IMPACTS OF RURAL TRANSIT FUNDING OPTIONS

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This paper summarizes a study undertaken to assist the Urban Mass Transportation Administration (UMTA) in programming non-urban transit funds available through the National Mass Transportation Act of 1974. The study produced estimates of the amount of transportation provided and probable assistance levels under a variety of possible funding options. It was found that the supply of rural transportation services available in the next few years will vary significantly according to the type and amount of financial assistance available from UMTA, that assumptions about the useful life-span of vehicles significantly affect overall costs and administrative burdens, and that the transit assistance program with the most benefit to rural areas would be flexible depending on local conditions and would include some assistance for operating costs.

Summary of Findings

This project was undertaken to assist the Urban Mass Transportation Administration (UMTA) to efficiently and effectively program the \$500 million of rural (non-urbanized area) transit assistance funds available through the National Mass Transportation Act (UMTA) of 1974. The study produced estimates of the amount of transportation provided and probable assistance levels under a variety of possible funding options.

Major findings include:

1. The demand for rural transportation services will be highly sensitive to the amount and quality of services available.

- 2. The supply of transportation services will vary significantly according to the type and amount of financial assistance available from UMTA. Without UMTA assistance, service levels and patronage of rural transit systems will decline due to cost increases resulting from inflation, but with assistance equal to \$77 million per year in 1985, a sixfold increase in passengers over the lowest probable UMTA funding level (\$20 million) is likely.
- 3. The requirements for UMTA capital and operating assistance in rural areas will probably total \$480 million from FY1977 through FY1985 under the

most probable combination of funding options.

4. Approximately 55 percent of the \$480 million would be devoted to capital assistance according to current vehicle life expectancies (three to five years in typical rural environments).

5. Because of the sensitivity of total costs, administrative costs, and the capital/operating ratio to vehicle life expectancy, techniques for ex-

panding vehicle life should be studied.

6. There is a general need for operating assistance. Increases to the amount or share of operating assistance from UMTA will benefit smaller and poorer counties more than larger or richer counties. Ratios of 80 percent of capital expenses and 50 percent for operating deficits - the same assistance now available to urban areas - would result in only 41 percent of UMTA assistance devoted to counties with populations of less than 50,000 persons.

7. The number of counties applying for assistance (even if the smaller counties participate in larger multi-county systems) is likely to be high (from 500 to 1,000 counties applying, compared to only 278 urban MPO's), which coupled with short lives of vehicles now available, will impose significant administrative burdens on UMTA unless policies on vehicle replacement for easing the UMTA administrative burden would be the use of multi-year

grants.)

8. The transportation requirements of rural (non-urbanized) areas, defined in terms of numbers and types of vehicles as well as operating assistance, differ so markedly depending on local conditions that a flexible program should be devised by UMTA. Attempts to develop standards for transportation in rural areas should emphasize the need for flexibility. In addition, funds for rural transit should be set aside solely for that use to encourage the growth of transit in smaller communities.

9. The most probable scenario would result, in 1985, in approximately 100 million annual one-way passenger trips, subsidy requirements (from Federal [non-UMTA] sources, State and local governments) of \$25 million per year, \$77 million from UMTA, and 41 percent of UMTA assistance devoted to counties with

populations of less than 50,000 persons.

Background and Study Objectives

The National Mass Transportation Act of 1974 provided up to \$500 million for exclusive use in non-urbanized areas during the six year period from 1975 through 1980. Such non-urbanized areas include cities, towns, and rural places with less than 50,000 population. Funds are available from the Urban Mass Transportation Administration (UMTA) for planning and program development activities, demonstration activities, vehicle acquisition, and the capital investments in support of general or special transit services, including those services provided for elderly, handicapped and other transit dependent persons. Legislation is pending in Congress to permit the use of some of the \$500 million for operating assistance in non-urbanized areas. Growing public interest in UMTA programs is also revealed by an annual doubling of UMTA non-urbanized areas grants during the last three years.

UMTA quickly needs more information to help develop options for the non-urbanized area funds in an effective and efficient manner. This project was undertaken to assist UMTA in assessing:

- o the demand for transit in non-urbanized counties through the nation, and
- o the level of funding that these counties might request for UMTA capital and operating assistance programs.

Methodology

Because there is no operational experience for a program of rural transit assistance, a series of assumptions concerning key characteristics of demand and supply were necessary. The Section 147 Rural Public Highway Transportation Demonstration Program, (authorized by the Federal Aid Highway Act of 1973 for the purpose of carrying out demonstration projects for public transportation in rural areas and small urban areas, and currently funding 102 two-year projects in 48 states at a total cost of almost \$25 million), administered by FHWA (the Federal Highway Administration) and UMTA, is the closest model to an operational rural transit program. Assumed values, based on actual experience, were given in terms of ranges for characteristics such as

- level of transit service to be provided,
- · vehicle utilization ratios,
- costs of equipment, labor, and supplies,
- alternative fare policies,
- proportion of all counties in the U.S. that will apply for assistance,
- financial aid available from Federal, State and local governments, and
 - · vehicle replacement schedules.

Various combinations of these factors were devised to describe alternative funding options or scenarios. Analysis of all the relevant options was a complex task, involving more than 1,000 distinct combinations. Through computer-aided simulation modelling, feasible systems were identified and those with the lowest operating deficits were selected. The simulation exercises rely on econometric demand functions for the prediction of transportation demands at the county level and on parametric cost functions for the projections of costs for several regions of the nation. Also a discriminant analysis model of rural transit system feasibility was developed to ensure that the predictions of transit assistance requirements correspond to the requirements of feasible transportation sys-

An overview of the simulation model is presented in Figure 1 which shows the steps involved in

conducting the simulation exercises. First, alternative levels of demand for each county type are estimated as a function of 3 alternative service levels for each county. $(\underline{1}, \underline{2}, \underline{3}, \underline{4}, \underline{5})$ Cost estimates based on service characteristics are provided for each of four regions of the country. $(\underline{6}, \underline{7}, \underline{8},$ 9, 10) The initial deficit of each applying county (costs minus revenues) is then reduced by both the UMTA transit assistance package (capital grants and operating subsidies) and the assumed levels of state and local aid. (11, 12) The three alternative systems are then evaluated in terms of their feasibility and one of these systems is selected for each county on the basis of which of the feasible systems leads to lower operating deficits. (13, 14) Finally, the transportation system selected for each county is contrasted with the existing inventory of vehicles in each county group (15, 16, 17, 18) and decision rules are developed on vehicle replacement schedules. (19, 20)

Out of the many possible combinations of factors influencing funding, three combinations of county application rates. UMTA program assistance, and other governmental aid were chosen as the scenarios for the simulation exercises. (Three other scenarios were also considered, none of which include any operating assistance at all from UMTA. These scenarios would decrease the overall demand for rural transit and would shift funds away from the smallest counties toward the largest.) These simulations have been classified as optimistic, moderate and pessimistic scenarios regarding the demands they create for UMTA transit assistance funds. These scenarios are displayed in Table 1.

Findings

Range of Federal Financing

The "optimistic" scenario represents the maximum probable investment in rural transit. It assumes a high level of state, local and other non-UMTA federal aid (levels as high as \$0.50 per bus mile in FY-1977) and the participation of 1,004 counties in the program (corresponding to application rates higher than the Section 147 application ranges). It assumes that UMTA pays 80 percent of capital costs and 50 percent of operating deficits. This scenario results in a requirement for UMTA funds of \$724 million during the period FY1977-FY1985, with 51 percent of the funding devoted to capital grant assistance. (See Table 2).

The "moderate" scenario includes medium participation rates which correspond to the experience of the application rates in the Section 147 Demonstration program. Under this scenario, nearly 805 counties will participate in the program. This scenario assumes capital and operating assistance from UMTA and a medium level of other governmental funding. In our view, this is the most probable of the six scenarios. It results in total UMTA funding requirements of \$480 million during the period FY-1977-1985. Fifty-five percent of the funds will be devoted to capital expenditures. (If no operating assistance were provided by UMTA, and other governments provided a medium level of support, the UMTA funds requested would drop to a total of \$288 million for the study period.)

The pessimistic scenario is characterized by a low proportion of counties applying for assistance (50 percent less than the rate of applications to the Section 147 demonstration program). This scenario assumes capital and operating assistance from UMTA and a low level of non-UMTA governmental funding. Probable UMTA funding requirements under this

scenario would total \$146 million during FY1977-FY-1985. (If no operating assistance were provided by UMTA, and other governments provided a low level of support, the UMTA funds requested would drop to \$38 million during FY1977 through FY1985).

Part of the explanation for the dominance of the capital assistance requirements lies in the rapid replacement assumed in the simulation exercises. By enabling the transit agencies to replace small buses every 5 years and paratransit vehicles every three years, as is the current experience (versus a normal replacement schedule of 12 years of large city buses (19, 20)), the replacement demand in these simulations grows rapidly, accounting for nearly half of the capital assistance requirements during the period. This is a subject which deserves more attention on the part of the policy makers; namely, the fact that the replacement demand may be excessive due to the very rapid vehicle replacement cycle now necessary.

On the basis of the above evidence, the statement can be made that a limitation that not more than 50 percent of all non-urbanized area grants from UMTA be devoted to operating assistance will not impair the growth of rural transportation, as long as this limitation is applied for the overall funding period FY1977-FY1985 (and not on year-toyear basis). However, if such a limitation is applied on a year-to-year basis, it will impair the ability of the systems to operate, since expenses for purchasing vehicles will probably not occur every year but operating expenses will occur each year. Since operating costs typically constitute about 70 percent of all costs for rural transit systems, any limitation on funds for operating assistance must be very carefully designed and administered. Substantial system to system variability suggests that UMTA might consider applying a restriction such as the 50 percent operating deficit limitation on a program-wide rather than systemspecific basis.

The Demand for Funding Over Time

The time pattern of demand for UMTA rural transit assistance requirements is shown in Table 3. In general, there is an increasing demand for UMTA funds through time, with no levelling-off after a few years. This is due to substantial inflationary pressures on operating costs, particularly on fuel and wages. (8, 9) The operating assistance requirements will grow through time at annual rates which vary from 6 to 10 percent depending on the scenario analyzed. However, the need for operating funds will continue to grow regardless of what assistance is provided by UMTA. There will be no levelling-off in transit assistance requirements through time since the cost inflation that is already occurring will cancel whatever other effects (for example, scale economies in vehicle production or transit operations) that may tend to produce a levelling-off in demand. (If operating assistance were not provided, the demand for capital assistance would decline. The lack of operating assistance most severely affects smaller counties whose share of operating assistance is often double their share of capital assistance. However, the lack of operating assistance makes it necessary to curtail their operations. This contraction of rural transportation operations eventually results in a decreased demand for vehicles and thus for capital assistance.)

The growth in demand for funds is liable to be rapid — about 12 percent per year — because there will be a need to include new systems and because the gap between urban and rural transit costs will

narrow. This rapid growth curve suggests that the program should start at a modest level — e.g., \$30 million the first year — and grow substantially from year to year. The alternative — starting at a high funding level — may lead to overcapitalization of the first rural transit systems.

The Demand for Transportation Services Over Time

Table 4 presents the activity results which correspond to the scenarios described in Table 1. The number of vehicles in the fleet presented in Table 4 apply only to those UMTA-supported vehicles which are still providing services as part of the rural transit fleet. It is not the total number of vehicles bought within the period, since it excludes those vehicles replaced and eventually sold to other organizations.

Table 4 also presents an estimate of the state and local aid requirement under each scenario. These requirements were projected assuming that state, local and other federal aid would grow at the same rate as the Consumer Price Index during the study period. $(\underline{11}, \underline{12})$

The rural passengers generated by each scenario also appear in Table 4. Under the most optimistic scenario the ratio of passengers to bus miles is close to 0.8, while this ratio descends to 0.6 in the pessimistic scenario. (This rate declines even farther, to 0.35, if no operating assistance is available from UMTA.) (In urban areas, this ratio can be as high as 3.0, which is a reflection of higher densities and larger vehicles.) The behavior of this important ratio is in accordance with the rural transportation experience and itself vouches for the credibility of the simulation runs.

The differential effects of inflation from 1977 to 1985 were calculated for each of the major cost elements. The major inflationary forces are fuel and wages (including fringe benefits). (8, 9) Costs due to inflation will not be balanced by the growth of fares or state/local aid (11, 12) or even by population growth. (4, 5) These forces have the effect of decreasing the efficient size of the larger transit systems (13), which is why the number of UMTA-supported vehicles in system fleets will decrease if systems continue to minimize their total deficits. (If systems do not attempt to minimize deficits, but maintain constant fleet sizes instead, this will substantially increase the demands for funding.) A decrease in passengers and vehicle miles from 1977 to 1985 follows this decrease in number of vehicles. Without UMTA assistance, the decline in service provided would be much more

Who Will Get the Money?

Table 5 summarizes the allocation of UMTA transit assistance requirements per county size group. The counties with population above 50,000 receive in all cases the majority of the funds, ranging from 44.6 percent of all funds in the most optimistic scenario to as high as 61.8 percent in the most pessimistic scenario.

Focusing on the allocation of the operating assistance funds, it was found that the counties with more than 50,000 residents receive 45 percent of the operating assistance funds in the optimistic scenario, 51 percent in the moderate and 63 percent in the pessimistic scenario. Thus, a curtailment in local and state aid tends to concentrate the operating assistance on the larger counties. However, in contrast to the capital grant program, the

operating assistance funding is more targeted on the smaller communities. (The effect of allowing no funds for operating assistance is to shift the funds for capital expenses to the larger counties which have a greater ability to support transit operations. The same is true of the sensitivity of the county allocations to the level of state and local aid. A reduction in the level of state and local aid shifts the available UMTA funds to the larger counties, since the smaller counties are forced to more drastically curtail their operations in response to the reduction in aid levels.)

Conclusion: Major Influences on Rural Transit Funding Options

The total demand for financial assistance from UMTA from rural communities for transit operations is highly sensitive to a number of factors that have been discussed above. Several of these factors are worthy of further comment.

The type of assistance available from UMTA significantly affects the amount of transportation that will be provided and who will get the transportation services. The National Mass Transportation Act of 1974 does not now allow any portion of the \$500 million set aside for non-urbanized areas to be used for paying operating deficits, although operating subsidy funds are now available to urbanized areas. If this restriction continues, it will significantly curtail the amount of transportation provided and will tend to shift funding toward the larger communities.

The second point deserving further emphasis is the sensitivity of the cost conclusions to vehicle life expectancy. The life cycle costing performed under this project covered several vehicle lives during the study period of FY1977-FY1985. In addition to the costs that could be directly attributed to short vehicle lives, there are significantly large indirect costs that we could not estimate. The most significant of these is the administrative burden - on UMTA and on transit operators as well involved in capital grant applications. Because of the length of time and the amount of work involved in preparing and processing grant applications, all parties in the process would be better off if such applications were not often necessary. However, given the current vehicle life expectancy of three to five years for those vehicles typically used in rural transit operations, the administrative burden will be large. Thus, UMTA and other Federal agencies could create substantial administrative savings and some capital cost savings by insisting on better product standards. A Federal role is necessary in this instance because of the inability of the purchasers of the vehicles - local transit organizations - to have an impact on manufacturing decisions and standards.

Finally, the demand for funds for rural transit can be expected to grow steadily for the foreseeable future. No levelling-off in the demand for funding is projected due to inflationary pressures on operating costs, particularly on fuel and wages. These inflationary forces are beyond the control of UMTA policies. The alternative to at least keeping pace with rising costs is to see a decline in the volume and quality of rural transit services. Increases of about 12 percent per year in program funding from an initial appropriation of \$30 million would best serve the projected rate of increase in the demand for funding.

Acknowledgements

The work described in this paper was performed under contract to the Office of Policy Development of the Urban Mass Transportation Administration. For a in-depth explanation of this research, see A Study of Non-Urbanized Area Transit Assistance Requirements, (May 1977), a report prepared by Ecosometrics, Inc. under contract to the Office of Policy and Program Development. The authors wish to thank Dr. Douglas B. Gurin, the UMTA Project Monitor, and Lawrence L. Schulman, Director, Office of Policy and Program Development for their assistance, guidance and encouragement. In addition, we are grateful to Ervin Poka of the Office of Highway Planning of the Federal Highway Administration for data he furnished to us.

The contents of this paper reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of UMTA, the U.S. Department of Transportation, or any other agency.

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Figure 1: OVERVIEW OF SIMULATION MODEL OF UNTA RURAL TRANSIT ASSISTANCE PACKAGES

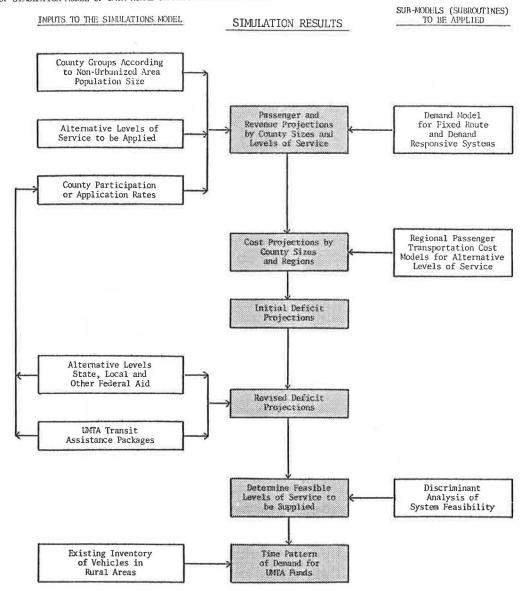


Table 1. Three Alternative Scenarios Resulting from Combinations of Factors Influencing Funding

	VALUES OF INFLUENTIAL FACTORS							
		UMTA Assista	nce Program	Level of State, Local and Other				
Scenario Designation	Percent of Counties in U.S. that apply for UMTA assistance*	80% Capital Grant Assistance	50% of Operating Deficits	Federal (Non-UMTA) Aid (subsidy per vehicle mile)				
Optimistic	High (32%)	Yes	Yes	High (\$0.50)				
Moderate	Medium (26%)	Yes	Yes	Medium (\$0.20)				
Pessimistic	Low (16%)	Yes	Yes	Low (\$0.10)				

^{*}There are 3,097 counties in the U.S. as of 1970, according to the U.S. Census. (The National Association of Counties lists 3,065 functional county governments. NACO has determined that, while only 11 counties in the nation are theoretically excluded from participation in the non-urbanized area funds of the 1974 National Mass Transportation Act, there are 442 other counties that contained urbanized areas in 1974, and, thus, are not as likely to apply or to receive funds as the remaining 2,612 counties.) The percent of counties applying is based on the U.S. Census total of 3,097 counties.

Table 2. Total Projected UMTA Expenditures for Non-Urbanized Area Transit Programs from NMTA Funds, FY1977-FY1985

	FY1977-FY1985 UMTA Rural Transit Assistance Requirements (Millions of Current Dollars)					
Alternative Scenarios	Capital Grant Assistance	Operating Assistance	Total			
Optimistic	\$366	\$358	\$724			
Moderate	\$264	\$216	\$480			
Pessimistic	\$ 75	\$ 71	\$146			

Table 3. Projected UMTA Non-Urbanized Area Transit Expenditures Over Time

Scenario	Time Period	FY1977-FY1985 UMTA Rural Transit Assistance Requirements* (Millions of Current Dollars)				
		Capital Grant Assistance	Operating Assistance	Total		
Optimistic	FY1977	\$ 13.9	\$ 30.5	\$ 44.4		
	FY1980	45.4	38.9	84.3		
	FY1985	64.9	58.6	123.5		
	FY77-FY85	366.0	358.2	724.2		
Moderate	FY1977	9.4	20.5	29.9		
	FY1980	36.8	23.9	60.7		
	FY1985	44.1	33.2	77.3		
	FY77-FY85	264.4	215.6	480.0		
Pessimistic	FY1977	2.3	6.8	9.1		
	FY1980	10.5	8.0	18.5		
	FY1985	9.5	11.0	20.5		
	FY77-FY85	74.6	71.3	145.9		

^{*}Based on matching ratios of 80 percent Federal share for capital expenses and 50 percent Federal share for operating deficits.

Table 4. Summary of Impacts of Selected Scenarios

			Transportat	ion Activit	y Results	St	ate, Lo	ocal and Other	
Scenario Designation	Scenario Definition	Year	One-Way Passengers (millions)	Vehicle Miles (millions)	No. of UMTA Supported Vehicles in Fleet	(Mill: State		f Current Dollars) Other Non-LMTA Federal Aid	UMTA Assistance (Millions of Current Dollars)
Optimistic:	High level of county participation (32%)	FY77	143	185	7430	\$20.4	\$31.5	\$22.2	\$ 44.4
	High level of state and local aid (\$0.50/vehicle mile)		143	165	7430	φ20.4	φ31.3	Ψ22.2	\$ 44.4
	UMTA assistance: 80% capital; 50% operating deficits		150	185	7430	\$32.5	\$50.2	\$35.4	\$123.5
Moderate:	Medium level of co. participation (26%)	FY77							
	Modium level of state & local aid (\$0.20/vehicle mile)		106	131	5280	\$ 3.9	\$11.7	\$ 2.6	\$ 29.9
	UMTA assistance: 80% capital; 50% operating deficits	FY85	100	113	4600	\$ 5.4	\$16.2	\$ 3.6	\$77.3
	Low level of county participation (16%)								
Pessimistic:		FY77	29	41	1665	\$ 0.4	\$ 2.0	\$ 0.4	\$ 9.1
	UMTA assistance: 80% capital; 50% operating deficits	FY85	18	30	1220	\$ 0.5	\$ 2.4	\$ 0.5	\$20.5

Notes: a) Computed by using the state and local aid contributions as specified. These aid levels are all projected at an annual growth rate of six percent to FY1985.

b) "Other federal aid" refers primarily to funds and in-kind services from the Comprehensive Employment and Training Act of 1974 (administered by the Department of Labor), various programs sponsored by the Community Services Administration (formerly OEO), and the Administration on Aging of HEW. It is expected that other sources (such as Title XX of the Social Security Act of 1936, as amended) will also be used, but not to the extent of the first three sources.

Table 5. Relative Assignment of UMTA Non-Urbanized Area Transit Assistance Funds from National Mass Transportation Act of 1974 According to County Size — FY1977-FY1985

	SCENARIO DESIGNATIONS				
Scenario Characteristics	Optimistic	Moderate	Pessimisti		
County Application Rate (Percent of 3,097 U.S. counties)	High (32%)	Medium (26%)	Low (16%)_		
• for Capital Grants: 80% • for Operating Deficits: 50%	Yes Yes	Yes Yes	Yes Yes		
Level of State, Local and Other Federal Aid per Vehicle Mile	High (\$0.50)	Medium (\$0.20)	Low (\$0.10)		
County Size Groups (By Population)	PERCENTAGE A TRANSIT ASSI FY1977	STANCE FU	OF UMTA		
Less than 2,500	0.1%	0.0%	0.0%		
2,500 - 9,999	5.7	7.2	7.5		
10,000 - 24,999	23.9	11.7	13.1		
25,000 - 39,999	16.9	19.5	8.3		
40,000 - 49,999	8.8	9.4	7.8		
50,000 - 99,999	28.4	29.8	43.6		
100,000 and over	16.2	22.4	19.7		
TOTAL	100.0%	100.0%	100.0%		
Total UMTA Non-Urbanized Transit Assistance (in millions of current- 1977-dollars)	\$724	\$480	\$146		