An analysis of police reports of fatal accidents involving motorcycles

Prepared for Road Safety Division, Department of the Environment, Transport and the Regions

D Lynam, J Broughton, R Minton and R J Tunbridge
This report has been produced by TRL Limited, under/as part of a Contract placed by the Department of the Environment, Transport and the Regions. Any views expressed are not necessarily those of the Department.

TRL is committed to optimising energy efficiency, reducing waste and promoting recycling and re-use. In support of these environmental goals, this report has been printed on recycled paper, comprising 100% post-consumer waste, manufactured using a TCF (totally chlorine free) process.
CONTENTS

Executive Summary

1 Introduction

2 General analysis

2.1 Types of vehicle and road user involved in motorcycle accidents
2.2 Ages of those involved in the accidents
2.2.1 Motorcyclists
2.2.2 Others involved
2.3 Accident circumstances
2.3.1 Lighting
2.3.2 Weather
2.3.3 Road surface
2.3.4 Speed limit
2.3.5 Road junctions
2.3.6 Pedestrian facilities

3 Contributory Factors in fatal motorcycle accidents

3.1 Introduction to the Contributory Factor reporting system
3.2 Sources of Contributory Factor data
3.3 Analysis of Contributory Factors
3.4 Accident clusters
3.4.1 Accidents where the Precipitating Factor was 'loss of control' - TWMV responsible
3.4.2 Accidents with the Precipitating Factor 'failed to avoid vehicle or object in carriageway' - TWMV responsible
3.4.3 Accidents with the Precipitating Factor 'failed to give way' - Other road user responsible
3.4.4 Accidents with the Precipitating Factor 'poor turn or manoeuvre' - Other road user responsible
3.4.5 Accidents with the Precipitating Factor 'pedestrian entered road carelessly' - Other road user responsible
3.5 Variations in the accident patterns according to differences in the engine capacity of the motorcycle
3.6 Implications of specific factors
3.6.1 Poor road surface
3.6.2 Alcohol
4 In-depth analysis

4.1 General details from the files

4.2 Accident sequences where the Precipitating Factor was assigned to a motorcyclist
   4.2.1 Accidents where the Precipitating Factor was loss of control
   4.2.2 Accidents where the Precipitating Factor was failure to avoid object/vehicle in the carriageway

4.3 Accident sequences where the Precipitating Factor was not assigned to a motorcyclist
   4.3.1 Poor turn or manoeuvre
   4.3.2 Accidents where the Precipitating Factor was 'Pedestrian entering carriageway carelessly'
   4.3.3 Accidents where the Precipitating Factor was 'Other vehicle failed to give way'

4.4 Location and manoeuvre

4.5 Journey purpose

4.6 Age and location of pedestrian casualties

4.7 Speed

4.8 Objects hit in single motorcycle accidents

5 Contributory Factors in serious and slight injury accidents

5.1 Analysis of Contributory Factors

6 The changing motorcycle population

7 Conclusions

8 Acknowledgements

9 References

Appendix A: Contributory Factor codes

Appendix B: Case studies of causation types

Abstract

Related publications
Executive Summary

National accident statistics show that motorcyclists are a particularly vulnerable group of road users, but a substantial number of other road users are also killed in accidents in which motorcycles are involved. The main focus of this report is an analysis of police reports of a sample of accidents in which a motorcyclist was involved, and where the motorcyclist or any of the other road users involved were killed. The analysis investigates the pattern of road users involved, and the actions of the road users who were considered to be principally responsible for the accident.

Background

Trends in casualties show that although the number of road accident fatalities has generally decreased in recent years, the number of motorcyclist fatalities has risen and the distribution of casualties has changed. From 1980 to 1992 the number of motorcyclists killed and seriously injured fell fairly rapidly. Since then, the number of casualties has begun to increase again, and the number of deaths has risen since 1993. The rise in casualties has been accompanied by a rise in the stock of motorcycles and an increase in the proportion of total motorcycle mileage on non built-up roads (NBU, on which the speed limit exceeds 40mph) in recent years. DETR statistics suggest that the total mileage ridden was relatively constant between 1993 and 1998, but there is evidence of a rise in 1999.

DETR asked TRL to undertake a detailed investigation of the causes of motorcycle accidents, using the database that TRL has compiled from police files of fatal accidents. This report describes that work. A total of 717 fatal accidents involving motorcycles from this database are examined here. The police files referred to accidents occurring between 1986 and 1995, with the majority in the later years between 1992-1994. Files are included from most police forces in England and Wales. Eighty seven per cent of those killed were motorcyclists and 11 per cent pedestrians.

The Contributory Factors (i.e. those factors which, in the opinion of the investigator, contributed directly to the occurrence of the accident) were identified by the TRL team that assembles the fatal accident database using the information from the police files. To do this they used a system devised and tested at TRL. A major part of the current study has involved re-examining the original police files to see whether they contain extra details about how and why these motorcycle accidents occurred.

Conclusions

Accident patterns

Forty one per cent of the motorcycle accidents in the database involved collision between one or more cars and a motorcyclist, 29 per cent involved a motorcyclist crashing without the active involvement of another road user, 15 per cent involved collision with a vehicle larger than a car, and 12 per cent collision with a pedestrian.

Causation factors

There are very clear differences between the Contributory Factors in those motorcycle accidents judged to have been the principal responsibility of a motorcycle rider and those accidents where a non-rider was judged to have been mainly responsible.

A high proportion of the former accidents involves ‘Loss of Control’, the proportion being higher on rural roads. This was often linked with excessive speed, alcohol impairment and careless/thoughtless/reckless behaviour.

In contrast, ‘Loss of Control’ was rarely identified as leading to an accident where the non-rider was judged mainly responsible; instead, ‘Failed to give way’ and ‘Poor turn/manoeuvre’ were relatively common. These were often linked with failure to observe satisfactorily, careless, thoughtless, or reckless behaviour, or failure to judge the rider’s path or speed.

In the accidents where motorcyclists lost control there were roughly equal proportions where the motorcyclist ran into another vehicle, went straight ahead at a bend or roundabout, or hit a kerb or verge. In only 15 percent of the cases did they lose control after trying to avoid a vehicle or an animal.

There is little evidence that weather or road condition was an important factor in the majority of these accidents.

Motorcyclist behaviour

Sixty per cent of the accidents involving cars or larger vehicles were considered to be principally the fault of the motorcyclist, and in 44 per cent of the cases this was due to excessive speed.

The mean speed of motorcyclists in those accidents for which they were judged to be principally responsible was 57 mph compared with 43 mph when the other party was mainly responsible. In many of the accidents where the principal responsibility was not assigned to the motorcyclist, the motorcyclist was still travelling at speeds above the limit; but the proportion of cases above the limit was similar to the proportion for all motorcyclists, as observed in DETR surveys.

In several cases where a motorcyclist failed to avoid a vehicle ahead which was manoeuvring the motorcyclist had just overtaken other vehicles which were slowing in anticipation of the manoeuvring vehicle.

Alcohol impairment was found to have a prominent role in the fatal and serious accidents for which riders were responsible, the incidence being approximately twice as great as for the accidents for which others were responsible. Data from the Coroners’ database over the past decade have shown that TWMV rider fatalities have similar or slightly lower BACs than vehicle driver fatalities. This suggests that the alcohol impairment produced by a given BAC level presents a greater problem for riders, in controlling their motorcycles, than it does for car drivers.

Where the motorcycle struck the kerb or failed to negotiate a bend inexperience seemed to be a major factor.
Losing control and hitting another vehicle seemed to be more of a problem for riders of the larger cycles riding for pleasure. Impaired vision caused by problems with a rider’s visor, or restricted field of view, was associated with motorcyclists running into stationary objects. Inexperienced riders often had accidents resulting from situations they came on unexpectedly because of their high speed.

**Pedestrian behaviour**

Sixty five percent of the accidents involving pedestrians were considered to be principally the fault of the pedestrian entering the road carelessly, mainly due to either failure to look or failure to judge the actions of the motorcyclist. Of the 35% where the motorcyclist was considered mainly responsible, about two fifths were due to excessive speed.

It is difficult to be clear about the precise actions of the pedestrians prior to the accident as in virtually all of the cases the pedestrian was killed. Most of the fatalities were elderly pedestrians. Past experience has shown that they are usually careful but are unable to adapt their actions quickly to unexpected changes. Forty percent of the accidents involving pedestrians were at sites with some type of pedestrian facility.

**Driver behaviour**

Drivers of cars or larger vehicles were judged to be principally responsible for about a quarter of all the motorcycle accidents in which there was a fatality. The driver was considered to be principally responsible in about 40 percent of the collisions between a motorcycle and another moving vehicle. In most of these cases the driver was making a poor or injudicious turning movement at a junction.

Drivers aged between 30 and 60 appeared to be proportionately more involved in accidents where they failed to give way to a motorcyclist or made a poor turn or manoeuvre than younger drivers. Sixty seven percent of those failing to give way on built-up roads were in this age group.

In accidents that were considered to be principally the fault of the driver, over 40 per cent were judged to be due to carelessness or inattention, and another 19 per cent were attributed to failure to judge the actions of the motorcyclist. In some accidents where motorcyclists were considered mainly responsible due to excessive speed, drivers also contributed through lack of care.

There was insufficient information in the files to explain fully the drivers’ actions, and this remains an important topic for further research.

**Value of analysis of police files**

The police files have yielded a large amount of useful data with which to investigate the causes of motorcycle accidents. The files relate to accidents in the early 1990s, and it is known that the motorcyclist population and motorcycle design is changing. But comparison with data collected by some Police forces in 1999, to a similar contributory factor framework, does not suggest the pattern of accident causes is changing substantively.

Analysis of causation factors for serious and slight accidents, using the 1999 data, show them to be generally similar, but the importance of different factors changes with the severity of the accident. For those accidents of lesser severity, excessive speed by motorcyclists is less often recorded, and ‘looked but did not see’ is more often recorded where drivers are mainly responsible.
1 Introduction

The focus of this report is an analysis of police reports of a sample of accidents in which a motorcyclist was involved and where the motorcyclist or any of the other road users involved were killed. The analysis investigates the pattern of road users involved and the actions of the road users who were considered to be principally responsible for the accident.

The main source of this data is the database (IDB) held by TRL that contains coded details from police files of 717 fatal motorcycle accidents. A major part of this study was to examine the original police files to see whether they contain extra details, not already coded in the IDB, about how and why these motorcycle accidents occurred.

In the report, Section 2 provides a general overview of the characteristics of the motorcycle accidents in the database. Section 3 analyses the Contributory Factors in these accidents. Section 4 examines further data from the original police files. Section 5 compares the causation factors identified with factors reported for non-fatal accidents; Section 6 comments on the possible effect of the changes in the population of motorcyclists over recent years on the patterns of accident causation found in the IDB. Section 7 summarises the conclusions that can be drawn from this investigation.

In this report, the term ‘fatal motorcycle accident’ is used to describe all accidents in which a two-wheeled motor vehicle (TWMV) is involved in an accident in which a fatality occurs. In the IDB, 87 per cent of the deaths were to riders or pillion passengers, 11 per cent to pedestrians and the remaining 2% other vehicle occupants or pedal cyclists. Of the TWMV involved in the accidents, 93% were motorcycles and 7 per cent scooters or mopeds.

Recent trends in motorcycling and motorcycle casualties

National accident statistics show that motorcyclists are a particularly vulnerable group of road users. They are at a greater risk per mile ridden than any other type of road user (DETR, 2000).

Trends in casualties show that although the number of all road accident fatalities has generally decreased in recent years, the number of motorcyclist fatalities has risen and the distribution of casualties has changed. From 1980 to 1992 the number of motorcyclists killed and seriously injured fell fairly rapidly. Since then, the number of casualties has begun to increase again, and Figure 1 shows that the number of deaths has risen since 1993. The rise in casualties has been accompanied by a rise in the stock of motorcycles. DETR statistics suggest that the total mileage ridden was relatively constant between 1993 and 1998, but there is evidence of a rise in 1999.

There have been substantial reductions in the number of motorcyclist casualties for those aged under 20 and the number of casualties involving small motorcycles (of less than 125cc) since the late 1980s/early 1990s. Thirty nine per cent of the casualties involved a motorcycle with an engine size less than 125cc in 1996 compared with 66 per cent in 1984, which suggests that learner and novice riders account for a smaller proportion of casualties than 12 years earlier. In contrast, since 1993 growing numbers of casualties have been in the age range 30-39. The majority are presumably fully licensed since over three-quarters were riding a cycle with an engine size greater than 125cc in 1996. The riders of larger motorcycles (with an engine size greater than 500cc) are dominating the casualty statistics with high proportions of fatalities occurring on NBU roads during the summer months.

Causes of accidents involving motorcycles

To devise countermeasures aimed at improving safety it is necessary to understand how and why accidents occur. Previous research has shown that major motivations for riding a motorcycle are related to risk-taking and sensation-seeking (e.g. Schulz et al., 1991). Such psychological factors are strongly related to behavioural tendencies that have been found to be common among motorcycle riders. These are typically: riding at high speeds (e.g. Hurdle, 1997; Mannering and Grodsky, 1995), close following (e.g. Thompson, 1982), and overtaking.

![Figure 1](image-url) Figure 1 Trends in motorcyclist fatalities, motorcycle mileage and stock relative to 1998
2 General analysis

This section provides an overview of the fatal accidents involving motorcyclists that are recorded in the IDB. The accidents described are mainly from a period in the early 1990s. Section 6 will discuss how the patterns might differ for current fatal motorcycle accidents.

2.1 Types of vehicle and road user involved in motorcycle accidents

Of the total of 717 motorcycle accidents in which a fatality occurred:

- 211 involved a single motorcyclist only;
- 17 involved impacts with other two-wheeled vehicles;
- 85 involved impact between a motorcyclist and a pedestrian;
- 294 involved impact between one or more cars and a motorcyclist;
- involved impact between a larger vehicle and a motorcyclist.

2.2 Ages of those involved in the accidents

2.2.1 Motorcyclists

About half the motorcyclists involved were in the age range 20-29. A lower proportion of older motorcyclists was involved in pedestrian impacts than in other accident types. Less than a fifth of the motorcyclists involved were between the ages of 16 and 19, but those in this age group were over-represented in the accidents involving pedestrians. Table 1 shows the age distribution by accident type.

Table 1 Distribution of ages of motorcyclists involved in accidents, by type of accident

<table>
<thead>
<tr>
<th>Age range</th>
<th>Motorcycle only</th>
<th>With car</th>
<th>With pedestrian</th>
<th>With larger vehicle</th>
<th>All fatal motorcycle accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-19</td>
<td>21%</td>
<td>17%</td>
<td>25%</td>
<td>16%</td>
<td>19%</td>
</tr>
<tr>
<td>20-29</td>
<td>47%</td>
<td>47%</td>
<td>60%</td>
<td>45%</td>
<td>48%</td>
</tr>
<tr>
<td>30-39</td>
<td>17%</td>
<td>19%</td>
<td>9%</td>
<td>22%</td>
<td>18%</td>
</tr>
<tr>
<td>Other</td>
<td>15%</td>
<td>17%</td>
<td>6%</td>
<td>17%</td>
<td>15%</td>
</tr>
</tbody>
</table>

2.2.2 Others involved

Two thirds of the pedestrians involved in fatal motorcycle accidents were aged 60 or over. In comparison, about half of pedestrians involved in fatal accidents of all types, not just those with motorcycles, are in this age range. For drivers of cars and larger vehicles, a larger proportion aged between 40-59 are involved in motorcycle fatal accidents than in all fatal accidents. Table 2 shows the age distributions.

2.3 Accident circumstances

2.3.1 Lighting

63 per cent of all the accidents occurred in daylight and a further 26 per cent on lit roads during darkness. A slightly
higher proportion of the single vehicle motorcycle accidents occurred at night.

2.3.2 Weather
88 per cent of the accidents occurred in fine weather. There was a similar high occurrence of fine weather for each type of motorcycle accident (e.g. motorcycle only, motorcycle-car, motorcycle-pedestrian).

2.3.3 Road surface
80 per cent of the accidents occurred on dry roads. Again there was a similar high proportion for each of the four main types of accidents involving motorcycles.

2.3.4 Speed limit
About 60 per cent of accidents involving cars and large vehicles occurred on non built-up roads (defined as where the speed limit exceeded 40mph), while more than half of accidents involving only motorcycles occurred on built-up roads (defined as where the speed limit is at most 40mph).

Table 3 Distribution of accidents by speed limit of road

<table>
<thead>
<tr>
<th>Speed limit (mph)</th>
<th>Motor - cycle only</th>
<th>With car</th>
<th>With pedestrian</th>
<th>With large vehicle</th>
<th>All fatal motor - cycle accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 or 40</td>
<td>56%</td>
<td>40%</td>
<td>91%</td>
<td>37%</td>
<td>51%</td>
</tr>
<tr>
<td>50 or 60</td>
<td>38%</td>
<td>54%</td>
<td>8%</td>
<td>54%</td>
<td>43%</td>
</tr>
<tr>
<td>70</td>
<td>6%</td>
<td>6%</td>
<td>1%</td>
<td>9%</td>
<td>6%</td>
</tr>
</tbody>
</table>

2.3.5 Road junctions
On built-up roads, about two thirds of accidents involving motorcycles alone occurred away from junctions, while two thirds of those involving pedestrians and cars occurred at junctions. Seventy-eight per cent of those involving large vehicles occurred at junctions. There were relatively few fatal accidents at roundabouts. Twelve per cent of accidents involving large vehicles and 7 per cent of those involving cars were associated with accesses to private property. Almost a quarter of the accidents involving large vehicles were at cross roads.

On non-built-up roads, 77 per cent of motorcycle-only accidents and 57 per cent of accidents involving cars or large vehicles occurred away from junctions. Accidents associated with accesses to private property contributed similar proportions of all accidents for the respective vehicle types as on built-up roads.

2.3.6 Pedestrian facilities
Forty per cent of the accidents involving pedestrians were at sites with some type of pedestrian facility; about 19 per cent were at traffic light or other controlled facilities, 10 per cent at zebra crossings and 10 per cent at sites with central refuges.

Other than those involving pedestrians, few fatal motorcycle accidents were at sites where there were pedestrian facilities, but about 7 per cent of those involving large vehicles were at zebra crossings or at traffic light junctions with pedestrian facilities.

3 Contributory Factors in fatal motorcycle accidents

3.1 Introduction to the Contributory Factor reporting system
The Contributory Factors which have been examined have been coded using a system which was devised and tested at TRL in 1996 (Broughton et al., 1998). This is described in more detail in Appendix A.

The following terms are used in this new system: The Precipitating Factor (PF) is the key action or failure that led directly to the actual impact, so identifying the PF answers the question ‘What went wrong?’ The list of PFs includes failures (e.g. failure to stop and failure to give way) and manoeuvres (e.g. poor overtaking or following too close). One PF is recorded for each accident: if this factor had not been present then the accident would very probably not have occurred.

The Contributory Factors (CFs) are the causes of the PF (‘Why did this failure or manoeuvre occur?’). At most 4 CFs are entered in order of decreasing significance.

Since the accident investigator is asked to identify the failure or manoeuvre which led directly to the accident, the data implicitly show who was judged to be principally responsible for the accident. As a result, the structure of the data allows separate analyses to be made of:

- the behaviour of TWMV riders that led to accidents (in those accidents where the PF was ascribed to a rider);
- the behaviour of other road users that led to accidents in which TWMV riders were involved (in those accidents where the PF was ascribed to someone who was not a TWMV rider).

3.2 Sources of Contributory Factor data
The Contributory Factors have been added to the Intermediate database (IDB) by the TRL team that assembles the database, using the information available from the police files. The fatal accidents from the IDB will form the basis of the analysis in this section.

A file is also available containing the Contributory Factors and related STATS19 data that had been supplied by the
police to DETR for the year 1999. This file contains details of 52,188 injury accidents. In this case, the CFs were coded by the police, not by TRL staff. Data from this file are analysed in Section 5 to illustrate the pattern of Contributory Factors occurring in non-fatal motorcycle accidents.

3.3 Analysis of Contributory Factors

The results are presented separately for those accidents in which a TWMV rider was judged to have been responsible and those in which other participants were judged to be responsible. Results are also presented separately for accidents which occurred on Built-Up (BU) and Non Built-Up (NBU) roads: the former have speed limits of at most 40mph while the latter have higher limits. Of course speeds tend to be higher on the latter roads and this may influence the types of behaviour which lead to accidents.

Some factors are abbreviated in the following tables, as follows:

<table>
<thead>
<tr>
<th>Precipitating Factors</th>
<th>Contributory Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failed to avoid..</td>
<td>Careless/thoughtless/..</td>
</tr>
<tr>
<td>Loss of control..</td>
<td>Failure to judge other..</td>
</tr>
<tr>
<td>Pedestrian entered carriageway..</td>
<td>Failure to give way</td>
</tr>
</tbody>
</table>

Tables 4a and 4b list the occurrence of the most frequent PFs on built-up and non-built-up roads.

The pattern of results for TWMV riders is distinctly different from that for other road users. ‘Loss of control of vehicle’ is by far the most frequent of the PFs attributed to TWMV riders; this may relate to the inherent instability of two wheeled vehicles. ‘Failed to give way’ is the PF most frequently attributed to other road users in these accidents, indicating that many of these accidents occurred at or near junctions.

The proportion of PFs ascribed to TWMV riders shows the proportion of accidents judged to have been caused by TWMV riders, namely 71 per cent on NBU roads and 66 per cent on BU roads.

Tables 4a and 4b have shown which factors led to these TWMV accidents. The reasons for these failures and manoeuvres will now be examined.

Tables 5a and 5b show the incidence of CFs in the IDB. For example, the file included 605 CFs in motorcycle accidents on NBU roads where the motorcycle rider was judged to be to blame, and the CF ‘Careless/thoughtless/..’ accounted for 85 of these; 85/605=14%. The Table includes all CFs, irrespective of the level of confidence ascribed by the TRL coder, but many CFs only occur in a small number of accidents and do not appear in the Tables. The factors are again listed in declining order.

Again, the pattern of results for TWMV riders differs from that for other road users. ‘Excessive speed’ and ‘Lack of judgement of own path’ are ascribed more frequently to

<table>
<thead>
<tr>
<th>Table 4a Most frequent Precipitating Factors in TWMV accidents where motor-cyclists were judged to be principally responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Fatal accidents (IDB file)</td>
</tr>
<tr>
<td>Loss of control..</td>
</tr>
<tr>
<td>Failed to avoid..</td>
</tr>
<tr>
<td>Poor overtaking</td>
</tr>
<tr>
<td>Failed to give way</td>
</tr>
<tr>
<td>Poor turn/manoeuvre</td>
</tr>
<tr>
<td>Number of PFs/accidents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 4b Most frequent Precipitating Factors in TWMV accidents where other road users were judged to be principally responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Fatal accidents (IDB file)</td>
</tr>
<tr>
<td>Failed to give way</td>
</tr>
<tr>
<td>Poor turn/manoeuvre</td>
</tr>
<tr>
<td>Loss of control..</td>
</tr>
<tr>
<td>Failed to avoid..</td>
</tr>
<tr>
<td>Poor overtaking</td>
</tr>
<tr>
<td>Pedestrian entered carriageway..</td>
</tr>
<tr>
<td>Number of PFs/accidents</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 5a Most frequent Contributory Factors in TWMV accidents where motor-cyclists were judged to be principally responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Fatal accidents</td>
</tr>
<tr>
<td>Excessive speed</td>
</tr>
<tr>
<td>Careless/thoughtless/..</td>
</tr>
<tr>
<td>Lack of judgement of own path</td>
</tr>
<tr>
<td>Inattention</td>
</tr>
<tr>
<td>Impairment - alcohol</td>
</tr>
<tr>
<td>Inexperience of driving</td>
</tr>
<tr>
<td>Failure to judge other..</td>
</tr>
<tr>
<td>Number of CFs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 5b Most frequent Contributory Factors in TWMV accidents where other road users were judged to be principally responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Fatal accidents</td>
</tr>
<tr>
<td>Careless/thoughtless/..</td>
</tr>
<tr>
<td>Failed to judge other..</td>
</tr>
<tr>
<td>Inattention</td>
</tr>
<tr>
<td>Excessive speed</td>
</tr>
<tr>
<td>Lack of judgement of own path</td>
</tr>
<tr>
<td>Inexperience of driving</td>
</tr>
<tr>
<td>Impairment - alcohol</td>
</tr>
<tr>
<td>Number of CFs</td>
</tr>
</tbody>
</table>
TWMV riders than to other road users. The reverse is true for 'Careless/thoughtless' and 'Failure to judge other's path'.

If the most important Contributory Factor only is considered, i.e. one CF is ascribed per accident, then in fatal accidents where the PF was assigned to the TWMV rider (i.e. the TWMV rider was responsible):

- 39% of CFs were associated with excessive speed.
- 16% of CFs were associated with carelessness/thoughtlessness or inattention.
- 11% of CFs were associated with impairment from alcohol or drugs.
- 9% of CFs were associated with failure to judge another road user’s path, failed to look, or looked but did not see.
- 7% of CFs were associated with inexperience.

In comparison, for fatal accidents where the PF was assigned to the other participant (i.e. the responsibility lay with the other road user):

- 41% of CFs were associated with failure to judge the other’s (in this case the TWMV’s) path, failed to look, or looked but did not see.
- 36% of CFs were associated with carelessness/thoughtlessness or inattention.
- 4% of CFs were associated with excessive speed.
- 2% of CFs were associated with inexperience.
- 2% of CFs were associated with alcohol or drugs.

The PFs and CFs can now be examined by the type of accident (e.g. those accidents involving a single motorcycle and those involving pedestrians or other vehicles). The results are shown in Table 6. Many CFs were involved in small numbers in each of the accident groups. The table shows those CFs that were attributed to at least 3 accidents (or 2 per cent of the accidents) in any one accident type, but no other Primary CF contributed more than 3 accidents or 2 per cent of the CFs within a group.

From the point of view of accident causation it is more useful to group the causation patterns regardless of what type of accident results. This is done in the next section by examining accident clusters.

3.4 Accident clusters

An accident is fully characterised by the combination of PFs and CFs. For each accident there are up to 4 CFs, each with a confidence marking, so the analysis can be complex, but a useful approach is to study what may be termed 'accident clusters'. An accident cluster comprises all those accidents that share the PF and the first definite or probable CF, so the clusters are disjoint (i.e. any particular accident will only fall into one cluster). The most common clusters are listed below, again distinguishing between those accidents where a TWMV rider was reportedly responsible and those other accidents where the person reportedly responsible was not a TWMV rider.

<table>
<thead>
<tr>
<th>Table 6 Distribution of Precipitating Factors and Contributory Factors by accident type</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of accidents</td>
</tr>
<tr>
<td>TWMV mainly responsible</td>
</tr>
<tr>
<td>Non-TWMV mainly responsible</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distribution of PFs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of control</td>
</tr>
<tr>
<td>Failed to avoid object</td>
</tr>
<tr>
<td>Failed to avoid pedestrian</td>
</tr>
<tr>
<td>Careless pedestrian</td>
</tr>
<tr>
<td>Poor overtaking</td>
</tr>
<tr>
<td>Poor turn/manoeuvre</td>
</tr>
<tr>
<td>Failed to give way</td>
</tr>
<tr>
<td>Other *</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distribution of most important CFs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Careless/Thoughtless</td>
</tr>
<tr>
<td>Excessive speed</td>
</tr>
<tr>
<td>Failure to judge others</td>
</tr>
<tr>
<td>Inattention</td>
</tr>
<tr>
<td>Lack of judgement of own path</td>
</tr>
<tr>
<td>Impairment - alcohol</td>
</tr>
<tr>
<td>Inexperience of driving</td>
</tr>
<tr>
<td>Inexperience of vehicle</td>
</tr>
<tr>
<td>Failed to look</td>
</tr>
<tr>
<td>Looked but did not see</td>
</tr>
<tr>
<td>Crossed behind parked vehicle</td>
</tr>
<tr>
<td>Slippery road</td>
</tr>
</tbody>
</table>

* These figures represent the other, less frequent, PFs attributed to all accidents of that type; responsibility has not been assigned for the purpose of this table
Clusters of fatal accidents on NBU roads

For accident clusters for which the TWMV rider was judged to have been principally responsible (237 accident clusters) the Precipitating Factor/first Contributory Factors were:

- Loss of control because of excessive speed in 28% of clusters.
- Loss of control because of alcohol impairment in 7.6% of clusters.
- Failed to avoid vehicle or object in carriageway because of excessive speed in 5.9% of clusters.
- Loss of control because of inattention in 5.5% of clusters.
- Pedestrian entered carriageway without due care because of failure to look in 14% of clusters.
- Failed to give way because of careless/thoughtless/reckless behaviour in 4.8% of clusters.
- Loss of control because of excessive speed in 6.1% of clusters.
- Loss of control because of alcohol impairment because of failure to judge other person’s path or speed in 10% of clusters.
- Failed to give way because of failure to judge other person’s path or speed in 7.1% of clusters.
- Loss of control because of excessive speed in 23% of clusters.
- Loss of control because of alcohol impairment in 11% of clusters.
- Failed to avoid vehicle or object in carriageway because of excessive speed in 10% of clusters.
- Loss of control because of careless/thoughtless/reckless behaviour in 4.8% of clusters.

Clusters of fatal accidents on BU roads.

For accident clusters for which the TWMV rider was judged to have been principally responsible (239 accident clusters) the Precipitating Factor/first Contributory Factors were:

- Loss of control because of excessive speed in 28% of clusters.
- Loss of control because of alcohol impairment in 7.6% of clusters.
- Failed to avoid vehicle or object in carriageway because of excessive speed in 5.9% of clusters.
- Loss of control because of inattention in 5.5% of clusters.
- Pedestrian entered carriageway without due care because of failure to look in 14% of clusters.
- Failed to give way because of careless/thoughtless/reckless behaviour in 4.8% of clusters.
- Loss of control because of excessive speed in 6.1% of clusters.
- Loss of control because of alcohol impairment because of failure to judge other person’s path or speed in 10% of clusters.
- Failed to give way because of failure to judge other person’s path or speed in 7.1% of clusters.
- Loss of control because of excessive speed in 23% of clusters.
- Loss of control because of alcohol impairment in 11% of clusters.
- Failed to avoid vehicle or object in carriageway because of excessive speed in 10% of clusters.
- Loss of control because of careless/thoughtless/reckless behaviour in 4.8% of clusters.

The next sections go on to examine the main characteristics of these groups of accidents, using STATS19 data to highlight differences between the accident clusters. Since many clusters contain relatively few accidents only the largest groups are described. The variables considered were weather, road condition, age of motorcycle rider, time of day and speed of the motorcycle.

3.4.1 Accidents where the Precipitating Factor was ‘loss of control’ - TWMV responsible

Over three-quarters of the accidents examined occurred during fine weather on dry roads. Thus, there is no support for the contention that wet and slippery road surfaces are mainly responsible for riders losing control of their motorcycle. However, for non-built-up roads considered separately, a higher proportion of accidents caused by the rider losing control were on wet/damp roads compared with accidents for which a different PF was recorded (23 per cent compared with 15 per cent).

When the accident clusters are considered accidents involving loss of control because of excessive speed occur most often during a fine weather with no wind and on dry roads (96 per cent of accidents). However, accidents involving loss of control on non-built-up roads due to excess alcohol occur slightly more often in worse weather conditions than other types of accident. This may be because motorcyclists are more likely to speed in good weather but will slow down if the weather is bad except when under the influence of alcohol.

For built-up roads, the average age of the rider where the PF was loss of control was lower than other PFs (26 years old compared with 31 years old). This may suggest that loss of control accidents are more common amongst riders with less experience than other types of motorcycling accident. No significant age differences exist on NBU roads.

The majority of those accidents involving loss of control due to excessive speed occurred between 4pm and 10pm whereas the majority of those involving loss of control due to alcohol impairment occurred between 10pm and 4am. Significantly more of the loss of control accidents occurred when at bends in the road than did other types of accident.

The average speed of motorcycles in loss of control accidents on BU roads was 47mph compared with 44mph in accidents with other PFs. On NBU roads the average speeds were 58mph and 50mph respectively. As expected, the difference is greater for accidents involving loss of control due to excessive speed. For accidents involving loss of control due to alcohol, speeds are lower than for other types of accidents involving alcohol impairment. Thus when driving over the alcohol limit, motorcyclists tended to lose control at lower speeds than when uninjured.

3.4.2 Accidents with the Precipitating Factor ‘failed to avoid vehicle or object in carriageway’ - TWMV responsible

Analysis of the STATS19 data indicates that on BU roads a higher proportion of accidents with the PF ‘failed to avoid a vehicle or object in carriageway’ occurred in rain/fog/mist than did other accidents. This suggests that the
poor weather conditions tended to prevent the riders from seeing properly. On BU roads accidents with this PF mostly occurred when the motorcycle was travelling straight ahead. On NBU roads, however, significantly more riders were executing other manoeuvres at the time.

3.4.3 Accidents with the Precipitating Factor ‘failed to give way’ - Other road user responsible

In these accidents the 30-59 age group is over-represented on BU roads contributing 67 per cent of the drivers who failed to give way compared with 42 per cent of drivers in this age range involved in all fatal accidents. It is possible that this might indicate reducing physical capabilities with age, over this age group, contributing to these situations, but there is no evidence of impairment. On NBU roads drivers aged over 60 are involved in 30 per cent of the accidents with this PF compared with 20 per cent for this age group for all PFs. These accidents predominantly occur on dry roads and in fine weather. They also predominantly occur at T-junctions, crossroads, and accesses to private properties, with 22 per cent at the latter on NBU roads.

3.4.4 Accidents with the Precipitating Factor ‘poor turn or manoeuvre’ - Other road user responsible

Drivers in the age group 30-59 are again over-represented in these accidents on both BU and NBU roads. Forty six per cent of all accidents attributed to a poor turn or manoeuvre on BU roads and 73 per cent on NBU roads are associated with either links (i.e. away from junctions) or with private drives. Forty two per cent on BU roads are at T-junctions.

3.4.5 Accidents with the Precipitating Factor ‘pedestrian entered road carelessly’ - Other road user responsible

These accidents are predominantly on BU roads and 63 per cent of them involve pedestrians aged 60 or over. Again weather and lighting conditions were generally good. 39 per cent of these occurred away from junctions, 6 per cent at zebra crossings, 10 per cent at central refuges, and 21 per cent at traffic light controlled crossings (17 percentage points of the 21 per cent were at traffic light controlled junctions).

3.5 Variations in the accident patterns according to differences in the engine capacity of the motorcycle

The IDB data include the engine capacity of most of the TWMVs involved in these accidents so this section will study whether the patterns found above may vary with engine capacity. Only those accidents where a TWMV rider was judged to have been responsible have been analysed. An additional criterion for the analysis is that the engine capacity of the TWMV ridden by the person responsible for the accident should be known. This was in fact known in 395/489 (80%) of cases.

Three capacity ranges have been analysed and the partitioning values of 200cc and 650cc chosen to give approximately equal numbers of machines in each range. The most frequent PFs and CFs are listed in Tables 7 and 8.

### Table 7 Most frequent Precipitating Factors in those TWMV accidents where the PF is assigned to a TWMV rider, by engine capacity

<table>
<thead>
<tr>
<th>Engine capacity</th>
<th>≤200cc</th>
<th>201-650cc</th>
<th>&gt;650cc</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BU roads</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of control</td>
<td>62%</td>
<td>57%</td>
<td>51%</td>
</tr>
<tr>
<td>Failed to avoid vehicle</td>
<td>19%</td>
<td>21%</td>
<td>26%</td>
</tr>
<tr>
<td>Failed to avoid pedestrian</td>
<td>8%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Failed to give way</td>
<td>4%</td>
<td>–</td>
<td>2%</td>
</tr>
<tr>
<td>Poor overtaking</td>
<td>3%</td>
<td>9%</td>
<td>4%</td>
</tr>
<tr>
<td>Poor turn/manoeuvre</td>
<td>3%</td>
<td>–</td>
<td>4%</td>
</tr>
<tr>
<td>Number of PFs/accidents</td>
<td>73</td>
<td>67</td>
<td>57</td>
</tr>
<tr>
<td><strong>NBU roads</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of control</td>
<td>59%</td>
<td>68%</td>
<td>65%</td>
</tr>
<tr>
<td>Failed to avoid vehicle</td>
<td>14%</td>
<td>13%</td>
<td>13%</td>
</tr>
<tr>
<td>Failed to give way</td>
<td>10%</td>
<td>1%</td>
<td>3%</td>
</tr>
<tr>
<td>Poor overtaking</td>
<td>4%</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Poor turn/manoeuvre</td>
<td>6%</td>
<td>3%</td>
<td>8%</td>
</tr>
<tr>
<td>Number of PFs/accidents</td>
<td>49</td>
<td>71</td>
<td>78</td>
</tr>
</tbody>
</table>

### Table 8 Most frequent Contributory Factors in those TWMV accidents where the PF was assigned to the TWMV rider, by engine capacity

<table>
<thead>
<tr>
<th>Engine capacity</th>
<th>≤200cc</th>
<th>201-650cc</th>
<th>&gt;650cc</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BU roads</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excessive speed</td>
<td>14%</td>
<td>23%</td>
<td>31%</td>
</tr>
<tr>
<td>Careless/thoughtless</td>
<td>12%</td>
<td>17%</td>
<td>18%</td>
</tr>
<tr>
<td>Inexperience of driving</td>
<td>12%</td>
<td>7%</td>
<td>2%</td>
</tr>
<tr>
<td>Inattention</td>
<td>10%</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>Lack of judgement of own path</td>
<td>8%</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>Failure to judge other</td>
<td>7%</td>
<td>3%</td>
<td>5%</td>
</tr>
<tr>
<td>Impairment - alcohol</td>
<td>7%</td>
<td>8%</td>
<td>12%</td>
</tr>
<tr>
<td>Inexperience of vehicle</td>
<td>4%</td>
<td>7%</td>
<td>4%</td>
</tr>
<tr>
<td>Number of CFs</td>
<td>169</td>
<td>166</td>
<td>138</td>
</tr>
<tr>
<td><strong>NBU roads</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excessive speed</td>
<td>13%</td>
<td>19%</td>
<td>28%</td>
</tr>
<tr>
<td>Careless/thoughtless</td>
<td>12%</td>
<td>13%</td>
<td>14%</td>
</tr>
<tr>
<td>Inattention</td>
<td>12%</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>Inexperience of driving</td>
<td>11%</td>
<td>6%</td>
<td>2%</td>
</tr>
<tr>
<td>Lack of judgement of own path</td>
<td>10%</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>Impairment - alcohol</td>
<td>8%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Failure to judge other</td>
<td>6%</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Bend/winding road</td>
<td>4%</td>
<td>7%</td>
<td>10%</td>
</tr>
<tr>
<td>Number of CFs</td>
<td>113</td>
<td>175</td>
<td>192</td>
</tr>
</tbody>
</table>

Whilst there are strong similarities between the columns some differences are also apparent. Because of the relatively small numbers of accidents in each category of engine capacity caution is necessary when attempting to identify systematic differences by ‘size’ of TWMV - especially in the case of Table 7. For example, it appears at first sight that on BU roads ‘loss of control’ is less common among larger machines. Statistical tests, however, and the existence of a contrary tendency on NBU roads suggests that these may be random variations within the sample and that no inference can be drawn one way or the other about such tendencies within the general population of such fatal accidents.
One difference that might be genuine, however, relates to poor overtaking which is relatively common among 201-650cc machines on BU and NBU roads. It could well be that these riders were attempting unsuccessfully to emulate riders of more powerful machines. Another difference that might represent an effect within the population of all fatal accidents of this type concerns the failure to give way by riders of the smaller machines on NBU roads.

The distribution of accidents in Table 7 leads to the result that the percentage of accidents on BU roads falls from 60 per cent among the smaller machines to 49 per cent among 201-650cc machines and 42 per cent among larger machines. This reflects the pattern found by previous analyses of STATS19 data.

Apparent differences between the distributions of CFs shown in Table 8 are more likely to be significant because of the greater numbers. The increase in the percentage of all CFs represented by ‘excessive speed’ as the engine capacity increases is highly significant, as is the increase in the CF ‘bend/winding road’. The decreases in ‘inexperience of driving’ and ‘inattention’ with engine capacity are also significant. The restriction of learner riders to machines of at most 125cc capacity is likely to have contributed to the former but inexperience is also fairly common among riders of 201-650cc machines.

These results represent a generally coherent picture: riders of larger machines are relatively experienced and attentive; however, they are likely to use the greater power of their machines to travel at excessive speed and consequently to lose control, especially failing to foresee the risks posed by bends and winding roads in rural areas.

Table 9 completes the comparison of the three TWMV ranges, presenting the incidence of the three most frequent clusters of these accidents. Five of the six rows show variations by engine capacity; in spite of the small numbers of clusters these are either statistically significant or - as with the first row - nearly so.

This analysis by engine size provides some indication of differences between riders using smaller and larger bikes. Whilst engine size may no longer be a good indicator of why riders choose particular bikes or the differences in performance between bikes, the issues of inexperience and awareness of the capability of the bike and the increased role of speed in accidents involving high performance bikes are likely to remain important.

### 3.6 Implications of specific factors

#### 3.6.1 Poor road surface

One risk factor often mentioned by TWMV riders appears in the new system as ‘Site details - poor road surface’. However, this factor has not emerged in the Tables so far and this suggests that this judgement might be misplaced. The involvement of this factor - poor road surface - in accidents is now examined.

Results in Tables 5a and 5b answered the question ‘What percentage of factors reported were of a specific type?’ Since there can be up to 4 CFs per accident the further question ‘In what percentage of accidents was the specific factor reported?’ has a different (and numerically greater) answer.

In virtually all of the accidents where this CF was reported the PF was ascribed to a TWMV rider. This presumably reflects the lack of stability of TWMVs making them more vulnerable than 4-wheeled vehicles on a poor road surface. The data suggest that poor road surfaces contribute to up to 5 per cent of the errors made by TWMV riders on NBU roads that lead to fatal accidents. On BU roads the incidence is about half as great. However, the use of a general descriptive factor like this may not fully demonstrate the effect of localised defects and further study of this issue may be useful.

#### 3.6.2 Alcohol

The main thrusts of Government road safety publicity are against excessive speed and drink/driving. It has been demonstrated above that the former is indeed a major factor in TWMV accidents and the CF ‘Impair-ment - alcohol’ has already featured several times among the results. The approach of the previous section has been applied to this factor. Alcohol appears to have been a factor in at least one tenth of the accidents on BU roads for which TWMV riders were thought to be responsible. The involvement appears to be less on NBU roads, particularly for larger motorcycles. Alcohol impairment of other

<table>
<thead>
<tr>
<th>Table 9 The three most frequent clusters of TWMV accidents where the PF was ascribed to the TWMV rider, by engine capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engine capacity</strong></td>
</tr>
<tr>
<td><strong>BU roads</strong></td>
</tr>
<tr>
<td>Loss of control because of excessive speed</td>
</tr>
<tr>
<td>Loss of control because of alcohol impairment</td>
</tr>
<tr>
<td>Failed to avoid vehicle or object in carriageway because of excessive speed</td>
</tr>
<tr>
<td>Number of clusters</td>
</tr>
<tr>
<td><strong>NBU roads</strong></td>
</tr>
<tr>
<td>Loss of control because of excessive speed</td>
</tr>
<tr>
<td>Loss of control because of alcohol impairment</td>
</tr>
<tr>
<td>Failed to avoid vehicle or object in carriageway because of excessive speed</td>
</tr>
<tr>
<td>Number of clusters</td>
</tr>
</tbody>
</table>
drivers occurred in only about 5 per cent of accidents for which they were considered responsible.

The greater involvement of alcohol among TWMV riders does not necessarily imply that they are more willing than non-riders to ride/drive after drinking. Indeed, data supplied by coroners over the past decade have shown that TWMV rider fatalities have similar or slightly lower BACs than vehicle driver fatalities.

This suggests that, at any particular alcohol level, TWMV riders are at greater risk (relative to their normal elevated level) than drivers of 4-wheeled vehicles and there are various possible explanations for this. The instability of TWMVs may well mean that a seemingly minor error can more easily have serious consequences with a 2-wheeled than a 4-wheeled vehicle. In addition, alcohol is known to affect the perception of risk.

4 In-depth analysis

The previous sections analysed data that had already been coded from the police files. Although useful, this leaves a number of questions about the causes of these accidents unanswered. Thus, the next stage of the project was to examine the individual police files to see if it would be possible to establish and analyse the accident sequence and events leading up to the accident.

As was discussed in section 3.1, a Precipitating Factor is assigned in each accident to one of those involved - the person judged by the investigator to be principally at fault. The files used in this analysis were split into those where the PF was assigned to a motorcyclist and those where it was assigned to a driver of another vehicle or a pedestrian. The most common PFs from each of these groups were as follows:

where the PF was assigned to a TWMV rider:
- Loss of control.
- Failed to avoid a vehicle or object in the carriageway.

where the PF was assigned to another road user:
- Failed to give way.
- Poor turn/manoeuvre.
- Pedestrian entered the carriageway.

The details extracted for motorcyclists from the files included the engine capacity of the motorcycle, the journey purpose, rider behaviour before the accident, details of licences and convictions and motorcycling history and experience. For drivers, details extracted included evidence of fatigue, inexperience, distraction, impairment, lack of licence and offences, as well as the age of the driver. In addition, a summary of the events leading up to the accident was written and a plan was drawn. These summaries were used to group the accidents and to provide case studies to illustrate the various groups; these are shown in Appendix B. As much information as was available was extracted from the police files. However, in many cases, there is significantly less information regarding the other road user and his behaviour than is available in some of the measurable aspects of the motorcycle and the motorcyclists, such as use of headlights or reflective clothing.

4.1 General details from the files

Details were recorded from 353 files in total. The contents of these files varied greatly in the depth of the police investigation. Some of the files, usually where only a motorcyclist was involved and there were no witnesses, contained only limited information - especially if the accident appeared straightforward. In contrast the more detailed files include information from multiple witnesses and from police accident reconstructions. In some cases police motorcyclists drove along the stretch of road where the accident occurred at different speeds to try to discover what went wrong. Measurements of skid marks and sight lines are made to understand more fully the rider’s behaviour.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Percentage of files where the information was available</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td>38</td>
</tr>
<tr>
<td>Experience</td>
<td>38</td>
</tr>
<tr>
<td>Journey purpose</td>
<td>58</td>
</tr>
<tr>
<td>Engine capacity</td>
<td>99</td>
</tr>
<tr>
<td>Number of people</td>
<td>99</td>
</tr>
<tr>
<td>Behaviour</td>
<td>88</td>
</tr>
<tr>
<td>Motorcycle licence</td>
<td>57</td>
</tr>
<tr>
<td>Car licence</td>
<td>25</td>
</tr>
<tr>
<td>Convictions</td>
<td>18</td>
</tr>
<tr>
<td>Serious prior convictions</td>
<td>12</td>
</tr>
<tr>
<td>Road surface conditions</td>
<td>97</td>
</tr>
<tr>
<td>Reflective clothing</td>
<td>54</td>
</tr>
<tr>
<td>Headlights</td>
<td>39</td>
</tr>
<tr>
<td>Impaired vision</td>
<td>99</td>
</tr>
<tr>
<td>Helmet loss</td>
<td>20</td>
</tr>
</tbody>
</table>

Of those journeys where the purpose was known, 27 per cent were commuting to or from work, 6 per cent were undertaken in the course of work, 20 per cent were undertaken for the pleasure of riding a motorcycle, 44 per cent were to or from a social occasion or venue such as to the pub and 3 per cent were for other reasons. Where the number of other riders in the group was known, 78 per cent of riders were riding alone and 17 per cent were riding in pairs.

The riding history was known for 135 of the motorcyclists, distributed as shown in Table 11.

<table>
<thead>
<tr>
<th>History</th>
<th>% of riders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young riders aged less than 30</td>
<td>72</td>
</tr>
<tr>
<td>Younger riders aged 30 or more</td>
<td>23</td>
</tr>
<tr>
<td>Older riders returning after a long break</td>
<td>1</td>
</tr>
<tr>
<td>Older riders who had learnt recently</td>
<td>4</td>
</tr>
</tbody>
</table>

The rider’s length of experience of motorcycling was unknown in 218 cases. Of those cases where it was known, 56 per cent of riders had less than 5 years experience and 5 per cent had over 20 years experience. Driver inexperience was
specifically noted by the police in 3 per cent of the cases.

Of the 201 cases where the rider’s licensing details were known, 68 per cent had a full motorcycle licence, 19 per cent had a provisional motorcycle licence and 13 per cent had no licence. 48 per cent had a full car licence, 18 per cent had a provisional car licence and 33 per cent had no car licence.

Of the 137 accidents where it was known whether or not the headlight was on, 76 per cent of motorcycles had their headlights on. Reflective clothing was worn in only 1 per cent of the 190 accidents where details of the riders clothing were noted in the files. In 7 per cent of accidents, something was wrong with the motorcyclist’s visor or goggles that could have impeded their vision.

The helmet came off during 20 per cent of accidents. This occurred before impact in 12 per cent of these cases and after the impact in 45 per cent; whether before or after is unknown in the remaining cases.

Details of behaviour before the accident were available in the majority of this sample of police files; in only 41 files was the behaviour not reported. Thirteen per cent of motorcyclists and 1 per cent of other drivers were impaired by either drink or drugs or both. Thirty eight per cent of the motorcyclists and 11 per cent of other drivers were considered to have been speeding before the accident. Six per cent of the motorcyclists and 2 per cent of the other drivers were behaving in a careless manner and 3 per cent of motorcyclists were considered inattentive. Two per cent of the motorcyclists and 3.5 per cent of other drivers were behaing in an inexperienced manner before the accident.

Details of the condition of the road surface were recorded from the police files. 61 per cent of the accidents occurred on dry roads, 5 per cent on damp roads, 12 per cent on wet roads and 2 per cent on very wet roads or in ice or fog. In the other 20 per cent of cases the wetness was not explicitly stated in the file although other statements about the quality of the road were included. It is most likely that these were all dry roads and this gives an overall estimate of 81 percent of accidents occurring on dry roads, which is consistent with the STATS19 data quoted in section 2. The condition of the road surface was described as good in 61 per cent of the accident files and as normal in 3 per cent. A problem was reported with the road surface such as potholes or no road markings in 2 per cent of accidents. In another 2 per cent of accidents the road surface was only described as reasonable and in 1 per cent the road surface was described as poor.

4.2 Accident sequences where the Precipitating Factor was assigned to a motorcyclist

As described in Section 3.3, the most common PFs for accidents where the PF was assigned to a motorcycle were:

- Loss of control of vehicle.
- Failure to avoid object or vehicle in carriageway.

4.2.1 Accidents where the Precipitating Factor was loss of control

Ninety-nine loss of control accidents were studied from the years 1993-1995. From the summary of each accident it was possible to form five main groups, those in which:

- 25% of the motorcycles lost control and hit another vehicle (25 cases).
- 22% of the motorcycles went straight ahead at a bend or roundabout (22 cases).
- 19% of the motorcycles hit the kerb or verge and lost control (19 cases).
- 15% motorcycles lost control whilst trying to avoid a vehicle or object (15 cases).
- 18% other loss of control accidents (18 cases).

4.2.2 Accidents where the Precipitating Factor was failure to avoid object/vehicle in the carriageway

The PF was failure to avoid object/vehicle in the carriageway in 82 of the accidents studied. These accidents fell into four groups:

- 28% of motorcycles drove straight into a stationary vehicle or object and took no or minimal evasive action (23 accidents).
- 27% of motorcycles collided with a vehicle performing an orthodox manoeuvre at a junction (22 accidents).
- 16% of the motorcycles were unable to avoid a collision with a vehicle or animal that was in an unexpected location (13 accidents).
- 29% did not fall into any major category (24 accidents).

4.3 Accident sequences where the Precipitating Factor was not assigned to a motorcyclist

The most common PFs in these accidents were:

- Poor turn or manoeuvre.
- Pedestrian entered carriageway without due care.
- Failed to give way.

4.3.1 Poor turn or manoeuvre

There were 48 of these accidents and most fell into one of two main categories:

- 42% of accidents involved a vehicle turning right across the oncoming carriageway and failing to see an approaching motorcyclist (20 accidents).
- 15% of accidents involved a vehicle performing a U-turn manoeuvre without sufficient care (12 accidents).

The other accidents involved vehicles turning into the path of motorcycles overtaking them, poor overtaking manoeuvres by vehicles and other poor manoeuvres by vehicles at junctions.

4.3.2 Accidents where the Precipitating Factor was ‘Pedestrian entering carriageway carelessly’

There were 54 accidents of this type. There were many different variants to what was basically the same type of accident in which a pedestrian walked out into the road and was struck by a motorcycle. There were no clearly discernible subtypes.

Three accidents involved a pedestrian walking across a pelican crossing when the ‘red man’ was illuminated. 13
accidents occurred on single carriageways away from a junction. 23 accidents occurred on single carriageways near or at a junction. In 4 accidents pedestrians were killed while crossing at junctions with crossings marked while in another 4 accidents they were crossing using a central island. 5 of the accidents occurred on dual carriageways. There was one accident where the pedestrians were walking along the road and not crossing the road.

4.3.3 Accidents where the Precipitating Factor was ‘Other vehicle failed to give way’
There were 70 accidents of this type and the majority of them involved a car, van or lorry turning right at a junction into the path of a motorcyclist. There are two main groups. 28 accidents involved vehicles pulling out of minor roads into the path of a motorcyclist approaching from the right along the main road. 32 accidents involved a vehicle making a right turn into a minor road across the path of a motorcyclist travelling in the other direction along the major road. 6 accidents involved a vehicle travelling straight across the path of a motorcycle at a crossroads. The remaining 4 accidents involved a vehicle turning into the path of the motorcycle to travel in the same direction.

4.4 Location and manoeuvre
The great majority of the motorcycles involved in the 345 accidents examined in detail were not performing any particular manoeuvre but were simply travelling straight ahead, without turning or overtaking other vehicles. 37 motorcycles were overtaking single vehicles or small groups of vehicles. 7 motorcycles were overtaking queues of traffic and 6 motorcycles were close following. No motorcycles involved in these fatal accidents were filtering between traffic or waiting to overtake.
26 motorcycles were travelling round a right hand bend and 61 were travelling round a left-hand bend. The others were travelling along a straight section of road.

86 per cent of the accidents where the motorcycles were overtaking queues of traffic occurred in the evening rush hour between 4pm and 6:30pm. 86 per cent of the motorcycles were travelling at over 50mph. Most of the riders were travelling alone.
The riders involved in the close-following accidents were mostly in groups riding for pleasure or to a social event. Two thirds of these accidents occurred in the evening.
56 per cent of accidents involving only motorcycles were on BU roads with roughly half on A or B class roads and half on C or Unclassified roads. 70 per cent of the ‘motorcycle only’ accidents on roads with a 60 mph speed limit were on A or B class roads.
By comparison, only 40 per cent of accidents involving a motorcycle and a car were on BU roads, with 60 per cent of these on A or B class roads. 79 per cent of this type of accident on roads with a 60mph speed limit were on A or B class roads. Accidents involving a motorcycle and a larger vehicle were distributed in a similar way. Six per cent of these accidents were on motorways or A(M) class roads.

4.5 Journey purpose
One of the details recorded during the in-depth analysis of the files was the purpose of the motorcyclist’s journey when the accident occurred, which is not recorded elsewhere. Five journey purposes were considered: commuting to or from work, using the cycle in the course of work, pleasure riding, social and other. Social refers to journeys to a social venue such as a pub. The purpose of 42 per cent of the motorcycle journeys was unknown. Figure 2 shows the distribution of the known journey purposes.
The average age of the motorcyclists was similar for all journey purposes with those riding for pleasure being the youngest. The average speed of the motorcyclists ranged from 44mph for those who were commuting to 54mph for those riding for pleasure. Only the accidents involving pleasure riding occurred predominantly on NBU roads.

Figure 2 Journey purpose
The accidents involving pleasure riding tended to occur in the summer during the day or early evening.

As would be expected, the most common journey purpose for motorcyclists riding in pairs was riding for pleasure: 55 per cent of the riders were in groups. 95 per cent of commuting motorcyclists were riding alone. Those riding for work or for pleasure predominantly rode motorcycles of over 500cc. Figure 3 shows the journey purpose by engine capacity.

When the PFs are analysed with respect to journey purpose they are fairly well dispersed. The most common combination is that 60 per cent of those who were riding for pleasure were involved in loss of control accidents.

Of all riders 33 per cent of those riding for pleasure were known to have had less than 2 years experience. When only riders whose experience was known were considered, 59 per cent of those riding for pleasure had less than two years experience.

Over half of those who were riding for pleasure were negotiating a bend when the accident occurred, whereas for the other journey purposes over 70 per cent of the riders were travelling straight ahead.

Thirteen accidents occurred when the motorcycle was being used for work. These were of various types including a policeman chasing a speeding car, a paramedic travelling on a 999 call and a motorcycle courier. The average age for these drivers was 31, on cycles averaging 668cc capacity, and their average speed was 53mph (range 25 to 82mph). Two of the riders had only provisional licenses but one had 14 years’ experience. Two of the riders were not insured and another gave false details to the police. The majority of the accidents occurred on 30mph roads, between 10am and 4pm, in daylight with fine weather. The riders lost their helmet in 4 of the accidents.

4.6 Age and location of pedestrian casualties

As stated in section 3.4.5, the average age of the pedestrians who entered the carriageway carelessly and were killed by motorcyclists was 63. This is fairly high for pedestrian fatalities. For example, the average age of pedestrians killed by cars (in the IDB database) was 52. 70 per cent of all the pedestrians killed by a motorcycle were over 60 compared with only 49 per cent of those killed by a car. This may suggest that older pedestrians are more likely to die when being struck by a motorcycle than younger pedestrians or that elderly people are more likely to be struck by a motorcycle in the first place. Elderly pedestrians may find it particularly difficult to spot motorcyclists and to judge their speed and path.

About three quarters of the accidents involving pedestrians occurred on roads with a 30 mph speed limit and about half of these were on A class roads. These proportions were similar for accidents where the motorcyclist was considered responsible and where the other party was considered responsible. (see Figure 4)

The difference between the average ages of those killed by a car and those killed by a motorcycle was greatest for those accidents occurring between 10pm and 6am. Between 6am and 10am the average age is higher for pedestrians killed by cars. This difference was larger on NBU roads, in the summer, at weekends and for vehicles travelling over 60mph.

Motorcyclists were considered to be responsible for the accident in slightly more of the accidents involving pedestrians aged 60-80 and slightly fewer of the accidents involving pedestrians aged 30-50.

4.7 Speed

In many fatal accidents the speed of the vehicles involved immediately prior to the accident is recorded by the police. This information may be obtained from a tachograph reading, a police reconstruction, a witness statement or from the driver of the vehicle. The accuracy of these estimates varies with their source. In this report all estimates available have been included. A more general analysis of the speeds of vehicles involved in fatal accidents is given in Taylor (2001).
In the accidents where the Precipitating Factor was assigned to the motor-cyclist, the speed of the motorcyclist was known in 65 per cent of cases. When the Precipitating Factor was assigned to another vehicle or pedestrian a speed was recorded for the motorcyclist in 74 per cent of cases.

Figure 5 shows the speed distributions for the accidents when the Precipitating Factor was assigned to the motorcyclist and to another vehicle or pedestrian. The mean speed of motorcyclists assigned responsibility was about 57mph, compared with a mean of 43mph for motorcyclists in accidents where the other party was assigned responsibility. In comparison, means speeds for cars and larger vehicles in these accidents were 34mph and 28mph respectively.

Figure 5 shows a notably high incidence of speeds above 60mph for the motorcyclists assigned responsibility for accidents, although some of these might be overestimates by witnesses.

Although some of the differences may be due to the location of the accident (e.g. accidents where pedestrians are ascribed principal responsibility are mainly on 30mph roads), there is strong evidence that excess speed of motorcyclists is a major factor. Figure 6 adjusts for locational differences by comparing speeds with speed limits. It shows that where the PF is assigned to the motorcyclist about 75 per cent of the motorcyclists are travelling above the speed limit; where the PF is assigned to the other road user 60 per cent of motorcyclists are travelling above the speed limit. This latter proportion is not inconsistent with the proportion of all motorcyclists travelling above the speed limit shown in the DETR Vehicle Speed surveys.
4.8 Objects hit in single motorcycle accidents

The 211 fatal accidents that involved only a motorcycle were defined on the basis that the precipitating event had not involved another vehicle or pedestrian. However, all these accidents resulted in the death of the motorcyclist due to the impact injuries they sustained during the course of the accident.

The pattern of impacts is as follows:

- 5 suffered their fatal injury as the direct result from the fall from their bike without striking any specific object.
- 32 sustained their fatal injuries as a result of contact with stationary vehicles, in some cases followed by impact with other vehicles or objects.
- In 19 cases the initial collision was with a car, in 7 cases a van and 6 cases larger vehicles.
- 36 sustained their injuries through initial contact with a narrow object (e.g. walls, crash barrier) although some of these subsequently also hit wider objects or cars.
- 132 motorcyclists initially hit wide objects (e.g. poles) although 44 per cent of these went on to hit other types of objects.
- 3 motorcyclists hit animals.
- 3 hit other motorcyclists who had already fallen from their bikes.

5 Contributory Factors in serious and slight injury accidents

This section addresses mainly serious and slight injury accidents and although outside the remit of fatal accidents throws further light on the processes likely to be common to all types of accident.

In the 1997 quinquennial review of the collection of data on personal injury road accidents (STATS19) it was decided not to introduce collection of information on contributory factors to accidents at a national level. However, police forces who voluntarily adopted the national scheme were encouraged to submit their data to DETR with the STATS19 record. In 1999 twelve forces submitted data, though not all started at the beginning of the year, so the proportion of accidents covered in the first three months of 1999 is much lower than that for the later months, which could provide a bias where a variable has a seasonal element. About one fifth of STATS19 motorcycle accidents in 1999 have a contributory factor record. Accidents on all road types are included in the data set with a contributory factor record, but motorcycle accidents on built-up roads are under-represented in the 1999 sample. However, the data do give a reasonable picture of the factors underlying accidents.

This section analyses data from the twelve police forces that recorded Contributory Factors during 1999 using the system described previously. They supplied the factors for 52,188 injury accidents to the DETR when they supplied the STATS19 accident data; the combined data for all the TWMV accidents are used in this analysis.

The police file contains details of many serious and slight accidents, so enabling investigation to be made of whether patterns of accident causation vary with severity.

The file contains relatively few fatal accidents so results based on these accidents will be limited, but they do provide a basis for comparison with the IDB data.

5.1 Analysis of Contributory Factors

Table 12 shows the most frequent Precipitating Factors for serious and slight accidents, in a similar format to that in Table 4a of Section 3.3.

The same five PFs appear for serious and slight accidents as for fatal accidents, although the order varies.

There are only 128 fatal accidents in this data set but Table 13 shows the proportions of accidents for which motorcyclists are assessed to be principally responsible matching closely those derived by the TRL coders for the IDB file.
Table 12 Most frequent Precipitating Factors in TWMV accidents

<table>
<thead>
<tr>
<th>NBU roads</th>
<th>BU roads</th>
<th>NBU roads</th>
<th>BU roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWMV PF</td>
<td>Other PF</td>
<td>TWMV PF</td>
<td>Other PF</td>
</tr>
<tr>
<td>Serious accidents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of control</td>
<td>61%</td>
<td>5%</td>
<td>40%</td>
</tr>
<tr>
<td>Failed to give way</td>
<td>2%</td>
<td>36%</td>
<td>7%</td>
</tr>
<tr>
<td>Failed to avoid</td>
<td>13%</td>
<td>12%</td>
<td>26%</td>
</tr>
<tr>
<td>Poor turn/manoeuvre</td>
<td>7%</td>
<td>31%</td>
<td>8%</td>
</tr>
<tr>
<td>Poor overtaking</td>
<td>11%</td>
<td>7%</td>
<td>11%</td>
</tr>
<tr>
<td>Number of PFs/accidents</td>
<td>456</td>
<td>227</td>
<td>393</td>
</tr>
</tbody>
</table>

Slight accidents

<table>
<thead>
<tr>
<th>TWMV PF</th>
<th>Other PF</th>
<th>TWMV PF</th>
<th>Other PF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failed to avoid</td>
<td>19%</td>
<td>23%</td>
<td>28%</td>
</tr>
<tr>
<td>Failed to give way</td>
<td>2%</td>
<td>29%</td>
<td>7%</td>
</tr>
<tr>
<td>Loss of control</td>
<td>53%</td>
<td>4%</td>
<td>31%</td>
</tr>
<tr>
<td>Poor turn/manoeuvre</td>
<td>10%</td>
<td>25%</td>
<td>7%</td>
</tr>
<tr>
<td>Poor overtaking</td>
<td>8%</td>
<td>7%</td>
<td>13%</td>
</tr>
<tr>
<td>Number of PFs/accidents</td>
<td>553</td>
<td>437</td>
<td>966</td>
</tr>
</tbody>
</table>

Table 13 The proportion of TWMV accidents in which the PF was assigned to a TWMV rider

<table>
<thead>
<tr>
<th>Accident severity</th>
<th>NBU roads</th>
<th>BU roads</th>
<th>All roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatal (IDB file)</td>
<td>71%</td>
<td>66%</td>
<td>68%</td>
</tr>
<tr>
<td>Fatal (Police file)</td>
<td>71%</td>
<td>60%</td>
<td>70%</td>
</tr>
<tr>
<td>Serious</td>
<td>67%</td>
<td>49%</td>
<td>57%</td>
</tr>
<tr>
<td>Slight</td>
<td>56%</td>
<td>39%</td>
<td>44%</td>
</tr>
</tbody>
</table>

Table 14 includes single vehicle TWMV accidents, where the PF is inevitably assigned to a TWMV rider. In other accidents involving, for example, a car and a motorcycle, 57 per cent of the PFs are assigned to the car driver for fatal and serious accidents and 65 per cent are assigned to the car driver in slight accidents.

The Contributory Factors are again similar to those for the fatal accidents, but the order of importance varies rather more with severity than for the Precipitating Factors. ‘Looked but failed to see’ and ‘failed to look’ occur more prominently than in fatal accidents.

6 The changing motorcycle population

The motorcycling population has varied considerably over the last 15 years. For most of that period it was declining but towards the end of the 1990s it began to increase again. Over this period the typical age of motorcyclists has also changed. The earlier decline in total numbers in the population was partly due to a reduction in younger motorcyclists. The recent increase has mainly been among older motorcyclists who are either returning to this activity or taking it up for the first time.

Tables 15 and 16 illustrate this shift in the age distribution between 1994 and 1999. The shift is the same for both male and female motorcyclists. In contrast, for moped riders the main increase has been among young riders. The IDB data are mainly based on data from the early to mid 1990s while the police data described in Section 5 relate to 1999.
The main change has been a reduction in the proportion of motorcyclists less than 30 years old and an increase in those over 30. The patterns of PFs and CFs can be assessed from the IDB for these groups separately and the main differences are show in Table 17.

Table 17 Causation factors where the motorcyclist is held principally responsible, by age of motorcyclist

<table>
<thead>
<tr>
<th>Per cent of PFs by age group</th>
<th>Motorcyclists aged under 30</th>
<th>Motorcyclist aged at least 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of control</td>
<td>63</td>
<td>55</td>
</tr>
<tr>
<td>Fail to avoid vehicle</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Fail to avoid pedestrian</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Poor overtaking</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Poor turn or manoeuvre</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Per cent of CFs by age group</th>
<th>Excess speed</th>
<th>Fail to judge others</th>
<th>Fail to judge own path</th>
<th>Inexperience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of control</td>
<td>43</td>
<td>13</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Fail to avoid vehicle</td>
<td>30</td>
<td>7</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

If the motorcyclists in each age range had the same pattern of accidents as those in 1994, the likely effect of the changes in age distribution on the overall pattern of accident causation factors could be deduced. If this were assumed this would suggest, by 1999, a lesser proportion of loss of control and excess speed accidents and a greater proportion of the smaller number of accidents associated with poor turns and manoeuvres and with misjudgement of other’s path or speed. But in fact we know the nature of the older motorcyclists in 1999 is likely to have changed since 1994, so patterns may not change simply in line with the changing age distribution.

The 128 fatal accidents available from the police files for 1999 show a fairly similar distribution of causation factors to that shown by the IDB, although there are some differences which may reflect in part the interpretation of the coders.

7 Conclusions

The principal conclusions are these:

Accident patterns

1 41 per cent of the accidents involved a collision between one or more cars and a motorcyclist, 29 per cent involved a motorcyclist crashing without the active involvement of another road user, 15 per cent involved a collision with a vehicle larger than a car and 12 per cent a collision with a pedestrian.

2 About half the motorcyclists involved were aged 20-29.

3 Younger motorcyclists were more involved in accidents with pedestrians. Older motorcyclists were more involved in accidents with cars or larger vehicles.

4 Two thirds of pedestrians involved in accidents with motorcyclists were aged 60 or over; in comparison, about half the pedestrians involved in all fatal accidents are in this age range.

5 By comparison with drivers of cars and large vehicles involved in all fatal accidents relatively few drivers aged under 30 and relatively many aged 40-59 are involved in fatal motorcycle accidents.

6 Of the accidents where motorcyclists crashed and no other vehicle was actively involved, over 60 per cent initially hit a large fixed object such as a crash barrier or wall, 17 per cent hit a narrow object such as a pole and 15 per cent hit a stationary vehicle.

Causation factors

7 These analyses have shown very clear differences between the Contributory Factors in motorcycle accidents where a motorcycle rider was judged to have been responsible and these accidents where a non-rider was judged to have been responsible.

A high proportion of the former involve ‘Loss of Control’, the proportion being higher on NBU roads. This PF was often linked with excessive speed, alcohol impairment and careless/thoughtless/reckless behaviour.

‘Loss of Control’ was rarely identified as leading to an accident where, in contrast, the non-rider was judged responsible; instead, ‘Failed to give way’ and ‘Poor turn/manoeuvre’ were relatively common. These PFs were often linked with failure to observe satisfactorily, careless/thoughtless/reckless behaviour and failure to judge the rider’s path or speed.

8 In all accidents involving a motorcyclist alone responsibility is judged to lie with the motorcyclist who crashed. A third of these were associated with excessive speed.

9 65 per cent of the accidents involving pedestrians were considered to be principally the fault of the pedestrian entering the road carelessly, mainly due to either failure to look or failure to judge the actions of the motorcyclist. Of the 35 per cent that were considered principally the fault of the motorcyclist about two fifths were due to excessive speed.

10 60 per cent of the accidents involving cars or larger vehicles were considered to be principally the fault of the motorcyclist, in 44 per cent of the cases due to excessive speed.

11 Where these accidents were considered to be principally the fault of the driver, over 40 per cent were judged to be due to carelessness or inattention and another 19 per cent were attributed to failure to judge the actions of the motorcyclist.

12 In the accidents where motorcyclists lost control there were roughly equal proportions where the motorcyclist ran into another vehicle, went straight ahead at a bend or roundabout and hit a kerb or verge. In only 15 per cent of the cases did they lose control after trying to avoid a vehicle or animal.

13 Over a half of motorcyclists who failed to avoid an object either collided with a stationary object or with a vehicle performing an orthodox manoeuvre, although in
several cases the manoeuvring driver was not acting with full care. Less than a fifth of this type of accident involved a vehicle or animal in an unexpected location.

14 Most of the accidents where a driver of another vehicle (i.e. not the motorcyclist) was considered principally at fault involved the driver making a poor or injudicious turning movement at a junction.

15 There is little evidence that weather or road condition was an important factor in the majority of these accidents. The proportion of accidents involving motorcycles losing control in fine weather suggests tendencies to speed when the weather is good but perhaps to be more cautious when the weather is bad. Poor road surfaces appear to contribute to at most 5 per cent of the errors made by TWMV riders on NBU roads that lead to accidents, and about half as many on BU roads.

**Motorcyclists behaviour**

16 The mean speed of motorcyclists in accidents for which they were judged principally responsible was 57 mph compared with 43 mph when the other party was principally responsible. In many of the accidents where the Precipitating Factor was not assigned to the motorcyclist, the motorcyclist was still travelling at speeds above the limit, but the proportion above the limit was similar to the proportion for all motorcyclists, observed in DETR surveys.

17 In several cases where a motorcyclist failed to avoid a vehicle ahead which is manoeuvring, the motorcyclist had just overtaken other vehicles which were slowing in anticipation of the manoeuvring vehicle.

18 Alcohol impairment was found to have a prominent role in the fatal and serious accidents for which riders were responsible, the incidence being approximately twice as great as the accidents for which others were responsible. Data from the coroners’ database over the past decade have shown that TWMV rider fatalities have similar or slightly lower BACs than vehicle driver fatalities. This suggests that the alcohol impairment produced by a given BAC level presents a greater problem for riders, in controlling their motorcycles, than it does for car drivers.

19 Where the motorcycle struck the kerb, inexperience seemed to be a major factor and also when the rider failed to negotiate a bend. Losing control and hitting another vehicle seems to be a problem for riders of the larger cycles riding for pleasure. Impaired vision caused by problems with a rider’s visor, or restricted field of view, were associated with motorcyclists running into stationary objects. Inexperienced riders often had accidents resulting from situations they came on unexpectedly because of their high speed.

20 There is some evidence that poor overtaking is most common among riders of medium-sized machines. This suggests that these riders sometimes become involved in fatal collisions when attempting to emulate riders of larger machines.

**Pedestrian behaviour**

21 It is difficult to be clear about the precise actions of the pedestrians prior to the accident as in virtually all the cases the pedestrian was killed. Most of the fatalities were elderly pedestrians. Past experience has shown that they are usually careful but are unable to adapt their actions quickly to unexpected changes. It is presumed that they did not anticipate the presence of the motorcycle. It is possible that elderly pedestrians find it harder to see motorcycles than cars and are unable to respond to them quickly if they detect them late.

22 40 per cent of the accidents involving pedestrians were at sites with some type of pedestrian facility.

**Driver behaviour**

23 Drivers of other vehicles were considered principally responsible for about a quarter of all fatal motorcycle accidents and about 40 per cent of those in which they were involved directly.

24 The main faults of drivers were carelessness and thoughtlessness, or failure to judge the actions of the motorcyclist. Even in some accidents where motorcyclists were considered primarily responsible due to excessive speed drivers contributed through lack of care.

25 A high proportion of the drivers failing to give way or making a poor turn or manoeuvre were aged between 30 and 60; the proportion being as high as 67 per cent for those failing to give way on built-up roads.

26 Alcohol, inexperience and excessive speed were not major factors in accidents where drivers were mainly responsible.

**General applicability of the conclusions**

27 Analysis of causation factors for serious and slight accidents show them to be generally similar, but the importance of different factors changes with severity. Excessive speed by motorcyclists is less often recorded for accidents of lesser severity, and ‘looked but did not see’ is more often recorded where drivers are mainly responsible.

28 The motorcycle population is changing in character over time in relation to ages of motorcyclists and types of bike, but there is no clear evidence from the data available that the pattern of accident causes is changing substantially.

**Value of police fatal accident files**

29 The fatal files have yielded a large amount of useful data with which to investigate the causes of motorcycle accidents. The most useful data are already coded in the formal database. Where additional data have been sought from the files they have often been available from only a limited number of files. These data provide a more comprehensive picture of the accident circumstances, but cannot be used to derive fully representative estimates for specific factors.
Further research

Areas where further research would be useful to identify the need for countermeasures and the form these should take include:

- why mature drivers appear more likely than younger drivers to fail to see motorcyclists or fail to anticipate their actions when making junction manoeuvres;
- why elderly pedestrians and younger motorcyclists are more at risk of being involved in accidents between these two road user types than other age groups;
- whether more detailed information on local defects in road surface condition would identify this as a more important factor than the current analyses suggest;
- to what extent loss of control, particularly among novice drivers, is due to poor use of braking capabilities of motorbikes.

In addition it will be useful to confirm that current accident patterns continue to be similar to those investigated in this report through continual monitoring of STATS19 contributory factor data.

8 Acknowledgements

This research was carried out by the Safety and Environment Division of TRL Limited. The authors would like to acknowledge the assistance of Lorna Pearce, Jackie Knowles, Liz Lowe, Mark Elliot, Maureen Keigan and Jonathan Tunbridge.

9 References


StBA (1995). Verkehrsunfälle in der Bundesrepublik Deutschland. Fachserie 8, Reihe 7. Statistisches Bundesamt Weisbaden: StBA.


Appendix A: Contributory Factor codes

Introduction to the Contributory Factor reporting system

The Contributory Factors which have been examined have been coded using a system which was devised and tested at TRL in 1996 (Broughton et al., 1998). The new system contains many of the factors already used by police forces but has an important new feature: it has two types of factors. The first is to record what went wrong? and led directly to the accident and the second is to record the reason(s) why? Instead of a general suspicion that a factor such as fatigue was involved the accident investigator needs first to identify what went wrong and only then enquire whether fatigue might have been involved in that failure.

The following terms are used in the new system:

- The Precipitating Factor (PF) is the key action or failure that led directly to the actual impact, so it answers the question ‘What went wrong?’. The list of factors includes failures (e.g. failure to stop and failure to give way) and manoeuvres (e.g. poor overtaking or following too close). One PF is recorded for each accident: if the factor had not been present then the accident would very probably not have occurred.

- The Contributory Factors (CFs) are the causes for PF (‘Why did this failure or manoeuvre occur?’). At most 4 CFs are entered in order of decreasing significance.

The lists of factors include 14 PFs and 1 ‘other’; there are 51 CFs and 3 ‘others’. The ‘other’ codes are included in the system to allow for relatively rare cases whose explicit inclusion would require unmanageably long lists of factors. The ‘other’ codes will not be included in the analyses. A copy of the Coding frame is included.

The identification of the Factors relies upon the skill and experience of the investigator. The PF normally presents few difficulties, but identifying the CFs can be more difficult and subjective. With some accidents there will be strong evidence from which to identify the CFs, as when there has been a full accident investigation. The evidence will be much weaker with some non-fatal accidents, as when the details are reported to a police station by one of the drivers involved. To represent this range, the system records whether each CF is Definite, Probable or Possible. If the evidence is not sufficient to identify any CF, no CF should be entered.

Since the accident investigator is asked to identify the failure or manoeuvre which led directly to the accident the data implicitly show who was judged to be principally responsible for the accident. In some accidents responsibility is actually shared, so this can be an oversimplification. Tests have shown that the proportion of such accidents is rather low, and allowing for shared responsibility would greatly increase the complexity of the investigator’s task in recording the CFs. Consequently, entering only one PF was judged to be a suitable compromise which would make the system more acceptable to the police.

As a result, the structure of the data allows separate analyses to be made of:

- the behaviour of TWMV riders which led to accidents (i.e. those accidents where the PF was ascribed to a rider);
- the behaviour of other road users which led to accidents in which TWMV riders were involved (i.e. those accidents where the PF was ascribed to someone who was not a TWMV rider).
### Contributory Factor Codes

**WHAT WENT WRONG? (Precipitating Factors)**

<table>
<thead>
<tr>
<th>Failures of Driver or Rider</th>
<th>Manoeuvres</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Failed to stop (mandatory sign)</td>
<td>9. Swerved to avoid object in carriageway</td>
</tr>
<tr>
<td>2. Failed to give way</td>
<td>10. Sudden braking</td>
</tr>
<tr>
<td>3. Failed to avoid pedestrian (pedestrian not to blame)</td>
<td>11. Poor turn/manoeuvre</td>
</tr>
<tr>
<td>4. Failed to avoid vehicle or object in carriageway</td>
<td>12. Poor overtaking</td>
</tr>
<tr>
<td>5. Failure to signal/misleading signal</td>
<td>13. Drove wrong way (eg one way street)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Failures of Pedestrian or Passenger</th>
<th>Other (please supply details)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Pedestrian entered carriageway without due care (driver/rider not to blame)</td>
<td></td>
</tr>
<tr>
<td>8. Passenger fell in or near PSV</td>
<td></td>
</tr>
</tbody>
</table>

**WHY? (Contributory Factors)**

<table>
<thead>
<tr>
<th>Personal Details</th>
<th>Vehicle Defects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Impairment</td>
<td>28. Tyres</td>
</tr>
<tr>
<td>2. Drugs</td>
<td>wrong pressure</td>
</tr>
<tr>
<td>3. Fatigue</td>
<td>29. Deflation before impact</td>
</tr>
<tr>
<td>4. Illness</td>
<td>30. Worn/insufficient tread</td>
</tr>
<tr>
<td>5. Distraction</td>
<td>31. Defective lights or signals</td>
</tr>
<tr>
<td>6. Physical in/on vehicle</td>
<td>32. Defective brakes</td>
</tr>
<tr>
<td>7. Physical outside vehicle</td>
<td>33. Other (please supply details)</td>
</tr>
<tr>
<td>8. Behaviour</td>
<td></td>
</tr>
<tr>
<td>9. Panic</td>
<td>34. Site details</td>
</tr>
<tr>
<td>10. Careless/thoughtless/reckless</td>
<td>poor road surface</td>
</tr>
<tr>
<td>11. Nervous/uncertain</td>
<td>35. Poor/no street lighting</td>
</tr>
<tr>
<td>12. Failure to judge other person’s path or speed</td>
<td>36. Inadequate signing</td>
</tr>
<tr>
<td>13. Disability</td>
<td>37. Steep hill</td>
</tr>
<tr>
<td>14. Failed to look</td>
<td>38. Narrow road</td>
</tr>
<tr>
<td>15. Looked but did not see</td>
<td>39. Bend/winding road</td>
</tr>
<tr>
<td>16. Inattention</td>
<td>40. Roadworks</td>
</tr>
<tr>
<td>17. Person hit wore dark or inconspicuous clothing</td>
<td>41. Slippery road</td>
</tr>
<tr>
<td>18. Other (please supply details)</td>
<td>42. High winds</td>
</tr>
</tbody>
</table>

**Pedestrian Details**

<table>
<thead>
<tr>
<th>Pedestrian Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. Crossed from behind parked vehicle</td>
</tr>
<tr>
<td>20. Ignored lights at crossing</td>
</tr>
</tbody>
</table>

**Driver Details**

<table>
<thead>
<tr>
<th>Driver Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. Excessive Speed</td>
</tr>
<tr>
<td>22. Following too close</td>
</tr>
<tr>
<td>23. Inexperience of driving</td>
</tr>
<tr>
<td>24. of vehicle</td>
</tr>
<tr>
<td>25. Interaction or competition with other road users</td>
</tr>
<tr>
<td>26. Aggressive driving</td>
</tr>
<tr>
<td>27. Lack of judgement of own path</td>
</tr>
</tbody>
</table>

**Vehicle Defects**

- 28. Tyres: wrong pressure
- 29. Deflation before impact
- 30. Worn/insufficient tread
- 31. Defective lights or signals
- 32. Defective brakes
- 33. Other (please supply details)
- 34. Site details: poor road surface
- 35. Poor/no street lighting
- 36. Inadequate signing
- 37. Steep hill
- 38. Narrow road
- 39. Bend/winding road
- 40. Roadworks
- 41. Slippery road
- 42. High winds
- 43. Earlier accident
- 44. Other (please supply details)

**Obscuration**

- 45. View: windows obscured
- 46. Glares from sun
- 47. Glares from headlights
- 48. Surroundings: bend/winding road
- 49. Stationary or parked vehicle
- 50. Moving vehicle
- 51. Buildings, fences, vegetation, etc
- 52. Weather (e.g., mist or sleet)
- 53. Failed to see pedestrian or vehicle in blind spot

**Animal Involvement**

- 54. Animal out of control

**Notes:**

- Only enter codes for the person who has a PF, with the Stats 19 Vehicle Ref for a driver or rider
- Stats 19 Casualty Ref for a pedestrian or passenger
- PF is the Precipitating Factor, CF1 is the most important Contributory Factor
- Show confidence in CF codes by 1 = Definite, 2 = Probable, 3 = Possible

---

Figure 1: Form used to record Contributory Factors
Appendix B: Case studies of causation types

Accidents where the Precipitating Factor was assigned to the motorcyclist

B1.1 Accidents where the Precipitating Factor was ‘loss of control’

B1.1.1 Loss of control while trying to avoid a vehicle/object
In the main, these accidents occurred when a TWMV rider travelling at speed caught up with a slower moving vehicle. The rider either braked to avoid a collision and lost control, or braked while overtaking the slower vehicle to avoid a head on collision with an oncoming car and lost control.

The majority of the accidents occurred in daylight during the spring in fine conditions on good dry roads. There were approximately equal numbers on non-built-up roads and on built-up roads. The average engine capacity was 589cc. The experience of the drivers was mostly unknown. The main CF was excessive speed.

Case study

The rider was carrying a pillion passenger on his cycle and they were riding for pleasure. The road was wet and all witnesses agree that the motorcycle was travelling too fast for the conditions. The rider negotiated a slight left hand bend and was then confronted by a slow moving car further down the road. This car had slowed due to a vehicle in front turning into a private driveway.

The rider lost control of the motorcycle under heavy braking; both the rider and pillion passenger were thrown from the motorcycle. After hitting the road the motorcycle travelled five or six feet into the air before colliding with the rear of the car ahead. The rider and pillion passenger both collided with the offside of a car that had been travelling in the opposite direction. The pillion passenger’s helmet was not secured and came off when she collided with this car. The pillion passenger sustained fatal injuries.

B1.1.2 Hitting the kerb or verge and losing control
In these accidents the motorcyclists hit the kerb or verge and lost control although in most cases there is little evidence to show which occurred first.

The majority of the accidents occurred in fine conditions on good dry roads. The accidents occurred predominantly in the summer, in the evenings, in daylight and on built-up roads; however, approximately a third of the accidents occurred in the dark. The accidents mainly involved motorcycles with an engine capacity below 500cc. The average engine capacity was 364cc. The riders were mainly driving alone. Although the length of experience was not known for the majority of the riders, the ones for which it was known were mostly inexperienced. 85 per cent of the riders whose experience was known were young riders under 30 who had ridden continuously. The main CFs were alcohol and excess speed.
The rider was proceeding down the road with a group of friends also on motorcycles. They were negotiating a gradual right hand bend when the rider got too close to the nearside verge. The rider lost control of the motorcycle and collided with the nearside bank; both the rider and motorcycle were thrown across the road into the path of an oncoming car. The rear tyre of the motorcycle was found to be under inflated; this may have contributed to the accident.

**B1.1.3 Loss of control and hitting another vehicle**

These accidents involved the motorcyclist losing control when speeding, crossing into the opposite lane and colliding with a vehicle travelling in the other direction; they often occurred on bends.

The majority of the accidents occurred during the day, in the summer, on non built-up roads, in fine weather and on good dry road surfaces. The accidents tended to involve larger motorcycles with an engine size over 500cc and over half of the riders were out riding for pleasure when the accident occurred. The average age of the rider was 29 years old. The main contributory factor was excessive speed followed by inattention.

**Case study**

The rider was seen by witnesses to be travelling at excessive speed. As the rider travelled down a hill and began to negotiate a left-hand bend, he lost control of the cycle, crossed into the other carriageway and collided head-on with a van. The loss of control seems to have been due to the speed at which the rider was travelling. The rider had left for work later than usual which may explain why he was speeding.
B1.1.4 Going straight ahead at a bend/roundabout
The riders in these accidents rode straight ahead when they should have made a turn.

The majority of the accidents occurred during the evening in daylight, in the spring, on non-built-up roads, in fine weather and on good, dry road surfaces. 73 per cent of the riders whose level of experience was known had less than one year’s experience - this included some older as well as younger riders. The engine capacities were mostly less than 500cc. The main CF was excessive speed.

B1.1.5 Other loss of control accidents
The other loss of control accidents often only involved the TWMV rider. In a few accidents the motorcyclist was overtaking a car and lost control. In one accident the motorcycle was stolen and was being ridden along grass parallel to the road. In another the rider was not on the motorcycle but was trying to push start it, and in a third the rider lost control and collided with a skip.

B1.2 Accidents where the Precipitating Factor was ‘failure to avoid object/vehicle in the carriageway’

B1.2.1 Driving straight into a stationary vehicle or object
These accidents mostly involved the TWMV running into a parked vehicle or skip at the side of the road. Although some of the vehicles and skips were poorly lit, other accidents occurred when the vehicle or skip was well lit. For example, one TWMV rider collided with a stationary fire engine answering a 999 call with its hazard lights and flashing beacons on. The most common contributory factors were inattention and excessive speed (i.e. riding too fast to deal with unexpected stationary vehicles).

Most of the riders were travelling alone on smaller cycles with an engine capacity of less than 500cc. The accidents tended to occur on BU roads at night with over half of them occurring in the dark. Fewer of them occurred during the summer months with most occurring during autumn. Although the majority of the accidents occurred in fine weather and on dry road surfaces in good condition, a relatively high proportion occurred in the wet. For nearly half the accidents there was evidence of something being wrong with the motorcyclist’s visor which restricted their vision (e.g. a scratched visor).

Case study

The moped rider collided with the back of a parked car while travelling at less than 30mph. She was not seen to brake or take evasive action before the collision occurred. Her helmet was not fastened and came off during the collision; she sustained fatal head and neck injuries. Upon impact the riders’ helmet was thrown over the car and the rider went through the rear window. The rider remained partially on the moped with the top half of her body through the window.

B1.2.2 Unable to avoid unexpected vehicle/animal
The majority of the motorcyclists involved in these accidents were driving too fast to stop when they encountered an unexpected hazard in the road. This was mainly a vehicle manoeuvring or, in a few cases, an escaped animal. In about half
of these accidents where the motorcyclist failed to avoid a vehicle, the driver was also considered to contribute to the
accident through either lack of care or inexperience.

All accidents occurred in fine weather, mostly on dry roads with good surfaces. The majority occurred in the autumn, in
the evening, with approximately equal numbers occurring in the light and the dark. Equal numbers occurred on built-up
and non built-up roads. The majority of the accidents involved large cycles with an engine capacity over 500cc. Nearly all
the accidents had excessive speed as the main CF.

Case study
The rider was estimated to be travelling well in excess of the speed limit before the accident occurred. An articulated lorry
had taken a wrong turning and was attempting a U-turn in the road. The bike collided with the lorry and slid underneath.
The police estimated that the rider should have been able to stop the bike even at the speed it was estimated to be
travelling (near 100mph) as the turning lorry would have been visible from a long distance away. The motorcyclist seems
to have ignored the fact that the lorry was turning across his path either because he expected it to complete its turn or he
did not register that it was in his path. The pillion passenger received serious injuries but survived; the rider was killed.
The lorry driver was prosecuted for driving without due care and attention.

B1.2.3 Collision with a vehicle performing a normal manoeuvre at a junction.
These accidents involved a TWMV rider travelling too fast to stop when a driver of another vehicle carried out a normal
manoeuvre at a junction. Excessive speed was the main CF in the majority of the accidents.

As with the previous groups, the majority of accidents occurred in fine conditions on good dry roads. The accidents
occurred mostly in daylight during the day or evening; half of these occurred on roads with a 30mph speed limit.
Approximately a third of the riders were riding in pairs. For nearly half of the accidents, not being able to see the rider/cycle
was a major factor in the accident. The majority of the motorcycles had an engine capacity of less than 500cc. Although the
ter’s experience was unknown in most cases, when it was known, the riders had been riding for less than 5 years.

Case study
The rider was travelling at about 50 mph, on a road with a 30mph speed limit. A driver was attempting to pull out of a
junction from the nearside to travel in the opposite direction to the motorcyclist. Parked cars were obscuring the driver’s
view of the road and the vehicles on it. She edged forward slowly. At this point the rider overtook a car travelling between
it and the junction, whose driver had already seen the emerging car and begun to slow. The rider’s view may have been
obscured by this car and the parked cars near the junction. A collision occurred between the emerging car and the
motorbike. The rider was thrown from his bike and over the bonnet of the car. The emerging driver would have been
unable to see the motorcyclist until just before the collision.

B1.2.4 Other accidents involving ‘failure to avoid object or vehicle in the carriageway’
Some of the other accidents with this PF involved collisions with bicycles and cars travelling in the same direction as the
motorcycle, some occurred when the motorcyclist suddenly became aware of a slower vehicle ahead. A few of the
accidents involved the motorcyclist overtaking cars at speed.

B2 Accidents where the Precipitating Factor was not assigned to the motorcyclist
B2.1 Poor turn or manoeuvre
B2.1.1 Right turn accidents
These accidents mainly occurred when a vehicle performed a right turn into a side road or private drive when the road was
not clear, leading to a collision with an oncoming motorcycle. There should have been time to make the turn successfully
in some cases, but the execution of the turn was poor and a collision occurred.

The accidents involved predominantly motorcycles with engine capacity between 500 and 1000cc and riders riding
mostly alone. The PF was assigned to a car in 65 per cent of cases and the motorcyclist survived in only one case (5 per cent).
75 per cent of accidents occurred in daylight, with 45 per cent between 4 and 9pm. Of the cases where it was recorded whether
or not the motorcycle’s lights were on, 88 per cent had the lights switched on. In the 15 accidents that occurred during
daylight, 3 motorcycles had their lights on and 1 did not. There were 4 accidents where not being able to see the motorcycle
was a major factor; all occurred in daylight and it is not known whether the motorcycle’s lights were on.

The main CF (attributed to the other driver) was thoughtless/reckless behaviour, while the second most frequent CF was
failure to judge other person’s path or speed. 4 of the 5 accidents involved failure to judge the speed or path of the
motorcycle occurred in daylight and it is not known whether the motorcycle’s lights were lit. The other occurred in the
dark and the motorcycle’s lights were lit. There were equal numbers of accidents on built-up and non built-up roads. 90
per cent of motorcyclists were travelling straight ahead. More than half the accidents occurred on good dry roads and all
occurred in fine weather with no wind.
The driver of the van involved in the collision was drunk. He was intending to turn right at a junction and pulled into the opposing carriageway before doing so. At this point a head-on collision with an approaching motorcycle occurred in which both the rider and pillion passenger received fatal injuries. The rider of the motorcycle was not at fault. The van driver had two previous convictions for drink/driving and was not insured to drive the van.

B2.1.2 Vehicle performing a U-turn
The vehicles in these accidents were performing U-turns in a variety of situations, most commonly to move from a parking space to travel in the opposite direction, to change direction because of a temporary road blockage or to reverse direction on a dual-carriageway. The drivers of the vehicles involved failed to notice the motorcycles.

The engine capacity of the motorcycles was mostly less than 500cc. All accidents occurred in fine weather with no wind and were mostly on dry roads in a good condition. Car drivers were judged to have been principally responsible for 83 per cent of these accidents and the commonest CF was thoughtless/reckless behaviour. 58 per cent of the accidents were on BU roads. The accidents tended to occur between 4 and 9pm and 75 per cent occurred in the daylight. In most cases the motorcyclist was travelling straight ahead and riding alone. The motorcycle’s lights were lit in a third of the accidents and the vehicle driver’s inability to see the motorcycle was a factor in 42 per cent of accidents. In only two of these ‘unable to see’ accidents were the motorcycle’s lights definitely lit (one in the dark and one in daylight).
The road had been completely blocked in both directions when a tractor shed its load of hay. A queue of stationary traffic developed and the motorcyclist began to overtake the stationary vehicles to his nearside. One of the drivers waiting in the traffic queue performed a U-turn. It appears that he failed to look before pulling out; this resulted in the motorcycle colliding with the offside of the emerging car.

B2.2 Pedestrian entering carriageway carelessly

Only 3 per cent of the accidents occurred on NBU roads, while 80 per cent occurred on 30mph roads. 85 per cent of the accidents occurred in fine weather with no wind and 59 per cent of them occurred in daylight. 79 per cent of the accidents occurred between 10 am and 9pm. The most common CFs (for the pedestrian) were failure to look and failure to judge a vehicle’s speed or path. 80 per cent of riders were riding alone but 31 per cent of the riders who collided with pedestrians on single carriageways away from a junction were riding in pairs. The majority of riders were not assigned any fault in the accident. In 21 per cent of the accidents the rider did not see the pedestrian. The majority of the motorcycles had engines of less than 500cc capacity, the average being 463cc.

The average age of the pedestrians was 63 years old. The average age for those killed away from a junction was higher than for those killed near a junction. The average age for the accidents involving motorcycles of less than 500cc was 60 years, compared with 66 years for those accidents involving cycles with larger engines. The 5 dual carriageway accidents involved 1 teenager and 4 adults more than 70 years old.

Case study

The accident occurred as an elderly lady attempted to cross the road. She decided to cross the central reservation on the grass rather than use the pelican crossing or concrete steps nearby. Witnesses state that she was unsteady on her feet. She began to cross the road and when approximately half way across the first lane she was struck by the motorcycle. This caused her to fall to the ground and the motorcycle’s rear wheel struck her head. The rider was not travelling at an excessive speed and was unable to take evasive action.
Case study

A pedestrian waiting at a pedestrian crossing proceeded to cross the road when the traffic lights were green in favour of oncoming traffic. She failed to see an approaching motor-cycle, its light possibly concealed by a car. The pedestrian stepped into the road; she only saw the motorcycle a moment before the collision and started to run. The motor-cyclist was travelling with a friend on another motorcycle further along the road and not directly involved in the accident.

Case study

A man aged 72 had been walking on the pavement with a friend. The man parted company with his friend and began to cross the road, intending to walk home. Witnesses state that he began to cross the road whilst still talking to his friend and looking over his right shoulder. A motorcyclist was travelling up the road with the pedestrian to his offside. It is not clear how the collision occurred; the police report stated that under normal circumstances an accident could have been avoided. The inexperience of the rider may have contributed. The pedestrian was principally at fault as he was not paying full attention to the road and was crossing near a junction.

B2.3 Other vehicle failed to give way

Both main groups of accident (vehicles pulling out of minor roads and vehicle turning into minor roads) occurred predominantly in fine weather with no wind and in daylight. Almost half the riders were aged 20-29 and the majority rode motorcycles of less than 500cc capacity; over three-quarters were riding alone. The accidents tended to occur between 4 and 9pm. The motorcyclist died in all but one of the accidents. Of the cases where it was recorded whether the motorcycle’s lights were lit, 81 per cent were. Car drivers were judged principally responsible for 78 per cent of the accidents. In the small minority of cases where the rider’s experience was known, the values varied widely but with an average of about 7 years. Driver inexperience was noted as a factor in 2 of the 70 cases.
Case study

The driver of an ice-cream van was intending to cross a major road to enter a minor road on the opposite side, the junction forming a crossroads. Witnesses state the driver failed to give way and pulled out into the road across the path of a motorcycle. The rider of the motorcycle tried to take evasive action but was unable to avoid a collision.

B2.3.1 Right turn from minor road
These accidents were all very similar. They involved a vehicle turning right out of a minor road or private drive when they should have given way to an oncoming motorcyclist. In some of the cases the motorcyclist may have been speeding but in all cases the vehicle driver was judged to have been principally responsible.

The average speed of the motorcycles in these accidents was 54mph. Failure to see the motorcycle contributed to 36 per cent of accidents. The motorcyclists lost their helmets at some point in 43 per cent of the accidents and some may have survived if this had not happened. The motorcyclist had been seen speeding before 4 of the accidents; in another 2 the motorcyclist may have been speeding, and in another 2 the motorcyclist had behaved carelessly. The most common CFs were recklessness and failure to judge another vehicle’s speed or path. The average age of the ‘principally responsible’ drivers was 42 with only 14 per cent being over 60; 68 per cent were male. The drivers’ ages are much lower than those found previously among pedestrians.
The car crossed the path of an oncoming motorcycle. The driver stated that he braking when he became aware of the motorcycle and estimated that it was travelling at an excessive speed of about 50mph. Examination of the scene and statements from witnesses suggest that the motorcycle was travelling at no more than 20mph. The motorcycle collided with the front offside wing and driver's car door. Upon impact, the rider was thrown forward onto the handlebars of the motorcycle, witnesses saw his helmet come off at this point. It seems that the driver was unaware of the motorcycle’s presence until he was halfway out of the junction. A tree reduced visibility at the junction, although a full view was available when the front of his car was only 2 feet into the road.

**B2.3.2 Right turn into minor road**

These accidents were again all very similar, although some occurred at signal-controlled junctions. In all cases the driver should have given way to the approaching traffic before turning right into a minor road. In some of the accidents the approaching motorcycle was hidden from view by another vehicle. These accidents are very similar to the poor manoeuvre - right turn accidents (Section 2.1.1).

The average speed of the motorcycles in these accidents was 45mph. Failure to see the motorcycle contributed to one quarter of accidents. In 89 per cent of the cases where the rider’s behaviour was known, the rider was not considered to have contributed to the accident. This is consistent with the average speed being lower for these accidents than the average reported above for the ‘right turn from minor road’ accidents. The most common CFs were recklessness and looked but did not see. The average age of the drivers judged to have been principally responsible was 46 years with only 22 per cent being over 60; 75 per cent of these drivers were male.
The driver of a car intended to turn into a minor road to his right. A motorcycle was travelling towards the car and the driver turned across its path causing a collision. The driver stated that he had seen the motorcycle; it therefore appears that he misjudged its speed. The motorcycle was travelling in excess of the speed limit which is thought to have contributed to the accident. It was the responsibility of the driver to make sure that it was safe to perform the manoeuvre and he failed to do this.
Information from 717 police files of accidents involving motorcyclists in which there was a fatality have been examined to establish the main factors that caused them. A high proportion of the accidents where a motorcyclist was judged to be principally responsible involve loss of control, often linked with excessive speed, alcohol or careless behaviour. Where other road users were judged principally responsible, the most common factors were 'failed to give way' and 'poor turn or manoeuvre', often linked with failure to observe satisfactorily or failure to judge the rider's path or speed. The mean speed of motorcyclists in accidents for which they were judged to be principally responsible was 57 mph compared with 43 mph when the other party was mainly responsible. A high proportion of the drivers failing to give way or making a poor turn or manoeuvre, in those accidents in which road users other than the motorcyclists were principally responsible, were aged between 30 and 60. For accidents of lesser severity, excessive speed by motorcyclists is less often recorded, and 'looked but did not see' is more often recorded where drivers of cars or larger vehicles are mainly responsible.

Related publications

TRL323  A new system for recording contributory factors in road accidents by J Broughton, K A Markey and D Rowe. 1998 (price £25, code E)

RR270  Factors affecting the accident liability of motorcyclists – a multivariate analysis of survey data by M C Taylor and C R Lockwood. 1990 (price £20, code C)

CR193  A survey of motorcyclists’ attitudes to selected accident counter-measures by O Gosnell. 1990 (price £20, code B)

CR146  Factors affecting the accident liability of motorcyclists – an analysis of survey data by P Lynn. 1990 (price £20, code D)

COST327  Motorcycle safety helmets: a literature review. 1997 (price £35, code J)

CT49.2  Motorcycle safety update (1997-2000) Current Topics in Transport: selected abstracts from TRL Library’s database (price £20)

Prices current at April 2001

For further details of these and all other TRL publications, telephone Publication Sales on 01344 770783 or 770784, or visit TRL on the Internet at www.trl.co.uk.