REPÚBLICA FEDERATIVA DO BRASIL

MINISTÉRIO DOS TRANSPORTES

United Nations Development Programme (UNDP)

Research on the Interrelationships Between Costs of Highway Construction, Maintenance and Utilization

Final Report - 1981

VOLUME 6 — Study of Vehicle Behavior and Performance

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MINISTÉRIO DOS TRANSPORTES
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WITH THE PARTICIPATION OF:

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VOLUME 6 – Study of Vehicle Behavior and Performance

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PREFACE

This research project was funded through an agreement signed in January, 1975 by the Brazilian Government and the United Nations Development Programme (UNDP). The Ministry of Transportation, acting through the Brazilian Transportation Planning Agency (GEIPOT), assumed the responsibility for the project on behalf of the Brazilian Govern - ment and the International Bank for Reconstruction and Development (IBRD) acted as the executing agency for UNDP.

The research was carried out by GEIPOT and the National Highway Department (DNER), acting through its Road Research Institute (IPR). Funding from the Brazilian Government was channeled through the Institute for Economic and Social Planning (IPEA) and the Secretariat for International Economic and Technical Cooperation (SUBIN), along with the Ministry of Transportation.

The World Bank contracted the Texas Research and Development Foundation (TRDF) to organize the international technical staff and to select and purchase the imported equipment needed for the research. The participation of the TRDF continued until December of 1979.

This report is comprised of twelve volumes (each edited in both English and Portuguese) which summarize the concepts, methods and results obtained by December, 1981 by the project entitled "Research on the Interrelationships Between Costs of Highway Construction, Mainte - nance and Utilization (PICR)". It includes a documentary index volume which will aid researchers in locating topics discussed in this report and in numerous other documents of the PICR. This report contains much detailed analysis which is being presented for the first time, and also incorporates relevant parts of earlier reports and documents produced under the 1975 Agreement, updating them through the inclusion of new results and findings.

A special mention is due the Highway Departments of the States of Minas Gerais and Goiás, the Universities of Aston, Birmingham and Texas, and the Western Australia Main Roads Department which placed some of their best and most experienced personnel at the service of this pro- ject to fill many key positions on the research staff.

Finally, thanks are due to the Transport and Road Research Laboratory for its assistance during the initial stages of the project, along with specialists from various countries who periodically visited Brazil to discuss the work being done in the PICR and to assist the permanent research staff in conducting analyses.

JOSÉ MENEZES SENNA
President

VOLUMES IN THIS REPORT

VOLUME 1 - SUMMARY OF THE ICR RESEARCH

VOLUME 2 - METHODS AND ORGANIZATION

VOLUME 3 - INSTRUMENTATION

VOLUME 4 - STATISTICAL GUIDE

VOLUME 5 - STUDY OF ROAD USER COSTS

VOLUME 6 - STUDY OF VEHICLE BEHAVIOR AND PERFORMANCE

VOLUME 7 - STUDY OF PAVEMENT MAINTENANCE AND DETERIORATION

VOLUME 8 - HIGHWAY COSTS MODEL (MICR)

VOLUME 9 - MODEL OF TIME AND FUEL CONSUMPTION (MTC)

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* Volume 1 contains a brief description of the contents of each volume, while Volume 12 provides a subject index to this report and all other PICR documents, including technical memoranda and working documents.

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SUMMARY

The type of vehicle, its operating speed, and highway characteristics, such as grades, curves and surface roughness, are key variables in determining fuel consumption and travel times. The Research on the Interrelationships Between Costs of Highway Construction, Maintenance and Utilization (PICR) thus sought to specify the relationships among these variables by conducting controlled experiments and by observing vehicle behavior on highways with given characteristics. This knowledge enabled the PICR team to utilize the Model of Time and Fuel Consumption (MTC) to calculate travel time and fuel consumption for any normal highway design or existing roadway whose characteristics are known. If congestion is present, the MTC can be used in the Model for Simulating Traffic (MST) to achieve similar goals. This Volume describes those experiments and observations and their results (the MTC and MST are described in Volumes 9 and 10 of this Report, respectively).

The road test sections were selected in such a way as to ensure the inclusion of principal characteristics of different types of roads comprising the Brazilian highway network. These characteristics included type of road surface (paved or unpaved), grades (from 0 to $\pm$ 8%) and curves (radii from 20 m to 3,000 m).