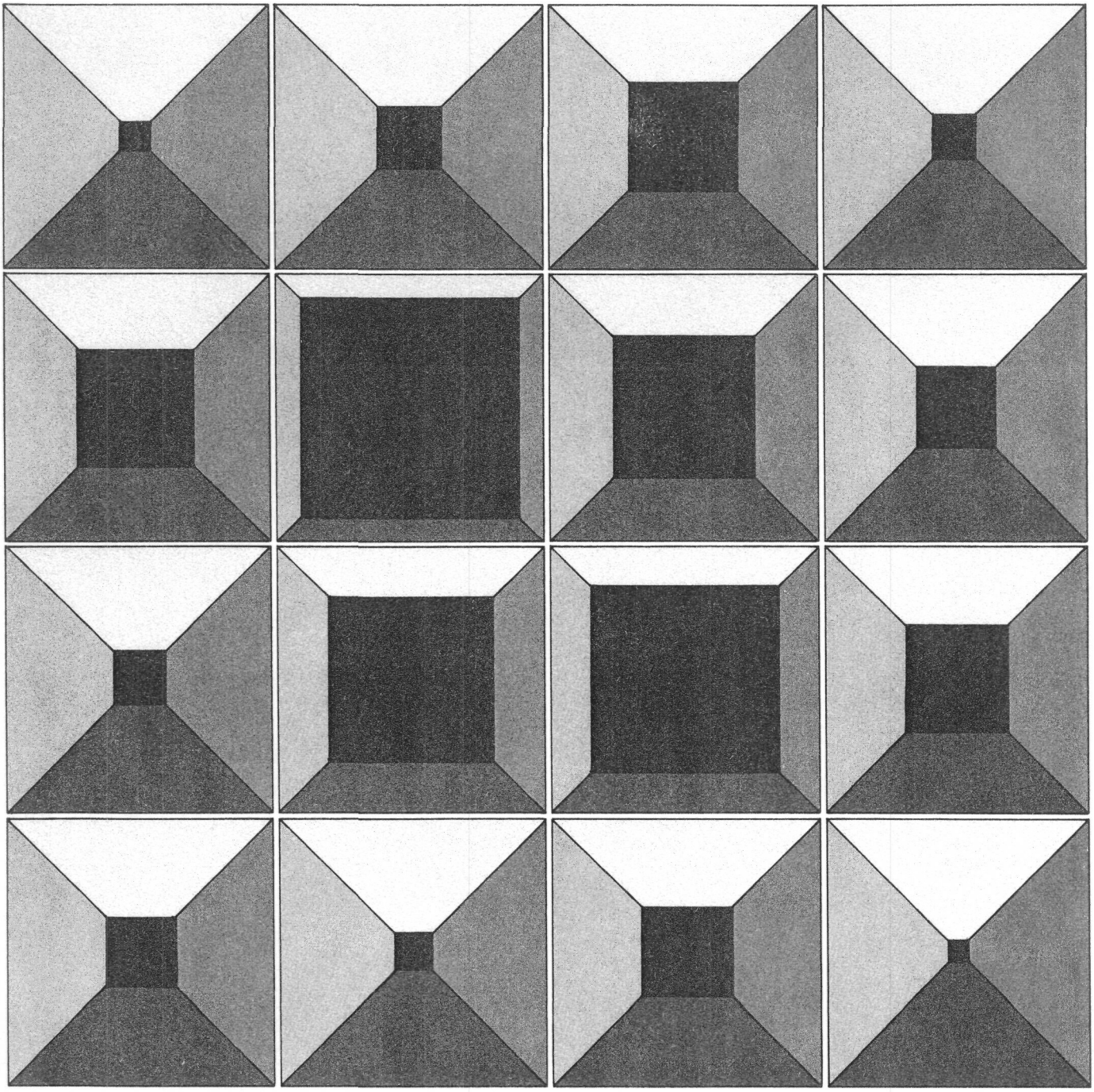
A CBO STUDY

The Interstate Highway System: Issues and Options

June 1982

Congress of the United States
Congressional Budget Office



THE INTERSTATE HIGHWAY SYSTEM:

ISSUES AND OPTIONS

The Congress of the United States
Congressional Budget Office

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

NOTES

Unless otherwise indicated, all dollar amounts in this report are in current dollars.

All 1979 dollars in this paper were deflated using the U. S. Department of Transportation's Composite Index of Federal-Aid Highway Construction.

PREFACE

During this session, the Congress probably will consider legislation to finance the completion and repair of the Interstate Highway System. Escalating completion costs, mounting repair needs, and declining financial resources have created major financial problems for the Interstate program. To alleviate these constraints, the Congress may decide to increase highway user fees, curtail low-priority Interstate projects, and phase out some highway programs that support essentially local roads. At the request of the Senate Environment and Public Works Committee, the Congressional Budget Office (CBO) has prepared this report, which analyzes these alternatives. In keeping with CBO's mandate to provide objective and impartial analysis, the study offers no recommendations.

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Director

June 1982

CONTENTS

CONTENTS (Continued)

TABLES

95-194 O - 82 - 2

TABLES (Continued)

APPENDIX TABLES

FIGURES

APPENDIX FIGURE

SUMMARY

Although 5 percent of its mileage still is uncompleted, the Interstate Highway System essentially has accomplished what it was designed to do: link the nation's cities with a high-speed, high-quality road network, necessary for commerce, personal mobility, and national defense. In the 25 years since construction began, the Interstate System has profoundly reshaped where Americans live, work, and shop.

The history of the Interstate program contrasts sharply with its future prospects, however. Several converging factors are fundamentally changing the continuous, largely self-adjusting method in which this program traditionally has operated. These are:

- Mounting Repair Needs. As the Interstate System passes its 25th anniversary, many of its early routes are at or nearing the end of the period they were built to last (called "design life"). As a result, massive repairs are needed that are projected to cost about $16 billion (in 1979 dollars) between calendar years 1980 and 1990.

- Escalating Completion Costs. Although all but 1,575 miles of the system's 42,944 miles have been built or are under construction, completing the system will cost $38.8 billion (in 1979 dollars), because much of the remaining mileage is in urban areas where construction is particularly costly, and because completion now includes upgrading some existing routes.

- Declining Financial Resources. In recent years, the growth in highway travel has slowed from its peak levels, and vehicles are more fuel efficient. As a result, receipts from the motor fuels tax--the chief revenue source for the Highway Trust Fund which finances the Interstate program--have leveled off. At the same time, high inflation in construction costs has actually shrunk the amount of construction that can be financed from existing highway user taxes.

Several features of the Interstate program have contributed to these financial pressures. When the federal government began the Interstate program, it provided extraordinary financial support. It authorized more for this program than for all other highway programs together; it provided an

unusually large share (90 percent) of project costs; and it created the Highway Trust Fund to ensure a stable, continuous source of financing for all highway programs. These relatively generous financial terms have probably encouraged system expansion, particularly the upgrading of existing Interstate routes. The federal government also exerted strong central control on the system, designating 41,000 miles and apportioning funds to states in proportion to their share of total costs. Throughout its 25-year history, the Interstate program has concentrated almost exclusively on constructing the planned system (and a few routes added in the intervening years), and only recently has it focused on the problem of mounting repair needs, a problem that was generally neglected in early Interstate legislation.

The financial pressures on the program are further intensified by the dual national and local emphasis of the program. Although the chief purpose of the Interstate program is to build an interconnected system of high-quality roads linking the nation's principal cities and industrial centers, it also includes many routes of predominantly local importance, such as heavily travelled commuter roads. Because of the high construction costs of these locally important projects, they are a major component of total system costs and use program funds that otherwise might be devoted to essential repairs.

Although the Federal-Aid Highway Act of 1981 made some adjustments in response to these pressures, the basic problems remain and will require resolution in one or more of the following ways:

- Shift program emphasis to trim spending on new construction and increase funding for needed repairs;

- Increase the tax on motor fuels and other highway user taxes to pay for an expanded Interstate program that includes repairs; and

- Restructure the overall highway programs, shifting funds into the Interstate program from other highway activities, which account for more than half of all federal spending on roads.

Two bills recently reported by the House of Representatives (H. R. 6211) and the Senate (S. 2574) take some initial steps in these areas. Both bills increase the resources devoted to repairs. The Senate bill increases funding for repairs from $800 million in fiscal year 1982 to $1.1 billion in 1983; the House bill increases this funding to $2.1 billion. Neither bill reduces the amount of new construction. Although neither bill specifically increases highway user taxes, the House bill raises authorization levels by $3.5 billion between fiscal years 1982 and 1983, which clearly

anticipate such an increase. Secretary of Transportation Drew Lewis has proposed an increase in highway user fees equivalent to an increase of 5 cents per gallon in the tax on motor fuels, which is now 4 cents per gallon, although President Reagan did not support this proposal. Nevertheless, all of these developments portend a major review of highway programs, and the Interstate program in particular, during the coming year.

PROGRAM ALTERNATIVES

Under existing legislation, the federal government would authorize $3.6 billion for new Interstate highway construction and $0.8 billion on repair and reconstruction in fiscal year 1983, for a total of $4.4 billion. These authorizations would fall far short of the projected costs of current programs, however. Currently planned new construction projects would cost around $5.1 billion a year between fiscal years 1983 and 1990; repairs would cost about $2.9 billion a year; and reconstruction would add $4.4 billion. Current policy programs are trying to do too much with too little. Completion of all of the construction, reconstruction, and repair projects that qualify for federal support under current programs would require an increase in annual authorizations of $8.0 billion. To support such an increase, the current tax on motor fuels would need to be nearly triple its current level of 4 cents per gallon.

The Interstate program could be reoriented in various ways to shift from the historical focus on new construction to the growing need for system repairs. This paper explores three such possibilities:

- Current Programs. This option would continue the provisions of the 1981 highway act, under which all 1,575 miles of unbuilt Interstate routes would be completed.

- Minimum System. The only new Interstate routes constructed under this option would be those that are essential to a national, interconnected highway system. Routes of predominantly local importance and upgrading of existing Interstate routes would be removed from the system plan. Instead, such projects would be eligible for financing under the reconstruction program, although funds for this program would be sufficient to finance only relatively high-priority reconstruction projects (about 50 percent).

- Intermediate System. This option would construct not only the nationally important routes included under the Minimum System, but also include both certain locally important projects that have

95-194 O - 82 - 3

reached the final stages of the planning process and upgrading needed to meet Interstate standards for the minimum number of lanes.

Under all three program options, it is assumed that the federal government will complete the Interstate System (according to the definition of completion associated with each option), will keep the Interstate system in repair, and will fund some, but not all, reconstruction projects. In particular, following the approach of the Federal-Aid Highway Act of 1981, this paper assumes that any relatively inessential projects that are removed from the complete system plan because of program redefinition will be eligible for reconstruction funds, but that reconstruction funding levels will be sufficient to build only half of all eligible projects. While states would have greater latitude to determine their own reconstruction priorities, the financial incentive to create reconstruction projects would be reduced. This incentive, which arises because funds for new construction are now apportioned to states in proportion to their share of the total cost of completing the system, would be eliminated if a state's apportionment of reconstruction funds was not increased by the creation of additional projects.

If the Congress decides to complete the currently planned Interstate System and provides for repair and reconstruction as discussed above, this continuation of the Current Program option would require $5.8 billion per year more than the $4.4 billion currently authorized annually for fiscal year 1983 and beyond. This massive financing requirement could be reduced substantially if system completion was scaled back to the Minimum System option, which would require additional financing of $3.9 billion annually. Similarly, the Intermediate System would require an increase of $4.5 billion per year.

FINANCING OPTIONS

In order to fund the program alternatives discussed above, this report presents three financing options. Although each option could be implemented separately, some combination probably would be more effective in meeting the goals of completing and repairing the Interstate Highway System. The three financing options are as follows:

- Increase highway user taxes. This method would maintain the present 90/10 federal financing share for new construction, repair, and reconstruction activities.

- o Reduce the federal matching share for repairs and reconstruction. This approach would also require some increase in highway user taxes, but, because of the assumed lower level of federal cost sharing, the necessary tax increases would be smaller.

- o Restructure federal aid for highway programs by transferring responsibilities for projects of local importance to the states.

Increase User Taxes. If the additional funds were obtained by raising the federal tax on motor fuels, they would require increases of 5.3 cents per gallon for the Current Program option; 3.5 cents per gallon for the Minimum System; and 4.1 cents per gallon for the Intermediate System (see Summary Table).

Reduce Federal Share for Reconstruction and Repairs. Reducing the federal share of reconstruction and repair costs would provide further relief from current financial pressures. This change could also dampen an expansionary incentive embodied in the present arrangement, under which the federal government pays 90 percent of these costs. With these terms, the project costs to a state may be small compared to larger benefits for the construction industry and other sectors of the state's economy. This encourages states to have as many reconstruction projects approved as possible in order to obtain the maximum amount of aid.

If the federal share of reconstruction projects was reduced to 50 percent and the federal share of repair projects to 75 percent, then the increases in highway user taxes needed to support the program could be reduced to 3.9 cents per gallon for Current Programs, 1.3 cents per gallon for the Minimum System, and 2.1 cents per gallon for the Intermediate System (see Summary Table).

Restructure Federal Aid to Highways. The Interstate Highway Program will be reauthorized with numerous other highway programs and as part of the act that extends the Highway Trust Fund to pay for these programs. In addition to examining the national interest in the Interstate System and the financial implications of restructuring that program, discussion of the reauthorization bill provides a natural forum in which to examine the national interest and financing methods of other highway programs as well. While federal aid to the primary highway system, like aid to the Interstate System, helps to support a national arterial network that carries goods and people from place to place, the federal interest in many other highway activities is less compelling. For example, federal aid to secondary and urban roads and bridges on these systems has become effectively a form of revenue sharing. These projects are important to states and localities,

SUMMARY TABLE. INCREASES IN FEDERAL TAX ON MOTOR FUELS REQUIRED TO FUND ALTERNATIVE INTERSTATE PROGRAMS UNDER VARIOUS FINANCING CONDITIONS (In cents per gallon) a/

Program Alternative	Increase Taxes Only	Reduce Federal Share of Repair and Reconstruction Costs	Eliminate Federal Support for Several Revenue-Sharing Highway Programs	Focus Federal Aid Exclusively on the Interstate and Primary Systems
Current Programs (as defined in Federal-Aid Highway Act of 1981)	5.3	3.9	3.1	1.6
Minimum System (Complete only those routes required for an interconnected, national network)	3.5	1.3	1.3	0.0
Intermediate System (Complete national routes and those local routes that already have federal approval and bring all routes to four-lane standard)	4.1	2.1	1.9	0.4

a. Table entries show the number of cents per gallon needed in addition to the present 4 cents per gallon in order to complete the Interstate System between fiscal years 1983 and 1990, make all projected repairs, and finance half of all reconstruction projects.

but have relatively little significance for national transportation. Transferring such programs to the states would release about $1.7 billion in Highway Trust Fund revenues that are currently spent on these programs. If these revenues were spent on the Interstate program, they would greatly reduce the additional motor fuels tax burden associated with the various program alternatives outlined above. For example, the Minimum System would require an increase in motor fuels taxes of 1.3 cents per gallon instead of 3.5 cents. Under the Intermediate System, the increase would be 1.9 cents per gallon instead of 4.1 cents (see Summary Table).

Indeed, if all federal aid to highways were concentrated exclusively on the Interstate and primary systems, the Minimum System could be completed without increasing highway user taxes at all and the Intermediate System would require an increase of only 0.4 cents per gallon. Such a course would shift to the states full responsibility for the secondary and urban systems, as well as a wide range of safety and other specialized programs. While the extent of national interest in these safety, resource development, and recreation programs can be argued, they clearly contribute less than the Interstate and primary systems toward the facilitation of interstate commerce and intercity travel. To the degree that this highway transportation objective is of the greatest national interest, the other programs are a secondary priority.

Transferring some current federal highway programs to the states would not reduce the need for increased highway user taxes, however, if the associated revenues for these programs were transferred as well. Although such a combined program-revenue shift would substantially alleviate any state financial dislocation,some states might face organizational stresses as federal categories and standards were eliminated, and various state factions pressed for specific uses of the newly gained latitude.

Whether by shifting program priorities away from new construction, by increasing highway user taxes to pay for the program, or by transferring funds from other highway programs into the Interstate program, the Congress faces difficult choices between eliminating various activities or increasing taxes to pay for them. While any resolution of the problems confronting the Interstate program might reflect a combination of all these steps, all three could substantially alleviate current financial pressures within the Interstate highway program.

CHAPTER I. INTRODUCTION

In its 25 years of existence, the Interstate Highway System has assumed enormous importance within the nation's transportation system. Interstate routes carry 19 percent of the nation's auto travel and an estimated 32 percent of the nation's truck traffic. The Interstate System has reshaped where Americans live, work, shop, and vacation. It has been a major factor in the growth of suburbia, with its attendant shift in populations and the services they require.

The Interstate System was conceived in the Federal-Aid Highway Act of 1944, which authorized a network of 40,000 miles to link the country with high-quality roads. Not until passage of the 1956 highway act, however, did full construction begin, when the program received a consistent source of funding through establishment of the Highway Trust Fund. 1/ Between fiscal years 1956 and 1981, the federal government, which pays 90 percent of construction costs, has spent $176 billion on the Interstate System (in 1979 dollars).

CURRENT PROBLEMS

Although most Americans take the Interstate Highway System for granted, its future is threatened by several emerging problems:

- The high, and constantly increasing, cost of completing the system;
- Projected declines in its financing base--revenues from the motor fuels and other highway user taxes; and
- The inadequacy of the program to keep pace with current and future repair needs.

Solving these problems will require several actions to be taken either separately or, more probably, in combination: trim and restructure the

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1. It should be noted that the Highway Trust Fund allocates money for about 90 percent of federally assisted highway programs, of which the Interstate System is only one.

current program to fit available future resources, increase highway user taxes, and discontinue other highway programs to free additional funds for Interstate projects.

In short, the present program is trying to do too much with too little, and is not succeeding on any front. With existing authorization levels, the system will not be completed before the mid-1990s at the earliest, repairs will fall further behind, and revenues from current user fees will continue to be inadequate to finance an effective resolution of these needs. The three factors that contribute to the present inadequate financing are described briefly below.

Escalating Completion Costs

To date, 95 percent of the routes in the Interstate System has been completed. In spite of continued progress in reducing the number of remaining miles, however, the $38.8 billion (in 1979 dollars) needed to complete the planned system remains high (see Table 1).

Two factors have caused the increased costs to complete the Interstate System. First, in addition to constructing new routes, completing the system has grown to include substantial expenditures for upgrading sections already open to traffic. 2/ Most of these upgrading costs are for additional lanes and interchanges, new safety measures, rest areas, noise barriers, and other features that have been added since the program began in 1956. Second, material and labor costs have risen by an average of 15 percent annually between 1977 and 1980. As a result, the cost per mile to complete the system (including upgrading) has risen from $4 million in 1959 to $20 million in 1979 (both estimates are in 1979 dollars) (see Table 1). Even if construction costs increased by only half that rate for the next ten years, current authorization levels for new construction could finance less than three-quarters of the remaining work.

Declining Trust Fund Revenues

The 1956 highway act both authorized the Interstate Highway System and created the Highway Trust Fund to finance it. Although federal taxes on motor fuels had been used to fund federal road programs since the 1930s,

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2. Throughout this report, estimates of cost to complete include costs to upgrade sections open to traffic.

TABLE 1. COST TO COMPLETE THE INTERSTATE SYSTEM a/, SELECTED CALENDAR YEARS 1959-1979 (In 1979 dollars) b/

Calendar Year	Miles Not Opened	Cost to Complete (In billions of dollars)	Cost Per Mile to Complete Sections Not Yet Opened (In millions of dollars)
1959	33,858	124.0	4
1966	19,024	89.6	5
1970	10,957	80.9	7
1975	5,108	59.9	12
1977	3,593	60.5	17
1979	2,723	53.8 c/	20

SOURCE: CBO estimates from data provided by the Federal Highway Administration.

a. Includes cost to upgrade completed sections.

b. Deflated using the U. S. Department of Transportation's Composite Index of Federal-Aid Highway Construction.

c. The Federal-Aid Highway Act of 1981 reduced this amount to an estimated $38.8 billion (after allowing for possible route withdrawals) through cuts in certain Interstate construction projects.

it was not until 1956 that the linkage between programs and financing was formally established by the creation of the trust fund. The key revenue source--the tax on motor fuels--began at 3 cents per gallon and has increased only once, to 4 cents per gallon in 1959. In spite of this relatively static revenue source, revenues entering the Highway Trust Fund grew rapidly in the first 20 years of the program because vehicular travel also grew rapidly.

95-194 O - 82 - 4

Recently, however, this revenue source has been increasingly constrained. Surges in fuel prices not only have slowed the rate of growth in vehicular travel, but also have encouraged consumers to purchase more fuel-efficient cars. Thus, there is less consumption of motor fuels to tax. Receipts from excise taxes on trucks and truck parts also have been reduced by lower sales caused by general economic conditions. As a result, receipts for the Highway Trust Fund fell from $8 billion in fiscal year 1979 to $7.3 billion in 1981 (see Table 2). In addition, the Interstate program has received a smaller share of overall highway revenues in the last eight years. Between fiscal years 1957 and 1973, the Interstate highway program generally received around 65 percent of all authorizations from the Highway Trust Fund. Starting in 1974, that share fell to under 50 percent, as more was allotted to other highway programs. When adjusted for inflation, Highway Trust Fund revenues have been falling sharply, as have authorizations for the Interstate program (see Table 2). Similarly, trust fund receipts in future years will remain relatively static, even as inflation forces increases in the cost of highway projects.

Mounting Repair Needs

At the same time that revenues are shrinking and costs growing, open portions of the system increasingly need repairs. Federal and state spending for repair of Interstate highways covers only about one-third of the work needed to keep them smooth and safe. Many of the earliest Interstate routes are nearing the end of their expected useful lives of 15 to 20 years (called "design life"), and many others will do so in the next several years. Since virtually no major repairs were made during the first 15 years, the percentage of Interstate miles in poor condition has grown rapidly in the last ten years. CBO estimates that about $16 billion (in 1979 dollars) will be needed for repairs between 1980 and 1990 (see Table 3). Under current authorizations, less than half this amount will be available.

PLAN OF THE PAPER

Chapter II discusses the key provisions of the current Interstate program and highlights how the provisions themselves have contributed to the problem of growing completion and repair costs. Chapter III describes the current program and sets out two alternative plans for restructuring the Interstate program to contain new construction costs, thereby freeing funds for needed repairs. Chapter IV examines options for financing the Interstate System.

All three program alternatives set forth in Chapter III would require sizable increases in user fees. Chapter V outlines some possible mechanisms for restraining such increases by decreasing federal funding of non-

TABLE 2. HIGHWAY TRUST FUND RECEIPTS AND INTERSTATE AUTHORIZATIONS, SELECTED FISCAL YEARS 1960-1981

Fiscal Year	Highway Trust Fund Receipts (In millions of current dollars) a/	Highway Trust Fund Receipts (In millions of 1979 dollars) b/	Authorizations for the Interstate Program (In millions of 1979 dollars) b/
1960	2,536	9,761	9,622
1965	3,670	12,550	9,233
1970	5,469	13,446	9,834
1975	6,774	9,989	4,498
1976	6,000	9,161	4,657
1977	7,302	10,413	4,635
1978	7,567	9,037	3,881
1979	8,046	8,046	3,425
1980	7,647	6,690	2,996
1981	7,303	6,633	3,338

SOURCE: CBO estimates from data provided by the Federal Highway Administration.

a. Includes tax receipts plus interest earned on trust fund balance.

b. Deflated using the U. S. Department of Transportation's Composite Index of Federal-Aid Highway Construction.

Interstate highway activities of relatively local importance and using the savings to finance the repair and remaining construction of the Interstate System.

TABLE 3. INTERSTATE SYSTEM REPAIR NEEDS, SELECTED CALENDAR YEARS 1960-1980

Year	Percentage of Route Miles Having Reached Design Life a/	Percentage of Route Miles in Poor Condition b/	10-Year Cost of Repair (In billions of 1979 dollars)
1960	0	0 c/	0 c/
1965	0	0 c/	0 c/
1970	0	0 c/	0 c/
1975	28	4 d/	12 e/
1980	41	9 d/	16 e/

a. Based on design life of 15 years for roads designed between 1956 and 1963, and 20 years thereafter.

b. The term "poor" covers pavements that have deteriorated to such an extent that, in the opinion of the Federal Highway Administration, they are in need of resurfacing.

c. Although no data are available it is probable that little Interstate mileage reached a state of poor condition in these years.

d. CBO estimates based on 1978 data presented in U. S. Department of Transportation, The Status of the Nation's Highways' Conditions and Performance (1981).

e. CBO estimates based on Final Report, Interstate Resurfacing, Restoration, and Rehabilitation Needs Study (Updated 1980).

Appendix A provides a detailed outline of Interstate program costs. Appendix B presents a historical overview of federal highway aid. Appendix C summarizes the characteristics of gaps in the Interstate system.

CHAPTER II. KEY FEATURES OF THE PROGRAM AND 1981 CHANGES

Since many of the causes of the Interstate program's current problems come from the very provisions that made it so effective in earlier years, it is instructive to review these features in light of today's financing concerns and economic outlook. In particular, four features of the program have contributed importantly to the existing situation:

- The extraordinary federal financial commitment to the Interstate System compared to other highway programs;
- The exceptional degree of centralized planning, as reflected in the appropriations of funds based on cost to complete the system;
- The almost exclusive orientation of the program toward new construction, without adequate provision for repairs of existing routes; and
- The dual emphasis on national and local transportation requirements of existing routes.

These key features are examined in this chapter, as well as the changes enacted in the 1981 highway act.

FEDERAL FINANCIAL COMMITMENT

The Congress has financed roads since the early 19th century, based on its constitutional powers to establish post roads and regulate commerce among the states. Throughout most of this century, federal aid for roads has been distributed to the states according to a formula based upon factors like area, population, and road mileage; and the states have retained substantial authority to decide which projects to fund. Over the years, the number of federal road programs has grown considerably. Since the beginning of the modern highway program in 1916, however, the bulk of federal highway aid was directed toward a system of interconnected arterial routes, now called the primary system, that links the nation's major cities.

The program was significantly expanded in 1944, when the federal government established separate, proportioned allocations for three cate-

gories of roads--the primary system (whose funding could be used for the Interstate System), a secondary system (mostly farm-to-market roads in rural areas), and urban extensions of the primary system. Since then, the highway program has continued to expand, including the creation of general improvement programs for bridge replacement, hazard elimination, and rail-highway crossings. Numerous, highly specialized programs have also been instituted for safety, emergency relief, the Great River Road, control of outdoor advertising, and other purposes. In fiscal year 1982, the federal government authorized about $8.5 billion from the Highway Trust Fund for various road programs, less than half of which went to the Interstate program (see Table 4).

The Interstate System was first conceived as part of the Federal-Aid Highway Act of 1944. It was envisioned as a separate, new interconnected network of high-quality roads, over and above those being built in various other categories. During the decade after the Interstate System was first approved, however, little progress was made in its construction. Although the 1944 highway act designated a network of 40,000 Interstate route miles eligible for federal funds, it did not set aside separate money for this purpose. The states were given no special incentives to build Interstate routes. Rather, they continued to receive the same 50 percent in federal matching funds for primary routes, which could also be devoted to the Interstate System. In addition, since the total funds available to each state for primary routes was fixed, a state that built Interstate routes diminished the amount of financing that remained for its primary routes.

As a result of this financing method, less than 1 percent of the Interstate System was completed by 1954--10 years after the system was first authorized. Consequently, many believed that, without special incentives, few state legislatures would ever appropriate enough money to build the Interstate System. The Federal-Aid Highway Act of 1956, which is generally regarded as marking the beginning of the Interstate highway program, established three such special incentives: first, it authorized a large, separate sum for Interstate highways; second, it provided federal funds to the states on a 90/10 matching basis; and third, it created the Highway Trust Fund to ensure a continuous, reliable source of program funds. These three provisions are discussed below.

TABLE 4. AUTHORIZED FEDERAL SPENDING FROM THE HIGHWAY TRUST FUND IN FISCAL YEAR 1982 a/

Program	Authorization (In billions of dollars)	Percent of Total
Major Road Systems		
Interstate	4.025	47.13
Primary	1.500	17.56
Secondary	0.400	4.68
Urban	0.800	9.37
General Improvement Programs		
Bridge replacement and reconstruction	0.900	10.54
Pavement marking and high-hazard obstacle removal	0.265	3.10
Railroad/highway crossings	0.190	2.22
Categorical Programs		
NHTSA operations and research b/	0.031	0.36
NHTSA safety grants b/	0.100	1.17
FHWA safety research and development c/	0.013	0.15
FHWA safety grants c/	0.010	0.12
Accident data collection	0.005	0.06
Demonstration projects		
Railroad/highway crossings	0.067	0.78
Emergency relief	0.100	1.17
Economic growth center development highways	0.050	0.59
Forest and public lands highways	0.049	0.57
Great River Road	0.025	0.29
Bicycle program	0.010	0.12
Total, All Programs	8.540	100.0

a. In addition to the figures shown, authorized expenditures on roads from general revenues total approximately $800 million in 1982. Of this, more than $500 million was appropriated in 1982. Most of these nontrust fund revenues are spent on forest development roads and trails, Appalachian Development highways, Indian reservation roads and bridges, and public lands development roads and trails.

b. NHTSA = National Highway Traffic Safety Administration.

c. FHWA = Federal Highway Administration.

Interstate Authorization

The 1956 highway act authorized huge federal sums for the Interstate program--beginning with more than $1 billion in fiscal year 1957 and growing to $4 billion in fiscal year 1970. This dramatic shift in highway funding can be appreciated by comparing it to authorizations for the other major highway programs--the primary, secondary, and urban extensions--which, even though their authorizations were also increased in the 1956 act, together received less than $900 million in total authorizations annually between fiscal years 1957 and 1959. Thus, in one definitive step, the Interstate System became the dominant federal highway program, accounting for about two-thirds of all federal spending on roads in the 1960s and early 1970s.

Through the Interstate's history, authorizations for the system have treated it as a one-shot, capital construction program. As a result, the periods of authorizations have extended many years into the future, and were intended to cover all construction until the system was completed. The large authorizations for the program were not considered to be a permanent feature of federal highway policy, but rather a once-only construction program.

90/10 Matching Funds

To encourage states to participate actively in the Interstate program, the 1956 act provided that the federal government would pay 90 percent of the costs of constructing the Interstate System. (The federal share was set even higher in states where the federal government owns a large proportion of the land.) 1/ Compared to the primary, secondary, urban extensions, and other highway programs, which generally received federal funding on a 50/50 matching basis, the Interstate program represented a high degree of financing responsibility by the federal government. Since the size of the system was agreed upon at the outset, the generous federal contribution was not seen as encouraging program expansion, but simply as a device for

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1. The 1956 act allowed the federal share to exceed 90 percent (but never more than 95 percent) to the extent that "unreserved public lands and nontaxable Indian lands exceed 5 percent of the state's total land area." Under this provision, 10 western states pay less than 10 percent of Interstate construction costs.

getting the job done quickly. Later events, however, proved this control to be less stringent than the framers of the 1956 act had envisioned.

The 90 percent federal contribution provides a substantial incentive for states to expand their participation independent of their actual transportation needs. This occurs because construction activities themselves generate jobs, which, in turn, generate additional retail and other economic activity, and ultimately result in increased state tax revenues by virtue of the enhanced employment, both direct and indirect. As a result, apart from the value of the roads itself, the Interstate program provides significant economic returns through its stimulation of local construction activity and indirect increases in related economic activity. Thus, states have an economic incentive to undertake construction projects of this sort simply because the highly subsidized financing yields economic benefits to the state during the construction phase. For example, during a period when its construction industry had substantial slack capacity, the state of Massachusetts estimated that, for each 10 cents it spent building Interstate roads, it received 15 cents in increased state tax revenue. 2/ Under such circumstances, there can be little doubt that 90/10 financing provides a significant incentive to the states to undertake Interstate projects without regard to their transportation merits.

This incentive has probably been responsible for a substantial share of the program's rapidly escalating costs in recent years. Since the Interstate program finances the upgrading of existing roads as well as construction of new routes, states have a financial motive to do as much upgrading as possible, and controls on upgrading have not been as tight as the controls on new construction. This situation may cloud the evaluation of whether or not proposed upgrading projects are justified from an overall, cost-effectiveness standpoint. The large amount of upgrading work that has occurred in the Interstate program in recent years may be caused partly by the high federal share of costs.

Highway Trust Fund

The 1956 act created the Highway Trust Fund to ensure a stable source of funds to build the Interstate System and other highway projects. Receipts from various federal highway excise taxes, most importantly the

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2. Telephone conversation with Fred Salvucci, Secretary of Transportation and Construction for the Commonwealth of Massachusetts from 1975 to 1978.

95-194 O - 82 - 5

4 cents per gallon tax on motor fuels, are deposited in the Highway Trust Fund. These funds are earmarked for highway projects, including the Interstate system, the primary system, secondary rural roads, urban roads, and more than 30 other separately authorized programs and projects. This earmarking ensures a source of long-term funding for multiyear construction projects such as the Interstate Highway System. Once authorized, funds for highway projects are virtually assured for the entire construction period.

The financing mechanism for the Highway Trust Fund also allowed the program to grow during the 1960s and most of the 1970s. Growth in vehicular travel between 1956 and the early 1970s increased the revenues available through the trust fund. Total federal expenditures for all highway programs grew from $2.9 billion in fiscal year 1959 to $5.3 billion in fiscal year 1973, an increase of about 83 percent, almost enough to keep pace with inflation during that period. But in the last decade, skyrocketing fuel prices have stemmed the growth in driving and consumers have been buying more fuel-efficient vehicles, thus lowering revenues from the gasoline tax. Simultaneously, rapid increases in highway construction costs have reduced the purchasing power of trust fund receipts. This trend is likely to continue throughout the 1980s as the growth in trust fund revenues remains well below the expected rate of inflation.

Matching the decline in trust fund revenues is the amount allocated to the Interstate System. The amount authorized for Interstate System completion fell from about 65 percent in the sixties and early seventies to 40 percent of total trust fund authorizations in recent years.

CENTRALIZED PLANNING AND APPORTIONMENT BASED UPON COST TO COMPLETE

Compared to other highway programs in which the states have broad discretion to choose which projects to build, the 1956 act designated a system of 41,000 route miles that were planned as parts of the Interstate Highway System. All of these miles were eligible for the 90 percent federal financing afforded by the program and all were included in the states' estimated cost to complete when funds were apportioned. This original route system has remained largely intact, although several intervening highway acts have extended it. In particular, it was extended by 1,500 miles in 1968 and 444 miles in the 1970s; the current maximum is 42,944 miles. The mileage of the system has always been somewhat imprecise because the exact length depends on the alignment along which routes are built. The system plan shows the general alignment of routes, but the states always are responsible for proposing the exact alignment and design of each route. The

Federal Highway Administration (FHWA), however, has final approval of the location and design of Interstate routes.

The alignment of all 42,944 miles has now been approved by FHWA (see Figure 1), and as of mid-1981, 40,634 miles--almost 95 percent of the system--were open and another 735 miles were under construction. The remaining 1,575 miles are not yet under construction. To begin construction of these unbuilt sections, states must meet two conditions. First, the FHWA must approve the environmental impact statement for the road (called design concept approval). Second, the FHWA must approve the detailed engineering, geometrics, and pavement design (called final design approval). Of the remaining 1,575 miles, 1,193 miles have design concept approval, and the remaining 382 miles are still in the earliest phases of planning and design.

Since the Interstate program started, funds to complete the system have been apportioned to states according to each state's share of the remaining completion costs. This approach has several advantages. First, it distributes funds in an even way which, barring changes in design or cost, permits each state to complete the same proportion of its Interstate work at the same time. 3/ Thus, if all went according to plan, by the time one state had completed 80 percent of its work, every other state would have completed the identical percentage. Second, the apportionment plan does not penalize states with mountainous terrain, densely populated areas, or other conditions that make road building especially costly. Rather, it has the effect of increasing the apportionment to such states each year, thereby giving them the additional resources needed to complete their routes.

The approach of financing the system based upon the cost to complete has a perverse consequence, however. Any state that can increase its completion costs can thereby increase its share of program funds, all else being equal. This feature tends to encourage expansion of the system, which is apparent in two ways. First, the 1968 and 1978 highway acts together

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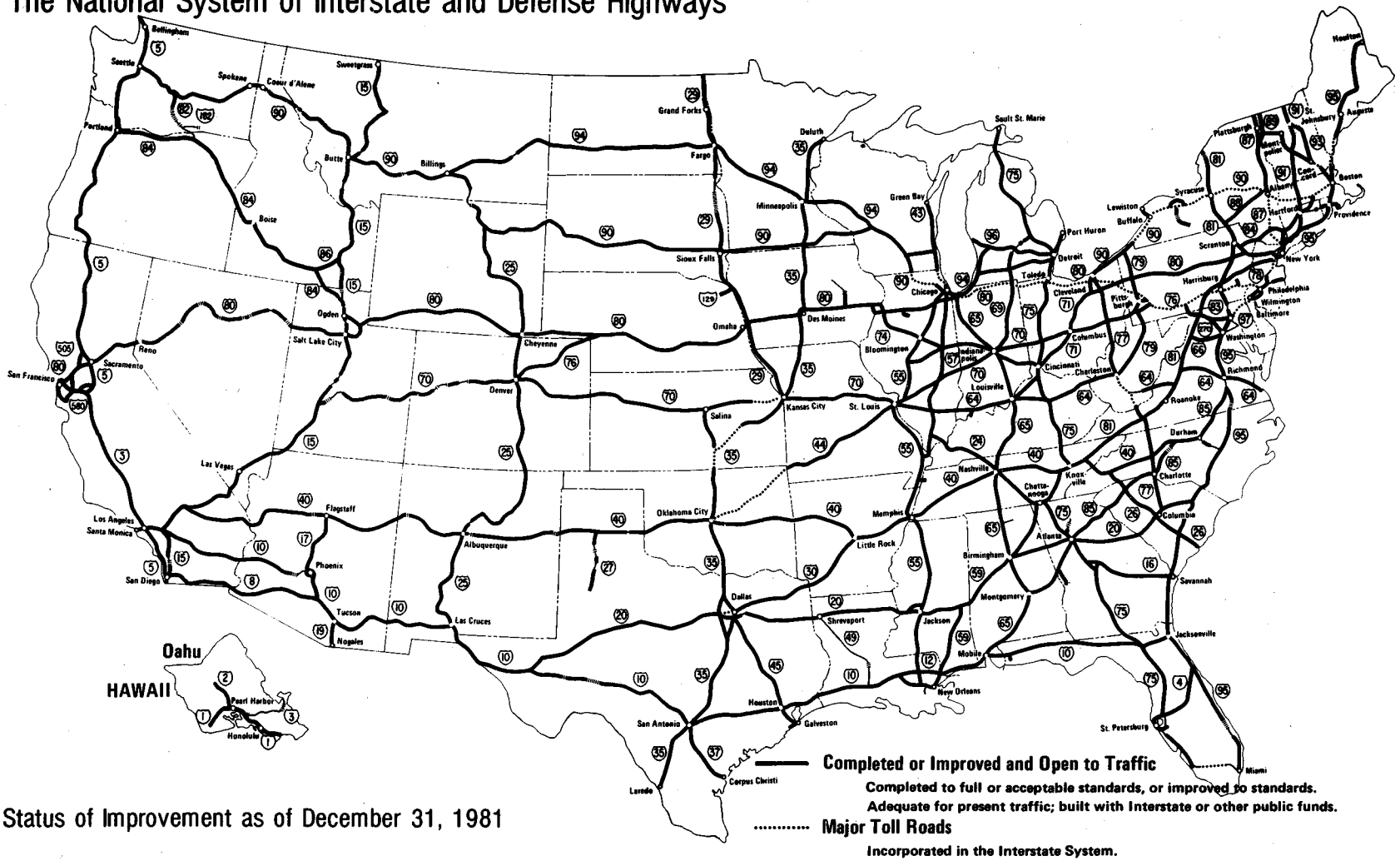
3. To give states an added incentive to complete the Interstate System, an exception to the apportionment formula provides that all states must receive a minimum amount of one-half percent of total authorizations. While helping small states, this minimum also provides an incentive to states to complete their Interstate construction quickly. Nine states currently receive the one-half percent minimum apportionment; three of these (Delaware, Nebraska, and North Dakota) have completed their Interstate routes.

Figure 1.

The National System of Interstate and Defense Highways



Status of Improvement as of December 31, 1981

Scale of map does not permit showing of status in urban areas and for very short sections.

SOURCE: Department of Transportation, Federal Highway Administration.

added nearly 2,000 route miles to the original 41,000 miles eligible for federal funding. Second, additional upgrading of existing or planned routes adds substantially to the total cost of completing the system.

While financing based on completion costs poses an incentive to expand the system, it would be unrealistic to assume that all expansions of the Interstate system are attributable to federal financing provisions. In the case of upgrading, for example, some of the costs come from incorporating various turnpikes and other existing highways into the Interstate System plan, rather than building entirely new routes. In these cases, the federal government paid to upgrade the existing roads to Interstate standards, thereby making them compatible with the remainder of the system. Many of the states had paid for the original routes with their own funds or by funds pledged against future tolls, which were largely paid by local users. In such cases, upgrading represents a net reduction in costs to the federal government, compared to the cost of constructing entirely new routes.

Similarly, some states built their Interstate routes in stages, opening a highway of minimum width as soon as possible and intending to widen it at a later date. Following this course could speed up the construction of the basic national networks, while deferring the widening of heavily travelled local sections.

Furthermore, many of the changes in design standards that have occurred since the program began in 1956 reflect improvements in construction techniques, advances in safety-related features, greater concern about the environmental consequences of roads, or increased emphasis on using roads to facilitate bus and carpool traffic. Thus, many of the added upgrading projects have responded to real changes in needs and technologies.

Nevertheless, there is little consensus about how to differentiate between genuinely needed upgrading projects and those that have been stimulated by the financial advantages conferred through apportionment based on cost to complete and the 90/10 federal matching funds. Prior to the passage of the Federal-Aid Highway Act of 1981, upgrading had grown to consume 47 percent of the cost of completing the Interstate System. Regardless of the reasons for this growth, many of these projects appear to be less important to the national interest than does completion of unbuilt parts of the system that are needed to connect important points of the national network.

Just as upgrading projects have arisen in response to changes in development patterns and social values during the last decade, it is likely that the system will have to adjust in similar ways in future years. At this

stage, with 95 percent of the planned routes built, it might be more appropriate to finance adjustments to these future needs on the basis of some set formula that does not encourage the creation of new projects. Now that the basic network is nearly complete, the highly centralized cost-to-complete approach is not well-suited to the complex local tradeoffs that determine the priorities for upgrading projects. If, instead, each state was apportioned some set amount for Interstate upgrading, this would remove the current incentive implicit in the cost-to-complete formula whereby additional "needs" generate more federal funds. As a result, each state would have some allocation of federal funds for upgrading, and could apply these in accordance with its own priorities, without attempting to increase its share of funding.

EMPHASIS ON CONSTRUCTION AND NEGLECT OF REPAIRS

In addition to having outgrown some of its financing provisions, the Interstate System is also confronted by repair needs that were not addressed in the early legislation governing this program. Historically, federal aid for roads has generally concentrated on new construction, and the states have been responsible for road repair. When federal policy toward repair of the primary system was evolving in the early 1920s, legislation required that federal construction funds be withheld if a state had failed to keep federally assisted routes in proper repair.

When the Interstate program began in 1956, repairs on the primary, secondary, and urban systems were not financed by the federal government. For the most part, repair of the Interstate System was also presumed to be a state responsibility, and early Interstate legislation followed the historical tradition of providing no federal funding for repairs.

Federal concentration on new road construction throughout most of this century is probably attributable to two factors. First, roads, like many other major improvements, impose very high capital costs, and federal financing helps to avoid dislocations in state and local economies. Repair costs are generally smaller, less volatile, and occur in smaller quantities. Therefore, they do not have the same financially disruptive effects on local budgets as construction. Second, local responsibility for road repair has a long, common-law history, dating from the time abutting property owners were responsible for clearing roads of fallen trees and the like. Although traditionally it is a national responsibility to ensure a right of way for passage, for hundreds of years it was the responsibility of local governments to keep that right of way clear and serviceable.

To some degree, the delineation of state and local roles in road repair is blurred by the distinction between maintenance and repair. Maintenance, such as snow removal, cutting roadside grass, cleaning highways, or patching potholes, has always been assumed to be a state responsibility. Indeed, state spending for these activities has increased relative to most other forms of state highway spending in recent years. Repairs, as used here, refers to resurfacing, restoration, and rehabilitation--or the so-called "3R" activities. These repairs typically involve major construction and may cost as much as new construction. Thus, while federal and state governments continue to assume that states will maintain roads, in the sense defined here, the resolution of appropriate roles regarding repairs has never been completely articulated at either level.

In recent years, the federal government has increased its financial assistance for road repair, for two principal reasons. First, roads formerly served mainly local traffic, even those occasionally used for long-distance travel. High-speed highways and vehicles, however, have permitted more long-distance hauling and driving. As a result, the mix of traffic using some roads has become increasingly nonlocal, and state priorities for road repair are increasingly diverging from federal priorities. This is particularly true on the Interstate System, which carries high percentages of out-of-state traffic on some routes. Second, road repair was once a relatively inexpensive activity. But, with the emergence of more intercity vehicular travel and the use of increasingly heavy vehicles, the cost of rebuilding worn out pavements can be nearly as much as building new roads.

Starting in 1974, the Congress began to redefine new construction and repair. 4/ No federal funds for repair of the Interstate System were authorized until 1976, when that year's highway act apportioned $175 million a year for repairs. The Surface Transportation Assistance Act of 1978 increased this funding to $275 million for fiscal year 1981 and the Federal-Aid Highway Act of 1981 increased it to $800 million for fiscal years 1982 and 1983. While this authorization has grown very rapidly since 1976, it still falls far short of paying for all repairs that are needed on Interstate roads. The Department of Transportation (DOT) estimates these will cost an average of $1.6 billion to $2.1 billion (in 1979 dollars) annually between calendar years 1980 and 1990.

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4. U. S. Code, Congressional and Administrative News, House Committee on Public Works, H. Report 93-1567, 93:2 (1974), p. 8013.

Federal authorizations for repairs have been funded by a formula based on lane miles (specifically, the number of lane miles that have been in use for more than five years on the Interstate System) and on vehicle miles of travel on these roads. This formula helps to avoid some of the cost-increasing incentives of the financing approach based on cost to complete that is now applied to new construction.

At this juncture, the Congress may wish to review whether and how the federal government should help to finance the repair of Interstate routes. While federal assistance in this area is fairly new, three highway bills in the last six years have explicitly increased federal participation. There appears to be little rationale for treating new construction differently from major repairs. Whatever the federal purposes in building the Interstate System--be it facilitation of interstate commerce, enhancement of internal communication, or promotion of national defense--these same federal interests require that the system be kept in repair. At the same time, the federal program for Interstate repair is relatively new and untried. Many features of this program, including financing provisions and project eligibility requirements, may eventually need to be adjusted to make the program more effective.

DUAL EMPHASIS ON NATIONAL AND LOCAL ROADS

Another key feature of the Interstate program is its compound scope. It finances not only major intercity arteries that carry goods and people from state to state, but also major arteries within urban areas--roads serving commuting and other local needs. Since roads serving primarily local needs account for roughly 75 percent of the completion costs of the unbuilt portions of the Interstate System, their treatment is central to the long-run financial stability of the program.

Since the Interstate program began in 1956, it has financed both national and local roads, although this policy has been much debated both as it was being written into law and during the years the law has been applied. In particular, many of the planned local portions of the system proved to be highly controversial because of their environmental, developmental, social, or architectural consequences. In addition, many people thought that the highly favorable financial terms for Interstate highways contributed to the deterioration of public transportation services and contravened local and federal policies promoting such services. In response to these concerns, the Interstate program was modified in the 1973 highway act to allow states to delete routes that were not integral to the national, interconnected system. States that withdrew such segments could spend the same amount of federal funds on public transportation projects (or other Interstate roads) instead. Highway interests were strongly opposed to the use of Highway Trust Fund

receipts for public transit, however. Therefore, the law stipulated that projects that were substituted for withdrawn Interstate routes had to be financed from general revenues, subject to appropriations, rather than from the Highway Trust Fund.

As more of the Interstate System has been built, and as budgetary pressures have increased, the uncertainty surrounding the financing of projects from Interstate withdrawals has also increased. For one thing, the Surface Transportation Assistance Act of 1978 stipulated that no substitutions could be approved after September 30, 1983. But probably more important, states withdrawing Interstate projects during this period of budgetary constraint face the risk that funds for the substitute projects will not be appropriated.

Since roads of predominantly local importance now account for roughly three-fourths of the cost of completing the Interstate System, their treatment is basic to solving the program's financial problems. While some of these costs are for roads that will probably be withdrawn, most are for routes that the states plan to build. The cost of completing the Interstate System could be substantially reduced if the program focused exclusively on routes of national importance. At the same time, this could greatly disrupt the plans of those states that have the largest shares of unbuilt, locally important roads.

In short, the dual national/local emphasis of the Interstate program, which has been its governing policy since 1956, has shifted complexion over time. First, in response to local concerns, a mechanism for withdrawing routes was devised, which implicitly recognized that certain, primarily local routes were dispensable. Now, in response to financial pressures, another policy change could further channel Interstate resources into those key routes that are integral to a national, interconnected system of roads.

The Administration highway bill, submitted during the previous session of the Congress, would have moved in this direction by directing the Secretary of Transportation to cut routes that:

> . . . are not essential to the completion of a unified and connected Interstate system, are not considered cost effective from a transportation standpoint, or have the potential for extensive environmental disruption. 5/

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5. S. 841, introduced May 1981.

95-194 O - 82 - 6

Although the Administration has not yet been presented details of this plan, its approach appears to use the concept of separate national and state responsibilities, as contained in President Reagan's new federalism proposals. The alternative roles of federal and state governments are treated in depth in Chapter V.

THE FEDERAL-AID HIGHWAY ACT OF 1981

Recognizing the developing financial pressures and shifts in program priorities, the Congress took two major steps to redirect the program in the Federal-Aid Highway Act of 1981: it curtailed the large number of upgrading projects and it provided additional financing for growing repair needs. Prior to this act, the cost of completing the system was estimated to be $53.8 billion (in 1979 dollars), $25.3 billion of which was to upgrade existing routes. The 1981 act cut a substantial amount of this planned upgrading, thereby reducing the cost to complete to $41.3 billion (or $38.8 billion after allowing for projected route withdrawals).

The 1981 act also substantially increased the amount potentially available for repairs. A total of $275 million was authorized for repairs in fiscal year 1981. The 1981 act increased this amount to $800 million a year, and allowed these funds to be used either for repairs or for a new category called reconstruction (a catchall for all projects that are deleted from the planned Interstate System). Prior to the 1981 act, most reconstruction projects were mainly included in the complete system plan.

The creation of the reconstruction category was a device to facilitate reductions in the planned system. Through this mechanism any state that had projects deleted from its planned system was permitted to finance these projects as reconstruction, but federal funding would be limited to the state's share of the $800 million.

This approach helps control costs since, unlike routes included as part of the planned Interstate network, a state cannot increase its share of the total federal funds simply by adding reconstruction projects to its highway plan. Instead, the combined repair and reconstruction program is funded by a formula based on lane miles and traffic. Thus, reconstruction work might or might not be undertaken, depending upon each state's priorities and how each elects to spend its repair and reconstruction funds.

When the 1981 act trimmed the cost to complete, it removed the relatively low-priority parts of the yet-to-be completed system, but made

them eligible for reconstruction funds. Not all can or should be built. But, by financing reconstruction out of the same category that funds basic repairs to essential national routes, there is some risk that the national system could be compromised in some states in which priority is given to reconstruction rather than repair. Nevertheless, the 1981 act initiated important steps to meet repair needs and to contain growth of the Interstate System.

CURRENT SITUATION

Even with its improvements, the 1981 act did not resolve the basic financing problems of the Interstate program. At the current level of authorization for new construction, the system may never be completed, because continued high inflation could increase the remaining completion costs more rapidly than completion of projects can reduce them. Nor will the 1981 act keep the system in repair; CBO estimates that the amounts authorized for this purpose are less than half of what is needed. In addition, as reconstruction projects compete for whatever repair funds are available, the amount actually spent on repairs could be even smaller than it has been in the past.

Altogether, the Interstate System could cost more than $80 billion (in 1979 dollars) between calendar years 1980 and 1990--$38.8 billion to complete (after deleting $2.5 billion in projected local route withdrawals), plus $16 billion for repairs and $26.4 billion for reconstruction (see Table 5). Federal authorizations would have nearly to triple in order to finance all of these costs. Such extraordinary budgetary demands have led to widespread concern about the costs of the Interstate highway program and to questions about whether it has grown beyond the means of the nation to support it.

Under current policy, as formulated in the Federal-Aid Highway Act of 1981, the federal government will devote $3.6 billion annually to new construction and $0.8 billion for repairs and reconstruction. These program levels appear grossly inadequate in view of the projected costs, which are described in detail in Appendix A. The mismatch between funding and costs is particularly apparent for repairs. The current authorization for repairs and reconstruction appears inadequate to finance repairs alone, not to mention reconstruction.

The current Interstate program is simply trying to do too much within the available authorizations. As a result, the system would not be completed by 1990; indeed, the system might never be completed unless authorizations are increased. At the same time, the need for repairs is

TABLE 5. INTERSTATE COMPLETION, REPAIR, AND RECONSTRUCTION COSTS, BY TYPE OF PROJECT, CALENDAR YEARS 1980 TO 1990 (In 1979 dollars)

	Cost (In billions of dollars)	Percent of Total Costs [a]
Completion Costs		
New construction on sections not open to traffic		
Minimum construction necessary to open traffic		
Routes of national importance	6.2	7.6
Routes of local importance	14.1 [b]	17.4
Additional safety and environmental improvements	3.0 [c]	3.7
Sections currently under construction	2.8	3.4
Subtotal, new construction	26.1	32.1
Completion of open highways built in stages		
Additional pavement, lanes, and interchanges	1.4	1.7
Subtotal, stage construction	1.4	1.7

(Continued)

a. Percentages may not add to subtotals because of rounding.

b. Based on $16.6 billion in routes of local importance (see Table 7 in Chapter III) minus $2.5 billion in projected local route withdrawals.

c. Of the $3 billion shown, about $1.3 billion is for existing construction plans and $1.7 billion is projected from future plans to meet essential environmental provisions as required in the Federal-Aid Highway Act of 1981 (see Appendix A).

TABLE 5. (Continued)

	Cost (In billions of dollars)	Percent of Total Costs a/
Completion Costs (Continued)		
Upgrading highways open to traffic		
Interstate highways built with federal-aid funds		
Additional lanes and interchanges	3.5	4.3
Additional safety and environmental improvements	0.6	0.7
Interstate highways built without federal-aid funds		
Additional lanes and interchanges	5.6	6.9
Additional safety and environmental improvements	1.4	1.7
Subtotal, upgrading	11.1	13.7
Miscellaneous	0.2	0.2
Total, completion costs	38.8	47.8
Repair and Reconstruction Costs		
Basic repair (resurfacing, restoration, and rehabilitation) of Interstate highways and bridges	16.0	19.7
Reconstruction of Interstate highways and bridges	26.4	32.5
Total, repair and reconstruction costs	42.4	52.2
Total, all costs	81.2	100.0

increasing, and the funds for this purpose would fall far short of the mark. Authorizations for reconstruction projects permitted under current policy would be adequate to complete only a fraction of such projects, and, to the extent that reconstruction work is done, it would divert scarce resources from repair work.

Two bills recently reported by both the House of Representatives (H. R. 6211) and the Senate (S. 2574) take some initial steps to correct these problems. Both increase the resources devoted to repair. The Senate bill increases funding for repairs from $800 million in fiscal year 1982 to $1.1 billion in 1983; the House bill increases repair funding to $2.1 billion. Neither bill reduces the amount for new construction nor increases highway user taxes, although the authorizations in the House bill are based upon the enactment of such an increase.

Continuation of the present Interstate program under current financing arrangements is inadequate. Nor do the current bills resolve this inadequacy permanently. Three types of actions could be taken, separately or in combination, to alleviate these problems:

- Change current programs to reduce the amount of new construction and to increase the amount of repair work;
- Increase highway user taxes; or
- Transfer to the states other, non-Interstate highway programs that are now financed by the Highway Trust Fund and devote a larger share of trust fund receipts to the Interstate program.

These three options are examined in Chapters III, IV, and V, respectively.

CHAPTER III. CHANGES IN PROGRAM EMPHASIS

The Interstate System faces large and increasing completion costs; declining growth in future receipts from road user taxes; continued inflation in general and escalating highway construction costs in particular; and sizable, rapidly increasing repair costs. To alleviate these financial problems, the highway program could be changed in several ways. For example, one possible alteration would be to restructure the Interstate program so as to hold down new construction costs, thereby freeing funds for needed repairs.

Other major alternatives would be to increase highway user taxes or to reduce federal spending on other highway programs and transfer those resources to the Interstate program. Alternatives of this sort are explored in Chapters IV and V. A practical solution to current Interstate problems would probably draw on all three types of financial relief. For simplicity, the program alternatives are discussed in this chapter and then combined with the other possible changes in later chapters.

PROGRAM ALTERNATIVES

Three alternatives illustrate the range of program options open to the Congress:

- Continue Current Programs;
- Reduce the Interstate System to the Minimum System essential for completing routes of national importance; and
- Build an Intermediate System with more locally important routes and upgrading projects than the Minimum System but fewer than the Current Programs option.

Continue Current Programs

Interstate Completion. As authorized by the Federal-Aid Highway Act of 1981, current programs call for the completion of all 2,310 miles of planned Interstate routes, of which 1,575 are not yet under construction, and

various upgrading projects. As defined in current programs, completion of the system would cost nearly $40 billion, although present authorizations fall short of this amount.

Repairs and Reconstruction. The Federal-Aid Highway Act of 1981 also provides funds for repair and reconstruction of the Interstate System. Between calendar years 1980 and 1990, the estimated cost of projects eligible for reconstruction amount to $26.4 billion, and projected repairs are expected to cost an additional $16 billion (all in 1979 dollars). Under current legislation, $800 million is provided annually in fiscal years 1982 and 1983 for repairs and reconstruction. These two activities are not financed separately; rather, states may select some combination of repair and reconstruction projects that reflects their own priorities.

Unlike completion of the planned Interstate System, for which there is a history of strong legislative commitment, reconstruction projects are often of lesser national importance, and there is less support for them. The inadequacy of current authorizations to fund all reconstruction projects reflects a federal policy of providing partial rather than full assistance for such activities.

Accordingly, this paper assumes that, under the continuation of the Current Programs option, funding for reconstruction would be set at a level sufficient to build half of all currently eligible reconstruction projects. Some states might view this arbitrarily selected level as restrictive, although it appears relatively generous compared to the levels set in the 1981 act, which provides funds for only about a quarter of all repair and reconstruction costs.

Similarly, it is assumed here that funding is provided for all repair costs, which will average around $2.9 billion a year between now and 1990. Again, current authorizations fall far short of this amount, although increasing awareness of needed repairs will probably lead to higher repair authorizations in future years.

Table 6 shows the annual costs for planned current programs. The current authorization levels, however, are inadequate to finance these programs. The program levels shown in Table 6 would complete the Interstate, keep it in repair, and offer some assistance for reconstruction. Because the cost of this approach is so high, requiring $10.2 billion a year, two less costly program alternatives--Minimum and Intermediate Systems--are discussed below.

TABLE 6. ANNUAL FEDERAL COSTS OF ALTERNATIVE INTERSTATE PROGRAMS, FISCAL YEARS 1983-1990 (In billions of current dollars)

Options	System Completion	Repair	Reconstruction[a/]	Total
Current Programs	5.1	2.9	2.2	10.2
Minimum System	1.0 [b/]	2.9	4.4	8.3
Intermediate System	2.2 [c/]	2.9	3.8	8.9

a. Assumes that the program level for reconstruction is set at an amount sufficient to fund half of the projects that would be eligible under each option.

b. Based on the following assumptions:

1. The cost to complete the Minimum System would be $10.6 billion (in 1979 dollars) as of January 1980, of which $9.5 billion is the federal share. Between January 1980 and September 1982, it is assumed that states would obligate approximately $4.1 billion in federal funds on projects included in this option. As of October 1982, remaining costs to complete the Minimum System would be $5.4 billion (in 1979 dollars).

2. In computing the required authorizations for future years, it is assumed that average annual inflation from fiscal years 1983 to 1990 will be 7 percent.

c. Based on the following assumptions:

1. The cost to complete the Intermediate System would be $21.2 billion as of January 1980, of which $19.1 billion is the federal share. Between January 1980 and September 1982, it is assumed that states would obligate approximately $7.0 billion in federal funds on projects included in this option. As of October 1982, remaining costs to complete the Intermediate System would be $12.1 billion (in 1979 dollars).

2. In computing the required authorizations for future years, it is assumed that average annual inflation from fiscal years 1983 to 1990 will be 7 percent.

95-194 O - 82 - 7

The Minimum System

One alternative to the Current Program option would be to construct only routes of national importance. Completion of this Minimum System would be the least costly Interstate program that could be developed without compromising the concept of a national, interconnected system. Such a policy might have resulted from an extremely strict interpretation of Administration proposals made last year. These would have eliminated certain upgrading projects and some unbuilt routes, although the particular routes and associated costs were not specified.

Interstate Completion. The Minimum System would cut the cost of completing the system from $38.8 billion to $10.6 billion in 1979 dollars (see Table 6, footnote b-1). It would concentrate federal aid on the estimated 931 miles of unbuilt segments that directly connect the nation's principal cities and industrial centers ($6.2 billion), on stage construction of lanes and interchanges ($1.4 billion), and on finishing routes that are already under construction and other related miscellaneous work ($3 billion). Federal funding for upgrading highways that are open would be curtailed. In addition, this alternative would eliminate all routes not yet under construction that serve predominantly local or regional needs. In other words, only routes of national importance, roads already under construction, and stage construction of lanes and interchanges would be completed. Allowing for the possible effects of inflation, completing this plan by 1990 would require $1.0 billion annually in federal authorizations (see Table 6).

Repairs and Reconstruction. Under the Minimum System, $4.4 billion annually would be spent on reconstruction and $2.9 billion on repairs. The increase in reconstruction funding would occur because, under the Federal-Aid Highway Act of 1981, projects that are removed from the complete system plan are eligible for reconstruction funding. As in the Current Program alternative, it is again assumed that half of all eligible reconstruction projects would be financed.

Intermediate System

The Minimum System sketched above is useful in illustrating the savings that could be effected by completing only routes of national importance. Such an approach, however, would not honor long-standing commitments to routes of local significance that would be eliminated under the Minimum System. Many of these local routes serve important transportation needs in the areas involved, and some states have developed their road networks in anticipation of completing these routes. In order to obtain some of the

savings of the Minimum System and to achieve some shift of resources toward mounting repair requirements, the second alternative to Current Programs--called the Intermediate System--would use less stringent criteria in deleting local routes and upgrading projects from the completion plan. In particular, it would continue to construct all unbuilt route segments that have received federal design approval whether these routes are of national or local importance. The Intermediate System illustrates one way in which the federal government could balance the disruptive effects of program changes against the budgetary and federalism advantages of program reductions.

Interstate Completion. Some projects of local importance, which are not yet under construction, have extensive, often controversial, histories. It would be very difficult at this stage, therefore, to drop these projects on the grounds that they lack national significance. It took ten years of planning and public hearings, for example, to reach a local decision on the need for and the alignment of New York's I-478 Westway Highway project in Manhattan. In September 1981, President Reagan finally gave federal approval for land purchase and preparation for construction. Similarly, some of the additional lanes (upgrading) that would be cut under the Minimum System option are needed to bring two-lane highways, like the West Virginia Turnpike, up to the four-lane standard now prevalent on most Interstate routes. Federal commitments to add these lanes were made many years ago when existing routes were first incorporated into the system and in 1963 when a minimum of four lanes was established as the standard for Interstate highways. The Intermediate System would include not only roads of recognized national importance but also other routes that have received design concept approval and are, therefore, close to the construction phase. 1/ In addition, the Intermediate System would finance the cost of adding lanes and interchanges to all two-lane Interstate routes. It would not cover the costs of rest areas, noise barriers, bicycle facilities, and other amenities, however. With these adjustments, the Interstate System would cost $21.2 billion to complete (see Table 6, footnote c-1). About $2.2 billion in annual federal authorizations would be required to complete the Intermediate System by 1990.

Repairs and Reconstruction. As in the Minimum System plan, projects dropped from the completion plan would be eligible for federal funding under the reconstruction program. If half of these are funded, $3.8 billion

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1. Roads that have received design concept approval represent about 60 percent of the total required to complete unbuilt routes.

annually would be required for reconstruction. As under the other alternatives, $2.9 billion per year would be allocated for repairs.

EFFECTS OF THE PROGRAM ALTERNATIVES

The effects of these program alternatives can be evaluated by several criteria:

- o The basic program objective of completing a national, interconnected system;
- o Budgetary effects;
- o State and local effects;
- o National defense considerations; and
- o The time required to complete the Interstate System.

Complete a National, Interconnected Highway System

The objective of the Interstate System, as articulated when the system was first approved in 1944, is to:

> Connect by routes, as direct as practicable, the principal metropolitan areas, cities and industrial centers, and serve the national defense. 2/

During the late 1940s and early 1950s, before financing for the Interstate System had been fully developed, this objective was debated extensively. A resolution of the federal role was incorporated into the 1956 highway act, which created the present Interstate highway program. This act permitted urban routes into, as well as around, principal cities, but the rationale for basic route selection was to connect these cities. 3/

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2. Federal-Aid Highway Act of 1944.

3. Gary T. Schwartz, "Urban Freeways and the Interstate System," Southern California Law Review, vol. 49, no. 3 (March 1976).

In the intervening years, both the desirability and the affordability of local Interstate highways have changed. As noted earlier, the 1973 highway act allowed for transit projects to be substituted for certain local Interstate routes, and in recent years authorizations have been insufficient to finance all current Interstate programs.

In view of these changes, the extent of federal interest in different segments of the system offers one criterion on which to decide which parts of the system are federal responsibilities and which parts might be transferred to the states. In particular, it is useful to distinguish between two types of routes:

- Routes of national importance that directly connect the nation's principal cities and industrial centers.
- Routes of local importance that are not needed to link principal cities, but instead link one or more locations of regional importance or improve traffic circulation within a specified self-contained area.

While these classifications are somewhat judgmental, most routes fall rather clearly into one category or the other, making this distinction a useful tool for exploring how much of the unbuilt system is essential for an interconnected, national network. 4/

Roads of National Importance. Of the 1,575 miles of Interstate highways that are neither built nor under construction, about 60 percent are of national importance (see Table 7). For example, a 40-mile gap in I-70 in rural Utah is classified as nationally important because it breaks the Interstate connection between Denver and Los Angeles and other southwestern points. Across the nation there are 951 miles of incomplete Interstate routes that CBO has similarly classified as having national importance. Most of these routes are concentrated in the South, the South-West, and the Rocky Mountain states, as shown in Figure 2.

Although routes of national importance represent over 50 percent of the unbuilt Interstate System, they account for only 27 percent of total new construction costs. This share differs radically from state to state, as shown in Figure 3. In Maryland, for example, less than 2 percent of new construction costs stems from gaps of national importance. By contrast, all new construction costs in West Virginia and South Dakota stem from gaps in routes that serve chiefly national needs.

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4. The Congressional Budget Office has used these classifications for purposes of analysis in this report.

TABLE 7. COST TO BUILD AND LENGTH OF INTERSTATE ROUTES NEITHER OPEN NOR UNDER CONSTRUCTION a/

	Cost of Unbuilt Routes (In billions of 1979 dollars)	Length of Unbuilt Routes
Routes of National Importance	6.2	951
Routes of Local Importance	16.6	624
Total	22.8	1,575

SOURCE: Congressional Budget Office.

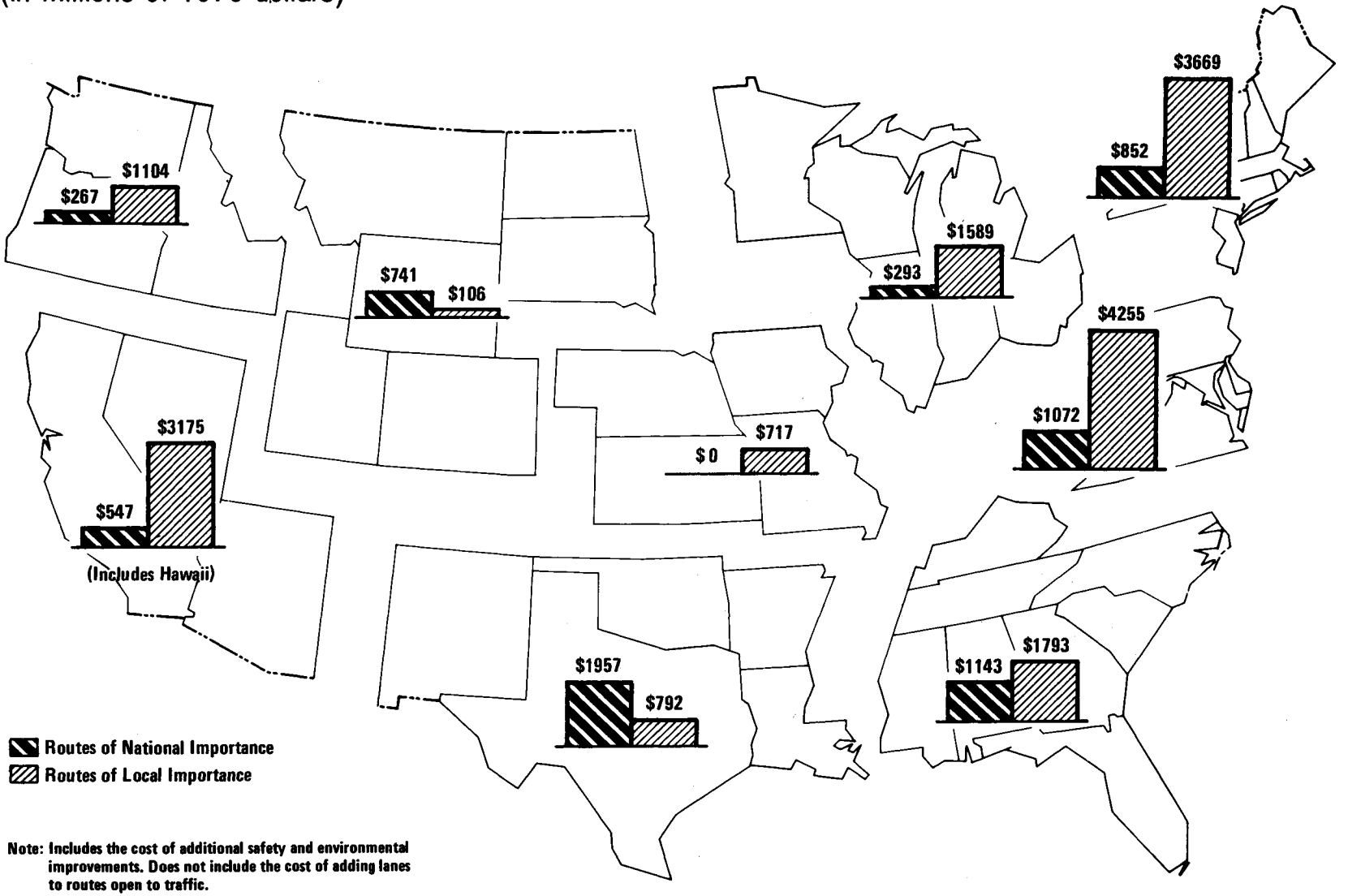
a. Excluding about $1.3 billion in additional safety and environmental improvement identified with existing construction plans.

Roads of Local Importance. About 40 percent of unbuilt Interstate highway mileage is of predominantly local importance. These segments occur along routes that are not part of the network needed to link principal cities together, but rather link facilities of regional importance or improve traffic circulation in congested urban areas. Included here are approximately 186 miles of beltway segments and 218 miles of local spurs that are not yet under construction. These roads of local importance represent 73 percent of the cost to complete all unbuilt Interstate mileage, because numerous unbuilt local segments are located in large urban areas, where construction costs are high, averaging about $35 million per mile.

None of the three options examined in this report would drop unbuilt routes that are needed for a national, interconnected system of roads. Both

Figure 2.

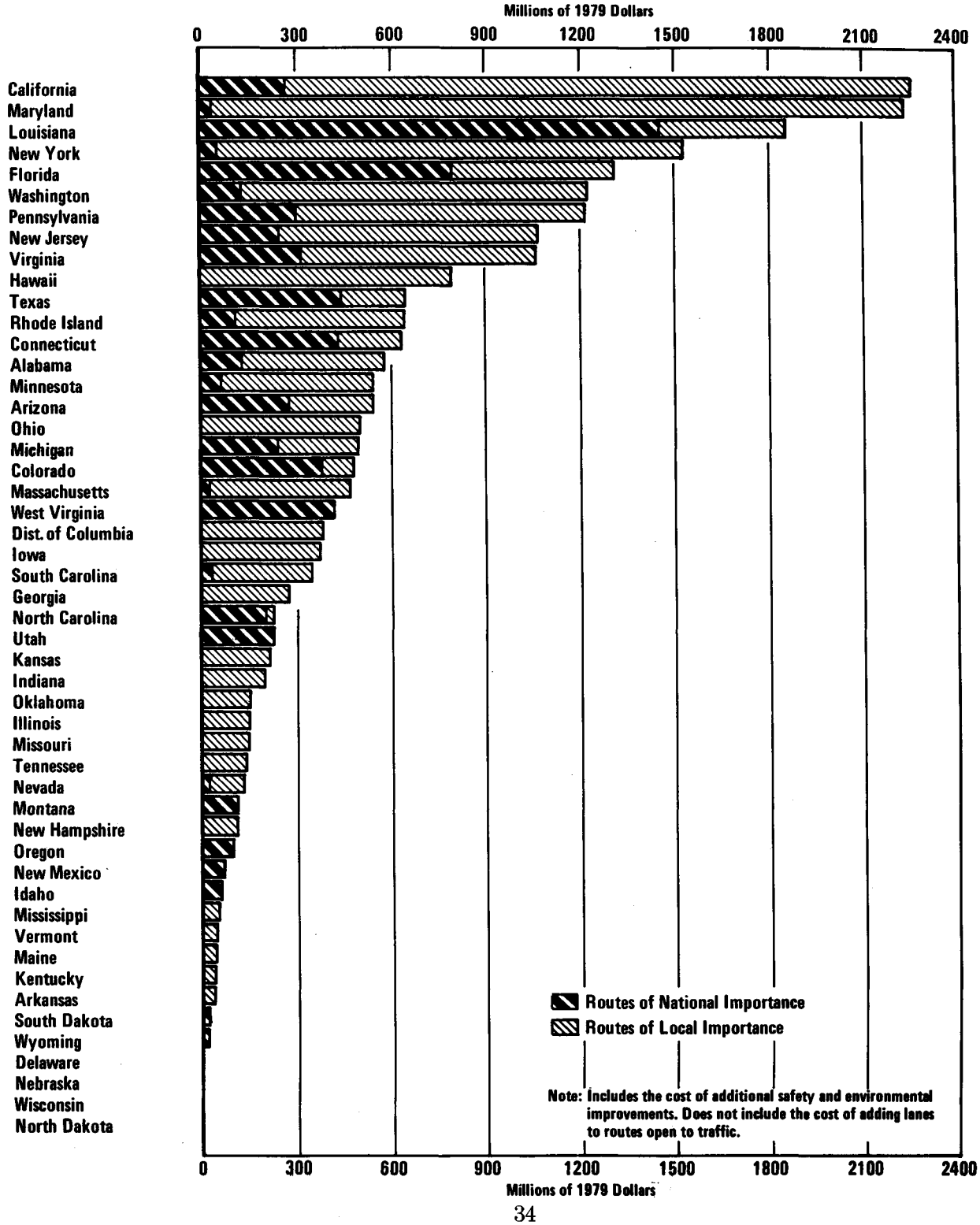
Cost to Complete Interstate Highways, by Region and Category (In millions of 1979 dollars)



Note: Includes the cost of additional safety and environmental improvements. Does not include the cost of adding lanes to routes open to traffic.

Figure 3.

Cost to Complete Interstate Highways, by State and Category



the Minimum and the Intermediate Systems would cut some unbuilt local roads, but they retain all routes of national importance. 5/

By dropping 624 miles of unbuilt route segments of local importance, the Minimum System option would save over $16 billion (in 1979 dollars) in total completion costs compared to the Current Program plan. These deletions affect primarily eastern and midwestern portions of the system; effects would differ sharply from state to state, however, as indicated in Figure 4. While most states would lose some mileage, seven states--California, Indiana, Maryland, New Jersey, Pennsylvania, Rhode Island, and Texas--would lose nearly 40 percent of the total number of miles deleted.

Under the Intermediate System option, local routes with federal approval for construction (that is, local routes that have received design concept approval) would not be dropped from the completion plan. Unbuilt segments to be dropped from the plan under this approach fall to about 250 miles, for a cost saving of over $7 billion (in 1979 dollars).

In summary, both alternatives to the Current Program option would complete nationally important Interstate routes. The Minimum System would focus exclusively on routes of national importance, cutting some projects for which firm federal commitments have previously been made. The Intermediate System option would cut only those unbuilt sections that have not already received federal approval for construction and those lanes that would exceed minimum Interstate standards in rural and urban areas.

Budgetary Effects

The three program alternatives considered in this report would cost from $8.3 billion annually (Minimum System) to $10.2 billion annually (Current Programs) through 1990. These costs would far exceed the $4.4 billion authorized for the Interstate program in fiscal year 1983, and they demonstrate the intense budgetary pressures on authorizations under current policies.

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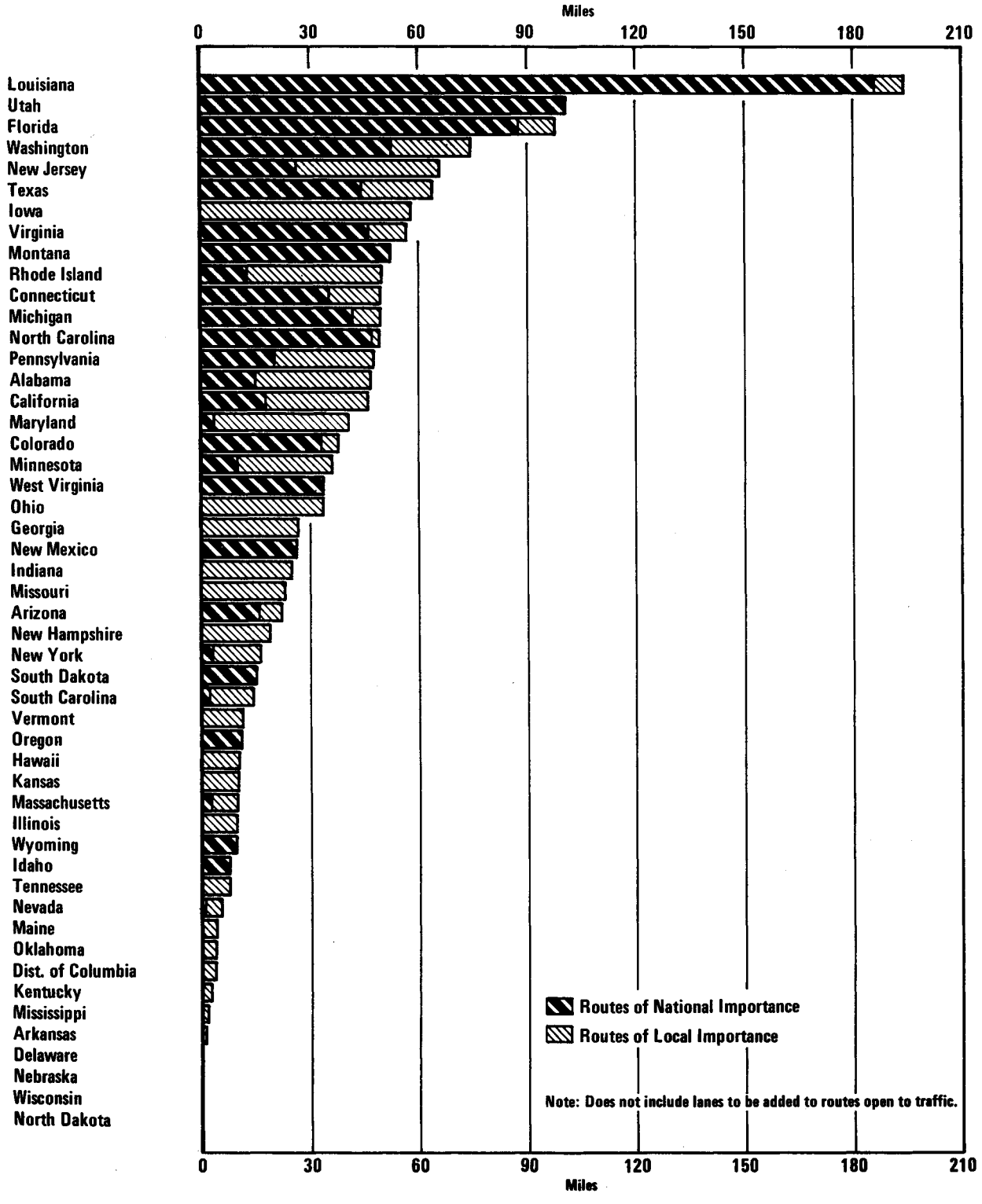
5. The Administration proposal made last year would drop some unbuilt routes, but only those that the Secretary of Transportation finds are not cost-effective, not part of a unified, interconnected system, or environmentally disruptive. The effect of these three conditions on the 1,575 miles of unbuilt routes is uncertain, but the language clearly intends to include all routes that are essential to a national, interconnected route system.

Figure 4.
Miles of Interstate Highways Not Open to Traffic, by State and Category.



Although the Interstate highway program is, like most other highway programs, financed by fuel taxes and other user fees that flow into the Highway Trust Fund, the Interstate program is subject to budgetary pressures similar to those faced by nonhighway programs--any shortfall between highway outlays and highway revenues adds to the federal deficit. Therefore, highway programs have been limited in recent years by "obligation ceilings"--legislation that restricts the total amount of new obligations that can be accumulated in a given year. In addition, non-Interstate highway projects that are substituted for withdrawn Interstate segments are financed from general revenues and thus compete directly with other federal programs for limited resources.

Two other factors have intensified the budgetary pressures on Interstate highway funds. In recent years, inflation in highway construction costs has exceeded the rate of inflation generally, and the need for Interstate System repairs has grown.

The alternative programs presented here could help relieve budgetary pressures in two ways. First, redefining system completion in a way that would exclude some projects would help to hold down total program costs. Continuation of Current Programs would cost $10.2 billion annually; the Minimum System, $8.3 billion; and the Intermediate System, $8.9 billion. Second, isolating the completion of the core system and essential repair needs from reconstruction work would restructure the program so that essential, nationally important parts of the program would be separated from less essential ones. Should future budgetary pressures require, this program structure would permit reconstruction activities to be scaled back without interfering with the most crucial elements needed to complete the Interstate System.

Alternatively, the Congress could continue to authorize much less than is needed to complete the system, keep it in repair, and reconstruct parts of it. Continued deferral of repairs is not necessarily more economical in the long run, however. Nor does deferring completion of gaps in the interconnected national network save money, assuming that the Congress is committed to completing such gaps at some point. Reconstruction projects are the logical ones to limit if budgetary pressures preclude doing everything that the program is trying to do. Indeed, the approach embodied in all three options--that is, fund only half of all eligible reconstruction projects--could be made significantly more restrictive, if necessary. For example, the cost of the Minimum System could be reduced from $8.3 billion to $5.8 billion annually if only one-quarter of all reconstruction projects were built. Somewhat similar results could be obtained by reducing federal matching funds for reconstruction projects, as described in Chapter VI.

Effects on States and Localities

Any attempt to refocus the Interstate program on national needs would probably affect the states unevenly. Continuation of the Current Program option would create the fewest equity problems among the states. The Minimum System would create the most problems, particularly by cutting projects that have been the object of intense local debate and hard-won federal commitments. The Intermediate System would fall somewhere between the other two options in its potential inequities. The creation of the reconstruction category to cover projects that are cut from the complete system design could help compensate states for some of their financial losses, both through its funding and the added flexibility it provides. As noted above, however, this would be the most logical program to cut in order to reduce the costs of completing the system.

Redirection of the Interstate program, with its long history of state and federal interrelated actions, would be complicated by the diversity of approaches taken by individual states and by the many unique situations that have arisen. In this regard, four issues stand out:

- Large states with a disproportionately large number of Interstate miles took longer to build them, and cutting the program now could affect these high-mileage states in a manner perceived to be unfair.

- Program reductions could penalize states that first completed their nationally important routes before turning to locally oriented Interstate projects.

- Some states built, at their own expense, roads that were later incorporated into the Interstate System. As part of the program agreement, such roads were eligible for federal funds to upgrade them to Interstate standards. By curtailing reconstruction activities now, states that contributed locally financed roads could be left with a disproportionate share of costs.

- If a state does not use all federal apportionments within two years, under the requirements of the 1978 highway act, the funds lapse and are placed in a pool for use by other states. To date, a total of $2.4 billion has been reissued in this fashion. Deleting projects from the completion plan now could mean that states which have let apportionments lapse would lose them permanently.

Large States. Changing the federal program at this stage would have particularly adverse effects on some large states. While the needs method of distributing annual construction funds was intended to maintain uniform progress towards system completion, it has not worked out that way in practice because of the disproportionate complexity involved in completing a large system. States with the largest Interstate mileage allotments tend to be those with the most work still to be done. California and Florida, first and sixth in the nation in terms of Interstate mileage, rank first and fifth in terms of costs to complete the system. Texas, Florida, and Louisiana did not even complete the full design of their route systems until the early 1970s, in part because additional mileage was designated in 1968. Thus, they still need to build $2.7 billion in rural roads of national importance. Similarly, states with large metropolitan areas have had to spend more time in the design and public participation process to minimize adverse environmental effects of urban projects. For example, having only just completed the environmental impact process, Maryland and New York recently received design approval to move towards the construction of $2.4 billion in local routes.

States That Completed Nationally Important Routes First. States that acted in the national interest by building routes of national importance first, before turning to locally oriented Interstate roads, would suffer disproportionately if the Interstate completion plan was revised to include national routes only. For example, the state of Georgia would lose funding for I-420 in metropolitan Atlanta under this plan. Had Georgia completed I-420 before turning to its Interstate through-routes, such funding would not be jeopardized. By contrast, the neighboring state of Florida completed most of its urban routes many years ago, and would gain additional federal funding because the large number of nationally important routes still to be built in Florida would boost its share of completion costs.

Toll Roads. When the 1956 act was passed, 5,200 miles of toll roads were already in existence along alignments that were substantially the same as planned Interstate routes. Rather than build entirely new, duplicative roads, the Interstate program incorporated some of these existing roads into the system, and made them eligible for federal funds to bring them up to Interstate standards by adding more lanes and upgrading other features. In exchange, the toll road authorities agreed to apply the toll revenues to the retirement of outstanding construction funds, and once these were retired, to make the roads free. The Kentucky Turnpike is an example of a toll road that has become free by this process.

Several other toll and state-built roads have applied for upgrading projects as allowed under the Interstate program. If such routes were made

ineligible for new construction funding, these states would be at a disadvantage financially. This problem would be most severe under the Minimum System option, which would shift all upgrading work into the reconstruction program. It would be reduced somewhat under the Intermediate System, which would continue to finance as new construction any lane additions needed to meet Interstate standards.

At present, the costs of upgrading toll and state-built roads are included among the costs of system completion as shown in Table 5 in Chapter II. If, as part of the redefinition of the new construction program, these projects were shifted to the reconstruction program, then the states that built these roads could argue that they have been shortchanged. At present, when upgrading of a toll road is financed as new construction, a state with toll roads to upgrade receives funds that it would not otherwise have been allotted. As part of the reconstruction program, however, the apportionment of funds would not increase for a state with toll roads. As a result, states that anticipated the travel needs of the Interstate program by building such roads before the Interstate program began would end up with relatively little federal support.

States Whose Federal Apportionments Have Lapsed. Under the 1978 highway act, apportioned Interstate funds were made available to states for only two years, rather than the four years previously allowed. Funds not expended by states within two years now revert to a pool for use on ready-to-go projects in other states. Assuming the program continues unchanged, the states whose funds were transferred to other states would ultimately recover their funds. As the other states complete their projects, the states that did not use their funds at the first opportunity would receive an increased apportionment reflecting their increased share of the cost to complete the system.

To date, 14 states and Washington, D. C., have deposited $2.4 billion into the fund, with the largest amounts from Maryland, Massachusetts, New Jersey, Pennsylvania, and Washington, D. C. 6/ In all five, funds lapsed because of lengthy environmental disputes over urban projects--projects that would be deleted under the Minimum and Intermediate System options.

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6. The other nine states are Arizona, Illinois, Louisiana, Maine, Minnesota, New Hampshire, Ohio, Rhode Island, and Washington.

National Defense Considerations

One important aspect of an interconnected, national Interstate System is its contribution to national defense preparedness. The Interstate System was created partly in response to the post-World War II recommendation that a system of connected, interstate highways be constructed during peacetime to meet essential national defense requirements. Today, Interstate highways are a crucial component of the nation's defense transportation system. Whether used to move material to ports, troops to airports, or goods to munitions factories, Interstate highways would be heavily used for defense purposes in times of war, just as primary routes played a major role in World War II. Completion of many of the gap sections in the Interstate System would enhance the effectiveness of the system during a military emergency.

In a 1981 study, the Military Traffic Management Command of the Department of Defense identified unbuilt route segments that might have defense significance. 7/ Of the total 1,575 miles of Interstate routes on which construction has not begun, the study reported over two-thirds, more than 1,000 miles, to be of importance to defense interests. The majority of these roads--about two-thirds--were routes of national significance; thus, most would be included under even the most restrictive option, the Minimum System.

Gaps in beltways designated to be of military significance account for about $2 billion of the routes to be dropped under the Minimum System option, and about $1 billion of the segments dropped under the Intermediate System (all figures in 1979 dollars). While elimination of these routes could affect certain possible defense concerns, keeping the overall system in

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7. Department of Defense, Military Traffic Management Command, Interstate Completion Study, Working Paper (September 1981). The criteria used to assess military significance could be used to describe virtually any route on the system. The criteria were: strategic importance, serving transportation centers, serving defense installations and industries, serving Civil Defense, support of industry, support of agriculture, serving Interstate traffic, service through and around cities, clearance requirements, and defense traffic density patterns and trends.

repair is also important to defense. 8/ Thus, it is not clear that there would be any net reduction in the Interstate System's contribution to defense if program priorities were changed according to the two alternatives in this report.

Completion Schedule

Six years after the Interstate System's scheduled completion date of 1972, the Surface Transportation Assistance Act of 1978 established deadlines to ensure that the system would be completed by 1990. It set time limits for decisionmaking on controversial segments, accelerated the process under which states could withdraw unbuilt, nonessential segments from the system, and authorized additional funds for Interstate completion. 9/ Despite these changes, however, the system cannot be completed until the mid-1990s at the earliest at the currently authorized spending level. While details of the schedule vary according to what is assumed about local route withdrawals, the number of environmental projects ultimately to be included in the completion plan, and the rate of inflation, completion by the 1990 deadline is well beyond reach of current authorizations. Indeed, if the Congress were to reduce current authorizations, then spending levels could prove to be insufficient to offset the rate of inflation, and completion costs would continue to rise each year. Similarly, if inflation increased at an annual rate of 13 percent, then the costs of the Interstate system would rise more rapidly than they could be offset by finishing projects that can be financed at current authorization levels, thereby making completion unattainable by any date.

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8. In fact, the Department of Defense has suggested that highway maintenance be given a high priority in the federal highway program. See Military Traffic Management Command, An Analysis of the Highways for National Defense Program (May 1981).

9. The act establishes that all routes requiring an Environmental Impact Statement must have it submitted by September 30, 1983. Similarly, if a route is to be withdrawn from the system, an "overall concept" of substitute projects must be submitted to the Secretary of Transportation by September 30, 1983. The Secretary is prohibited from approving any substitute projects after that date. Finally, all routes must be under construction, or under contract for construction, by September 30, 1986. Any route that fails to meet these deadlines must be removed from the Interstate System by the Secretary, and funding of substitute projects is cancelled.

By focusing on the essential parts of an interconnected, national road system, both the Minimum and the Intermediate System options would reduce the cost of completing the system, thereby making it more likely that the necessary tax revenues could be raised to complete the system as scheduled.

CHAPTER IV. INCREASES IN HIGHWAY USER TAXES

The three options discussed in this report could help to shift Interstate program priorities so that both a national road network could be completed and all Interstate routes properly repaired. Even with changes in program emphasis, however, increased financing would be required as well to achieve these goals. As now funded, continuation of present policies would neither complete the currently planned system nor allow adequate funds for repairs. The current annual authorization level of $4.4 billion could complete the Minimum System and fund adequate repairs, but its strict conception of system completion might be extremely difficult for many states to accept. The Intermediate System, which attempts to balance these concerns, would require additional financing for completion and repairs, particularly if funds were devoted to reconstruction as well.

This chapter explores two financing changes that could help the Interstate program meet programmatic and budgetary demands:

- Increase highway user taxes to pay for all the options described in the preceding chapter. This method would maintain the present 90/10 federal financing share for new construction, repair, and reconstruction activities.

- Reduce the federal matching share for repairs and reconstruction. This approach would also require some increase in highway user taxes to finance one of the alternatives discussed earlier. But because of the assumed lower level of federal cost sharing, the necessary tax increases would be smaller.

RAISE HIGHWAY USER TAXES BUT MAINTAIN FEDERAL 90 PERCENT SHARE OF COSTS

Meeting the high costs of the Interstate program would require increases in highway user taxes. Tax increases alone, however, would not provide a feasible solution to the Interstate System's financial problem, because of the enormous amounts needed. To finance the Current Program option, as defined in the preceding chapter, would require a massive increase in highway user taxes--from the current 4 cents per gallon tax on

motor fuels to over 9 cents per gallon--in order to raise the necessary additional revenues.

This is a large financial requirement, especially when compared to proposals now being discussed. Secretary of Transportation Drew Lewis recently proposed increasing the motor fuels tax by 5 cents per gallon, of which 4 cents would be for all highway programs (the other cent would be allocated to mass transit). Only a proportion of the revenue from the 4 cents increase would go to the Interstate Highway program, however. Thus, the annual costs of the current Interstate program would still exceed the resources of the much expanded Highway Trust Fund proposed by Secretary Lewis, even if financing was provided for only half of all currently eligible reconstruction projects.

The financial requirements of the other program options--the Minimum and Intermediate Systems--are less demanding. By shifting more projects from new construction to reconstruction, these options reduce the Interstate's completion costs (again assuming that only half of all eligible reconstruction projects are financed). As a result, an increase in the motor fuels tax of 3.5 cents per gallon--to a total of 7.5 cents--would finance the Minimum System and an increase of 4.1 cents per gallon--to a total of 8.1 cents--would pay for the Intermediate System.

REDUCING THE FEDERAL MATCHING SHARE

As the above estimates of tax increases indicate, the additional taxes needed to complete the Interstate System would be sizable, even if more projects were shifted from new construction to reconstruction and only half of the latter receive financing. Although the Congress could delay increases in highway user taxes by continuing to defer repair and reconstruction projects, such an approach would not necessarily channel program resources to the projects of greatest national interest, nor would it necessarily yield reductions in program costs in the long run.

An additional change that could help to achieve a long-run resolution of the financial problems of the Interstate program would be to reduce the current 90 percent federal matching share for reconstruction and repairs. Not only would this help to relieve the financial pressures now confronting the program; it would also adjust program incentives to reflect the national scope of the system, for which routes are almost all completed.

As noted earlier, when federal funds for construction are provided on a 90/10 matching basis, the impact on state economies of each program dollar

spent may actually exceed the 10 cents of state funds expended. Under these conditions, states might seek as many projects as possible, possibly without regard for the transportation needs they might serve.

Generous federal incentives of this sort might have been ideal for encouraging the states to build their new Interstate routes quickly and in compliance with federal needs and standards. The expansionary incentive implicit in this matching arrangement was not a serious problem for new routes, which by and large were limited by the system plan established in legislation at the start of the program (although mileage has been added several times in subsequent legislation).

As reconstruction and repairs have become the dominant program costs for the next decade, however, the 90/10 matching provisions might be inappropriate for these activities. Repair and reconstruction programs are inherently open-ended, particularly in the case of urban freeways. Environmental, safety, and aesthetic features of these freeways are frequently matters of intense local concern. Most major repairs or reconstruction are not simply a matter of replacing worn-out roads, but simultaneously improving them to meet the particular needs of the sites.

While many improvements of this sort are unquestionably desirable, the availability of 90 percent in federal funding could distort the incentives that go into planning these improvements. The large amount of federal money flowing into the area could outweigh the balancing of local costs and benefits. This distortion could be lessened by reducing the federal percentage for reconstruction projects and, perhaps, repair projects as well. This approach would continue to reflect a federal interest in reconstruction, but it would dampen the expansionary influence embodied in current federal financing provisions.

Federal funding might be more closely aligned with federal priorities by enacting different matching ratios, depending upon the extent of national interest in various program categories. Completion of gaps in the interconnected, national system of roads has important consequences for interstate commerce, travel, and national defense. For this purpose, CBO has assumed that the federal government would continue to finance 90 percent of the cost of new construction, but would reduce its share of repair costs to 75 percent and of reconstruction expenses to 50 percent. Further, CBO assumed for all other Interstate projects that all repair projects would be built at the new 75 percent rate, and that each state's apportionment for reconstruction would be fully expended at the new 50 percent rate.

These illustrative matching ratios are arbitrary, and necessarily so, since the exact balance of local and federal interests in any particular project would be impossible to define systematically. For example, the need to widen congested urban Interstate segments might be clearly attributable to local commuter traffic, but there might also be significant benefits for nonlocal traffic as well. Similarly, erection of noise barriers clearly would protect local residents, although the source of the noise might come from nonlocal trucks. Virtually all reconstruction and repair projects involve some mix of national and local responsibilities and benefits. The matching ratios used here illustrate how ratios could be adjusted to reflect varying degrees of national interest. This approach, combined with the various program options discussed in Chapter III, could yield an Interstate program more tightly focused on national priorities and more responsive to repair requirements. By financing only half of all currently envisioned reconstruction needs and by reducing the federal cost share to 50 percent for reconstruction and 75 percent for repairs, additional federal support of about $4.3 billion a year would be needed to continue Current Programs. Under the same assumptions, $1.4 billion more would be needed annually to support the Minimum System option, and an additional $2.3 billion annually for the Intermediate System (see Table 8).

TABLE 8. ADDITIONAL ANNUAL AUTHORIZATIONS NEEDED UNDER FINANCING OPTIONS AND PROGRAM ALTERNATIVES (Federal funds needed in addition to $4.4 billion now authorized, in billions of 1979 dollars)

Program Alternative	Increased Highway Authorizations Under Current 90/10 Matching Ratio	Increased Highway Authorizations with Reduced Federal Matching Share[a]
Current Programs	5.8	4.3
Minimum System	3.9	1.4
Intermediate System	4.5	2.3

a. This financing option assumes the following federal shares in each category: 90 percent for new construction; 75 percent for repairs; and 50 percent for reconstruction.

The increases in motor fuels taxes needed to support these programs would be substantially smaller than if the federal matching provisions were reduced, as suggested above. With the assumed reductions in federal share, continuation of Current Programs would require an increase of 3.9 cents per gallon in the motor fuels tax. Enactment of the Intermediate System would require much less--an increase of about 2.1 cents per gallon--and the Minimum System could be financed by a tax increase of only 1.3 cent per gallon (see Table 9).

TABLE 9. INCREASE IN MOTOR FUELS TAXES NEEDED UNDER FINANCING OPTIONS AND PROGRAM ALTERNATIVES (Motor fuel tax needed in addition to 4 cents per gallon now levied, in cents per gallon)

Program Alternative	Increased Highway User Taxes Under Current 90/10 Matching Ratio	Increased Highway User Taxes With Reduced Federal Matching Share a/
Current Programs	5.3	3.9
Minimum System	3.5	1.3
Intermediate System	4.1	2.1

a. This financing option assumes the following federal shares in each category: 90 percent for new construction; 75 percent for repairs; and 50 percent for reconstruction.

CHAPTER V. TRANSFER NONINTERSTATE HIGHWAY PROGRAMS TO THE STATES

Even if the Interstate program was redesigned to place greater emphasis on completion of nationally important routes and on more repairs and less new construction, these activities would require a higher level of funding than the $4.4 billion currently authorized for fiscal year 1983. Depending upon the extent and terms of federal support for upgrading projects and other work eligible for reconstruction funds, the increased financing requirements could be substantial--30 to 130 percent or more above current authorizations.

REASONS FOR TRANSFER OF OTHER PROGRAMS TO THE STATES

These massive demands for additional Interstate funds come at a time of severe federal budgetary constraints and an emerging emphasis on federalism. Because the Interstate program is authorized at the same time as more than 30 other federal highway programs, and because the Highway Trust Fund finances many of these activities, any consideration of major changes in the Interstate program or its financing would inevitably induce similar scrutiny of other highway programs.

The unique national scope of the Interstate System creates an exceptional federal interest in this program compared to many other highway activities. As the nation reconsiders the appropriate degree of federal involvement in various programs, one treatment for highway programs would be to shift federal resources from those of lower national importance into the Interstate System.

More than 30 different federal highway programs are now authorized, with most of the general purpose ones financed from the Highway Trust Fund. The largest programs are the primary road system ($1.5 billion in fiscal year 1982), the secondary system ($400 million), the urban system ($800 million), and the bridge replacement program ($900 million). All other trust fund authorizations together totaled $813 million in fiscal year 1982. In addition, about $800 million in general revenues were authorized for highways in 1982, although only about $500 million of this was appropriated.

The extent of federal interest in different highway programs varies and, in some cases, has shifted significantly over time. Some of the programs have become essentially revenue-sharing ones. (The structure and evolution of various major highway programs is described in Appendix B.) As ways are sought to finance the completion and repair of the Interstate System, the federal government could transfer to the states responsibility for those highway programs in which there is less national interest, and use the savings for Interstate routes.

OPTIONS FOR TRANSFERRING PROGRAMS TO THE STATES AND LOCALITIES

Although federal, state, and local interests in roads overlap substantially, there are significant differences in the extent of national interest in various highway programs. From a transportation viewpoint, roads that link activities in different states and contribute to interstate commerce are of prime national importance, while roads that serve local traffic needs or that link localities to the national network are of lesser national importance. But there are other aspects to national interest as well. For example, some safety-related programs produce research or guidance that benefits the nation generally, and others provide some minimum threshold safety features that permit motorists to travel anywhere in the country without fear of extraordinary local hazards. The relative national priorities of specific safety programs can be argued, but there appear to be clear national interests in this area. Similarly, roads promoting resource development or recreation contribute to the national well-being, although their local importance is equally clear.

While the division among them is not precise, three general groups of non-Interstate highways are currently authorized and financed by the Highway Trust Fund (see Table 10):

- Programs that provide major intercity arteries,
- Revenue-sharing activities, and
- Safety and other programs.

Intercity Arteries Programs

Programs that provide intercity arteries include the primary system and that part of the bridge replacement program that applies to the primary

TABLE 10. TYPES OF NONINTERSTATE FEDERAL HIGHWAY PROGRAMS FINANCED BY THE HIGHWAY TRUST FUND

Program	Fiscal Year 1982 Authorizations (In thousands of dollars)
Programs that Provide Intercity Arteries	
Primary system	1,500
Part of bridge construction and reconstruction applied to primary routes a/	400
Subtotal, intercity arteries	1,900
Revenue-Sharing Activities	
Secondary system	400
Urban system	800
Part of bridge replacement and reconstruction applied to nonprimary routes	500
Subtotal, revenue sharing	1,700
Safety and Other Specialized Programs	
Rail-highway crossings	240
Pavement marking and hazard removal	265
Categorical safety programs	159
Emergency relief	100
Economic growth centers	50
Forest and other recreational roads	84
Subtotal, other programs	898
Total	4,498

a. Estimate based on proportion of fiscal years 1979-1981 Bridge Construction and Reconstruction Program funds that were obligated to bridges on the Interstate and Primary systems.

system. These two federal programs authorized about $1.9 billion in fiscal year 1982 on the primary system. Because of the relatively strong national interest in these programs, it is assumed that federal support for them will be continued.

Primary routes in rural areas carry twice as much interstate traffic as the Interstate System, and primary system routes are defined in legislation to comprise an "adequate system of connected main roads . . . ." While some routes on the primary system may not be major intercity arteries, their percentage of the total system cannot be estimated because of a lack of data. For simplicity in this discussion, therefore, all primary routes are considered major intercity arteries.

Revenue-Sharing Programs

The need for federal support for the other two types of highway programs depicted in Table 10 is less clear. The secondary and urban systems and the parts of the bridge replacement program outside the primary system are essentially revenue-sharing programs. Although the secondary system originally consisted of farm-to-market routes, it grew to include almost any nonprimary route, and it now encompases 93 percent of all major rural roads in the country. Similarly, the urban system can include many routes not included on another federally aided system. Federal funding for the secondary and urban programs is only a small part of their total costs, with the states and localities spending the greater share. Federal criteria delimiting the extent of these systems are generally loose. While discontinuation of federal support for these programs would impose a burden on state and county finances, such an action would have only relatively minor effects on the ability of people and goods to move throughout the nation. Accordingly, about $1.7 billion in revenues used to fund these programs could be shifted to other, more nationally important programs should the Congress choose to terminate these revenue-sharing programs.

Such a transfer of costs to the states and localities could substantially alleviate the need to increase highway user taxes. For example, if the Intermediate System was adopted and financing was provided for only half of all reconstruction projects, then the increase in the motor fuels tax needed to support the program would fall to 1.9 cents per gallon, down 2.2 cents from the tax that would be needed if the revenue-sharing programs were retained. Under the Minimum System, the increase needed would be 1.3 cents. Similarly, the tax increases required under the Current Program option and financing alternatives could also be reduced by 2.2 cents per gallon, resulting in the net tax increases shown in Table 11.

TABLE 11. MOTOR FUELS TAX INCREASES REQUIRED IF FEDERAL HIGHWAY AID IS ENDED FOR REVENUE-SHARING TYPE PROGRAMS (In cents per gallon of increase)

Program Option a/	Increased Highway User Taxes Under Current 90/10 Matching Ratio	Increased Highway User Taxes with Reduced Federal Matching Share b/
Current Programs	3.1	1.7
Minimum System	1.3	c/
Intermediate System	1.9	c/

a. Options are described in Chapter III.

b. Options are described in Chapter IV.

c. No tax increase required.

Safety and Other Programs

Although there is some federal interest in safety and other categorical programs, the need for national support appears less compelling than it is for roads that interconnect the various states and that carry significant components of intercity travel. If the Congress should choose to eliminate highway safety and other categorical programs and concentrate federal highway aid exclusively on the Interstate and primary systems, this would free about $3.7 billion a year compared to current policy--the equivalent of a tax on motor fuel of around 3.4 cents per gallon. This change would yield more than enough revenue to finance the Minimum System and almost enough to finance the Intermediate System and would make continuation of Current Programs viable if the tax on motor fuels were increased by about 2 cents per gallon (see Table 12).

Any large-scale transfer of highway programs to the states would reverse the trend of past years, during which the scope of federal highway programs has increased. The options discussed in this paper, however, are

TABLE 12. MOTOR FUELS TAX INCREASES REQUIRED IF FEDERAL HIGHWAY AID IS FOCUSED EXCLUSIVELY ON INTERSTATE AND PRIMARY SYSTEMS (In cents per gallon of increase)

Program Option [a]	Increased Highway User Taxes Under Current 90/10 Matching Ratio	Increased HIghway User Taxes with Reduced Federal Matching Share [b]
Current Programs	1.6	0.2
Minimum System	[c]	[c]
Intermediate System	0.4	[c]

a. Options are described in Chapter III.

b. Options are described in Chapter IV.

c. No tax increase required.

less drastic than the new federalism outlined by President Reagan, under which the federal government would retain only the Interstate program. These alternatives show that substantial relief from the current financial pressures facing the Interstate Highway System could be achieved if funding for less nationally important highway programs was shifted to this purpose.

If the Congress refocused federal highway aid exclusively on the Interstate and primary systems, it might still need to increase highway user taxes, particularly if adequate revenue sources were transferred to the states along with any transferred programs. Thus any estimated reductions in the amount by which highway user taxes would need to be raised to support various Interstate programs might not be achieved for several years. Transferring both the programs and the associated revenues would substantially alleviate any financial burdens on the states. Indeed, because these funds would not be tied to specialized programs, the states would gain flexibility that would permit them to spend more on projects that are of high priority to them. At the same time, this new latitude could create some organizational stress, as various factions pressure state agencies and legislatures to spend these funds on their favored projects.

APPENDIXES

APPENDIX A. COSTS OF THE INTERSTATE SYSTEM 1/

Interstate program costs fall into five categories:

- o Cost to complete routes not yet open;
- o Cost to complete final stages of work on segments already open;
- o Cost to upgrade routes already open;
- o Cost of repairs; and
- o Cost of reconstruction.

The total completion bill of $38.8 billion (in 1979 dollars) includes all costs in the first three categories, namely, completion of routes not yet open ($26.1 billion); final stage construction ($1.4 billion); upgrading open highways ($11.1 billion); and miscellaneous costs ($0.2 billion). 2/

Repairs are projected to cost an additional $16 billion between calendar years 1980 and 1990, and reconstruction projects could add another $26.4 billion if all such projects were built. Each of the five cost categories is discussed below. Together, they total more than $80 billion between 1980 and 1990.

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1. All costs in Appendix A are in 1979 dollars.

2. The most recent estimates of the completion costs for the Interstate System came from a nationwide survey of the states conducted by the Federal Highway Administration (FHWA) in January, 1980. CBO has updated the survey to the extent possible, using the FHWA monitoring system, but a comprehensive update will not be available until January, 1983.

Costs to Complete Routes Not Yet Open

Route completion is the largest single category of Interstate costs, totalling $26.1 billion. This estimate is uncertain for two major reasons. First, it depends upon the extent to which states decide not to finish incomplete route segments, an option available to them under the Federal-Aid Highway Acts of 1973 and 1978. 3/ The estimate of $26.1 billion presented here assumes that states will withdraw about $2.5 billion in unbuilt route segments, and that the completion costs will decline by the same amount.

Second, under the 1981 act, new routes must meet "essential environmental requirements." The $26.1 billion includes a rough estimate of $3.0 billion for these environmental requirements, based on the graction of the cost of environmental features for recently designed highways. Since many unbuilt segments have not yet been fully designed, it is impossible to make a precise cost allowance for environmental features, such as carpool lanes, noise walls, landscaping, and so on. In particular, over 70 percent of the undesigned mileage is in urban areas where congestion makes carpool lanes highly desirable from the local standpoint, although extremely expensive (over $40 million per mile) from the federal standpoint. Few carpool lanes have been built as parts of recently completed segments--many of which are in rural areas--and their cost may, therefore, be underrepresented in the $3.0 billion projected here. On the other hand, these costs might be offset somewhat if states decide not to finish more segments than allowed for in this report. On balance, the estimated cost of $26.1 billion appears reasonable for routes not yet open in light of these uncertain factors.

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3. Under the Federal Highway Acts of 1973 and 1978, states are permitted to make such withdrawals from the plan and apply for an equivalent sum to be spent on non-Interstate highway projects or on public transit projects. The equivalent sum must be appropriated from general revenues, however, rather than paid from the Highway Trust Fund. Thus, in deciding whether to withdraw routes, states must consider the risk of losing funds because the Congress may not appropriate funds for substitute projects because of federal budget constraints. The deadline for withdrawing routes is September 1983.

Stage Construction Costs

The second category of costs applies to states that built their Interstate routes in two or more stages. Some states, notably Georgia, built a number of Interstate routes to a minimum standard and planned to upgrade them at a later date to allow the opening of other segments as quickly as possible. The deferred work, which involves adding layers of pavement and, in a few cases, lanes and interchanges, is generally known as "stage construction." Stage construction that is eligible for federal financing will cost about $1.4 billion.

Cost to Upgrade Routes Now Open

In addition to unbuilt routes and stage construction, the third category of completion costs includes upgrading projects that were added after the program began. Compared to more recent Interstate highways, early routes were built with less capacity and fewer safety and environmental features. Such features have been included in the program mainly through new legislation over the years, but also in response to applications from individual states to add capacity, such as extra interchanges, lanes, and other facilities to accommodate traffic growth.

The cost of upgrading segments of the Interstate System is estimated to be about $11.1 billion. The kind of projects involved in upgrading Interstate highways varies greatly, including additional lanes and interchanges; safety improvements, such as nonskid pavement and breakaway signs; rest areas; bicycle and pedestrian paths; and noise barriers. About $9.1 billion of these upgrading costs is to increase capacity; the remaining $2.0 billion is for safety projects, noise barriers, and amenities (see Table A-1).

Construction of additional lanes is the most costly type of upgrading. Part of the total is for state-built roads incorporated into the Interstate program. The West Virginia Turnpike for example requires additional lanes to bring them up to the four-lane minimum Interstate standard. Of the $7.9 billion to complete additional lanes, around $1.9 billion is to bring two-lane routes up to minimum.

Repair Costs

Keeping the Interstate System in good repair will cost increasingly more in the years ahead, whether these costs are assumed by the federal government or left to the states. Since 1956, an average of 1,400 Interstate

miles have been opened annually, and mileage is now reaching the end of its design life at about the same pace. Current federal authorizations for repairs fall far short of their projected cost.

TABLE A-1. COST OF UPGRADING OPEN INTERSTATE HIGHWAYS, BY CATEGORY (In billions of 1979 dollars)

	New Interstate Highways Built With Federal Funding	Existing Roads Later Incorporated Into the Interstate System	All Interstate Highways
Additional Lanes and Interchanges			
Mixed traffic lanes	2.3	5.6	7.9
Carpool lanes	1.2	0.0	1.2
Additional Safety and Environmental Improvements and Amenities	0.6	1.4	2.0
Total	4.1	7.0	11.1

SOURCE: Congressional Budget Office and U. S. Federal Highway Administration.

Repairs include the addition of pavement layers, the replacement of malfunctioning joints, repair of shipping and splintering, pavement undersealing, grinding and grooving of faulted pavements to restore smoothness, and reworking or strengthening of bases or sub-bases. Bridge repairs, including the complete removal and replacement of an entire bridge deck, are eligible for repair funds, as well. Collectively, these repair activities

are often referred to as resurfacing, rehabilitiation, and restoration, or "3Rs". For simplicity, this paper refers to all these activities as repairs.

The measurement of pavement and sub-base conditions is largely judgmental, and projected needs are thus subject to a great deal of uncertainty. Based on studies made by individual states, the Department of Transportation projected that repairs would cost $21 billion (in 1979 dollars) between calendar years 1980 and 1989. Further, this projection warned that delaying these projects could increase their costs disproportionately, since the rate of deterioration is thought to accelerate as pavement condition worsens, depending upon traffic conditions, age, weather, drainage, and other conditions. There are, however, several reasons why this estimate may be too high. First, from 1980 to 1989, about 26,000 miles of Interstate highways will reach the end of their design lives of 20 years. (This number also includes estimated mileage that reached design life in the 1970s and has not been repaired.) Assuming that the current cost-per-mile for repair work remains constant (in real dollars) at $570,000, 4/ then repair in accordance with design life implies that about $15 billion would be needed for repairs during the 1980s.

Second, there might have been an incentive for states to overstate their repair needs. These studies were prepared in response to a Congressional directive, for use in assessing the federal financial role in highway maintenance. State-assessed needs to determine federal funding have led to overstated estimates of highway needs in the past, notably where tight, objective standards were not established as a basis for the self-assessment. Neither minimum nor maximum standards were uniformly enforced for the 1980 study; the only restraint imposed was that roads had to be in service for five years before qualifying for the study.

Third, a separate study of repair costs made by the Department of Transportation (DOT) projected costs of $16 million. 5/ The DOT study did not rely exclusively on each state's own assessments of its repair needs. Rather, it relied upon a subjective but standardized "Present Serviceability Rating" of the road surface, ranging from four to five for new pavement in good condition (see Figure A-1-a) to zero for pavement is in poor condition.

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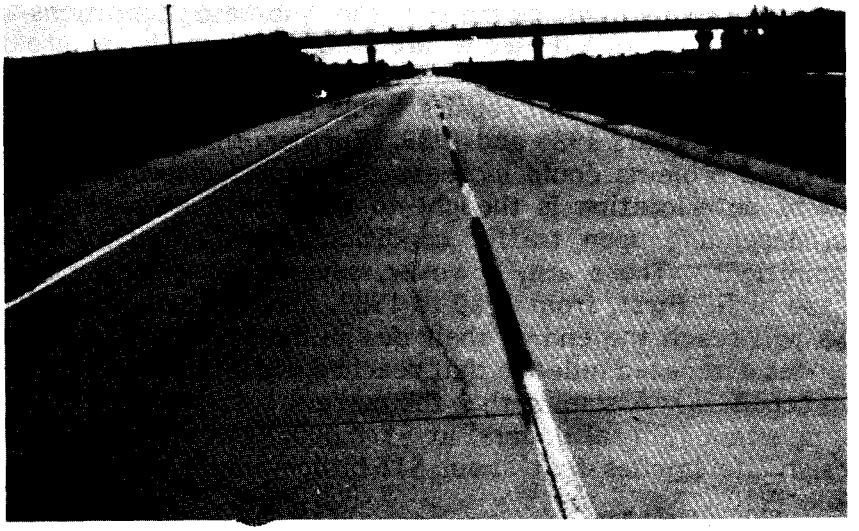
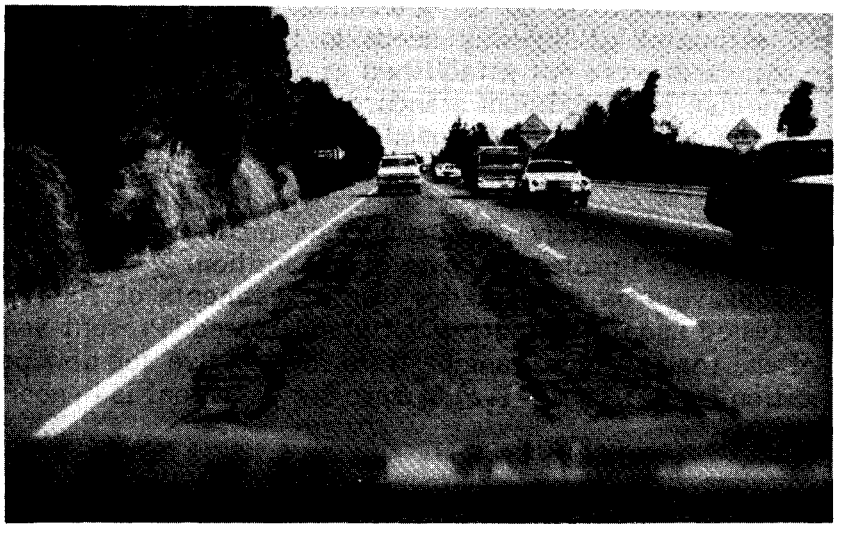
4. This estimate assumes that repairs are made as soon as a road reached its design life.

5. U. S. Department of Transportation, The Status of the Nation's Highways, Conditions and Performance (1981).

Figure A-1.
Degree of Pavement Condition



a. *Pavement in good condition.* About 62 percent of all Interstate highway mileage was in this condition in 1978. Such pavement may exhibit some light cracking, but in general it is smooth and safe for high-speed traffic. The section shown above exhibits some low-severity longitudinal cracking.

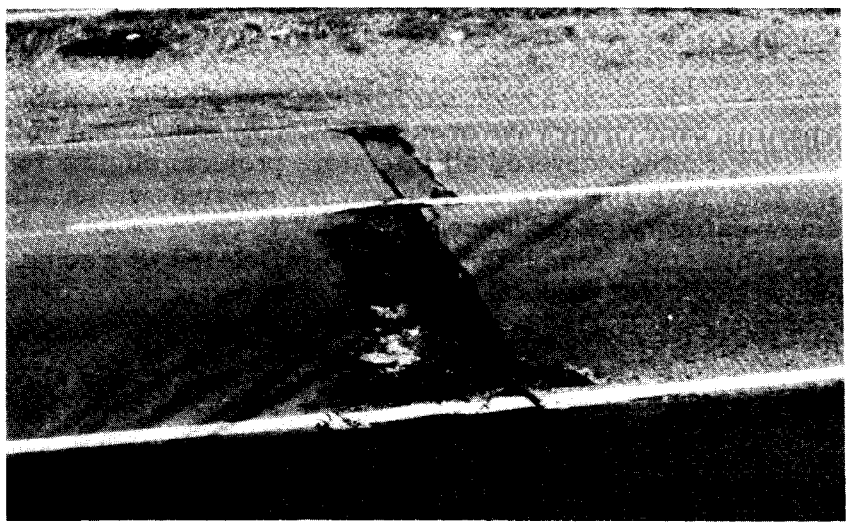


b. *Pavement in fair condition.* This represented about 29 percent of all Interstate highway mileage in 1978. Fair pavement exhibits rutting and cracking and may be barely adequate for high-speed traffic. The above section exhibits medium severity "alligator cracking" in the wheel paths.

SOURCE: U.S. Department of Transportation, *Highway Pavement Distress Identification Manual for Highway Condition and Quality of Highway Construction Survey* (March 1979).

Figure A-1. (Continued)

c. *Pavement in poor condition.* About 9 percent of all Interstate highway mileage was in this condition in 1978. Poor pavement is in extremely deteriorated condition, and may need new sub-base and base material in addition to resurfacing. The above section exhibits high-severity longitudinal cracking in the center lane.



d. *Pavement in poor condition.* Same characteristics as photograph c. The above section shows high-severity joint load transfer system associated deterioration.

About 9 percent of all Interstate highway mileage was found to be in poor condition (see Figure A-1-c and d). The term poor covers pavement that is in an extremely deteriorated condition (cracked, splintering, and uneven) and that may need new sub-base and base material in addition to resurfacing; it also covers pavements that have not deteriorated quite as badly, but do need resurfacing. 6/ Another 29 percent of all Interstate mileage was reported to be in "fair" condition, defined as pavement that exhibits rutting, cracking and extensive patching, and that is barely adequate for high-speed traffic (see Figure A-1-b). Such pavements do not require immediate resurfacing, but delay in resurfacing the worst of them is thought to accelerate wear and tear, and cause premature need for major sub-base and base restoration.

The DOT study's projected repair requirements were based on the assumption that roads will be resurfaced as soon as their pavement serviceability ratings fall below 2.5, a point at which the riding quality of pavement is noticeably inferior to that of new pavement and, according to engineering tests, may be barely tolerable for high-speed traffic. Such pavement exhibits visible signs of wear, such as cracking and extensive patching. In view of these considerations, this paper assumes that repairs will cost approximate $16 billion between 1980 and 1990, in line with the later DOT study.

Reconstruction Costs

Before 1981, the four above categories--completing routes not yet open, completing final stages on open routes, upgrading open routes, and repaving existing routes--covered all Interstate projects eligible for federal financing. The 1981 highway act, however, created within the repair program a new category called "reconstruction" to cover projects that were cut from the Interstate completion program. Deleted upgrading projects were made eligible for federal funds as reconstruction costs. Over

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6. About half the states are reported to have less than 2 percent of their Interstates in poor condition. Only five states--Arizona, Minnesota, North Carolina, Ohio, and Oregon--are reported to have more than 10 percent in poor condition, indicating that these states have substantially poorer roads than the other states.

$14 billion of such work was redefined as reconstruction projects (see Table A-2).

In addition, other deleted projects could be reclassified as reconstruction. Based on a recent national survey by the Federal Highway Administration, the estimated demade for additional reconstruction projects, above those previously included in the completion plan, would cost about $12.2 bil-

TABLE A-2. COST OF RECONSTRUCTION OF INTERSTATE HIGHWAYS AND BRIDGES, BY CATEGORY (In billions of 1979 dollars)

Reconstruction Category	Cost
Projects Transferred From the Interstate Completion Plan [a]	
Spot Improvements	4.40
Rest Areas	0.80
Bridges and Tunnels	0.74
Landscaping	0.70
Highway separation	0.55
Traffic control	0.54
Noise abatement	0.47
Railroad separation	0.20
Pedestrian and bicycle facilities	0.19
Stage Construction of Safety and Environmental Improvements	0.40
Miscellaneous Construction	1.00
Engineering and Contingencies	4.21
Subtotal	14.20
Other Projected Costs	12.20
Total	26.40

a. Breakdown of costs by type of project estimated by CBO.

lion (in 1979 dollars) over the next ten years. 7/ This would bring the total cost of reconstruction of $26.4 billion. A large portion of reconstruction costs--about 30 percent--stem from spot safety improvements, while the remaining 60 percent covers rest areas, landscaping, noise abatement, and other environmental projects (see Table A-2).

7. Unpublished estimate drawn from U. S. Department of Transportation, Interstate Resurfacing, Restoration, and Rehabilitation Study (1980 update).

APPENDIX B. THE DEVELOPMENT OF PROGRAMS FOR FEDERAL AID TO HIGHWAYS

The federal government operates more than 30 programs that help finance highways or highway-related activities (see Table B-1). Most of these are funded from the Highway Trust Fund. In addition to financing the Interstate System from the fund, in fiscal year 1982 the federal government authorized $1.5 billion for the primary system, $400 million for the secondary, $800 million for the urban system, $900 million for bridge reconstruction, and $813 million for various other highway programs. More than $500 million in general revenues also were spent to support various highway activities, and several programs were authorized with joint financing from the Highway Trust Fund and general revenues.

Primary Program

Federal assistance for the primary highway system dates back to 1916, when the inadequacy of the main intercity arteries represented the paramount highway needs of the nation. Today, federal highway legislation defines the primary system, which consists of 269,433 route miles, as "an adequate system of connected main roads." These highways are primarily the U. S.-numbered roads--routes U. S. 1, U. S. 66, and so forth--many of which are similar in character to Interstate routes, since they are intercity, have more than two lanes, and have limited access. Even with the creation of the Interstate system, the primary system today carries twice as much traffic in rural areas as the Interstate System.

Although the primary system is national, the designation of all 269,433 route miles as nationally important may well overstate the mileage that is essential to a national network of primary routes. Whereas the federal government plays a decisive role in the selection of Interstate routes, the designation of primary routes is left largely to the states. Currently, the law requires that the system shall "consist of an adequate system of connected main roads important to interstate, statewide, and regional travel, consisting of rural arterial routes and their extensions into or through urban areas." 1/ While there is no systematic basis for distinguish-

1. Federal-Aid Highway Act of 1973 (P. L. 93-87).

TABLE B-1. HIGHWAY PROGRAM AUTHORIZATIONS IN FISCAL YEAR 1982, BY SOURCE OF FUNDS AND PROGRAM (In millions of dollars)

Source of Funds and Program	Fiscal Year 1982 Authorization	Amount Available for Spending in 1982
Programs Financed by the Highway Trust Fund		
Interstate System	3,100.0	3,100.0
Interstate apportionment	125.0	125.0
Interstate 4R a/	800.0	800.0
Federal-aid primary	1,500.0	1,500.0
Federal-aid secondary	400.0	400.0
Federal-aid urban	800.0	800.0
Forest highways	33.0	33.0
Public lands highways	16.0	16.0
Economic growth center development highways	50.0	50.0
Emergency relief	100.0	100.0
NHTSA	100.0 b/	92.5
Highway safety R&D (NHTSA)	31.0	23.8
Federal Highway Administration (FHWA) safety grants	10.0	10.0
Highway safety R&D (FHWA)	13.0	4.9
Bridge reconstruction	900.0	900.0
Elimination of hazards	200.0	200.0
Pavement marking	65.0	65.0
Rail-highway crossings	190.0	190.0
Accident data collection	5.0	1.0
Programs Financed Jointly by the Highway Trust Fund and General Revenues		
Bicycle program	20.0 c/	0.0
Great River Road	35.0 d/	25.0
Demonstration projects for railroad/highway crossings	100.0 e/	0.0

(Continued)

TABLE B-1. (Continued)

Source of Funds and Program	Fiscal Year 1982 Authorization	Amount Available for Spending in 1982
Programs Financed by General Revenues		
Forest development roads and trails	140.0	313.7 f/
Public lands development roads and trails	10.0	18.0 g/
Public roads and trails	30.0	0.0
Parkways	45.0	3.5
Indian reservation roads and bridges	83.0	47.2
Appalachian development highways	140.0	140.0
Administration expenses for highway beautification	1.5	0.5
Territorial highways	12.0	3.0
Control of outdoor advertising	30.0	0.0
Safer-Off system roads	200.0	0.0
Access highways to lakes	15.0	0.0
Total	9,299.5	8,962.1

a. 4R = Resurfacing, Restoration, Rehabilitation, and Reconstruction.

b. Grants made by the National Highway Traffic Safety Administration (NHTSA). Also includes $20 million for enforcement of maximum speed limit.

c. 50 percent trust fund, 50 percent general fund.

d. $25 million in direct spending from the trust fund and $10 million for appropriation from the general revenues.

e. 67 percent trust fund, 33 percent general fund.

f. Part derived from timber sales.

g. Part derived from grazing fees.

ing routes within the primary system that serve local versus intercity purposes, there is little doubt that the vast majority of travel between states is on the Interstate and primary systems, making these systems of considerable national importance in their facilitation of interstate commerce, communication, and personal travel.

Secondary Program

The secondary road system was started in 1944. It originally consisted of farm-to-market routes, but because of very loosely defined criteria, it rapidly grew to include every type of rural road from local access to the highest grade arterial roads. The only restriction was that a secondary route could not be part of the primary system.

In 1976, the secondary system was redesigned so that only roads that functionally serve as major rural collector routes are eligible for inclusion in the program. Today the system includes 402,000 (93 percent) of the some 430,000 miles of major rural collectors in the country. These routes, unlike those in the primary system, do not form an interconnected network of highways. Instead they are collectors of traffic funneling onto and off the state arterial network.

The secondary system currently serves three major purposes. First, the routes provide service to county seats not on an arterial route and to other places of intracounty importance, such as mining or agricultural areas, shipping points, and so forth. Second, they link major county locations with nearby larger towns or cities. Finally, they serve the more important intracounty travel corridors and connect with routes of higher classifications within the county.

The federal secondary program provides almost 25 percent of the capital improvement funds spent on these routes--a proportion that has held fairly constant over the last 10 years. State spending on secondary routes has declined as a proportion of total funding, while local participation has become more prominent.

The chief purpose of the program--to develop paved farm-to-market routes--has largely been accomplished since 85 percent of all secondary routes now are paved. In addition, the often amatuerish and inadequate engineering practices of the local administrative units responsible for these roads generally have been replaced by competent engineering methods. Continued federal support to the secondary program has essentially evolved

into a revenue-sharing program. Lask year the Administration proposed to eliminate the secondary program by fiscal year 1984.

Urban Program

Early highway legislation explicitly excluded roads in urban areas from receiving federal aid. This urban exclusion was not eliminated until the depression years of the 1930s, and by 1944, a separate urban program was created to finance urban extensions of the national primary system.

If fiscal year 1970, this program was broadened to include any urban arterial or collector route not on another federally funded system. Local officials select the routes to be eligible. Federal urban program funds may also be used to purchase public transportation facilities and rolling stock, both fixed rail and bus. As with the secondary program, the urban program has become essentially a form of revenue sharing, and the Administration also proposed last year to eliminate the urban program by fiscal year 1984.

Bridge Replacement and Reconstruction Program

In 1982, a special program authorized $900 million for replacement and reconstruction of bridges. About half of all authorized funds are spent on bridges on the Interstate and primary systems; these improvements are considered nationally important since they are located on routes with that designation. The remaining funds are spent on bridges on the secondary or urban systems, or on bridges on nonfederally aided routes. This second group of projects are predominantly of local importance, although some argue that the associated safety improvements should be considered a national priority. For example, although the Administration proposed last year to discontinue a number of locally oriented highway programs, the entire bridge program, including federal expenditures on bridges not located on the Interstate and primary systems, would have been retained on the grounds that a high national interest exists in reducing the safety problems presented by deficient and obsolete bridges.

Safety, Emergency Relief, and Recreational Programs

Safety Programs. In recent years, several highway safety programs related to vehicles, drivers, and roadways were enacted because of increased Congressional concern over the loss of life and the drain on public and private resources caused by accidents. Since 1976, the number of

highway fatalities per mile travelled has risen, and, if the rate continues, the total number of highway deaths will soon again exceed 55,000, the number of fatalities in 1973. (The rate had dropped after imposition of the 55 mile-per-hour speed limit and decreased travel after fuel prices increased, as a result of the OPEC embargo.) Significant changes now taking place potentially could accelerate recent trends. For example, the changing vehicle mix resulting from smaller cars, more motorcycles, larger trucks and the growing number of vehicles are placing increasing demands on vehicles and highways designed for different conditions.

Accident frequency and severity on the nation's highways is a complex interaction of drivers, vehicles, and roadway environment. Responsibilities for these factors rests with many levels of government and in different departments and agencies, as well as many parts of the private sector. The Highway Safety Act of 1973, for example, initiated several programs to address roadway-related hazards and deficiencies that contribute most to injuries and fatalities. Authorized programs gave states funds to eliminate bridge deficiencies, improve high-hazard locations, remove roadside obstacles, reduce hazards at railroad-highway crossings, demonstrate the value of standard pavement markings, and improve safety on roads and streets located off the federally financed highway system. In addition, federal highway tax receipts support the National Highway Traffic Safety Administration, a branch of the Department of Transportation that conducts safety-related research and development. These safety programs differ from the other major road programs in that they are not tied to some specific system of roads, such as the secondary system, but rather apply to all road systems. In fiscal year 1982, over $500 million was authorized for trust fund programs that promote highway safety.

Emergency Relief. The Federal-Aid Highway Act of 1956 established the emergency relief program, which authorizes the Secretary of Transportation to help states fund the repair of highways, minor roads, and trails that have been seriously damaged as the result natural disasters, such as floods, hurricanes, and earthquakes. These funds are used for local as well as national roads, and the program reflects what is often perceived as the federal government's broad role as a safety net in times of unforeseen disasters.

Recreational Programs. Several federal highway programs authorize funds for the development of roads and trails on public lands. The economic benefit of these programs are derived almost entirely by the states in which the facilities are located.

APPENDIX C. GAPS IN THE INTERSTATE SYSTEM

TABLE C-1. GAPS IN THE INTERSTATE SYSTEM, BY STATE AND CHARACTERISTICS a/

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received b/	Designated by DOT as an Essential Gap c/	Designated by DOD as a Gap of Defense Importance d/	Balanced or Peaked Traffic Flow e/	Functional Classification f/	National or Local Significance g/
Alabama	I-65, Birmingham	81.7	8.1	Yes	Yes	Yes	Peaked	Through-Route	National
	I-65, Near Birmingham	42.2	6.4	Yes	Yes	Yes	Peaked	Through-Route	National
	I-210, Mobile	170.2	6.2	No	No	N/A	Peaked	Downtown Circulator	Local
	I-565, Near Huntsville	105.6	16.2	Yes	Yes	Yes	Highly Peaked	Spur	Local
	I-565, Huntsville	144.2	5.1	No	No	Yes	Highly Peaked	Spur/ Downtown Circulator	Local
	I-759, Gadsden	34.8	4.5	Yes	No	No	Balanced	Spur/ Downtown Circulator	Local
Arizona	I-10, Phoenix	49.9	5.4	Yes	Yes	Yes	Peaked	Through-Route	National
	I-10, Phoenix	207.1	7.5	Yes	Yes	Yes	Peaked	Through-Route Feeder	National
	I-10, Phoenix	272.7	6.3	Yes	No	No	Balanced	Downtown/ Circulator	Local
	I-40, Near Flagstaff	15.4	2.7	Yes	Yes	Yes	Balanced	Through-Route	National

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received [b]	Designated by DOT as an Essential Gap [c]	Designated by DOD as a Gap of Defense Importance [d]	Balanced or Peaked Traffic Flow [e]	Functional Classification [f]	National or Local Significance [g]
Arkansas	I-630, Little Rock	31.6	0.8	Yes	No	No	Peaked	Downtown Circulator	Local
California	I-15, San Diego	44.4	2.4	Yes	Yes	Yes	Peaked	Feeder	Local
	I-15, North of San Diego	45.7	4.1	Yes	Yes	Yes	Peaked	Through-Route	National
	I-15, San Bernadino	152.2	11.1	Yes	Yes	Yes	Highly Peaked	Through-Route	National
	I-80, Auburn	60.3	2.1	Yes	Yes	N/A	Peaked	Through-Route	National
	I-105, Los Angeles	397.3	1.6	Yes	Yes	No	Balanced	Spur Connector Downtown Circulator	Local
	I-105, Los Angeles	1,216.6	15.7	Yes	No	No	Balanced	Downtown Circulator/ Connector	Local
	I-180, San Francisco	185.5	5.9	Yes	No	Yes	Balanced	Connector/ Downtown Circulator	Local
	I-380, San Francisco	40.7	1.2	Yes	Yes	N/A	Balanced	Spur/ Downtown Circulator	Local
	I-580, San Francisco	79.8	1.3	Yes	Yes	Yes	Balanced	Connector/ Downtown Circulator	Local

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received b/	Designated by DOT as an Essential Gap c/	Designated by DOD as a Gap of Defense Importance d/	Balanced or Peaked Traffic Flow e/	Functional Classification f/	National or Local Significance g/
California (Contd.)	I-980, San Francisco	41.1	0.3	Yes	No	Yes	Highly Peaked	Connector/ Downtown Circulator	Local
Colorado	I-70, Grand Junction	82.0	20.0	Yes	Yes	Yes	Peaked	Through-Route	National
	I-70, Grand Junction	291.5	12.6	Yes	Yes	Yes	Balanced	Through-Route	National
	I-76, Denver	106.1	5.2	Yes	No	Yes	Peaked	Connector/ Downtown Circulator	Local
Connecticut	I-84, Eastern Connecticut	434.9	35.0	No	Yes	Yes	Peaked	Through-Route	National
	I-284, Hartford	33.1	3.1	No	No	No	Peaked	Connector/ Downtown Circulator	Local
	I-291, Hartford	66.8	6.3	No	No	Yes	Peaked	Connector/ Downtown Circulator	Local
	I-484, Hartford	40.0	0.8	No	No	No	Peaked	Connector/ Downtown Circulator	Local
	I-691, Meriden	62.6	3.6	Yes	No	No	Peaked	Connector	Local

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received [b]	Designated by DOT as an Essential Gap [c]	Designated by DOD as a Gap of Defense Importance [d]	Balanced or Peaked Traffic Flow [e]	Functional Classification [f]	National or Local Significance [g]
District of Columbia	I-66, Washington, D.C.	13.8	0.3	No	No	No	Balanced	Spur/ Downtown Circulator	Local
	I-266, Washington, D.C.	245.4	1.5	Yes	No	No	Peaked	Spur/ Downtown Circulator	Local
	I-295, Washington, D.C.	122.1	1.3	No	No	No	Balanced	Connector/ Downtown Circulator	Local
Florida	I-75, Miami	44.9	1.0	Yes	Yes	No	Balanced	Through-Route Feeder	National
	I-75, Outside Miami	274.6	17.4	Yes	Yes	Yes	Balanced	Through-Route	National
	I-75, Near Naples	48.0	11.0	Yes	Yes	Yes	Balanced	Through-Route	National
	I-75, Near Tampa	48.4	9.2	Yes	Yes	Yes	Peaked	Through-Route	National
	I-75, Tampa	123.8	15.2	Yes	Yes	Yes	Peaked	Through-Route	National
	I-95, Near Palm Beach	254.6	33.9	Yes	Yes	Yes	Balanced	Through-Route	National

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received b/	Designated by DOT as an Essential Gap c/	Designated by DOD as a Gap of Defense Importance d/	Balanced or Peaked Traffic Flow e/	Functional Classification f/	National or Local Significance g/
Florida (Contd.)	I-275, St. Petersburg	32.8	1.8	Yes	No	No	Balanced	Connector/ Downtown Circulator	Local
	I-275, Near St. Petersburg	22.0	4.0	Yes	No	No	Balanced	Connector	Local
	I-595, Ft. Lauderdale	457.4	4.2	No	No	No	Balanced	Spur/ Downtown Circulator	Local
Georgia	I-420, Atlanta	104.7	5.4	No	No	No	Balanced	Connector/ Downtown Circulator	Local
	I-575, Near Atlanta	63.9	11.0	No	No	N/A	Peaked	Spur	Local
	I-675, Atlanta	101.6	10.3	Part	No	No	Peaked	Feeder/ Connector	Local
Hawaii	H-3, Honolulu	109.4	0.9	No	No	No	Highly Peaked	Feeder	Local
	H-3, Near Honolulu	686.7	9.4	No	No	No	Highly Peaked	Connector	Local
Idaho	I-90, Coeur D'Alene	26.0	5.9	No	Yes	Yes	Peaked	Through-Route	National
	I-90, Near Montana Border	27.2	1.6	Yes	Yes	Yes	Peaked	Through-Route	National

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received [b]	Designated by DOT as an Essential Gap [c]	Designated by DOD as a Gap of Defense Importance [d]	Balanced or Peaked Traffic Flow [e]	Functional Classification [f]	National or Local Significance [g]
Illinois	I-255, East St. Louis	146.6	9.3	Portical	No	Yes	Balanced	Beltway/ Connector	Local
Indiana	I-164, Evansville	103.3	21.3	No	No	No	Balanced	Spur/ Beltway	Local
	I-165, Indianapolis	91.7	2.7	No	No	No	Balanced	Spur/ Connector/ Downtown Circulator	Local
Iowa	I-380, Between Cedar Rapids and Waterloo	365.1	57.7	Partial	Yes	No	Peaked	Spur	Local
Kansas	I-435, Kansas City	114.2	8.9	Yes	No	Yes	Peaked	Beltway/ Connector	Local
	I-670, Kansas City	93.0	0.8	Yes	No	No	Peaked	Downtown/ Circulator Spur	Local
Kentucky	I-265, Louisville	37.6	2.4	Yes	No	Yes	Balanced	Beltway/ Spur	Local

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received b/	Designated by DOT as an Essential Gap c/	Designated by DOD as a Gap of Defense Importance d/	Balanced or Peaked Traffic Flow e/	Functional Classification f/	National or Local Significance g/
Louisiana	I-49, Alexandria-Natchitoches-Bunkie	1,215.3	177.4	Yes	Yes	N/A	Peaked	Through-Route Connector	National
	I-49, Shreveport	237.0	8.5	No	Yes	N/A	Peaked	Through-Route Feeder	National
	I-110, Baton Rouge	7.5	0.5	Yes	No	Yes	Peaked	Spur/ Connector	Local
	I-220, Shreveport	94.3	5.0	Yes	No	Yes	Peaked	Beltway/ Connector	Local
	I-310, New Orleans	185.8	9.5	Yes	No	Yes	Peaked	Spur/ Connector	Local
	I-510, New Orleans	116.9	2.7	Yes	Yes	No	Peaked	Spur/ Connector	Local
Maine	I-395, Bangor	38.2	3.3	No	No	Yes	Balanced	Spur/ Connector	Local
Maryland	I-70, Baltimore	351.1	4.1	No	No	Yes	Peaked	Connector/ Downtown Circulator	Local
	I-70, Frederick	38.0	3.8	Yes	Yes	Yes	Peaked	Through-Route	National

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received b/	Designated by DOT as an Essential Gap c/	Designated by DOD as a Gap of Defense Importance d/	Balanced or Peaked Traffic Flow e/	Functional Classification f/	National or Local Significance g/
Maryland (Contd.)	I-83, Baltimore	575.6	3.4	No	No	Yes	Peaked	Connector/ Downtown Circulator	Local
	I-95, Baltimore	871.2	1.7	Yes	Yes	Yes	Balanced	Connector/ Downtown Circulator/ Through-Route	Local
	I-97, Baltimore/ Ft. Meade	49.3	8.2	No	Yes	Yes	Peaked	Connector	Local
	I-170, Baltimore	67.3	0.7	No	No	No	Peaked	Spur/ Downtown Circulator	Local
	I-195, Baltimore	79.6	2.2	No	No	N/A	Peaked	Spur/ Connector	Local
	I-297, Near Ft. Meade	105.2	9.4	Yes	Yes	No	Peaked	Spur	Local
	I-370, Gaithersburg	37.1	2.7	No	No	No	Highly Peaked	Spur	Local
	I-795, Baltimore	69.4	4.1	Yes	No	No	Peaked	Spur	Local
Massachusetts	I-90, Boston	406.3	2.5	No	Yes	No	Balanced	Spur/ Downtown Circulator	Local
	I-95, Boston	20.2	1.9	Yes	No	Yes	Highly Peaked	Through-Route Downtown Circulator	National
	I-391, Springfield	5.6	0.2	Yes	No	No	Highly Peaked	Spur	Local

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received b/	Designated by DOT as an Essential Gap c/	Designated by DOD as a Gap of Defense Importance d/	Balanced or Peaked Traffic Flow e/	Functional Classification f/	National or Local Significance g/
Massachusetts (Contd.)	I-495, Near Taunton	17.5	3.5	Yes	No	Yes	Peaked	Beltway	Local
	I-895, Providence	13.6	1.5	No	No	No	Peaked	Beltway	Local
Michigan	I-69, Near Lansing	234.4	41.3	Partial	Yes	Yes	Peaked	Through-Route	National
	I-696, Detroit	262.2	7.4	Yes	Yes	Yes	Balanced	Beltway/ Connector/ Downtown Circulator	Local
Minnesota	I-35, Duluth-Superior	107.8	2.4	No	Yes	No	Peaked	Spur	Local
	I-35E, St. Paul	92.7	9.0	Yes	No	Yes	Peaked	Feeder	Local
	I-94, St. Paul	58.8	9.2	No	Yes	Yes	Peaked	Through-Route/ Feeder	National
	I-394, St. Paul	188.9	9.2	No	No	No	Peaked	Connector/ Downtown Circulator	Local
	I-494, St. Paul	97.2	5.8	Yes	Yes	Yes	Balanced	Beltway/ Connector/ Downtown Circulator	Local
Mississippi	I-110, Biloxi	44.5	1.4	Yes	No	Yes	Balanced	Spur/ Downtown Circulator	Local

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received b/	Designated by DOT as an Essential Gap c/	Designated by DOD as a Gap of Defense Importance d/	Balanced or Peaked Traffic Flow e/	Functional Classification f/	National or Local Significance g/
Missi-ouri	I-170, St. Louis	26.0	1.7	Yes	No	N/A	Balanced	Spur/ Connector/ Downtown Circulator	Local
	I-229, St. Joseph	26.5	6.6	Yes	No	No	Peaked	Feeder/ Spur	Local
	I-435, Kansas City	91.9	14.4	Yes	No	Yes	Peaked	Beltway/ Connector	Local
Mon-tana	I-15, Near Dillon	15.8	6.9	Yes	Yes	Yes	Balanced	Through-Route	National
	I-15, Near Butte and Boulder	36.2	13.7	Yes	Yes	Yes	Balanced	Through-Route	National
	I-90, Near St. Regis	8.8	3.3	Yes	Yes	Yes	Balanced	Through-Route	National
	I-90, Near Lodge Grass	31.9	22.9	Yes	Yes	Yes	Balanced	Through-Route	National
	I-94, Near Miles City	11.4	5.0	Yes	Yes	Yes	Balanced	Through-Route	National
Nevada	I-80, Near Lovelock	16.7	0.7	Yes	Yes	Yes	Balanced	Through-Route	National

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received b/	Designated by DOT as an Essential Gap c/	Designated by DOD as a Gap of Defense Importance d/	Balanced or Peaked Traffic Flow e/	Functional Classification f/	National or Local Significance g/
Nevada (Contd.)	I-515, Las Vegas	100.6	5.0	Yes	No	No	Balanced	Spur/ Downtown Circulator	Local
New Hampshire	I-93, Northern New Hampshire	85.5	16.4	Yes	No	Yes	Highly Peaked	Connector	Local
	I-393, Concord	16.9	1.7	Yes	No	No	Peaked	Spur	Local
New Jersey	I-78, New York	121.4	5.8	No	No	Yes	Peaked	Feeder	Local
	I-78, Near Phillipsburg	51.5	6.5	No	Yes	Yes	Peaked	Through-Route	National
	I-95, New York	25.3	2.9	No	Yes	Yes	Peaked	Feeder/ Through-Route	National
	I-95, Near Trenton	160.8	15.5	Yes	Yes	Yes	Peaked	Feeder/ Through-Route	National
	I-95, Trenton-Philadelphia	9.5	1.0	No	Yes	Yes	Peaked	Feeder/ Through-Route	National
	I-195, Trenton-Philadelphia	26.8	1.7	Yes	Yes	Yes	Peaked	Feeder/ Spur	Local
	I-287, New York	474.5	20.9	No	Yes	Yes	Balanced	Beltway/ Connector	Local

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received [b]	Designated by DOT as an Essential Gap [c]	Designated by DOD as a Gap of Defense Importance [d]	Balanced or Peaked Traffic Flow [e]	Functional Classification [f]	National or Local Significance [g]
New Jersey (Contd.)	I-295, Trenton-Philadelphia	133.4	6.0	Yes	Yes	Yes	Peaked	Beltway/ Bypass	Local
	I-295, Philadelphia	30.1	2.0	No	Yes	Yes	Peaked	Beltway	Local
	I-695, New York	31.7	3.4	No	No	Yes	Peaked	Feeder/	Local
New Mexico	I-25, Near Albuquerque	61.9	25.9	Yes	Yes	Yes	Highly Peaked	Through-Route	National
New York	I-88, Binghamton	48.2	2.6	No	Yes	Yes	Peaked	Through-Route Feeder	National
	I-481, Syracuse	43.3	5.4	No	No	Yes	Peaked	Beltway/ Connector	Local
	I-478, New York	1,410.0	4.3	Yes	No	No	Peaked	Downtown Circulator/ Connector	Local
	I-990, Buffalo	27.0	3.4	Yes	No	No	Peaked	Spur	Local
North Carolina	I-40, Near Raleigh	199.7	46.9	Yes	Yes	Yes	Peaked	Through-Route	National
	I-277, Charlotte	26.0	1.7	Yes	No	No	Peaked	Downtown Circulator	Local

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received b/	Designated by DOT as an Essential Gap c/	Designated by DOD as a Gap of Defense Importance d/	Balanced or Peaked Traffic Flow e/	Functional Classification f/	National or Local Significance g/
Ohio	I-470, Near Wheeling	40.7	5.6	Yes	No	Yes	Balanced	Beltway/ Bypass	Local
	I-480, Cleveland	85.6	5.3	Yes	Yes	Yes	Peaked	Beltway/ Connector	Local
	I-490, Cleveland	56.1	1.3	Yes	No	No	Peaked	Downtown Circulator/ Connector	Local
	I-670, Columbus	152.6	4.4	No	No	No	Peaked	Connector/ Downtown Circulator	Local
	I-675, Dayton	163.1	16.5	Yes	No	Yes	Peaked	Bypass/ Connector	Local
Oklahoma	I-235, Oklahoma City	149.5	3.2	Yes	No	No	Balanced	Downtown Circulator/ Feeder/ Connector	Local
Oregon	I-82, Near Pendleton	90.8	10.6	No	Yes	Yes	Peaked	Through-Route	National
Pennsylvania	I-78, Allentown	276.1	19.9	No	Yes	Yes	Peaked	Bypass/ Through-Route	National

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received b/	Designated by DOT as an Essential Gap c/	Designated by DOD as a Gap of Defense Importance d/	Balanced or Peaked Traffic Flow e/	Functional Classification f/	National or Local Significance g/
Pennsylvania (Contd.)	I-79, Erie	8.8	0.5	Yes	Yes	No	Peaked	Spur/ Downtown Circulator	Local
	I-279, Pittsburgh	403.0	12.2	Yes	No	No	Peaked	Feeder	Local
	I-476, Philadelphia	230.9	12.2	Yes	No	Yes	Peaked	Bypass/ Connector	Local
	I-579, Pittsburgh	109.6	0.5	Yes	No	No	Peaked	Downtown Circulator	Local
	I-676, Philadelphia	167.8	1.6	Yes	Yes	No	Balanced	Downtown Circulator/ Connector	Local
Rhode Island	I-84, Near Providence	102.8	12.1	No	Yes	No	Peaked	Through-Route	National
	I-895, Near Providence	543.0	37.1	No	No	No	Peaked	Beltway/ Connector	Local
South Carolina	I-77, Columbia	24.8	1.6	Yes	Yes	Yes	Peaked	Through-Route	National
	I-326, Columbia	63.4	3.3	Yes	No	Yes	Balanced	Spur	Local
	I-526, Charleston	253.3	8.7	No	No	Yes	Balanced	Spur	Local

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received b/	Designated by DOT as an Essential Gap c/	Designated by DOD as a Gap of Defense Importance d/	Balanced or Peaked Traffic Flow e/	Functional Classification f/	National or Local Significance g/
South Dakota	I-29, North of Sioux Falls	19.0	14.8	Yes	Yes	Yes	Balanced	Through-Route	National
Tennessee	I-440, Nashville	130.5	7.4	Yes	No	Yes	Balanced	Connector/ Downtown Circulator	Local
Texas	I-20, Dallas	206.4	19.6	Yes	Yes	Yes	Peaked	Feeder	Local
	I-20, Ft. Worth	21.8	4.0	Yes	Yes	Yes	Peaked	Through-Route/ Beltway	National
	I-27, Lubbock	401.3	37.5	Partial	Yes	Partial	Balanced	Through-Route	National
	I-35, Laredo	1.1	0.2	Yes	Yes	Yes	Peaked	Downtown Circulator/ Border Interchange	National
	I-40, Near Amarillo	19.7	2.7	Yes	Yes	Yes	Balanced	Through-Route	National
Utah	I-15, Near Salt Lake City	75.2	29.0	Yes	Yes	Yes	Balanced	Through-Route	National
	I-15, Near Salt Lake City	35.4	13.8	Yes	Yes	Yes	Balanced	Through-Route	National

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received [b]	Designated by DOT as an Essential Gap [c]	Designated by DOD as a Gap of Defense Importance [d]	Balanced or Peaked Traffic Flow [e]	Functional Classification [f]	National or Local Significance [g]
Utah (Contd.)	I-70, Near Cove Fort	91.8	43.4	Yes	Yes	Yes	Balanced	Through-Route	National
	I-70, Near Cove Fort	6.8	2.3	Yes	Yes	Yes	Balanced	Through-Route	National
	I-84, Between Salt Lake City, and Boise, Idaho	16.7	12.1	Yes	Yes	Yes	Balanced	Through-Route	National
Vermont	I-93, Near St. Johnsbury	40.6	10.9	Yes	No	Yes	Peaked	Connector	Local
Virginia	I-81, Near Wytheville	40.2	8.2	Yes	Yes	Yes	Peaked	Through-Route	National
	I-85, Near Petersburg	50.4	9.9	No	Yes	No	Peaked	Through-Route/ Connector	National
	I-95, Near Petersburg and Richmond	228.2	27.7	No	Yes	Yes	Peaked	Feeder/ Connector/ Through-Route	National
	I-264, Norfolk-Newport News	259.1	2.3	Yes	No	Yes	Peaked	Downtown Circulator	Local

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received b/	Designated by DOT as an Essential Gap c/	Designated by DOD as a Gap of Defense Importance d/	Balanced or Peaked Traffic Flow e/	Functional Classification f/	National or Local Significance g/
Virginia (Contd.)	I-464, Norfolk-Newport News	14.6	1.6	Yes	No	Yes	Peaked	Downtown Circulator/ Connector	Local
	I-595, Near Washington, D. C.	25.2	0.8	Yes	Yes	No	Peaked	Spur/ Downtown Circulator	Local
	I-664, Norfolk-Newport News	445.9	6.2	Partial	No	No	Balanced	Spur/ Downtown Circulator	Local
Washington	I-5, Kelso	5.1	2.0	Yes	Yes	N/A	Peaked	Through-Route	National
	I-82, Yakima-Richland	117.8	50.4	Yes	Yes	Yes	Peaked	Through-Route	National
	I-90, Seattle	879.9	6.4	Yes	No	Yes	Peaked	Downtown Circulator/ Connector	Local
	I-182, Richland	128.6	14.0	Yes	No	Partial	Highly Peaked	Spur	Local
	I-705, Tacoma	95.4	1.5	No	No	No	Peaked	Spur/ Downtown Circulator	Local

(Continued)

TABLE C-1. (Continued)

State	Route	Cost (In millions of 1979 dollars)	Length (In miles)	Federal Design Concept Approval Received b/	Designated by DOT as an Essential Gap c/	Designated by DOD as a Gap of Defense Importance d/	Balanced or Peaked Traffic Flow e/	Functional Classification f/	National or Local Significance g/
West Virginia	I-64, Near Beckley	419.0	33.4	Partial	Yes	Yes	Balanced	Through-Route	National
Wyoming	I-90, Near Sheridan	18.8	9.3	Yes	Yes	Yes	Balanced	Through-Route	National

NOTE: N/A = Not Available.

a. Based on gaps included in A Revised Estimate of the Cost of Completing the National System of Interstate and Defense Highways, communication from the Secretary of Transportation, January 1981. The table has been updated wherever possible to reflect gaps that had not come under basic construction as of January 1981.

b. To receive federal design concept approval, all route location studies must be completed, the required public hearings held, and an Environmental Impact Statement, if required, approved by the Department of Transportation (DOT). Following design concept approval, land acquisition and clearing may commence. Wherever possible, the table reflects the design status of each gap as of April 1981.

c. Report of the Secretary of Transportation to the United States Congress, Interstate Gap Study, prepared in accordance with Section 102(b) of the Federal-Aid Highway Act of 1976 (October 1976).

d. Department of Defense, Interstate Completion Study, (September 1981, as updated).

e. Based on Design Hour Volume Direction (DHVD), a percentage measure of the projected traffic flow in each direction during peak or rush hour traffic. In this table, routes with a projected DHVD less than 55 percent are termed balanced; routes with a projected DHVD between 55 percent and 66 percent are termed peaked; and routes with a projected DHVD over 67 percent are termed highly peaked. Rural Interstate through-routes typically have a DHVD of 55 percent, which means that peak hour traffic would be divided 55 to 45 percent in each direction. Some urban gaps, however, have DHVD values higher than 67 percent which means that traffic would be twice as heavy in one direction as the other during rush hour. This is generally a characteristic of local routes designed to relieve traffic congestion (for example, during rush hour) rather than a characteristic of interstate through-routes. All else being equal, a high DHVD value points to heavy local use.

TABLE C-1. (Footnotes Continued)

f. CBO categorized routes into five functional classifications as follows: Interstate Through-Routes--those that provide direct interstate connections between principal cities and industrial centers. Spur Routes--those that branch off an Interstate highway and terminate at a specific location, such as an airport. Beltways Bypasses--those that encircle part or all of an urban area, possibly connecting with one or more Interstate through-routes along the way. Connector Routes--those that enhance interconnections between Interstate and other highways, usually located where two or more Interstates converge in an urban area. Feeder or Collector Routes--those that provide access into or out of an urban area, usually from an Interstate through-route or beltway. Downtown-Circulator Routes--those that are located in the center of urban areas and serve primarily to improve traffic circulation in the area.

g. Routes of national importance directly connect the nation's principal cities and industrial centers. Routes of local importance are not needed to link principal cities, but instead link one or more locations of regional importance or improve traffic circulation within a specified self-contained area.