United States General Accounting Office

GAO

Report to Congressional Committees

June 1997

HIGHWAY FUNDING

The Federal Highway Administration's Funding Apportionment Model

GAO/RCED-97-159

GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-276879

June 5, 1997

The Honorable John H. Chafee
Chairman
The Honorable Max Baucus
Ranking Minority Member
Committee on Environment and Public Works
United States Senate

The Honorable Bud Shuster
Chairman
The Honorable James L. Oberstar
Ranking Minority Member
Committee on Transportation and Infrastructure
House of Representatives

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which authorized $155 billion from 1992 through 1997 for surface transportation programs, is due for reauthorization in fiscal year 1997. As part of the reauthorization debate, a number of legislative proposals have been made to alter the existing formula by which federal-aid highway funds are apportioned to the states. The current formula determines the distribution of funds for 13 funding categories. These categories include eight individual programs and five separate mechanisms for increasing individual states' funding in order to achieve certain goals for equity among the states.[1] The formula has evolved over many decades as new programs and apportionment factors have been layered on top of existing rules. The result is a complex, multistep process in which calculations occur in a strict sequence, incorporating one or many apportionment factors.[2]

Altering the existing formula will affect the distribution of highway funds among the states. Accurate estimates of the impacts of funding under the various proposals are imperative to support the Congress's decision-making process. Therefore, the Federal Highway Administration (FHWA) has developed and is operating, through the use of a contractor, a new apportionment model to estimate the expected distribution of

[1]Equity adjustments ensure a level of federal-aid highway funding to states beyond that provided by the states' basic program apportionments and are intended to address concerns about such things as states' share of highway user tax contributions or other considerations.

[2]For more detail on the apportionment process, see Highway Funding: Alternatives for Distributing Federal Funds (GAO/RCED-96-6, Nov. 28, 1995).

federal-aid funds under the proposals.[3] Because of the importance of the accuracy and reliability of these estimates, you asked us to validate the model. We agreed with your offices to examine whether the model matches the current highway funding formula and whether it is adaptable to a variety of reauthorization proposals.

Results in Brief

FHWA's new apportionment model matches the highway funding formula contained in the governing legislation. The model captures the structure of the overall apportionment process, accurately representing the interrelationships among programs and equity categories and how each builds on the other. The model is internally consistent to the extent that the various parts of it work well together and that the operation of one part does not adversely affect another part. Furthermore, the model is adaptable to reflect the provisions of new highway funding proposals. However, the model is complex because of the complexity of current law, and this complexity does not lend itself well to the widespread use of the model by staff not trained in its structure and programming language. Furthermore, as with any model, the precision of its estimates will depend on the accuracy of the data and subroutines that are used for alternative legislative proposals.[4] However, we found that the FHWA office responsible for overseeing the model does not verify new input data, nor does it have staff with the technical expertise to verify the accuracy of new subroutines developed by the contractor.

Background

Each fiscal year, FHWA apportions highway funds to the states on the basis of the governing laws—specifically, provisions of title 23 of the United States Code and uncodified sections of both ISTEA and the National Highway System Designation Act of 1995. During the reauthorization process, the Congress reviews the continuing need for each highway spending program and the appropriateness of the apportionment formula. FHWA assists the Congress in its deliberations on the impact and equity of alternative proposed formulas by estimating for each state the apportionment that would flow from each of the alternatives. Producing these estimates can be complex and time-consuming.

[3]This new model is only used to estimate the apportionments that a state might receive if a particular proposal were adopted. Once new legislation is signed into law, a separate model will be developed that actually establishes the apportionments (and set-asides) required by the new legislation.

[4]A subroutine is a sequence of computer instructions, written in the model's programming language, that actually does the apportionment calculations for a specific highway program.

To improve its responsiveness to the Congress and ensure the accuracy of its estimates, FHWA contracted for the development of a general apportionment model. FHWA's contractor based the model on current law, but the model must be adapted at each use to match the provisions of the particular formula proposal. The new model was intended to improve on the existing one that had been used for a number of years to make apportionment estimates for policy decision-making. The new model currently is being used to provide the information that the Congress needs in reauthorizing surface transportation programs.

The Model Accurately Replicates the Provisions of the Current Formula

We found that the new model matches the provisions of current law. The model captures the structure of the overall apportionment process, accurately representing the interrelationships among programs and equity categories and how each builds on the other. Furthermore, the model is internally consistent to the extent that the various parts of it work well together and that the operation of one part does not adversely affect another part.

FHWA told us that transportation interest groups, state departments of transportation, and congressional staff have indicated that they would like copies of the model for their own use and modification. However, current law relating to highway apportionments is complex because of the number of interrelated programs, apportionment calculations, and equity adjustments. Estimating these apportionments requires a complex model, which makes it difficult for anyone not very familiar with the model's structure, calculation processes, and programming language (Visual Basic) to use or modify the model accurately. FHWA expressed concern that different users could produce different apportionment estimates for the same legislative proposal. These different estimates may not be easy to reconcile without a detailed analysis of the model's subroutines. We believe that FHWA's concern is valid in light of the complexity of the law and model. Therefore, FHWA needs to maintain accountability for the model to help ensure that the estimates used during reauthorization are consistent.

The Model Is Adaptable for New Legislative Proposals

Because the model is based on current law, it can be used to generate a baseline forecast of future apportionments. Although this capability is a necessary starting point, the primary purpose of the model is to estimate apportionments for prospective changes to current law. Therefore, the

model must be readily adaptable and flexible enough to reflect the provisions of a variety of proposed reauthorization bills.

To test this capability, we modified and added subroutines to the baseline model to reflect the provisions of a specific proposed formula that was under discussion at the time of our review. We found the model well-suited to the task. As a result of our work, we have made some suggestions directly to the designers of the model for technical changes that may improve the model's flexibility and FHWA's ability to verify modifications. The model's designers agreed with our suggestions and plan to make the changes.

Inaccurate Data Could Affect the Model's Precision

As with any model, the precision of the model's estimates depends on the accuracy of the input data that are entered into the model. The data must be accurate and based on correct weights. For instance, existing law requires that 55 percent of the funds for the Interstate maintenance program be apportioned on the basis of Interstate lane miles and that 45 percent be apportioned on the basis of vehicle miles traveled on the Interstate. Once the type of data and weights are determined, each state's share of federal-aid highway funds must be calculated.

Individual FHWA offices, which are responsible for producing data used to actually apportion federal highway funds, are required to certify that the data are correct. The office within FHWA that oversees the model and its contractor use this same information when it is applicable to alternative model estimates. However, when a proposed formula requires data not used for distributing federal highway funds, the new data do not receive a similar level of scrutiny. Currently, there is no internal certification by FHWA that such new data are accurate.

The precision of the model's estimates also depends on the accuracy of the modifications made to the model to match the various proposed formulas. Every time new estimates are produced, there is a potential for introducing undetected errors into the model. Therefore, for FHWA to have confidence in the model's modifications, there must be some method, independent of the contractor, for ensuring that the subroutines accurately reflect the proposed formula and that the structure of the model remains internally consistent. While the office within FHWA that oversees the model has staff that reviews the results of the model's various analyses, this office does not currently have staff that can verify the accuracy of new subroutines.

Conclusions

FHWA and its contractor have produced a model that incorporates the current complexities of the highway apportionment process. Furthermore, the model can be adapted with varying degrees of difficulty for new proposals, depending on their complexity and level of divergence from existing law. However, strong quality assurance measures are needed to help ensure that reliable results are produced when changes to the input data and the model are made to reflect new proposed formulas. Maintaining accountability for the model within FHWA would help to ensure that the estimates used during reauthorization are consistent.

Recommendation

To ensure the accuracy of the model's estimates and to provide the Congress with confidence in the model's results, we recommend that the Secretary of Transportation direct the Administrator, FHWA, to establish a quality assurance process to ensure the integrity of any changes to the model's input data and validation of any changes to the model, including new subroutines developed for the model.

Agency Comments

We provided copies of a draft of this report to the Department of Transportation for review and comment. We met with Department officials—including the Deputy Assistant Secretary for Budget and Programs in the Office of the Secretary and the Director of FHWA's Office of Budget and Finance. The Department agreed with the facts presented as well as the recommendation and indicated that it would be responsive to the recommendation. Technical comments provided by the Department have been incorporated where appropriate.

Scope and Methodology

To validate FHWA's apportionment model, we first studied its structure, including the spreadsheets, the main calculation module, and the calculation subroutines. As part of our examination, we verified the internal consistency of the model, including the structural relationships, the use of input data, and the reporting of results. We next studied title 23 of the United States Code, ISTEA, and the National Highway System Designation Act of 1995. We then cross-checked the model and subroutines with the specific applicable sections of the laws, ensuring that all aspects of the model were contained in the laws and that all relevant provisions of the laws were contained in the model. Our assessment of the model, however, provides no basis for validating any future changes to it.

To test the model's adaptability, we modified its subroutines to match the provisions of one of the legislative proposals under consideration at the time of our review, the ISTEA Integrity Restoration Act (STEP-21). Finally, we resolved with the model designers and FHWA all of the uncertainties that arose during our review.

As agreed with your offices, we did not verify the accuracy of the input data that various units within FHWA supply as calculation factors for the model. We conducted our review from February through May 1997 in accordance with generally accepted government auditing standards.

As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report for 30 days. At that time, we will send copies of the report to the Secretary of Transportation; the Administrator, FHWA; and other interested parties. We will also send copies to others upon request.

If you have any questions, please call me at (202) 512-3650. Major contributors to this report are listed in appendix I.

Phyllis F. Scheinberg
Associate Director, Transportation Issues

Major Contributors to This Report

Mark Dayton
Gary L. Jones
SaraAnn W. Moessbauer
Yvonne C. Pufahl

Ordering Information

The first copy of each GAO report and testimony is free. Additional copies are $2 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary. VISA and MasterCard credit cards are accepted, also. Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:

U.S. General Accounting Office
P.O. Box 6015
Gaithersburg, MD 20884-6015

or visit:

Room 1100
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders may also be placed by calling (202) 512-6000 or by using fax number (301) 258-4066, or TDD (301) 413-0006.

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (202) 512-6000 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

For information on how to access GAO reports on the INTERNET, send an e-mail message with "info" in the body to:

info@www.gao.gov

or visit GAO's World Wide Web Home Page at:

http://www.gao.gov

PRINTED ON  RECYCLED PAPER

United States
General Accounting Office
Washington, D.C. 20548-0001

Bulk Rate
Postage & Fees Paid
GAO
Permit No. G100

Official Business
Penalty for Private Use $300

Address Correction Requested