

CHAPTER 8  
SUMMARY, CONCLUSIONS AND  
RECOMMENDATIONS



## 8.1 SUMMARY

The Model for Simulating Traffic (MST) was presented in this volume. This model simulates the traffic flow on two-lane highway sections of any complexity in terms of horizontal and vertical alignment.

Initially, existent literature on traffic simulation models was reviewed for identifying the major characteristics that a traffic simulation model should have, while also identifying the deficiencies of existent models. This procedure will make it possible to develop a more useful and efficient model than those already in use.

After the review of pertinent literature, the concepts inherent to traffic simulation were presented. The concepts of headway between vehicles, additional length, safety margin and, finally, the variable *time increment* were defined. Aside from this, a discussion was presented on the headway distribution, the maximum number of vehicles that can be overtaken at a single time, and the concept of overtaking-speed differential. Finally, the six classes of vehicles in the MST were established, together with a variable to characterize vehicle performance.

In Chapter 3, the Model of Time and Fuel Consumption (MTC) and the SPEEDS Model were presented. Either of these can be used to generate the free-speeds profile, which is an input data of the MST.

Chapter 4 explains the process of simulating vehicle travel in the MST. In this process, there are two fundamental types of interaction: the first between the vehicle and the road, and the second between vehicle and vehicle.

Chapter 5 shows how the MST is operated. Aside from describing the necessary inputs of the Model, together with its outputs, the possibility of effecting a sampling of the traffic flow at any transversal section of the highway being simulated is also presented.

The calibration and validation of the MST was discussed in Chapter 6. The calibration process is composed of two steps, the

first of which associated with the Free Speed Model, and the second with the Simulation Model. The validation of the MST consists in comparing travel times observed with simulated travel times, on a given road section.

In Chapter 7, the potential and current applications of the MST are described. A discussion was presented on how the MST could be used in highway strategic planning and design, in traffic analysis and other applications.

The remaining sections of the present chapter contain the conclusions and recommendations regarding the MST.

## 8.2 CONCLUSIONS

Simulation is utilized when theoretical studies or field observations do not adequately describe the observed standard of behavior. A traffic flow simulation model can be a powerful tool in highway research, planning and design. However, like all tools, it must be calibrated for each application ascribed to it. The MST as described in this document was structured in such a way that the levels of the variables used can be rapidly altered, for purposes of calibration.

## 8.3 RECOMMENDATIONS

The utilization of the MST is recommended on highway sections that present the problem of traffic congestion or which may soon become congested. Apart from being the only calibrated and validated model in existence for Brazilian highways, it is highly efficient in terms of computation, principally when the vehicle sample utilized is not large. Although the MST can also be used for non-congested highway sections, this application is not recommended, since, being a simulation model, it will consume more computation time than the MTC and SPEEDS models. The MTC and SPEEDS models are used herein simply as subroutines for the calculation of travel time and fuel consumption at free speed by the MST. Therefore,

in non-congested sections, the direct use of the MTC or SPEEDS is recommended.

In short, the current and potential applications of the MST warrant a recommendation to further improve and expand it, so as to make it capable of analyzing highway duplication, to determine units equivalent to passenger cars for all vehicle types, to determine overtaking-speed differentials, and to establish minimum distances for safe overtakings.

It is further recommended that the MST be adapted to urban traffic, so that Brazil will also have an urban traffic simulation model (MSTU). The MSTU could facilitate the study of the problem of traffic on urban streets, making possible the analysis of a number of alternative traffic policies, with the ultimate aim of reducing the problems of urban traffic, particularly congestion. To transform the MST into an urban traffic simulation model, the following steps should be taken: (1) to generate a traffic-sign subroutine for the MSTU, similar to the STOP-sign subroutine of the MST; (2) to eliminate MST limitations as to the existence of only one crossing and only one STOP-sign, so as to make it possible to analyze the effect of more than one crossing and STOP-sign, as commonly found in urban traffic; (3) to collect data (travel time, speed, fuel consumption, etc.), using the GEIPOT test vehicles or other vehicles, in congested urban traffic; (4) to calibrate the MSTU through the use of a part of the data collected in the previous item; (5) to validate the MSTU through the use of the other part of the data collected in item (3). After having been adapted, calibrated and validated, the MSTU could be used for analyzing the impact of a variety of alternative urban traffic policies, such as an exclusive lane for mass transit vehicles, priority traffic signs for mass transit vehicles, multiarticulated buses, unidirectional urban streets, economic feasibility of elevated and underground streets, and the reorganization of traffic directions in urban networks.

