PROBLEM ANALYSIS OF MOPED ACCIDENTS IN THE UNITED STATES

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Introduction

This paper presents an overview of a current project being performed by the University of North Carolina Highway Safety Research Center (HSRC) for the National Highway Traffic Safety Administration (NHTSA). The project is entitled, "An Analysis of Mopeds as a Potential Safety Problem in the United States"*. It was initiated February 1, 1978 and is scheduled for completion by the end of January 1979. Since the project is still in a rather early stage, the results that are available at this time are only interim findings.

As suggested by the title, the basic project effort is an attempt to forecast the possible moped accident problem that may occur in the U.S. over the next five to ten years. Thus the contract represents an attempt by NHTSA to anticipate a possible safety problem in the U.S. rather than simply reacting to one at a later date.

There are three basic objectives as specified in the contract:

- 1. Formulate a model to forecast the nature and scope of the moped accident problem that may develop in the U.S.
- 2. Use the analytical model to predict outcomes for input values such as sales volume, usage patterns and crash rates.
- 3. Based on the outputs of the model, recommend NHTSA research and safety program action.

In terms of the first objective, HSRC will be drawing from both U.S. and foreign experience. Mopeds have been used in European countries for well over 50 years. However, they are rather new in the U.S., and as a result there is only a limited amount of information available. HSRC will be trying to synthesize the U.S. data that is available and use it to develop models for forecasting moped accident trends in the country. Where data is lacking or inadequate, additional input may be derived from foreign studies and/or data bases.

In order to use the models for predicting the U.S. moped experience, a variety of questions will need to be answered. For example: How many moped units are being sold in the U.S.? To whom are they being sold? How are they being used? What factors are important in predicting the required outcomes? etc.

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Obviously the model or methodology that is developed will be quite dependent on the quality and quantity of the data available. Given adequate data, HSRC will use the results of the data analysis to recommend future NHTSA research and safety program action. Such recommendations could apply to a variety of different areas:

- 1. What should be the research requirements by NHTSA in terms of mopeds?
- 2. What sorts of projects need to be undertaken?
- 3. Will special data collection be necessary?
- 4. Should projects be started that concern development of driver education or driver licensing countermeasures?
- 5. What should be the schedule for such projects?

The idea here is to determine the pace of the schedule for NHTSA research from the model predictions. In other words, if sales increase rapidly and subsequent accident problems occur, then the pace for recommended research or other projects may have to be stepped up to be in line with these outcomes.

Tasks

There are a variety of tasks to be undertaken in this contract effort (Table 1). Task 1 basically involved the planning and administrative duties required to initiate the project. Task 2, which deals with reviewing the research literature and whatever accident data bases are currently available, is the point in the project where we are now working. This is approximately a four-month effort which will end around July 1, 1978. Task 3 involves performing market research. This is being undertaken by a subcontractor and deals primarily with learning about expected sales volume of mopeds in the U.S. and the characteristics of moped riders. Thus, this activity will closely involve moped manufacturers, distributors and dealers. As stated earlier, Task 4 concerns formulation of the analytical model and is necessarily based on the amount and quality of data that can be uncovered. Task 5 is an optional task and will only be undertaken if the results from the first four tasks do not provide the type of data needed to perform the analysis in the project. If additional data needs to be collected in the project effort, Task 5 is where such data collection would occur. Approval of a data collection plan would need to come from NHTSA before any such step could be taken. In Task 6, the analytical model is exercised. This entire effort also proceeds after approval of the basic analysis plan by NHTSA. The duration of Task 6 would be three months or less. Then, finally, Task 7 concerns preparation of basic research and development plans for NHTSA in this project area.

Literature Search Elements

There are a variety of basic literature searches that can be conducted to develop possible information sources for mopeds (Table 2). The most useful searches to date have been TRISNET and the International Road Research Documentation (IRRD) search on two-wheeled vehicles. From these searches we have

Table 1. Project tasks.

- TASK 1. Perform program planning and administration
- TASK 2. Review research literature, existing accident data bases, other information sources
- TASK 3. Perform market research
- TASK 4. Formulate analytical model
- TASK 5. Collect input data for the analytical model -- OPTIONAL
- TASK 6. Exercise the analytical model
- TASK 7. Prepare program plans

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Table 2. Literature search elements.

- 1. TRISNET
- 2. Highway Safety Literature File
- 3. International Road Research Documentation (IRRD) Search
- 4. NHTSA Docket on Mopeds

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identified some 60 to 70 moped articles to uncover and examine. We have presently in-house over 50 of these articles and are still continuing to gather the basic articles. Many, of course, are in foreign languages and still need to be translated at this point in time. Again, this is a reflection of the heavy moped usage in Europe. Another possible data source is the NHTSA docket on mopeds which was prepared before the basic contract was awarded. The docket has been preliminarily reviewed and contains a variety of elements including letters, personal testimony, and a few basic studies dealing with moped accidents. At this point, the utility of the docket has not been clearly identified.

Data Sources

Other possible data sources are listed in Table 3. The Moped Association of America (MAA), formerly the Motorized Bicycle Association, is, of course, the key link to the industry and accompanying sales figures. Contacts have been made with MAA by both HSRC and the subcontractor doing the market survey, and the MAA has been very cooperative in terms of getting both groups in touch with key industry personnel.

The Bureau of the Census National Personal Transportation Study could provide some important user characteristics data. This is a joint project sponsored by the Federal Highway Administration, the National Highway Traffic Safety Administration, the Office of the Secretary of Transportation, and the Bureau of the Census. This study involves home interviews of approximately 20,000 households across the nation. Questions are asked about the trips taken the preceding day and any long trips taken within the last two weeks. The study has had a good response rate. Data collection was complete in March, 1978 and subsequent data will be prepared and ready for analysis in August, 1978. The goal of the study is to develop national estimates of such factors as the frequency of use of various vehicles, trip purpose, rider/driver demographic characteristics and location of use (urban/rural). The big question here is whether there is much moped data available from this survey. If so, it can provide valuable input into the development of a predictive model.

The companion NHTSA project dealing with moped handling characteristics is being performed by Systems Technology, Inc. This contract was started some two months before the HSRC contract, and as a result STI has uncovered several sources that have proved very helpful to HSRC. Some of the STI data sources and others uncovered by HSRC will now be discussed.

- A. <u>California Highway Patrol Data</u>. The California Highway Patrol has been compiling moped accident data for some time. In 1977 some 1100 moped accidents were identified and the available accident information stored on computer tape. It would appear that this is the largest state data base available to date.
- B. <u>National Safety Council (NSC) Traffic Records Committee</u> <u>Survey</u>. This group is in the process of conducting a survey of the 50 states for the availability of moped data.

Table 3. Preliminary data sources.

- 1. Moped Association of America
- 2. Bureau of Census National Personal Transportation Study
- 3. Companion NHTSA Project on Moped Handling Characteristics

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The study is headed by Ross Kelley of the Arizona Department of Transportation. Upon examining an interim report and preliminary results from the states, it would appear that only a few have easily retrievable computerized data. We have already made contact with some of these states, including California, New York, Pennsylvania, and Ohio.

Based on our findings so far, police-reported accident data is one of the areas that we will concentrate on in the analysis. We will attempt to compile enough data from various states to try to insure representativeness. The California accident data base has already been mentioned above. The State of New York would also appear to have wide moped usage and subsequent accident experience. The NSC survey shows that New York State has in excess of 700 moped accidents per year. We have been in contact with traffic records personnel in this state and will obtain a computerized data tape for analysis. The State of Ohio has over 100 accidents per year and an attempt will be made to obtain computerized data here also. The State of Pennsylvania has mailed some computerized output from their records, and this also looks like a state in which data can be obtained.

There are two other big markets that can only be used in a limited fashion. The State of Florida has many moped riders and subsequent accidents (greater than 400/year), but only manual tallies are being kept of these events. The same is true for Massachusetts, where some 18,000 mopeds were registered through the end of 1977 and where greater than 100 moped accidents occur per year. Finally, we will attempt to accumulate three years worth of data from our own state of North Carolina. It would appear that North Carolina has greater than 100 moped accidents per year, also.

- C. <u>In-Depth University of Southern California Accident Investi-</u> <u>gations</u>. USC has had two MDAI accident teams operating in the past several years-- one investigating motorcycle accidents and the other investigating bicycle accidents. In early 1977, NHTSA asked these teams to start investigating any moped accidents that occurred in their areas, and to date there are approximately 20 cases available.
- D. <u>National Electronic Injury Surveillance System (NEISS)</u>. The National Electronic Injury Surveillance System is a national network (a statistical sample) of approximately 120 emergency room data providers maintained by the Consumer Product Safety Commission. NEISS collects some moped data now, but this data is lumped in with mini-bike, motor scooter, etc. accidents. Moped data were to be collected as a separate line item starting approximately April 1, 1978, but this date has now been moved back to October 1, 1978. The earlier date would have been much better for the current project in that there would have been considerably higher usage in the spring and summer and subsequently more accident data available.

E. <u>Other Questionnaires or Surveys</u>. Presently there are some questionnaires being administered that may be helpful. In the May issue of <u>Moped/Biking</u> magazine a tear-out questionnaire will be available. The Moped Owners Association has attempted to conduct such a survey also. Data from both of these surveys will be available for the project. Finally, it was recently learned that the U.S. Air Force has administered a questionnaire at training centers that dealt with moped usage.

Foreign Country Information Items

The second task in the contract requires that HSRC attempt to document important foreign country factors to try to identify circumstances that could possibly account for different outcomes in moped usage and accident patterns in the U.S. This would imply that knowledge be gained about basic economic/ demographic/geographical differences between these countries and the U.S. Possible information items are shown in Table 4. Mode shift is an item for which some information already exists. In North Carolina, a statewide survey by the Highway Patrol indicated many instances where those with either a revoked or suspended license were seen riding a moped. There were also many instances of driving under the influence (DUI) while on a moped. This could imply that we are shifting drivers to this mode of transportation who would otherwise be off the roadway.

Market Research

There are basically two tasks to be performed in this effort: (1) formulating a market research plan and (2) conducting a market survey. This effort has been subcontracted to a group entitled Management Analysis Center, Inc. (MAC). MAC is a faculty owned marketing firm, and one of the original founders is a professor in the University of North Carolina School of Business. Thus, HSRC has convenient contact with this organization. The thrust of the MAC effort will be to collect data on moped sales and the characteristics of moped users. MAC envisions working in a moped market that would appear to have four levels: (1) manufacturers and importers, (2) distributors, (3) retailers and (4) consumers. MAC has proposed that the market research efforts be as follows:

- 1. A general review of market data and construction of a profile of industry factors at all of the first three levels.
- 2. An inquiry into the source of engine power for domestic moped units to determine if a major supplier (e.g., Briggs & Stratton, Homelite) may have market data on these assemblers as a potential customer.
- 3. An estimate of past and future sales using two different MAC offices to develop independent projections.
- 4. A review of the results and comparison of findings. If there are discrepancies these will be resolved by reinterviewing key principles in the market. If further data collection is

Table 4. Possible foreign country information items.

- 1. Rider Types
- 2. Riding Environment
- 3. Codes and Laws
- 4. Alternative Transportation Modes or Mode Shift
- 5. Registration
- 6. Usage Patterns
- 7. Accident Data

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needed in this area of the project, this would also be undertaken under Optional Task 5.

This entire effort should be finalized by July 1, 1978.

Analysis of Data

The primary flow of the data analysis can be seen in Figure 1. There are three basic inputs into the analytical forecasting model. From the literature review and data search, information will be gained concerning moped usage and accident rates. From the market survey, information will be gained concerning moped sales and user characteristics. From federal agencies, various projections concerning economic factors, demographic projections, etc. may be obtained to also fit into the model. The model itself will then be used to predict the projected U.S. moped accident rates and projected U.S. moped usage rates. These outputs will provide the basis for formulating a moped research and development (R & D) plan.

Moped Program Plans

There will be three basic elements to the moped R & D plans:

- 1. Moped R & D plan components.
- 2. Schedule for recommended research.
- 3. Recommended technical approach to data collection and/or countermeasure identification.

The idea here is to develop the plan based on synthesizing the model outputs with feedback from NHTSA as to future direction. It is hoped that the plan can be based on the pace of the anticipated sales activity in this country. It should also be stated that the plan will in all likelihood not be entirely based on the model output but also on common sense or simpler forms of "paper and pencil" analyses.

Even though it is fairly early in the project effort, some candidate components of the plan can be mentioned.

Police accident data. State accident reporting systems for 1. the most part remain unprepared for the moped. There is no specific moped vehicle category that can be marked on the accident report forms when a moped accident occurs, and it is often left to the investigating officer's discretion as to how the moped should be classified concerning vehicle type. States will probably need guidelines in formulating definitions of mopeds so that accurate data can be collected on this new transportation mode. This precise situation existed in the collection of the University of Southern California MDAI team moped data. It was decided that the bicycle team would investigate the accident if the moped rider were pedalling at the time of the event, or if the motorized power were used, then the motorcycle team would investigate the accident.



Figure 1. Data analysis flow.

- 2. <u>Special accident data</u>. There may be a need to collect special moped MDAI project data in the future, and it would appear that NHTSA is presently leaning in this direction. However, so little is known about the basic accident problem at this point that it might be better to concentrate funds and effort on simply gathering basic police reported accident data from the various states.
- 3. Exposure data. Along with accident data, non-accident exposureto-risk data is also necessary to grasp the magnitude and extent of the problem and develop commensurate countermeasures. Only by collecting such population data is it possible to identify factors which either elevate or reduce the risk of a crash.
- 4. Driver licensing. Should moped riders be licensed? Most states require that the moped rider possess a valid operator's license of some sort. Others specifically require a motorcycle license, and still others require no license at all. The question in issue here is whether specialized skills are needed for riding a moped.
- 5. Driver education. Again the question is whether it is needed. There may be many youngsters riding mopeds who have only minimal training from a dealer. Also, there may be many riding with little knowledge of the rules of the road.
- 6. <u>Vehicle registration and insurance</u>. These relate closely to driver licensing, and if no licensing is required in the state, then there probably will be no registration. Similarly, in the absence of licensing and registration requirements, insurance requirements may be difficult to define.
- 7. <u>Codes and laws</u>. Special moped legislation has already been passed in some 38 states. The legislation concerns a variety of topics including vehicle definition, horsepower, maximum speed, age of the rider, helmet usage, etc. Guidance will need to be given to all states concerned with either passage or modification of such laws.
- 8. <u>Enforcement</u>. Closely related to codes and laws is the idea of enforcement. Any policies enacted to govern the use of mopeds must consider the feasibility and likelihood of effective enforcement.
- 9. <u>Safety standards</u>. NHTSA may become concerned with some form of standards setting in the future as it has done with other vehicles. Here there are a variety of candidate items, including cylinder displacement and horsepower, maximum moped speed and other (possibly hazardous) vehicle parts.

Potential Problems

There are basically two potential problems that can be identified at this stage in the contract. The first and largest of the two problems involves the availability and quality of the data. This is largely unknown at this point in time. There may also be unpredicted time delays in obtaining literature sources, data bases and market data. This has already been shown to be the case in terms of the literature sources where a large number of the documents are foreign in nature.

Schedule

As noted earlier, this is a one-year contract effort which was started February 1, 1978. Thus, the contract effort should be completed near the end of January 1979. If optional data needs to be collected concerning either accidents, sales or user characteristics, then the project schedule may be shifted to some extent.