MOPEDS — BICYCLE OR MOTORCYCLE?

by

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ABSTRACT

The basic issue concerning mopeds is whether they should be considered as being bicycles — and, basically, be free of regulation, or as motorcycles — and thus be subject to all regulations applicable to motor vehicles. In an effort to resolve this issue, European accident data, Virginia crash data, the laws of the several states, the position taken by a number of the major transportation related organizations, and public opinion were reviewed.

In terms of crash, injury, and fatality data, mopeds are more like motorcycles than bicycles. The laws of the various states lack a uniform approach in dealing with mopeds as a form of transportation. Both organizational and public opinion tend to support some type of regulation, but there is little agreement on the specific areas in which there is a need for regulation and how comprehensive this regulation should be.

From the review made for this study, it is recommended that a separate category of vehicles be established for mopeds, as they are neither bicycles nor motorcycles. It is further recommended that the vehicles be registered, that their operators be licensed, that maximum allowable speed and horsepower be increased to 30 mph and 1.5 bhp, and that liability insurance be made available for purchase by moped owners.

1788

CONCLUSIONS

Mopeds, when compared to bicycles and motorcycles on vehicle and operator use characteristics; available crash, injury, and fatality data; and design and engineering components, and viewed as a transportation mode by the general motoring public, appear to be more like motorcycles than like bicycles. Therefore, some regulation of these vehicles appears desirable for their control and the safety of the public.

RECOMMENDATIONS

Based on the results of the analyses presented in this report, the following recommendations are advanced for implementation by the Commonwealth of Virginia.

1. Because a moped is neither a bicycle nor a motorcycle, and because of limitations on its design, construction, and operation, a separate category in the vehicle classification scheme should be established for it. Through establishment of a "moped" category, the Commonwealth could eliminate difficulties of regulation based on the bicycle/motorcycle dichotomy.

2. Mopeds should be registered. Registration would aid in preventing thefts and in the recovery of stolen vehicles; it would provide a mechanism for determining the number and types of mopeds in operation and whether they meet equipment standards; and facilitate the collection of data involving mopeds, where such data are needed for analytical studies.

3. Moped operators should be licensed. The current minimum age for motor vehicle operators in Virginia is 16 years. Since the possession of any valid motor vehicle operator's license now authorizes a person to operate a moped, licensing is already, in effect, in force. If the minimum operator age should be lowered, and for individuals who are eligible and do not have a valid license, a special moped license should be developed.

4. The speed limits for mopeds should be established on the basis of the characteristics of the vehicle and its use in a traffic mix. The maximum speed and horsepower of mopeds used in Virginia should be increased to 30 mph and 1.5 bhp.

5. Mopeds should not be made subject to mandatory insurance requirements. The State Corporation Commission's Bureau of Insurance should consider authorizing the sale of moped insurance in Virginia. Such insurance would be available to moped owners on a voluntary basis.

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INTRODUCTION

At the end of World War II there were shortages of gasoline, rubber, and steel. Several European governments encouraged the use of lightweight, low-powered vehicles for personal transportation by modifying their motor vehicle license requirements and the moped came into existence. Today, a number of countries still do not require registration plates or an operator's license for the use of these vehicles.

To the motoring public the general appearance of a moped is more like that of a motorcycle than that of a bicycle. It is a two-wheeled vehicle with a step-through design, has wider tires than a bicycle, a headlight integrated into the steering system, and shock absorbing front forks and rear end. Propulsion is provided by a small one-cylinder, two-cycle engine, mounted low and in the center of the vehicle, through an automatic transmission. The typical moped weighs around 100 pounds.

Mopeds provide a viable alternative to conventional forms of transportation. In this era of high costs of automobiles and rising prices for gasoline, insurance, and vehicle maintenance, the moped has a relatively low initial cost, can travel up to 75 kilometers on a liter of fuel (175 miles per gallon) and, typically, the maintenance is minor in nature and is performed by the owner/rider.

Mopeds can be used, depending on the minimum legal age for operators, by high school and college students to travel to and from classes, by family members for shopping trips, by wage earners for commuting to and from their places of employment, and by a number of other groups as an economical means of mobility. They are easy to operate and to learn to ride, and have been described as fun machines.

In October 1974 the National Highway Traffic Safety Administration (NHTSA) eased the safety standards for vehicles with a top speed of 30 mph. The changes resulted from a petition by several manufacturers of mopeds and involved brakes, taillights, and turn signals. As a consequence of the NHTSA decision,

handbrakes were permitted, turn signals were not required, and taillight candlepower was reduced. With these changes, mopeds were effectively exempted from the safety standards applying to motorcycles. From that point, as the individual states have passed legislation exempting mopeds from some of their motor vehicle regulations, sales have increased and mopeds have become a matter of concern for motor vehicle and safety officials.

The increase in the use of mopeds in this country and in the number of operators has been quite rapid in the last three years. Although no precise sales figures are available, there are data on the number of these vehicles that have been imported into the U. S.1/ During 1975 the number imported was 40,332; in 1976 it was 105,301; and for 1977 it has been estimated at 175,000. Current demands exceed supply, and there are still markets which have not been opened; therefore, it could be expected that moped use will continue to increase in the future.

Under § 46.1-1 (1a) of the Code of Virginia (C.O.V.) mopeds with motors rated less than 1 brake horsepower (bhp), which produce only "ordinary pedaling speeds" up to a maximum of 20 mph, are classified as bicycles. Therefore, such mopeds are regulated as bicycles, with the exception that no person under 16 years of age shall operate a bicycle with a helper motor. Although the definition of "ordinary pedaling speeds" is uncertain, the legislative intent of this section was that mopeds should not be regulated as bicycles, if they could travel at speeds in excess of 20 mph.

If a moped has a helper motor rated more than 1 bhp, or one which produces speeds in excess of 20 mph, then it will be considered a motorcycle within the definition of § 46.1-1 (14) C.O.V. Once the vehicle is classified as a motorcycle, then all motorcycle regulations are applicable to a moped operator. Accordingly, the operator of a moped which does not fall within the definition of a bicycle would be required to wear a helmet and to have eye protection.

The problem presented by the existing scheme of regulations is that it vastly oversimplifies the issue of moped regulation. Obviously, the assumption is that if a moped cannot travel at speeds in excess of 20 mph it is similar to a bicycle and can be regulated as one. On the other hand, the assumption is that if a moped can travel in excess of 20 mph it is similar to a motorcycle and should be regulated accordingly.

1/ Carney, Leo, "New Factors Brighten An Already Prosperous Market Picture", Moped Magazine, Summer 1977, p. 6.

STATEMENT OF THE PROBLEM

The term "moped" applies to a wide variety of vehicles judged on the basis of design and type, but they all have a similarity in style and concept of use. The terms "bicycle", from a small 1-speed to a 10-speed racing model, and "motorcycle", both stock and modified machines of many power and accessory options, also include a great divergence of vehicles.

The primary issue concerning the use of mopeds as a transportation mode is whether they should be classified as being bicycles and thus be subjected to very few regulations, or as motorcycles and thus be subjected to all regulations applying to motor vehicles. There is a diversity of opinion on regulation which can be characterized by the positions taken by the various transportation related groups. No two groups appear to be in complete agreement, but all groups are concerned with the same set of issues. These issues involve engine size and horsepower, the maximum allowable vehicle speed, operator age and licensing, vehicle registration and insurance, and the use of helmets by operators.

PURPOSE AND SCOPE

This report gives the results of an analysis of the available accident data involving mopeds, discusses factors relevant to the need for regulating mopeds, summarizes current legislation on mopeds in this country, gives the positions of several of the major organizations concerned with motor vehicle travel, and offers recommendations for consideration in the development of a legislative program for the Commonwealth of Virginia.

SOURCES OF INFORMATION

Limitations of time, funds, and manpower prohibited original research into the frequency and characteristics of accidents involving mopeds. Because the term "moped" is not a separate category on the Virginia accident report form, the state accident records system does not contain data on the numbers of crashes, injuries, or fatalities in which this type of vehicle was involved.

A variety of organizations and individuals were contacted for data relating to the use, regulation, and accident characteristics of mopeds. A Highway Research Information

Service* search was carried out to obtain reports on studies dealing with the moped issue. Unfortunately, the search turned up very few studies, either completed or in progress, and none that dealt specifically with the accident characteristics of mopeds.

The U. S. Department of Transportation furnished, upon request, Docket 75-29, Motorized Bicycles, for review. The docket was opened to ensure the availability of information to guide the federal government in regulating the use of mopeds on public highways. The docket contained comments received from the public in Washington between December 3, 1975, and September 14, 1976. Also contained in the docket was a report on the road safety problems of two-wheeled vehicles carried out by the European Conference of Ministers of Transport.2/ This study was part of the submission by the Motorized Bicycle Association (MBA). The MBA, however, had no part in the design, conduct, or interpretation of the study.

The Highway Safety Division of Virginia (HSD) requested the Virginia Division of Motor Vehicles (DMV) to furnish copies of accident reports known to involve mopeds for calendar years 1975 and 1976. The data that are available were obtained at the time of matching the citizen and police reports by DMV personnel. Any accident report recognized as involving a moped was duplicated by the DMV and sent to the HSD. There were 9 reports in 1975 and 13 in 1976. The cases undoubtedly represent only a portion of the actual number of accidents in these two years because the method of selection left too much to chance. So far in 1977, the HSD Crash Investigation Team has issued studies of three accidents involving mopeds that resulted in fatalities. These 25 cases proved to be the only moped accidents in Virginia for which data were available.

The 1975 and 1976 issues of the Virginia State Police publication Crash Facts were used to establish a data base relative to accidents involving bicycles and motorcycles. This was done to allow a comparison between these two forms of travel and a comparison with data from the European study and the data available for moped crashes in Virginia.

2/ European Conference of Ministers of Transport, The Road Safety Problems Concerning Two-Wheeled Vehicles, Paris, June 1974.

* Highway Research Information Service is a service of the Transportation Research Board, National Academy of Sciences, 2101 Constitution Avenue, N. W., Washington, D. C., 20418.

AREAS OF REGULATION

Regulations on the operation of two-wheeled vehicles imposed by the various states deal with the vehicle itself, the operator, and the use of the vehicle. In the vehicle category are those regulations related to the definition of mopeds, including those on the displacement of the engine and the horsepower it develops. Regulations in the operator category include those on the minimum age for operators, operator's license, and use of a helmet. The vehicle use category includes regulations on the maximum speed of travel, insurance, and vehicle registration.

The moped has been categorized by various labels, among them bicycle and motorbicycle. In some states they are included under the motorcycle, or motor vehicle, classification. While all states have some regulations applying to mopeds, 31 states and the District of Columbia have legislation limiting the application of their motor vehicle laws to mopeds. This legislation establishes limits on engine displacement, maximum horsepower, maximum speed of travel, and minimum operator age, and includes a number of regulations with respect to operator's license, vehicle registration, and financial responsibility. None of these states have legislation requiring the operator to wear a helmet; however, in the other states helmet use is dependent upon the statutes which apply to motorcycles.

Regulations on the items listed below are those which have received special attention in these 32 jurisdictions. Under each item, the number of states following a specific legislative practice is given. It is apparent from a review of these data that there is no uniformly used approach to dealing with the various vehicle and operator issues. In Appendix A, this legislation is shown for individual states.

1. Definition — The moped is most commonly called a motorbicycle (14 states), or a bicycle (9 states), while 6 states use the term moped, and 3 states have other terms.

2. Engine Displacement — Twenty-one states place a limit of 50 cc's on engine size, 10 have no stated size limits, and 1 uses a 60 cc limit.

3. Maximum Horsepower — A maximum of 1.5 bhp is used by 14 states, 4 states have no maximum rating, and the remainder are split between 1 bhp (6 states) and 2 bhp (8 states).

4. Maximum Speed — The federal easement applies to vehicles with a top speed of 30 mph, but 2 states do not specify a top speed. Fifteen states use 25 mph as the maximum allowable speed, while 9 use a 30 mph limit, 5 use a 20 mph limit, and 1 a 17 mph limit.

5. Minimum Operator Age — The minimum age ranges between 12 years old and no stated limit. The majority of the states (18) use 16 years as their lower age limit; 8 states use 15 years, 3 use 14 years, 1 uses 12 years, and 2 do not state minimum age limits.

6. Operator Licensing — The majority of the states (16) require the operator to hold a valid license, 7 states allow the use of special permits, and 9 states require no form of licensing.

7. Vehicle Registration — About half of the states (15) require registration, while 16 do not, and there are no data from 1 state. In those states requiring registration, the fees range from a low of about $1.50 a year for a multiyear registration to a high of $10 for a single year.

8. Insurance — One state requires insurance; 10 make moped operation subject to their financial responsibility laws; but 21 have no insurance requirements.

9. Helmet Use — None of the 31 states and D.C. require a moped operator to wear head or eye protection.

POSITION OF OTHER ORGANIZATIONS

In the development of this report, it was believed that a review of the opinions and positions of some of the major transportation related organizations would be helpful in developing a recommendation relative to the position to be taken by the Commonwealth. The list of organizations contacted was not intended to be all inclusive, but it is felt that the organizations included are representative. The names of the organizations, and in cases where personal contact was made, the names of the individuals contacted, are presented in Appendix B.

The Motorized Bicycle Association's position is contained in a statement to NHTSA Docket 75-29 on Motorized Bicycles. This position has also been stated in a number of magazine and journal articles. The MBA defines a moped as a bicycle, and therefore takes the position that an operator's license, vehicle registration, insurance, and helmet use should not be required. The MBA also states that the minimum operator age should be 14 years, that the maximum speed should be 25 mph, and that the horsepower limit should be 1.5 bph.

The Motorcycle Industry Council also submitted comments to the Docket on Motorized Bicycles. It proposes that there be a separate vehicle classification called "moped". Vehicles so classified would have a maximum engine displacement of 50 cc's, would not develop over 2.0 bhp, and would be limited to a top speed of 30 mph. The minimum operator age would be 14 years, insurance would not be required, and helmet use would be voluntary. The vehicle would need to be registered and the operator would have to be licensed under the Council's proposal.

The spokesman for the National Committee on Uniform Traffic Laws and Ordinances said that the Committee's position is that a moped is a motor vehicle, and as such should have to comply with motor vehicle statutes. There is no category of motor vehicle with engine displacement, horsepower, or maximum speed specially defined. If at some future time the Committee establishes exemptions in the areas of helmet use, vehicle registration, operator licensing, or in any other regulatory area, at that time a moped category will need to be developed.

"A bicycle is a bicycle and a moped is a moped" is the only position taken by the Bicycle Manufacturers Association. This is nearly the same position as that taken by the League of American Wheelmen. The League feels that mopeds should have their own vehicle classification. Operator licensing, vehicle registration, and insurance would be taken care of through this definition. The use of a helmet should be voluntary and the League recommends its use.

The Vehicle Equipment Safety Commission has proposed a set of minimum requirements for mopeds. This organization deals only with equipment areas. The Commission's definition of moped is that it is a motor driven cycle with a maximum engine displacement of 50 cc's, a maximum power of 2.0 bhp, and a top speed of 30 mph.

In a telephone conversation, a spokesman for the Insurance Institute for Highway Safety indicated that the Institute feels that mopeds have many of the characteristics of motorcycles, and therefore they should meet all of the safety performance standards relevant to motorcycles. The Institute did not have specific recommendations for each of the items currently regulated.

Upon contacting the National Safety Council, the author learned that it has a subcommittee in the process of developing a policy statement on mopeds. The subcommittee report will be presented to the membership at the 1977 annual meeting. It is planned that this position will be made public sometime after the end of October 1977.

The American Automobile Association does not have a national policy on mopeds, because each club is encouraged to develop its own policy on issues. The Association is supportive of state efforts to collect accident data to be used in an analysis of potential problem areas.

The Virginia Division of Motor Vehicles and the Department of State Police were also contacted. The DMV has not stated its position on the vehicle, operator, and use areas at the time this report is being prepared. They are following a "neutral" position on licensing, registration, insurance, and operator age. The State Police also has not stated an official position dealing with mopeds, their operators, or their use. As these vehicles become more numerous, and if problems arise as to their use on the streets and roads of the state, both agencies will develop positions commensurate with the problems which occur.

The NHTSA Docket on Motorized Bicycles contains a large number of submittals from the general public. The majority of these letters, nearly 70%, were opposed to designating the moped as a motorcycle, although they did not reject all forms of vehicle, operator, and use controls. Of the people submitting statements, 20% were favorable to the use of mopeds, provided they are made subject to some vehicle and operator regulation. Suggested controls were as variable as the state legislation on mopeds, but usually involved age, licensing, and registration. Approximately 5% of the people writing held very strong feelings that there should be no regulation of mopeds, and the remaining 5% totally opposed any use of these vehicles.

In summary, eleven organizations, or individuals representing organizations, were contacted to learn their position on the regulation of mopeds. Public comments to NHTSA Docket 75-29 were also reviewed. It was found that there is nearly a uniformity of opinion that mopeds should be regulated in some manner. There appears to be little opposition to some form of vehicle registration or to operator licensing, provided any valid license applies to mopeds.

ACCIDENT ANALYSIS

The European Conference of Ministers of Transport (ECMT) study cited above reported on data collected from eleven nations during 1971*. The authors point out that their report contains a number of gaps because of an absence of data or difficulties in verifying data. In particular they point out that there is a lack of accurate figures for the number of bicycles and mopeds in use, no data on vehicle ownership or use by age group, and limited data on vehicle mileage.

Table 1 summarizes the data from the ECMT study. There were more bicycles than either mopeds or motorcycles in use, but mopeds accounted for nearly 152,000 of the injuries (49.9%) and 5,278 of the deaths (43.1%) resulting from the accidents involving two-wheeled vehicles. On the basis of the vehicle population, the numbers of deaths per 100,000 vehicles were 7.7 for bicycles, 51.4 for mopeds, and 170.8 for motorcycles. The numbers of injuries per 100,000 vehicles were 161 for bicycles, 1,516 for mopeds, and 4,659 for motorcycles.

Table 1

Summary of ECMT Data

Data Item	Bicycles	Mopeds	Motorcycles
Estimated no. of vehicles	48,650,000	10,060,000	1,741,000
Vehicles per 100,000 population	330	49	8
Number of deaths	4,384(35.8%)	5,278(43.1%)	2,572(21.0%)
Number of injuries	86,235(28.3%)	151,842(49.9%)*	65,020(21.4%)*
Death per 100,000 vehicles	7.7	51.4	170.8
Injuries per 100,00 vehicles	161	1,516	4,659
Percentage total road deaths	7.7%	9.5%	4.6%

*Excluding Ireland, as there mopeds and motorcycles are listed together.

*West Germany, Belgium, Denmark, France, Ireland, Norway, Luxembourg, Netherlands, Switzerland, Portugal, and the United Kingdom.

Overall, mopeds had a worse accident record than either of the other two types of vehicles when considered on the basis of the total number of deaths and injuries, but not when based on rates per 100,000 vehicles in use. When the numbers of vehicles were considered, mopeds accounted for 7 times more deaths than did bicycles, but only one-third as many as motorcycles. For injuries, mopeds accounted for 9 times more than bicycles, but still only one-third of those for motorcycles.

The ECMT report also shows that approximately three-fourths of the two-wheeled vehicle accidents occurred during daylight hours and in built-up areas. This finding held for each of the three vehicle types — bicycles, mopeds, and motorcycles. Table 2 presents data on the numbers and percentages of deaths by age group. The over-20-years-old group accounted for two-thirds of the deaths in bicycle accidents, about three-fourths of those in moped accidents, and nearly half of those in motorcycle accidents. For people under 20 years of age, most of the deaths from bicycle accidents were in the 0-14 year group, while most of the deaths resulting from moped and motorcycle accidents were in the 15-20 group. Bicycles and mopeds are alike in that most deaths resulting from accidents involving them are in the over-20 age group. Mopeds and motorcycles are alike in that the largest portion of deaths for people under 20 was in the 15-20 age group.

Table 2

Deaths by Age Group

	0 - 14		15 - 20		Over 20	
Vehicle	No.	Percent	No.	Percent	No.	Percent
Bicycle	1,144	26.2	315	7.1	2,925	66.7
Moped	114	2.2	1,241	23.5	3,923	74.3
Motorcycle	21	0.8	1,308	50.9	1,243	48.3

A recent article in Business Week magazine pointed out that according to La Prevention Routiere, a French group similar to the American Automobile Association, mopeds now account for 17% of all traffic deaths and 22% of all traffic injuries in France.3/ In the same article, the International Federation of Pedestrians in the Hague attributed 15% of all traffic related deaths in Holland to moped accidents.

3/ Hitching, Bradley, "Personal Business", Business Week, August 1, 1977, p. 65.

For the years 1975 and 1976, the only data available for moped accidents in Virginia are those for accidents involving injury, and these were given in the 22 accident reports previously mentioned. The 1977 data, given in 3 reports, are for fatal crashes only. Of these 25 crashes, 24 occurred on straight roadways, 22 on a dry surface, 19 on a clear day, 16 during daylight hours, and 19 involved an automobile. Ten of the 25 crashes were on open highway and the remainder were in residential, business, or school zones. Seventeen of the crashes were in areas where the posted speed limit was in excess of 30 mph, 6 were in zones where the posted limit was less than 30 mph, and in 2 cases the posted speed was unknown. In 6 of the total, the operators were under 20; in 5 they were between 21 and 30; and in 11 crashes they were over 40. All of the 25 operators were male. Most injury accidents, 15 cases, involved lacerations, abrasions, and bruises, while the 3 fatalities were due to major head injuries.

Since no specific surveillance of moped accidents is maintained at the state level, the actual frequency with which injuries and fatalities occur is unknown. This fact, coupled with a lack of knowledge of the number of mopeds being used on the streets and highways and the absence of an estimate of their vehicle miles of travel, prevented a comprehensive analysis of moped accidents.

The Virginia Crash Facts for 1975 and 1976 were also used in attempting to determine whether the accident experiences of mopeds more closely resemble those of motorcycles than those of bicycles. These years are the same ones for which the limited moped crash data were available for analysis. Appendix Table C-1 presents the motorcycle crash data used. A little over half of all motorcycle crashes and the resulting injuries occurred in urban areas, while over half of the fatal crashes were in rural areas. For bicyclists, over two-thirds of the crashes and injuries were in urban areas and over three-fourths of the fatalities were on rural roads (see Appendix Table C-2). Although the urban-rural trends for both types of vehicles are the same, the proportions are different. It is logical to assume the higher percentages of crashes and injuries for bicyclists in urban areas are due to the fact that bicycles are operated primarily in urban areas, whereas motorcycles are not.

The severity of injuries resulting from bicycle and motorcycle crashes was also reviewed. Injuries were categorized as serious, slight, and complaint of pain. For both types of vehicles, over half of the crashes were of the serious type. Of the injuries from motorcycle crashes 59% were listed as serious; and of those from bicycle crashes, 53% were the serious type. Twenty percent of the injuries from motorcycle crashes were listed as slight, and 23% of those from bicycle crashes were so listed (see Appendix Table C-3).

Appendix Table C-4 lists the numbers and rates of male and female bicyclists killed and injured. Males made up nearly 85% of the total number of persons killed during 1975 and 1976 and over 79% of those injured during these two years. Age data on the number and rate of bicyclists killed and injured during 1975 and 1976 are given in Appendix Table C-5. The data are categorized in the manner used in the ECTM study. The 0-14 age group accounted for just over 61% of the fatalities and about 58% of the injuries. The over-20 group accounted for nearly 35% of the fatalities and 20% of the injuries. Information on age and sex was not available for motorcyclists because these operators are included in the motor vehicle figures and are not listed in a separate category.

Summary of Crash Data

Data from the ECMT study show that 85% of the bicycle crashes, 82% of those for mopeds, and 77% of those for motorcycles occurred in built-up areas. The ECMT data are not available for the percentages of persons killed and injured by location. In Virginia, during 1975 and 1976, about 68% of the bicycle and 55% of the motorcycle crashes and resulting injuries were in urban areas. Over the same period, 77% of the bicycle and 56% of the motorcycle fatalities were in rural areas. The Virginia moped data also show that crashes and injuries are an urban problem, but urban-rural rates cannot be computed from the information available.

Recent data published in Business Week magazine indicate that fatalities from accidents involving mopeds are making up an increasing percentage of the total fatalities from motor vehicle accidents in France and Holland. Mopeds account for 17% of all traffic deaths in the former and 15% of those in the latter.

Data from the ECMT study and those obtained from Crash Facts and selected moped accident reports indicate that male operators make up the largest portion of those killed and injured while operating two-wheeled vehicles. From the limited Virginia crash data, it also was found that the moped operators killed and injured were travelling in areas where the posted speed was over 30 mph.

The European results show that during 1971, 67% of the people killed in bicycle accidents, 74% of those in moped accidents, and 48% of those in motorcycle accidents were operators over 20 years of age. In Virginia, during 1975 and 1976, 62% of the persons killed and 58% of those injured in

bicycle accidents were under 14; all of the people known to have been killed or injured in moped crashes during 1975, 1976, and 1977 were over 20; and, though data on the age of the people involved were not available for motorcycle operators, the people killed would be expected to be over 16 years old because of state licensing requirements.

In the ECMT study, for each 100,000 vehicles, mopeds were involved in 9 times more injury accidents than were bicycles, but only one-third as many as for motorcycles. The study did not include data on injuries categorized according to the severity of the injury. It was not possible to calculate injury rates for two-wheeled vehicles from the Virginia data available. The data available on moped injuries indicate that most injuries were in the form of lacerations, abrasions, and bruises. Data on injuries to Virginia bicyclists and motorcyclists indicate that over half were of the severe type. In Europe, there were more total injuries to moped operators than to bicyclists or motorcyclists, but the number of motorcycle injuries per 100,000 vehicles was higher than those for the other two-wheeled vehicles. In Virginia, there were more motorcyclists injured, and a higher percentage of the injuries were listed as serious.

Table 3 is a summary of crash data from the sources reviewed. In the ECMT study, mopeds fall between bicycles and motorcycles on injury and death rates per 100,000 vehicles, and are similar to motorcycles in respect to the age of those killed (over 15) and crash location (urban areas). The available Virginia data are too incomplete to allow computation of fatality and injury rates for two-wheeled vehicles. Because of current state statutes on minimum operator age and maximum speed of travel, it could be expected that the age of the operators and the locations of fatal and injury crashes for mopeds would be similar to those for motorcycles. From the analysis of the ECMT study, selected reports on moped crashes in 1975, 1976, and 1977, and crash data from the Virginia Crash Facts for 1975 and 1976, it appears that mopeds more closely resemble motorcycles than they do bicycles in their accident characteristics.

In the United States, bicycles are used mainly for recreation and motorcycles for transportation, while they both are used primarily for transportation in Europe. This difference could explain some of the differences in the data presented in this report. It is difficult to completely establish the scope of the moped problem in Virginia because of the lack of factual data on which to base generalizations. The solution lies in establishing a reporting system to provide data for analysis.

Table 3

Summary of Crash Information

Category	Source	Bicycles	Mopeds	Motorcycles
Sex	Virginia data	84%[a] killed males 79% injured males	All killed males All injured males	N/A[b]
	ECMT study	N/A	N/A	N/A
Age	Virginia data	62% killed 0 to 14 58% injured 0 to 14	All killed over 20 73% injured over 20	N/A
	ECTM study	67% killed over 20 26% killed 0 to 14	74% killed over 20 24% killed 15 to 20	48% killed over 20 51% killed 15 to 20
Location	Virginia data	68% crashes urban 68% injured urban 77% killed rural	N/A	56% crashes urban 54% injured urban 56% killed rural
	ECMT study	85% crashes urban	82% crashes urban	77% crashes urban
Deaths per 100,000 vehicles	Virginia data	N/A	N/A	N/A
	ECMT study	7.7	51.4	170.8
Injuries per 100,000 vehicles	Virginia data	N/A	N/A	N/A
	ECMT study	161	1,516	4,659
Severity of Injury	Virginia data	53% serious	68% minor	59% serious
	ECMT study	N/A	N/A	N/A

(a) Data summarized by nearest whole percentage point.
(b) Data not available.

Registration

Since most, if not all, mopeds in Virginia fall within the definition of a bicycle, there is no requirement that they be registered. Consequently, it is impossible to determine the number of mopeds being operated in the state. This presents a number of problems, but makes an accident analysis virtually impossible. Even if there were accurate figures on the absolute number of moped accidents and fatalities, the significance of these figures would be hard to determine since no meaningful accident rates could be calculated. Accordingly, a requirement for the registration of mopeds is an essential first step to successful accident analysis.

Registration could also provide an effective means of enforcing equipment standards for mopeds. Such standards could be legislatively defined and be supplemented and administered by the Superintendent of State Police. For example, legislation could be drafted to provide that no moped could be registered unless it complied with standards set by the Superintendent or was on a list of approved vehicles compiled by the Superintendent.

Finally, registration would be a deterrent to theft. Ownership could more easily be established and the resale of a stolen vehicle would become more difficult. Also, if a vehicle were recovered, registration would ensure its return to the rightful owner.

Licensing

A vehicle operator's license is not required to operate a moped in Virginia, but the person must be over 16 years old. Such a permissive scheme is consistent with the choice to include mopeds within the bicycle definition, but if mopeds are recognized as being distinct from bicycles, then a more restrictive scheme may be appropriate.

It is believed that moped operators should be required to possess an operator's license. Any motor vehicle license issued under the existing licensing system would be sufficient. This would assure that the moped operator would have some knowledge of the rules of the road and motor vehicle operation, and provide a method of identification of the operator for law enforcement purposes. In addition, a special moped license

should be created for individuals who wish to operate only mopeds. Such licenses would be issued only after the individuals desiring them have demonstrated a reasonable understanding of the rules of the road and/or sufficient operating proficiency of a moped. These special moped licenses also could be issued to individuals under the age of 16, if the minimum operator age is lowered. However, no factual basis for such a change in minimum age is apparent, and it is recommended that the age limit on operators remain at 16.

Insurance

Public policy in Virginia dictates that owners of motor vehicles be able to respond in damages for liability which may result from the operation of their motor vehicle. This is accomplished through insurance or some other method of establishing financial responsibility. However, since most mopeds are not considered to be motor vehicles, moped owners need not meet any financial responsibility requirements. Nevertheless, it would certainly be consistent with public policy if a moped owner voluntarily secured insurance if he were not otherwise able to respond in damages for liability which may result from his ownership or operation of a moped.

At present, however, no form of moped insurance is available in Virginia. Such insurance is desirable to protect moped owners from economic hardship and to assure relief to any injured parties. The State Corporation Commission's Bureau of Insurance should consider authorizing the sale of moped insurance in Virginia. Such insurance would be available to moped owners on a purely voluntary basis.

There are not sufficient data available to determine whether or not mandatory insurance is warranted. However, given the limited speed at which mopeds operate and their lightweight character, it appears that they do not pose the same liability problems as those associated with larger motor vehicles.

Accident Reporting

The accident report form currently used in Virginia does not include a category for moped accidents or for accidents in which mopeds are involved. Although it would be useful to have such a category, there are inadequate data to determine if there are sufficient numbers of mopeds being operated in Virginia to warrant a change in the accident report form. Also, there are many other classes of vehicles which are not recognized as distinct categories for purposes of accident reporting. For example, trucks with gross weight in excess of 6,500 pounds are a distinct class of vehicles for registration purposes, but are grouped with other vehicles on the accident report form.

Accordingly, there is no readily apparent reason to give mopeds any special treatment. However, if their use becomes extremely widespread, then a separate category may be justified.

Vehicle Inspection

Although there are no data to indicate whether or not periodic mechanical inspection of mopeds may be warranted, it is believed that such inspections are not justifiable. This position is based on the following considerations:

1. The mechanics of mopeds are relatively simple, and are subject to owner/operator inspections and repair.

2. Use of mopeds is limited to short trips and by weather conditions, so that wear and tear will usually not be excessive.

3. The low operating speeds and handling characteristics of a moped will permit accident avoidance even if there is a mechanical failure.

4. The cost of enforcement and administration of such a program would be expensive and present a number of practical difficulties.

Head and Eye Protection

Since Virginia law permits certain mopeds to be operated as bicycles, operators of such mopeds are not required to use protective helmets or devices which provide eye protection. Whether or not use of helmets would afford increased protection for moped operators is an important issue. Unfortunately, the scarcity of data on moped accidents in Virginia or any other state makes it difficult to formulate a recommendation on this issue.

In 1977, three accidents in which moped operators were killed were selected for investigation by the Crash Investigation Team of the Highway Safety Division. In each of the three cases, it was determined that the fatality was due to a major head injury. In only 1 of the 22 known moped crashes during 1975 and 1976 was a major head injury sustained. A recent study presented to the 21st Stapp Car Crash Conference by a German engineer, Klaus Langwieder, was reported in the November 30, 1977, issue of Status Report of the Insurance Institute for Highway Safety. The report concludes that moped

drivers are less likely than motorcyclists to be in a crash, but when they are in a crash, their risk of injury is almost identical. Langwieder recommends the mandatory use of helmets by moped riders.

If registration and improved accident reporting procedures are implemented, then meaningful accident data will become available and an informed judgment on the issue of mandatory helmet use and eye protection can be formulated. However, any recommendation on these issues at the present time would be premature.

Vehicle Classification

The current system of regulation treats mopeds as either bicycles or motorcycles, depending upon their horsepower rating and maximum operating speed. It is believed that this treatment of mopeds should be abandoned, and that a separate motor vehicle category should be established. Regulation of mopeds under a separate motor vehicle category requires that they be defined by law.

The moped category should include only vehicles which have all of the following features:

1. Two wheels.
2. Operable pedals.
3. A motor that does not exceed 50 cc piston displacement, produces 1.5 bhp or less, and cannot propel the vehicle at a speed greater than 30 mph on a level surface.
4. A transmission which assures that operation of the vehicle will be simple and will not require the coordination of clutch and gear mechanisms.

Accordingly, for purposes of drafting legislation, a moped could be defined as

> A two-wheeled vehicle with operable pedals and a transmission which permits operation without the coordination of clutch and gear mechanisms, which is equipped with a motor that does not exceed 50 cc piston displacement, produces 1.5 bhp or less, and propels the vehicle at a speed not greater than 30 mph on a level surface.

Such a definition would increase both the maximum speed for mopeds and the maximum horsepower ratings for moped motors. These increases are justifiable for a number of reasons. First, the NHTSA made amendments to the Motor Vehicle Safety Standards in 1974. The 1974 amendments provided relaxed safety standards for motor-driven cycles whose speed attainable in one mile is 30 mph or less. Thus, mopeds with maximum operating speeds up to 30 mph are permissible under federal standards. It is believed that making Virginia law consistent with these standards will alleviate problems of enforcing the stricter Virginia standards, because it is more difficult to isolate vehicles which do not comply with Virginia standards when those standards are different from federal standards.

Second, increasing the maximum operating speeds for mopeds will enhance their ability to interact with other traffic. The current limit on moped speed produces a situation in which mopeds are often forced to operate at speeds lower than other urban traffic. In many instances, this may expose moped operators to unnecessary risks. Accordingly, increasing the operating speed limit could produce substantial benefits. Of course, where speed limits were less than 30 mph, mopeds would be subject to such lower posted limits.

Third, experience and observation of moped operation indicate that, currently, significant numbers of mopeds operated in Virginia can and do exceed the 20 mph limit. It appears that enforcement of the limit is impracticable. Accordingly, the legislation should be amended to recognize this factor.

1810

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Current Motorized Bicycle Legislation

(Compiled by the Motorized Bicycle Association)

	CC	POWER	MAX. SPEED	REG.	DEFINED	MIN. AGE	LICENSE	INS.	HELMET
Arizona	50 or less	1.5 bhp or less	25	yes $8.yr.	ped. bicycle w/helper mot.	16	any valid	no (fin. resp)	no
Arkansas	no more than 50	no more than 2 bhp	30	no	mot. bicycle	14	any valid or spec. license at 14 yrs.	no	no
California	none	less than 2 gross bhp	30	no	mot. bicycle	15	any valid or learner perm.	no (fin. resp)	no
Colorado	no more than 50	no more than 2 bhp	30	yes $5.-3 yrs.	mot. bicycle	16	any valid	no	no
Connecticut	less than 50	no more than 2 bhp	30	no	bicycle	16	any valid	no	no
Delaware	less 50	no more than 1.5 bhp	25	yes $5.-3 yrs.	moped	16	any valid	no	no
Florida	none	max. of 1.5 bhp	25	no	moped under bicycle def.	15	no	no	no
Hawaii	none	1.5 bhp or less	none stated	no	bicycle	15	no	no	no
Indiana	no more than 50	no more than 1.5 bhp	25	no	mot. bicycle	15	no	no Amended eff. 7/77	no
Iowa	no more than 50	none	25	yes $5.yr.	motorized bic. or motor bic.	14	any valid or mot. bic. lic. at 14, no road test	no (fin.resp)	no
Kansas	no more than 50	no more than 1.5 bhp	25	yes $5.yr.	mot. bicycle	14	any valid or license w/writ test only at 14	no (fin.resp)	no
Louisiana	no more than 50	no more than 1.5 bhp	25	no	mot. bicycle	15	any valid	no	no
Maine	no more than 50	no more than 2 bhp	30	yes $5.yr.	moped	16	any valid	no (fin. resp)	no
Maryland	less than & 50	less than 1 bhp	none stated	no	bicycle	16	any valid	no	no
Massachusetts	no more than 50	no more than 1.5 bhp	25	yes $3.-2 yrs.	mot. bicycle	16	any valid or learner permit	no	no

Michigan	no more than 50	max. 1.5 bhp	25	yes $2.yr.	moped	15	any valid or moped license (no road test)	no	no
Minnesota	less than 50	max. 2 bhp	30 $3.yr.	yes	mot. bicycle	16	any valid	no (fin. resp) Eff. 8/1/77	no
Nevada	none	none	30	no	moped	16	any valid	no (fin. resp)	no
New Jersey	less than 50	no more than 1.5 bhp	25	no	bicycle	15	no	no	no
New Hampshire	no more than 50	no more than 2 bhp	30	yes $3.yr.	moped	16	any valid	no (fin. resp)	no
New Mexico	less than 50	none	25	no	mot. bicycle	none stated	any valid or restricted	no	no
New York	a) none b) none	1 hp or less none	17 18-30	no yes	bicycle ltd. use Class B motorcycle, moped	16 16	no any valid	no yes	no yes
North Carolina	none	less than 1 bhp	20	no	bicycle	16	no	no	no
Ohio	none	less than 1 bhp	20	no	bicycle	none	no	no	no
Pennsylvania	no more than 50	no more than 1.5 bhp	25	yes $6.yr.	motorized pedalcycle	16	any valid	yes	no
Rhode Island	none	no more than 1.5 bhp	25	yes $10.yr.	mot. bicycle	16	any valid	no	no
South Carolina	none	less than 1 bhp	20	no	bicycle	12	no	no	no
Tennessee	no more than 50	no more than 1.5 bhp	25		mot. bicycle	16	any valid	no	no
Texas	less than 60	none	20	yes	motor assisted bicycle	15	yes (written test only)	no	no
Vermont	50	max. 2 bhp	30	yes $10.yr.	Moped	16	any valid	no (fin.resp)	no
Virginia	none	less than 1 bhp	20	no	bicycle	16	no	no	no
Washington, D.C.	no more than 50	no more than 1.5 bhp	25	yes $6.yr.	mot. bicycle	16	any valid or mot. bicy permit no road test	no (fin.resp)	no

APPENDIX B

ORGANIZATIONS AND INDIVIDUALS CONTACTED

American Automobile Association — Telephone conversation with Joe Leep.

Bicycle Manufacturers Association — Telephone conversation with Phil Burke.

General Public — There were approximately 250 letters to NHTSA Docket 75-29, Motorized Bicycles.

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1816

Appendix Table C-1

Summary Data for Crashes of Motor Vehicles with Motorcycles

	Urban	Rural	Total
		1975	
Total Crashes	1,046 (58.3%)	748 (41.7%)	1,794
Person Injured	911 (55.8%)	723 (44.2%)	1,634
Persons Killed	16 (41.0%)	23 (59.0%)	39
		1976	
Total Crashes	1,501 (54.8%)	1,237 (45.2%)	2,738
Persons Injured	1,369 (52.4%)	1,245 (47.6%)	2,614
Persons Killed	29 (46.0%)	34 (54.0%)	63

Appendix Table C-2

Summary Data for Crashes of Motor Vehicles with Bicycles

	Urban	Rural	Total
		1975	
Total Crashes	810 (67.5%)	390 (32.5%)	1,200
Persons Injured	789 (66.8%)	392 (33.2%)	1,181
Persons Killed	5 (31.3%)	11 (68.7%)	16
		1976	
Total Crashes	753 (67.8%)	357 (32.2%)	1,110
Persons Injured	768 (68.3%)	356 (31.7%)	1,124
Persons Killed	1 (10.0%)	9 (90.0%)	10

Appendix Table C-3

Degree of Injury in Motorcycle and Bicycle Accidents

Motorcycle Accidents

Degree	1975	1976	Total
Serious	976 (59.7%)	1,521 (58.2%)	2,497 (58.8%)
Slight	311 (19.0%)	556 (21.3%)	867 (20.4%)
Pain	206 (12.6%)	350 (13.4%)	556 (13.1%)
Not Stated	141 (8.6%)	187 (7.2%)	328 (7.7%)
Total	1,634 (99.9%)*	2,614 (100.1)*	4,248(100.0%)

Bicycle Accidents

Degree	1975	1976	Total
Serious	627 (53.1%)	594 (52.8%)	1,221 (53.0%)
Slight	276 (23.4%)	264 (23.5%)	540 (23.4%)
Pain	150 (12.7%)	152 (13.5%)	302 (13.1%)
Not Stated	128 (10.8%)	114 (10.1%)	242 (10.5%)
Total	1,181(100.0%)	1,124 (99.9%)*	2,305(100.0%)

*Rounding Error

Appendix Table C-4

Fatalities and Injuries by Sex of Bicycle Operator

Sex	Killed	Injured
1975		
Male	14 (87.5%)	900 (78.1%)
Female	2 (12.5%)	250 (21.7%)
Not Stated	0	2 (0.2%)
Total	16	1,152*
1976		
Male	8 (80.0%)	893 (80.3%)
Female	2 (20.0%)	213 (19.2%)
Not Stated	0	6 (0.5%)
Total	10	1,112*

*Total differs from Appendix Table A-1 because only bicyclists injured are included.

Appendix Table C-5

Fatalities and Injuries by Age of Bicycle Operator

Age Group	Killed	Injured
1975		
0 - 14	11 (68.8%)	688 (59.7%)
15 - 19	0	251 (21.8%)
Over 20	5 (31.2%)	213 (18.5%)
Total	16	1,152*
1976		
0 - 14	5 (50.0%)	615 (55.3%)
15 - 19	1 (10.0%)	252 (22.7%)
Over 20	4 (40.0%)	245 (22.0%)
Total	10	1,112*

*Only bicyclists are included.

1830