHICLE						
A PEDAL-CYCLE						
A PEDESTRIAN						
TWO OR MORE CARS						
SOME OTHER COMBINATION						

(a,1) 66-72

The last three questions ask for information which will help work being done on accidents involving motorcycles. It is very important that as a road user you answer these questions, whether or not you have any motorcycling experience. We want to be sure that all points of view are taken into account.

Q16 Do you presently have a close friend or anyone in the immediate family who OWNS a motorcycle, motor scooter or moped?

YES [3] NO [2] 7

Q17 Do you presently have a close friend or anyone in the immediate family who USES a motorcycle, motor scooter or moped, either AS THE DRIVER OR AS THE PILLION PASSENGER?

YES [3] NO [2] 7

Q18 Finally, other road users have commented on what they consider to be the "unpleasant aspects" of two-wheeled motor vehicles and motorcycling. A list of the most common aspects given by them is presented below.

Please would you tick up to four which you think are the most unpleasant aspects. If you feel, for example, that only two are relevant or accurate, just tick these two; if you consider none to be, tick "NONE". However, even if you consider more than four to be of relevance, please select from these only the FOUR MOST IMPORTANT OR UNPLEASANT in your opinion.

11	Speed
10	Noise
9	Their manoeuvres and approach speeds are sometimes difficult to predict
8	Motorcyclists often provoke accidents
7	It is difficult to distinguish between various types of two-wheeled motor vehicle
6	Riders' vulnerability
5	There are a lot of motorcycle accidents
4	They are not always visible on the roads
3	There are many complexities involved with driving a motorcycle and they are often limited by weather and road conditions
2	Riders' behaviour
1	NONE

(1..13) 75-78

If you have completed all of the parts to the questionnaire that are relevant to you it is now ready to send back to us using the envelope provided. WE WILL PAY THE POSTAGE FOR THIS. The address is: Peter Brooks, Research Organiser, Applied Psychology Unit (T.A.A.P.), Cranfield Institute of Technology, FREEPOST, Cranfield, Bedford MK43 7BR (tel: 0234-750111 Ext2235).

If you wish to comment on the questionnaire or on any aspect of road safety please feel free to do so in the space provided below (or overleaf if necessary). We would welcome any views which you may feel strongly about.

THANK YOU VERY MUCH. YOUR CO-OPERATION AND HELP GIVEN IS GREATLY APPRECIATED

Appendix 10

First reminder letter used in the DVLC survey

Applied Psychology Unit
College of Aeronautics
Cranfield Institute of Technology
Cranfield Bedford MK43 0AL England
Telephone Bedford (0234) 750111
Telex 825072 CITECH G

Cranfield

Dear Sir or Madam

About a week ago I wrote to a number of people, including yourself, asking them to help our present work on road safety by completing a brief questionnaire.

Most of the people have already replied, but I have not yet heard from you. Your survey return and this letter may well have crossed in the post. However, if you have put the questionnaire aside to finish later I do hope that you will be able to complete and return it as soon as possible. We would be most thankful.

Yours faithfully

Peter Brooks

Peter Brooks

Research Organiser

Appendix 11

Second reminder letter used in the DVLC survey

Applied Psychology Unit
College of Aeronautics
Cranfield Institute of Technology
Cranfield Bedford MK43 0AL England
Telephone Bedford (0234) 750111
Telex 825072 CITECH G

Cranfield

Dear Sir or Madam

About two weeks ago I wrote to you about a survey we are conducting as part of our work on road safety. My apologies for troubling you if you have recently returned your reply to us, but as I had not heard from you prior to sending this letter I expect the form has gone astray or has been mislaid. I have therefore enclosed another questionnaire and a postage-paid envelope for its return. I hope you will be able to spare a moment to send it off. Your co-operation and help would be greatly appreciated.

Yours faithfully

Peter Brooks

Peter Brooks

Research Organiser

Appendix 12

Summary of the standard multiple regression analyses

The following significance levels are used:

***	$p < 0.001$
**	$p < 0.01$
*	$p < 0.05$
†	$p < 0.07$
ns	not significant

Data Set	Group Comparison	Culpability of Motorist	Main variables contributing to prediction	sr^2 (unique)	Significance of variable	R	R^2
Northants	Group 1 vs Group 7	not known	MILES	0.03	*	0.39**	0.15
			SEX	0.02	*		
	Group 1 vs Group 5	not known	SEX	0.03	**	0.32***	0.01
			MILES	0.01	*		
	Group 1 vs Group 4	not known	SEX	0.03	*	0.31*	0.10
	Group 1 vs Group 3	not known	SEX	0.01	†	0.31*	0.10
			MILES	0.01	†		
	Group 1 vs Group 2	not known	SEX	0.02	*	0.33**	0.11
			AREA	0.02	*		
Lincs	Group 1 vs Group 7	Category II	AREA	0.02	ns	0.44†	0.19
			AGE	0.02	ns		
			SEX	0.02	ns		
			GROUP	0.02	ns		
	Group 1 vs Group 5	Category II	GROUP	0.07	**	0.46**	0.21
	Group 1 vs Group 4	Category II	GROUP	0.04	*	0.44*	0.19
			AREA	0.03	†		
	Group 1 vs Group 3	Category II	GROUP	0.04	*	0.45*	0.20
	Group 1 vs Group 2	Category II	AREA	0.03	†	0.41*	0.17
Beds/TV	Group 1 vs Group 7	Category II	AREA	0.02	*	0.23(ns)	0.05
		Category I	AREA	0.03	*	0.38*	0.15
			FREQ	0.03	*		
			CC	0.03	*		
	Group 1 vs Group 5	Category II	AREA	0.01	*	0.19(ns)	0.04
		Category I	AREA	0.03	**	0.34**	0.11
			FREQ	0.03	**		
	Group 1 vs Group 4	Category II	AREA	0.01	*	0.24*	0.06
		Category I	AREA	0.01	*	0.36**	0.13
			AREA	0.02	†		
			AGE	0.02	†		
	Group 1 vs Group 3	Category II	AREA	0.01	*	0.23*	0.05
			AREA	0.01	*		
		Category I	CC	0.02	*	0.35*	0.13
	Group 1 vs Group 2	Category II	AREA	0.01	*	0.20(ns)	0.04
		Category I	AREA	0.04	**	0.41**	0.17
			FREQ	0.04	*		
			CC	0.03	*		

Appendix 13

Summary of the hierarchical multiple regression analyses

The following significance levels are used:

***	$p < 0.001$
**	$p < 0.01$
*	$p < 0.05$
†	$p < 0.07$
ns	not significant

Data Set	Group Comparison	Culpability of Motorist	Variables entered giving significant increase in R	sr^2 (incremental) & significance level	R	R^2
Northants	Group 1 vs Group 7	not known	MILES SEX	0.03** 0.03*	0.26**	0.07
	Group 1 vs Group 5	not known	SEX MILES AREA	0.02** 0.05*** 0.02**	0.30***	0.09
	Group 1 vs Group 4	not known	SEX	0.02*	0.17*	0.03
	Group 1 vs Group 3	not known	MILES SEX	0.02* 0.02*	0.20*	0.04
	Group 1 vs Group 2	not known	SEX	0.02*	0.19*	0.03
Lincs	Group 1 vs Group 7	Category II	AREA	0.09**	0.42**	0.18
		Category I & II	FREQ+SEX+AGE+AREA GROUP	0.21*** 0.04*	0.50***	0.25
	Group 1 vs Group 5	Category II	AREA GROUP	0.08* 0.07*	0.44***	0.19
		Category I & II	AGE+SEX+AREA+FREQ+MILES GROUP	0.15*** 0.09***	0.49***	0.24
	Group 1 vs Group 4	Category II	AREA GROUP	0.10** 0.04*	0.42**	0.18
		Category I & II	FREQ+SEX+AGE+AREA GROUP	0.19*** 0.04*	0.48***	0.23
	Group 1 vs Group 3	Category II	AREA GROUP	0.09** 0.04*	0.44**	0.19
		Category I & II	M2+AREA+AGE+SEX+FREQ GROUP	0.20*** 0.05*	0.50***	0.25
	Group 1 vs Group 2	Category II	AREA	0.08**	0.35**	0.13
		Category I & II	AREA	0.12***	0.38***	0.15
Beds/TV	Group 1 vs Group 7	Category II	AREA	0.03**	0.20**	0.04
		Category I	AREA FREQ CC	0.05** 0.05** 0.02†	0.34**	0.12
	Group 1 vs Group 5	Category II	AREA	0.02**	0.16**	0.03
		Category I	FREQ AREA	0.05*** 0.03**	0.29***	0.09
	Group 1 vs Group 4	Category II	AREA AREA	0.02** 0.01*	0.18**	0.03
		Category I	AREA AGE	0.04** 0.03*	0.33**	0.11
	Group 1 vs Group 3	Category II	AREA AREA	0.02** 0.01*	0.19**	0.03
		Category I	-	-	0.13(ns)	0.02
	Group 1 vs Group 2	Category II	AREA	0.02**	0.16*	0.03
		Category I	AREA FREQ GROUP	0.06** 0.03* 0.02†	0.34***	0.12