



U.S. Department  
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**Urban Mass  
Transportation  
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# Cost Analysis For Social Service Agency Transportation Providers

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JANUARY 1981

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# **Cost Analysis For Social Service Agency Transportation Providers**

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**Prepared by  
Center For Transportation Research  
The University of Texas at Austin  
Austin, Texas**

**Prepared for  
U.S. Department of Transportation  
University Research and Training Program  
Urban Mass Transportation Administration  
Washington, D.C. 20590  
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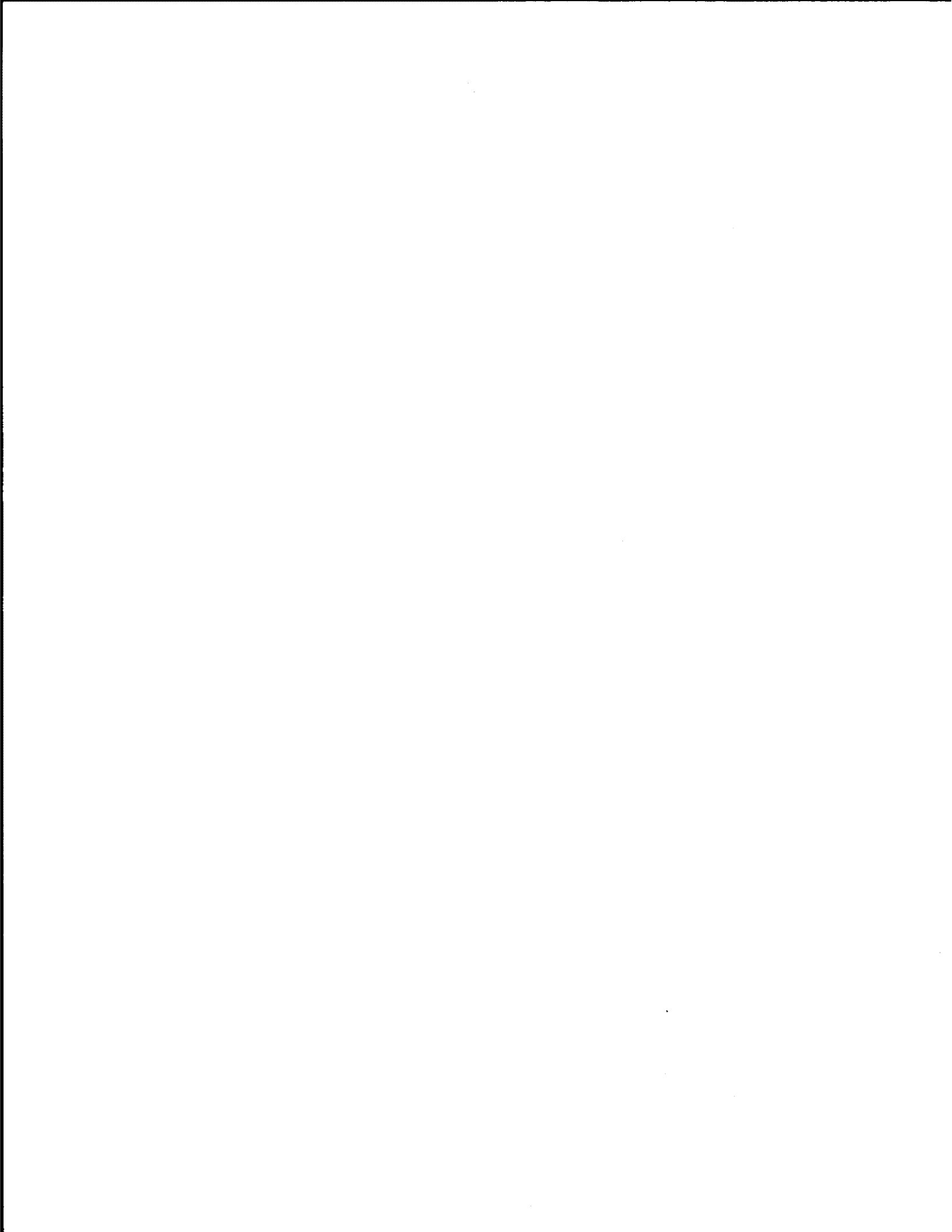
# Introduction

This Manual focuses on one topic in the delivery of transportation services by community providers -- the costs of functions performed in the delivery of transportation services.

This Manual is designed to assist social service agencies and community transportation providers

- to identify all the functions and activities involved in the provision of transportation services,
- to match costs and expenses to the system activities that generate them,
- to understand and be comfortable with the concept of full costs,
- to calculate total annual system costs and expenses by major cost category,
- to calculate a few basic unit cost measures based on annual system costs, and
- to perform some preliminary comparative assessments of their systems.

This Manual is designed to be used by agencies currently providing transportation services as well as those who are only considering direct service provision.



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--SR,AP,HD,CS  
Austin, Texas  
January 1981

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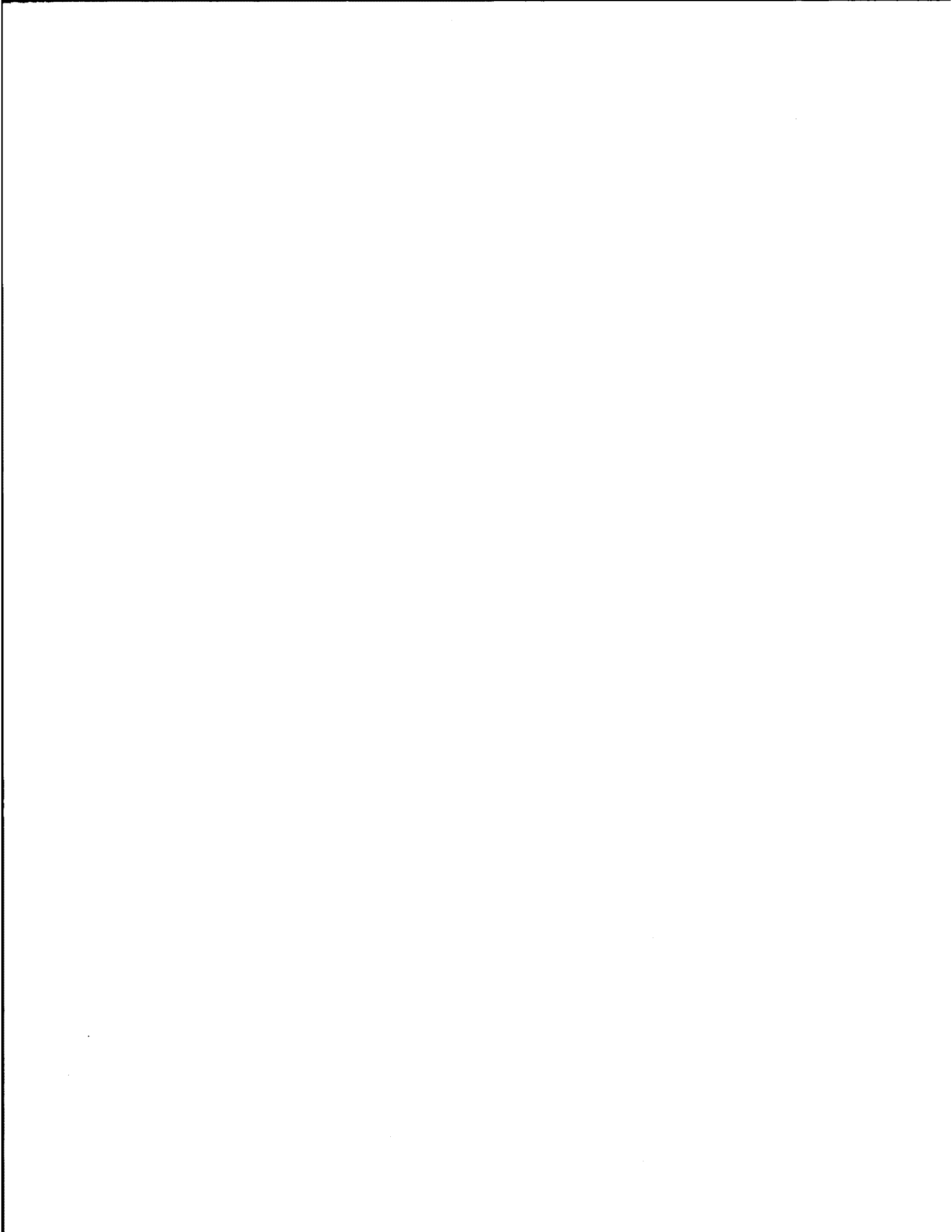
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# Chapter One.

# **How to Get the Most Out of This Manual**

## INTRODUCTION

This Manual is the first in a series of Manuals designed to help social service agencies and small community providers increase the effectiveness of their transportation services. This Manual is the basis of the entire series. It provides the reader with the basic data and skills necessary to undertake a wide variety of analyses and evaluations. It is absolutely necessary to understand the cost features described here in order to understand how to provide transportation services to your clients and riders in the most efficient and effective way.

Of course, the techniques and procedures discussed in this Manual are not the only available methods of analyzing the cost and performance of transportation services. The strength of the approach chosen by this Manual, however, is that the methods discussed in this Manual have been developed over several years and

they have been reviewed by both large and small transportation operators. Wherever possible the Manual has incorporated the work of others.\*

Many of the procedures and working materials have been revised several times in response to the constructive comments of researchers, operators, and planners. Moreover, the style of presentation, the kind of examples used to illustrate key points, and the organization of important materials in the Manual have also been reviewed in operation and in group workshops. They have been revised where necessary in order to make the entire Manual easier to understand and easier to use.

#### HOW TO USE THE MANUAL

The materials presented in this Manual are designed to be used together as part of a comprehensive cost analysis of the transportation services that you do provide or wish to provide. It is possible to gain some useful information simply by reading the Manual but you will gain much more by actually doing the analyses and calculations suggested by the Manual (and facilitated by the Worksheets and Examples).

It is very difficult to understand the importance of certain factors and the interrelationships among key variables without actually calculating the appropriate numbers and figures for a real system (preferably your own rather than an abstract example). The best way to use the Manual is to read it through first. Then return to the Worksheets and examples and do the appropriate calculations for your system.

Each of the calculations shown and explained in the Manual builds upon calculations and data developed in earlier sections of the Manual; most of the work is cumulative. It is sometimes possible, but rarely wise, to do later analyses and computations without having done the basic ones as shown earlier in the Manual. For example, the Manual begins with an extensive discussion of the calculation of system costs; later work discusses comparing

\*See Appendix for discussion of UMTA Section 15 reporting requirements.



your unit cost measures, such as cost per vehicle hour, to those of a national survey. If you do not calculate your cost figures correctly, as shown by the Manual, you cannot accurately compare your alternatives even if you correctly follow the procedures shown in that section.

You may find that doing the calculations shown by the Worksheets and Examples is both time-consuming and tedious. Unfortunately, there will always be an element of both factors in any evaluation of your system. However, once you have begun to keep appropriate and accurate records in a useful format, and once you fully understand the procedures and their rationale, the time and personal effort required to perform necessary calculations should decrease significantly. Much of the initial frustration in an effort of this kind arises from working with inaccurate or missing data, disorganized files, and a lack of familiarity with the necessary processes.

Some of the explanations or specific details in the Manual may initially appear trivial or even irrelevant to your system. Obviously, one Manual that is attempting to assist many different types of providers must make some general assumptions that may not be true or relevant for any specific system. But before you decide that some evaluation or calculation is not relevant, carefully consider the issue.

One of the major reasons social service agencies have trouble evaluating their transportation service is that they do not recognize the importance of certain cost or service components. Many of the Examples provided in the Manual are designed to alert agencies to the existence and importance of such system components. Before you dismiss those suggestions, you should actually work through the examples and procedures described, using your system data; you may be very surprised to find that "trivial" issues have a great deal of importance. On the other hand, should you actually find that certain calculations are not relevant to your service or your agency, dismiss them.

This manual asks you to spend significant time and effort in understanding both elemental and complex features of the operation of a transportation service. All reports that we have received from agencies actually using the drafts of this Manual indicate that the time spent mastering these details and in the calculation of important characteristics was fully rewarded. We are hopeful that this will be your experience as well. We urge you to report to us any successes or problems that you have had in using this Manual.

#### THE OVERALL MESSAGES OF THIS MANUAL

One point is stressed over and over again in this Manual -- YOU MUST RECOGNIZE ALL THE COSTS THAT ARE INCURRED IN PROVIDING TRANSPORTATION SERVICES WHETHER OR NOT YOU ACTUALLY PAY THEM. Only in this way can you respond to changes in federal and state policy, increases in individual cost components, and the need to consider alternatives to your current transportation method.

This "full-costing" approach raised the most initial objection from social service agencies which reviewed earlier drafts; why calculate costs that are not actually incurred? Chapters Two and Three address this question at length. Here it is only necessary to point out that important factors can change; vehicles break down and there is no money available to buy more, other agencies cut off free services, volunteer escorts ask for gas money, etc. You must understand all the costs that are involved in your current service at least in part to be prepared for potential problems. In order to use this Manual to its fullest potential, you should do the "full-cost" calculations described in spite of the fact that they are time-consuming and may not seem to be immediately applicable.

Another basic point -- COST MEASURES ARE ONLY marginally COMPARABLE BETWEEN SYSTEMS; HOW EFFICIENT A SYSTEM IS DEPENDS IN LARGE PART ON WHAT SERVICE IT PROVIDES AND WHAT ITS OBJECTIVES ARE.

The Manual's failure to give many comparative national figures also sparked some comments from social service agencies and other observers. Many agencies want to compare their costs against those of other systems in the country to see how well they are doing. Unfortunately, rarely is another system in exactly the same operating environment, meeting the same system objectives. Climate, geography, state laws, local regulatory structures, population density, funding sources, and the type of clients to be served and the kind of trips they require, all impact the operating experiences of such systems. Such variables make it very difficult to make meaningful comparisons between widespread systems.

This Manual gives some ways to make preliminary system comparisons. Other Manuals in the series give more complex, and more realistic, comparative procedures.

## ORGANIZATION OF THE MANUAL

There are six Chapters in the Manual -- five of which deal with substantive issues. Chapter Two explains why it is necessary to identify all the functions and activities involved in providing a transportation service. Chapter Two goes on to explain how you can link costs and expenses with the transportation functions that generate them.

Chapter Three provides a lengthy justification for the full-cost analyses adopted by the entire series of Manuals. Chapter Three explains the differences between costs and expenses and describes the management as well as budgetary uses to which you can put such data.

Chapter Four shows you how to calculate your current or predicted annual system costs, as well as the yearly cost of each major cost item in your budget. Chapter Four illustrates the full range of calculations required using data from two real systems.

Chapter Five shows you how to calculate some of the many important unit cost figures which you need to have to evaluate

properly your system. Chapter Five explains the value of unit cost data and describes some of the important uses to which such measures can be put.

Chapter Six shows you how to use the cost data that you have generated to perform three preliminary comparative analyses. First, Chapter Six explains how to use the incidence of cost items in your budget to compare to some national figures. Second, Chapter Six gives you average unit cost data from a 1977-78 national survey against which to compare your system's data. Third, the Chapter explains how you can compare your current costs to the prices for one-way passenger trips which may be offered to you by a community provider.

#### WHAT YOU SHOULD DO NOW

In order to use this Manual effectively, you should not only read it carefully but be prepared to undertake the calculations and Worksheet assignments. You should try to set aside sufficient time to do this.

In general, you can do the work in each Chapter at one sitting. You will need to pull together all your financial, cost, and operating records. You will probably need a small hand-held calculator as well.

The Appendix has extra copies of all the Worksheets and Tables. In a few cases, very long or multi-part Worksheets have been shown in the text of the Manual in a reduced form. This reduction allows you to see the entire example or evaluation at one glance. However, the reduced Worksheets may be too small to use in doing your own system calculations; you should photocopy the full size sheets in the Appendix for your own use.

## Chapter Two.

# **Analyzing and Understanding the Cost and Activities You Perform in Providing Transportation Services**

### WHAT THIS CHAPTER WILL DO FOR YOU

This Chapter is designed to help you identify and analyze all of the functions and activities that you perform in providing transportation services. It is important for you to understand how each of these activities creates expenses for your agency. Such an analysis will allow you to understand the cost implications of changes in your current service or assist you to predict the impact on various operational components of any change in funding levels.

In order to undertake an estimate or calculation of your current cost patterns or of your potential expenses, you must understand why and how each activity that you perform generates expenses for your agency. In order to calculate your total annual system costs or to compute your unit cost figures as shown in Chapter Five, it is necessary to understand exactly how each function affects your cost patterns. This Chapter is designed to

give you the tools to understand the relationship between the functions that you perform and the expenditures that you make.

The analyses presented in this Chapter are most useful for agencies already providing client transportation services in their own vehicles, or for those agencies that are considering such direct service provision. Agencies currently providing transportation services can use the methods described here to analyze and evaluate their own activities. Agencies considering direct transportation provision can use these methods to alert themselves to the many responsibilities and functions that they will have to undertake (and pay for).

The methods presented in this Chapter can also be useful to agencies that are not directly providing transportation services but who still retain some transportation-related functions. Such agencies may want to identify all the functions that they may still be performing; for example, paying bills, arranging rides for clients, monitoring contractor performance, etc. The performance of these activities certainly creates costs for the agency involved.

This Chapter makes two major points:

- you must identify all the activities that your agency performs in providing transportation services, and
- you must understand how the performance of each of those activities creates costs for your agency.

ACTIVITIES THAT CREATE EXPENSES FOR YOUR AGENCY

There are six major cost items involved in providing transportation services. If you are currently operating a transportation system, the headings themselves probably look familiar. They are

- Overhead and Administration
  - Operations
  - Maintenance
- } Activity Related

- Equipment and Depreciation
  - Fuel and Oil
  - Insurance and Licenses
- } Purchase Related

In general, your agency or system incurs expenses because you either

- buy something (such as tires or a two-way radio), or
- you do something (such as performing maintenance on your vans, or making up driver manifests).

The costs you incur in buying something are generally apparent and often easy to understand. The costs that you incur performing some activity often are not considered separately. Such costs often appear only in an aggregate column on a budget.

The following section will briefly describe the functions and activities usually carried out by an agency providing client transportation. Do not be alarmed if you put a certain activity or a cost item in a different category than does this Manual. The significant points to be made are a) that it is important to recognize these activities wherever they are recorded, and b) that it is important to be consistent and logical in recording their associated costs.

#### THE ACTIVITIES OF EACH MAJOR COST CATEGORY

Figure 1 lists the activities and functions commonly associated with the six major cost categories listed above. Each cost category will be discussed separately below.

#### Overhead and Administration

Several activities are normally considered in this category. It is useful to carefully examine each function in detail even though not all of these functions will be performed by your agency. It is wise to first clearly identify all the tasks, activities, and functions that you do perform in conjunction with your

**Figure 1**  
**FUNCTIONS COMMONLY ASSOCIATED WITH THE SIX MAJOR CATEGORIES**

**I. OVERHEAD AND ADMINISTRATION**

- program start-up activities
- client screening and eligibility certification
- trip reservations
- issuing travel documents
- accounting
- analysis of operating data
- monitoring and evaluation of service delivery

**II. OPERATION**

- scheduling and routing
- dispatching
- driving
- escort services
- training

**III. MAINTENANCE**

- preventive maintenance
- motor repair
- vehicle repair

**IV. EQUIPMENT AND DEPRECIATION**

(no particular functions; only purchases)

**V. FUEL AND OIL**

(no particular functions; only purchases)

**VI. INSURANCE AND LICENSES**

(no particular functions; only purchases)



transportation program. This will allow you to make an accurate assessment of your expenses.

In the event that you contract for service or join a coordinated program this procedure will allow you to clearly identify which functions and activities you will shift to the contractor and which you will retain. If you retain some functions, this will mean an additional and continuing cost to you, over and above the contract costs.

Two overhead functions occur largely at the beginning of a new system.

Program Start-Up. Such activities can include a study of how to provide the service (in what area, at what cost, during what time, under what conditions, client eligibility, etc.), done either in-house or by a hired consultant. It can also include advertising the new system.

If the transportation service is not directly provided; it is also necessary during this stage to outline the service characteristics, identify possible providers, request bids, and negotiate contractual agreements.

Client Screening and Eligibility Certification. The heaviest burden of this activity occurs at the on-set of the operation, when all existing clients are reviewed. However, this function can continue through time as some clients are added to the list and others removed. Typically, a client file is established, eligibility verified according to whatever criteria have been adopted, and some means of identification (e.g. an I. D. card) is issued.

Once a system is in operation, the following functions must routinely be performed.

Intake of Client Reservations for Trips. In many systems such requests are normally received at least 24 hours in advance. In systems not directly providing transportation, all requests are forwarded to the actual provider usually the night before. For direct provision, scheduling and routing the vehicles on the basis of the requests received may or may not be done when the client

calls in. This Manual shows trip reservations as a separate function from dispatching.

Issue of Vouchers, coupons, tickets, or other travel documents if the system has been set up in a way which requires this procedure.

Accounting for all the different cost components. This includes bookkeeping as well as preparation of payrolls, and other administrative tasks. In the case of coordination agreements, this function may be complicated by the need to separate costs and bill the participating agencies accordingly.

Identification and analysis of ridership and operating data, perhaps at a level of detail required by funding agencies or contractors.

Monitoring and periodic evaluation of the quality of the transportation service, whether directly provided or not. If the service is not directly provided, compliance of the contractor with the original agreement, and levels of cost and performance can also be evaluated.

Overhead activities are among the hardest to identify clearly because their associated costs are often paid for under different budgets, and because there is often no clear distinction between staff people working full time on transportation and people working for other programs.

### Operations

This cost category item includes all the key functions related directly to the provision of transportation services which are performed by employees.

Scheduling and Routing. Trip reservations from eligible clients are normally received in advance (24-hour advance notice is usually required). Once all reservations have been made, a schedule must be prepared and a route designed for each vehicle. Vehicles are usually routed in an effort to combine trips by time and location and to achieve the most efficient use of each vehicle.

Dispatching may or may not be a separate activity from scheduling and routing. Dispatching often means the modification of the original schedule to accommodate return trips, on-demand or emergency reservations received on short notice, or to respond to any unexpected problem. Dealing with problems caused, for example, by a vehicle breakdown which requires a transfer of clients often requires the use of a radio communication system between the base of operations and the vehicles. Such "real time" flexibility is the function of dispatching.

Driving is obviously indispensable in taking the vehicles and the clients anywhere. Some agencies utilize staff members for part of their time, others are able to secure volunteers, still others hire personnel part or full time.

Escort Services may be needed to assist severely impaired or emotionally dependent clients. This function can often be performed by the driver herself/himself. That, of course, implies that more time may be required for a client to board and leave the vehicle. If the clients are not severely impaired or if they are allowed or requested to provide their own escort, the agency will not need to perform this function.

### Maintenance

Maintenance of vehicles involves routine checks, which can be carried out daily or weekly by the drivers themselves, and more complex work requiring the involvement of skilled mechanics. The complex work can further be separated into preventative maintenance (such as periodic checks of the vehicle systems, change of parts and tires at given mileage and time intervals) and repair work. The amount of time involved in maintaining equipment can become significant in the case of intensely used and old vehicles.

### Equipment and Depreciation, Fuel and Oil, and Insurance and Licenses

The remaining three categories do not generally involve activities that have not already appeared under one of the three

previous categories. The costs and expenses that arise under these categories are generally purchases of tangible and identifiable goods and services, as Fig. 2 illustrates.

#### HOW ACTIVITIES CREATE COSTS FOR YOUR AGENCY

As discussed previously, the first three major cost headings generally represent costs that your agency incurs in doing something or in performing some function. The last three major cost categories represent costs that your agency incurs because you buy something.

Figure 2 illustrates how each of the major cost categories generates agency expenses. In general, the three categories representing outright agency purchases create only direct expenses for your agency. The exception is vehicle depreciation which is not a direct purchase cost but an expense nonetheless to you.

#### A Brief Discussion of Indirect Costs Associated with the Specific Activities

In the case of direct provision by the agency, all the functions discussed above could be performed by administrative personnel involved either full or part time with the transportation program or under contract to the agency. Performing such functions generally creates the following costs under several cost categories.

Salaries of Employees specifically hired for any activity, or the percentage of the salary paid to agency staff members who spend only part of their time on transportation activities. This cost should be based on the percentage of their time they dedicate to the transportation service. This concept will be discussed in the next section of this Chapter.

FICA and Other Fringe Benefits, such as unemployment and health insurance, Social Security, retirement plans, etc. If no better information is available it can be useful to know that, as a rule of thumb, fringe costs represent between 15% and 25% of the salary. If an employee dedicates only part of his/her time

**Figure 2**  
**TYPICAL PURCHASES & FUNCTION-RELATED COSTS**  
**GENERALLY FALLING INTO SIX MAJOR COST CATEGORIES**

Major Cost Categories	Indirect or Associated Costs	Direct or Purchase Costs
I. Overhead and Administration Start-up Client Screening Reservations Issue Travel Documents Accounting Analysis of Operating Data Monitoring and Evaluation	Salaries Fringe Benefits Office Rent Utilities Communications Interest Contract and Consultant Fees	Materials Supplies
II. Operations Routing and Scheduling Dispatching Driving Escort Services Training	Salaries Fringe Benefits Garage Rent and Utilities Contract Fees	
III. Maintenance Preventive Maintenance Motor and Vehicle Repairs Body and Accessory Repairs	Salaries Fringe Benefits Space Rent and Utilities Contract Fees and Charges	Materials Supplies Tires
IV. Equipment and Depreciation	Equipment and Vehicle depreciation	Vehicle Purchase Costs Radio Communications Equipment Purchase Vehicle Modifications Purchase

Major Cost Categories	Indirect or Associated Costs	Direct or Purchase Costs
V. Fuel and Oil		Fuel Oil
VI. Insurance and Licenses		Vehicle Insurance License Fees Personal Liability Insurance Other Fees and Licenses

to transportation, only a percentage of the fringe benefits should be included.

Office Rent and Utilities; all activities must be placed somewhere. The use by transportation staff of a mixed-use facility can be measured in terms of number of hours dedicated by all personnel to transportation, the number of rooms utilized, or other suitable criteria.

Communications include telephone and mailing and freight charges.

Travel Expenses for administrative and other personnel. Such expenses can be incurred in the first phases of contract negotiation, in monitoring and evaluating the program in the investigation of clients' complaints, and in other activities.

Interest Payments on start-up loans to purchase vehicles and equipment (perhaps in advance of the arrival of grant monies) or on loans taken to ease cash-flow problems.

#### WHY YOU MUST IDENTIFY ACTIVITIES THAT YOU PERFORM AND THEIR ASSOCIATED COSTS

Many of the changes that will create financial difficulties for your system are not associated with the things that you buy directly (like tires). Many financial disruptions arise because you have to change the way in which you are doing something. For example, if you increase the number of riders whom you serve you may have to spend more time screening eligible clients, more time in dispatching and scheduling your vehicles, and more money in doing routine vehicle maintenance. Or if your parent agency can no longer donate a staff person's time to handle your billing and accounting needs, you may have to take over that function.

Note how many categories in Fig. 2 show salary and benefit expenses, as well as various rent and utilities costs. Most agencies simply lump together all their salary expenses; that is, they know how much the agency spends in total on salaries but not how much the agency expends on salaries to perform one function

of the many performed by the agency. But that kind of knowledge is really required by most agencies.

But Fig. 2 shows how deceptive and non-informative a traditional aggregate cost category like "salaries" can be. Since salary and benefit costs can arise from several of the activities that you perform, aggregate figures would give you little idea of how much you were really spending for maintenance, or for administrative duties, or for simply operating your vehicles. If you had to cut salaries, the aggregate figure would give little immediate idea of the impact on your activities.

Therefore, it is necessary to separate many of your aggregate budget figures in such a way that costs match up with the various activities and functions that you perform. Aggregate salary figures must be apportioned among the various activities that generate those expenses; aggregate rent and utility charges, too, must be apportioned among the activities that create those expenses.

Very large agencies may not find this procedure too difficult. Often large agencies have one or more people hired to do specific activities; they hire people to be drivers, different people to be mechanics, and still different people to perform administrative functions. Smaller agencies may have much greater difficulty in deciding how to apportion expenses. It is not uncommon for a person to be both a driver and mechanic, both a professional social worker and trip scheduler and reservation taker, etc.

The general rule that you should follow: divide the costs of any item in rough proportion to the amount of time or effort spent on the activity in question. Divide salary and benefit expenses according to the amount of time a person with split responsibilities spends performing each transportation-related activity. Divide expenses such as supplies, rent, and utilities according to the amount of time or space consumed by each major transportation activity.



Example: *how to divide the salary and benefit costs of a person with multiple responsibilities*

The Director of your agency will spend about 20% of her time on various administrative and overhead activities related to your proposed transportation system. The rest of her time she will spend on other agency activities and responsibilities.

The Director's annual salary is \$14,500; her yearly benefits are approximately 21% of that amount (or \$3,045 per year).

You should show 20% of both her salary and fringe benefits in your budget as an indirect or associated administrative and overhead cost.

$$.20 \times (\$14,500 + \$3,045) = \$509$$

That amount should appear as salary and benefits costs under the overall cost category, Overhead and Administration.

Example: *how to divide the salary and benefits of a person with multiple responsibilities; a different situation*

You run a small transportation service for senior citizens from a community senior citizens center. Your three vehicles operate about four hours per day although on some days there is some demand for more trips. A staff coordinator at the center spends about two hours per day scheduling and routing the vehicles and four hours per day actually driving one of the vehicles. The remainder of his time he spends on other administrative duties arising from the transportation program.

The coordinator spends a total of four hours per day on overhead and administrative duties (if he works an 8-hour day). He also spends four hours per day on operations, since the activity "driving" falls into that major cost category.

In short, he spends 50% of his time in each of those two major cost categories. If his monthly salary were \$1,000 and his benefits \$174 per month, your budget should show 50% of that total under Overhead and Administration and 50% of that total under Operations. ➡

$$.50 \times (\$1,000 + \$174) = \$587$$

Overhead and Administration (50%)	Salaries and Benefits
	\$587
Operations (50%)	Salaries and Benefits
	\$587

*Note:* on some days the coordinator may drive more than four hours per day. You will have to judge if the 50/50 division is both a reasonable and logical way to show his/her time when considered on a monthly or yearly basis. Complete accuracy is not required; you just must be logical and consistent.

#### WHAT YOU NEED TO KNOW TO DIVIDE ASSOCIATED COSTS AMONG CATEGORIES

It is probably clear from the examples above, that in order to divide up aggregate budget figures in a meaningful way you have to know how much time and effort is spent on the various activities and functions. You may not now know that information.

One of the major reasons to follow the kind of allocation procedure described in this Chapter is to understand how your system operates. If you do not know how much of the staff's time is spent performing various activities, you should try to find out. You need to know how your staff and other resources are being used, in part so you can understand your cost patterns but also so that you can better manage your system.

If you do not know how much of a staff person's time is taken up with various administrative details, you can find out by taking a sample of the time spent on various representative days or weeks. You can ask the staff to make a quick note or you can assign somebody to monitor activities.

Absolute accuracy is not required; few people do the same thing every day. Administrative activities are particularly hard to pin down. But an analysis of the general activity pattern of the staff is the first requirement for better management of your entire system as well as a sensible assessment of alternatives.

The previous sections have also described how it is important to understand how to divide other than salary aggregate costs. Your rent, for example, should be divided up among the activities that use space, as should utilities and supply costs.

Example: *how to divide rent and utilities among major cost categories*

You run a transportation system with eleven vans. You rent several offices, and a garage and minor maintenance facility from the County government for a total of \$450 per month.

When you decide to divide these costs up among the major cost categories, you ask the County to tell you how much you are spending for each particular facility. Unfortunately, they cannot tell you.

So you look at the amount of floor space consumed by the various functions. You find that the offices account for roughly 40% of the total space rented; the maintenance facilities approximately 60%.

Therefore, you apportion 40% of \$450 or \$180 to the Overhead and Administrative category; and 60% or \$270 to the Maintenance category. You also divide the utilities bills in the same manner.

However, you do not use the same procedure for the telephone bill. The maintenance facility does not have a telephone; moreover, all the phones are used for administrative purposes or for scheduling and routing. You divide the telephone bills, 50% to Overhead and Administration, 50% to Operations.

Example: *how to divide rent and utilities among major cost categories; a more complex situation*

Assume all the same system characteristics as shown in the previous example. When you go to divide rent and utilities you still apportion 60% of those expenses to Maintenance.

However, about half the remaining office space is used for administrative activities, and the other half is used for Operations (for example, scheduling and routing). Therefore, you show one-half of the remaining 40% as Overhead and Administration, the other half

of the remaining 40% as Operations.

Total rent = \$450

Maintenance (60% of all space)	\$270
--------------------------------	-------

Overhead and Administration (20% of all space)	\$ 90
--	-------

Operations (20% of all space)	\$ 90
-------------------------------	-------

You divide utilities costs in the same manner.

The last example above raises the question; how detailed should you be? How important is it to divide and subdivide these kind of overall costs, costs which are often lumped into an aggregate figure in a budget? There is no easy answer.

The larger your system is the more important it is that you trace and divide all your costs so that you can see how each activity creates expenses for your agency. For some agencies it would be far too confusing to list very small expenditures divided among several cost categories.

The important point, however, is that every agency, large or small, should go through the analytical process of separating costs into the functions that generate those costs. Once you have performed this procedure thoroughly for your system at least once, you can then decide if it is worthwhile to abandon the finer degree of detail. You cannot make that judgement before you have undertaken this analysis.

#### A PROCEDURE FOR MATCHING ACTIVITIES AND ASSOCIATED COSTS

Worksheet One is designed to be used as a checklist for identifying the functions and activities that you perform under the three major activity-related cost categories; Overhead and Administration, Operations, and Maintenance. The Worksheet lists the common activities of each of these functions. These activities have already been discussed. If you perform different activities, you could add those to the Worksheet as well.

# Worksheet One

## CHECKLIST FOR IDENTIFYING ACTIVITIES AND COMMONLY ASSOCIATED COSTS

<i>COST ITEMS</i>		<b>I. OVERHEAD AND ADMINISTRATION</b>							
		<i>FUNCTIONS</i>							
Perform Functions?		Start Up	Client Screening	Trip Reservations	Issue Documents	Accounting	Analysis	Monitoring	Other and General
a. Salaries									
b. Fringe Benefits									
c. Rent, Utilities									
d. Communications									
e. Travel									
f. Interest									
g. Contract Fees & Charges									
h. Other & General									

<i>COST ITEMS</i>		<b>II. OPERATIONS</b>					
		<i>FUNCTIONS</i>					
Perform Functions?		Scheduling and Routing	Dispatching	Driving	Escorts	Training	Other and General
a. Salaries							
b. Fringe Benefits							
c. Rent, Utilities							
d. Communications							
e. Travel							
f. Interest							
g. Contract Fees & Charges							
h. Other & General							

<i>COST ITEMS</i>		<b>III. MAINTENANCE</b>		
		<i>FUNCTIONS</i>		
Perform Functions?		Preventive	Vehicle Repair	Body & Accessory Repair
a. Salaries				
b. Fringe Benefits				
c. Rent, Utilities				
d. Communications				
e. Travel				
f. Interest				
g. Contract Fees & Charges				
h. Other & General				

# Worksheet One

## CHECKLIST FOR IDENTIFYING ACTIVITIES AND COMMONLY ASSOCIATED COSTS

I. OVERHEAD AND ADMINISTRATION									
COST ITEMS	FUNCTIONS								
	Perform Functions?	Start Up	Client Screening	Trip Reservations	Issue Documents	Accounting	Analysis	Monitoring	Other and General
a. Salaries			✓			✓	✓	✓	
b. Fringe Benefits			✓			✓	✓	✓	
c. Rent, Utilities			✓				✓	✓	
d. Communications			✓			✓	✓	✓	
e. Travel								✓	
f. Interest									
g. Contract Fees & Charges						✓			
h. Other & General									✓

II. OPERATIONS							
COST ITEMS	FUNCTIONS						
	Perform Functions?	Scheduling and Routing	Dispatching	Driving	Escorts	Training	Other and General
a. Salaries		✓	✓	✓			
b. Fringe Benefits		✓	✓	✓			
c. Rent, Utilities		✓	✓	✓			
d. Communications		✓	✓				
e. Travel							
f. Interest							
g. Contract Fees & Charges							
h. Other & General							

Sample

III. MAINTENANCE				
COST ITEMS	FUNCTIONS			
	Perform Functions?	Preventive	Vehicle Repair	Body & Accessory Repair
a. Salaries				
b. Fringe Benefits				
c. Rent, Utilities				
d. Communications		✓	✓	✓
e. Travel				
f. Interest				
g. Contract Fees & Charges		✓	✓	✓
h. Other & General		✓	✓	✓

To use the Worksheet, you should first read through the listed activities and simply answer yes or no. Do you screen your clients for eligibility? Do you monitor the quality of service that you provide to your clients? Do you dispatch your vehicles? Do you perform preventative maintenance? For all those activities that you do perform, you should then consider if you incur any costs in doing so.

As you use Worksheet One, consider whether these functions create the commonly associated costs that are listed. If you perform client screening, you probably incur salary expenses and fringe benefits. You also probably incur rent and utility charges since the screening is done in an office probably using a telephone and other office equipment. Perhaps the screening process involves traveling to a client's home. Or perhaps you contract out for your clients' eligibility screening.

Use Worksheet One to indicate to you what functions and activities your agency performs and the costs that are associated with the performance of those functions. Sample Worksheet One shows how a filled-in worksheet might look. Remember a large version of all worksheets appears in the Appendix.

The next Chapter will build on this procedure by explaining how you can and should divide certain expenses so that they accurately reflect the function which creates them. At that point there will be Worksheets to use in actually filling in numbers and cost data.

Chapter Three makes a very important point which fits neatly into the analysis discussed in this Chapter. Chapter Three explains why it is so important to identify and understand all the costs that are incurred in the provision of transportation to your clients and by your system, whether those costs appear in your budget or not.

Chapters Two and Three together make the following points: you must understand all the activities that are performed in providing transportation services and you must understand all the

costs associated with those activities whether you pay for them or not.

#### A QUICK PROCEDURE FOR IDENTIFYING ALL DIRECT COSTS

In working with local community providers and agencies we found that some agencies were not fully aware of all the direct or purchase-related costs that they had incurred. Sometimes this was because of bad recordkeeping. Other times certain costs or expenses were "hidden".

While it is generally easier to identify and calculate the direct expenses involved in transportation provision, it is not always done correctly. Worksheet Two, therefore, gives you a checklist to use in making sure that you have considered all the direct costs and purchases that are commonly associated with the provision of transportation services. You can add items not appearing here if they are important for your system. Chapter Three will give you more detailed procedures for actually calculating the numbers and dollar figures for these expenses.

Depreciation is probably the only direct cost that may initially prove difficult to understand. Chapter Four will have a brief description of what depreciation is and how it should be handled as a cost in your budgeting and in your financial analysis. The handling of depreciations will vary. It depends on whether you obtained your vehicle(s) from the same funding source that pays your operating expenses, and whether you utilized certain specific government programs to buy vehicles (or radios or vehicle modifications). (See Appendix.)

We may have shown some cost items under associated or indirect costs which you consider to be direct costs. Common examples are interest on loans and contract fees. There were reasons why we felt that these expenses ought to be linked to specific activities. However, if such expenses make more sense to you shown as direct costs, feel free to do so. In later budget analyses the two



# Worksheet Two

## CHECKLIST FOR IDENTIFYING DIRECT COSTS

FUNCTIONS	DIRECT COSTS						
	Supplies	Parts	Contract Charges	Depreciation	Insurance	Licenses & Fees	Other & General
<b>I. OVERHEAD &amp; ADMINISTRATION</b>							
1. Start-Up _____							
2. Client Screening _____							
3. Trip Scheduling _____							
4. Issue Documents _____							
5. Accounting _____							
6. Analysis _____							
7. Monitoring _____							
8. Other & General _____							
<b>II. OPERATIONS</b>							
1. Scheduling & Routing _____							
2. Dispatching _____							
3. Driving _____							
4. Escort Services _____							
5. Training _____							
6. Other & General _____							
<b>III. MAINTENANCE</b>							
1. Preventative _____							
2. Vehicle Repair _____							
3. Body & Accessory _____							
<b>IV. EQUIPMENT PURCHASE &amp; DEPRECIATION</b>							
1. Vehicle _____							
2. Vehicle Modifications _____							
3. Radio _____							
<b>V. FUEL AND OIL</b>							
1. Fuel _____							
2. Oil _____							
<b>VI. INSURANCE AND FEES</b>							
1. Insurance _____							
2. Licenses _____							
3. Fees _____							

# Worksheet Two

## CHECKLIST FOR IDENTIFYING DIRECT COSTS

FUNCTIONS	DIRECT COSTS						
	Supplies	Parts	Contract Charges	Depreciation	Insurance	Licenses & Fees	Other & General
<b>I. OVERHEAD &amp; ADMINISTRATION</b>							
1. Start-Up _____							X
2. Client Screening _____	X						X
3. Trip Scheduling _____	X						X
4. Issue Documents _____							
5. Accounting _____	X		X				
6. Analysis _____	X						
7. Monitoring _____	X						
8. Other & General _____							
<b>II. OPERATIONS</b>							
1. Scheduling & Routing _____							
2. Dispatching _____							
3. Driving _____							
4. Escort Services _____							
5. Training _____							
6. Other & General _____							
<b>III. MAINTENANCE</b>							
1. Preventative _____	X	X	X				
2. Vehicle Repair _____	X	X	X				
3. Body & Accessory _____	X	X	X				
<b>IV. EQUIPMENT PURCHASE &amp; DEPRECIATION</b>							
1. Vehicle _____				X		X	
2. Vehicle Modifications _____				X			
3. Radio _____				X		X	
<b>V. FUEL AND OIL</b>							
1. Fuel _____	X						
2. Oil _____	X						
<b>VI. INSURANCE AND FEES</b>							
1. Insurance _____					X	X	
2. Licenses _____						X	
3. Fees _____							

Sample

types of cost figures will be brought back together and shown in the same budget document.

#### CLOSING THOUGHTS AND A PREVIEW OF THE NEXT CHAPTER

The message in this Chapter is that you must understand not only what functions you perform in carrying out your transportation responsibilities, but also how those functions create costs for your agency. In order to properly manage your system, you must have a good idea of all the many duties, activities, and responsibilities that your agency and individual staff have accepted because you provide transportation services or run a transportation system.

Your agency requires such an assessment for management as well as for financial reasons. A careful reading of this Chapter will allow you to survey and inventory the work and duties that you are performing.

Once you have a clear idea of the functions and activities that your agency performs in providing transportation services, you can analyze how those activities create agency expenses (and perhaps revenues). It is very important for your agency to understand the relationship between each of the functions that you perform and your total cost pattern. Only in this way can you understand and predict the impact of changes in your activities or your objectives on the costs that you incur.

Chapter Three will explain why it is so important to identify and calculate the value of all the resources that are expended in providing transportation services. Chapter Three will give examples of both that principle and the one that appears in this Chapter; you must understand all the activities for which your agency has accepted responsibility and possible expenses.

Chapter Three will make a careful distinction between costs and expenses, a distinction not made in this Chapter. In this Chapter the two words have been used interchangeably but they will no longer be.

## Chapter Three.

# The Value of Full Cost Analyses

### WHAT THIS CHAPTER WILL DO FOR YOU

Economic considerations are a crucial element in the evaluation of any transportation service or system. This Chapter will help you estimate or calculate the costs that you incur in performing each of the functions associated with providing transportation services to your clients or riders. Once you have calculated the cost of each of the functions or activities that you perform in providing transportation services, you can compute the total annual system costs.

If you are not now providing transportation services, you use the same procedures to estimate the total annual costs of direct transportation provision. You will need to approximate many of your costs. This may require you to spend some time researching the expenses involved; that is a valuable exercise if you should decide to purchase vehicles and begin your own system.

An analysis of your total annual system costs will serve a number of purposes. These annual costs, or the unit cost figures which are based on them (which Chapter Five will help you to compute), will allow you to

- estimate your costs for the coming year or estimate the costs of operating a system for the first time
- combine cost figures with performance measures to evaluate the productivity of your system (as shown in a later manual in the series)
- compare, with considerable caution, your cost patterns with national averages, and with those of other providers in your community
- compare your costs with those offered to you by other providers in your community.

## INTRODUCTION

In order to calculate your total annual system costs for any purposes listed above or to compute your unit cost figures as shown in Chapter Five, it is necessary to understand exactly how you incur costs.

The preceding Chapter has explained why you must understand all the activities that you perform in providing transportation services, and why you must calculate all the associated costs of those activities. This Chapter will go into greater detail on these topics. It will present a methodology for calculating a) the individual costs of specific functions, and b) the full costs of the services provided.

This Chapter is an attempt to provide you with an extensive checklist and monitoring device to use when analyzing the cost of providing client transportation. You can use these procedures to prepare preliminary budgets for new systems, to control the costs of your existing system, or to compare the costs of different transportation alternatives.

This Chapter is not designed to help you to develop an accounting system nor does it present the only way that costs can be broken down and recorded. If you are interested in developing

an accounting system Refs. 2 and 5 may be of interest to you. The information in this Chapter may be helpful, however, when working with accountants and others because it can alert you to the type of information you wish your records to contain.

#### WHAT ARE COSTS?

Any commitment of time, effort, money, or resources to the provision of transportation services represents a real cost. That definition of cost is probably not the one your agency has traditionally followed.

Quite often you have the opportunity to take advantage of external resources. Perhaps you can obtain a vehicle at only a fraction of its full cost by taking advantage of a federal grant. You can avail yourself of "free" parking facilities at the local church. Perhaps your escorts are all volunteers.

Your budget and your own calculations of costs probably show only the fraction of the vehicle for which your agency paid, and you probably show no parking expenses or escort costs. Yet resources were expended to perform those functions and activities. Those resources represent costs and it is important to know them and keep track of them.

The previous Chapter has already explained a number of reasons why you should understand all the resources that are expended to provide your agency's transportation services. You must know about the expenditures of these resources because they are a true cost in the economic sense.

Monetary and other resources that are charged to your transportation budget are out-of-pocket expenses. All the resources committed to the provision of your transportation services are costs.

<u>costs or full costs</u>	= the monetary value of all resources devoted to the provision of transportation services, out-of-pocket expenses plus reconstructed costs.
<u>reconstructed costs</u>	= a dollar value for resources expended to provide transportation services which do not (currently) appear as an expense in your budget.
<u>out-of-pocket expenses</u>	= only that portion of the full costs of providing transportation which are born directly by your agency (or appear in your budget).

#### HOW TO BREAK DOWN COST CATEGORIES INTO EXPENSES AND FULL COSTS

Worksheets One and Two which appeared in Chapter Two gave you a way to consider all the functions that are involved in your provision of transportation services and all the expenses that are associated with those functions.

Worksheet Three is a variant of Worksheets One and Two. It allows you to make sure that you have considered whether any resources have been committed to the performance of any relevant activity whether you actually incurred those as expenses or not. Worksheet Three simply adds another category; it questions whether any resources are expended for any activity or purchase regardless of who pays.

This Chapter is designed to help you calculate the value of all the resources that are committed to the provision of your transportation services under each major cost component. Worksheet Three gives you a way to obtain full costs by first identifying those costs into those that you actually incur, your out-of-pocket expenses, and then identifying those that you do not (reconstructed costs). Once you have identified out-of-pocket expenses and the additional costs paid for (or donated) by others, summing the two will give full costs. Figure 3 is a summary of the process that will be followed by this Manual.

Worksheet Three

I. OVERHEAD AND ADMINISTRATION																
COST ITEMS	FUNCTIONS															
	Start-Up		Client Screening		Trip Reservations		Issue Documents		Accounting		Analysis		Monitoring		Other and General	
	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs
a. Salaries																
b. Fringe Benefits																
c. Rent, Utilities																
d. Communications																
e. Travel																
f. Interest																
g. Contract Fees & Charges																
h. Other & General																

II. OPERATIONS														
COST ITEMS	FUNCTIONS													
	Scheduling and Routing		Dispatching		Driving		Escorts		Training		Other and General			
	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs		
a. Salaries														
b. Fringe Benefits														
c. Rent, Utilities														
d. Communications														
e. Travel														
f. Interest														
g. Contract Fees & Charges														
h. Other & General														

III. MAINTENANCE						
COST ITEMS	FUNCTIONS					
	Preventative		Vehicle Repair		Body & Accessory Rep.	
	Expenses	Costs	Expenses	Costs	Expenses	Costs
a. Salaries						
b. Fringe Benefits						
c. Rent, Utilities						
d. Communications						
e. Travel						
f. Interest						
g. Contract Fees & Charges						
h. Other & General						



## Worksheet Three

COST ITEMS	I. OVERHEAD AND ADMINISTRATION															
	FUNCTIONS															
	Start-Up		Client Screening		Trip Reservations		Issue Documents		Accounting		Analysis		Monitoring		Other and General	
	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs
a. Salaries				X		X				X		X		X		X
b. Fringe Benefits				X		X				X		X		X		X
c. Rent, Utilities				X		X				X		X		X		X
d. Communications				X		X				X		X		X		X
e. Travel										X		X		X		X
f. Interest																
g. Contract Fees & Charges																
h. Other & General				X		X				X		X		X		X

COST ITEMS	II. OPERATIONS											
	FUNCTIONS											
	Scheduling and Routing		Dispatching		Driving		Escorts		Training		Other and General	
	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs
a. Salaries					X	X	X					
b. Fringe Benefits					X	X	X					
c. Rent, Utilities			X		X							
d. Communications												
e. Travel												
f. Interest												
g. Contract Fees & Charges												
h. Other & General												

COST ITEMS	III. MAINTENANCE					
	FUNCTIONS					
	Preventative		Vehicle Repair		Body & Accessory Rep.	
	Expenses	Costs	Expenses	Costs	Expenses	Costs
a. Salaries		X		X		
b. Fringe Benefits		X		X		
c. Rent, Utilities		X		X		
d. Communications						
e. Travel						
f. Interest						
g. Contract Fees & Charges					X	
h. Other & General	X		X			

**Sample**

**Figure 3**  
**ILLUSTRATION OF SUMMARY CALCULATION**  
**OF FULL ANNUAL COSTS**

MAJOR COST CATEGORY	Out-of-Pocket Expenses (Col. 1)	Reconstructed or Additional Costs (Col. 2)	Full Costs (Cols. 1 + 2)
I. Overhead and Administration			
II. Operations			
III. Maintenance			
IV. Equipment and Depreciation			
V. Fuel and Oil			
VI. Insurance and Licenses			
ANNUAL TOTAL			

Use of Column 1 data: to report costs to funding source  
to prepare budget estimates  
to compute annual cash outlay required

Use of Column 2 data: to predict impact of loss of donated services  
to prepare for future budgets based on known increases in expenses  
to predict the cost implications of joining a coordinated system or other alternatives

Use of Column 3 data: to compare your cost and performance data to comparable systems  
to calculate a price to charge for selling transportation services  
to identify the impact of various funding programs (and changes in them) on your cost patterns

You will use each of the three sets of cost data for different purposes. In general, you will use your annual expenses total (Column I on Fig. 3) to prepare your budgets and to report your costs to relevant funding agencies. You will use reconstructed costs to consider the impact of changes in your funding patterns and of changes in your transportation services. For example, you could use the reconstructed costs of volunteer escorts to calculate what would happen if you still required escort service but volunteers were no longer available.

Lastly, you will use the full costs of service (Column III) to compute the price you should charge to other agencies if you provide transportation services to them and to compare your cost and performance data to those of other comparable systems.

#### WHY YOU MUST CALCULATE YOUR FULL COSTS

You must separate your costs so that they reflect the individual functions that your agency performs. In addition, it is necessary for you to calculate or estimate all of the costs involved in the provision of transportation services, whether you actually pay them or not.

Some of your vehicle costs may be covered by grants or donations. You may have volunteer drivers or escorts. Your parent agency may donate office space or telephones or a place to park your vehicles. Yet resources are expended and costs are incurred to perform those activities even if these items do not appear as expenses in your budget.

You must identify and calculate all of the costs involved in operating a transportation system if you want to provide services more effectively. There are four major reasons why you need to identify and calculate your full system costs:

to properly manage your system you should understand all the costs associated with your system, just as you should understand all the activities that you perform in providing services;

to be able to respond to changing events you must recognize the costs involved if, for example, donations and volunteer labor disappear, or if needed grants are no longer available;

to be able to compare your system costs and operationg performance to other similar systems you must be using comparable full cost and productivity measures; and

to be able to intelligently consider alternatives to your current method of service provision (e.g. coordinated systems, contracting for services) you must understand your cost patterns well enough to calculate the impact of alternatives on individual cost items.

#### USING FULL-COST FIGURES TO BETTER MANAGE YOUR SYSTEM

It is possible to be providing inappropriate or ineffective services even if they cost you very little. You may be operating inefficiently even if any one cost item creates few expenses. It may be possible to get more or better services for the same amount of money you currently expend. Full-cost accounting may be able to assist you in doing so.

Example: *the management information gained by correctly attributing full costs*

You use one of your drivers to do routine maintenance on your vehicles. Therefore, your budget does not show any salary or labor costs under maintenance. Overall, your maintenance expenses appear very low.

However, when you use the materials in this Chapter to identify your functions and their corresponding costs, you find that the driver is spending so much much time doing maintenance that he only drives about 50% of the time. In fact, several other drivers are making overtime pay because they have to pick up some of the mechanic-driver's runs.

If you correctly attribute 50% of the driver's salary and benefits to maintenance and 50% to operations, you would be able to tell

- if your current arrangement is cost-effective, or
- if it would be cheaper to hire a mechanic half-time rather than paying the other drivers overtime pay.

USING FULL-COST FIGURES  
TO ALLOW RESPONSE TO CHANGING CONDITIONS

Any number of cost and operating factors can change over time or even in the immediate future. Funding sources may dry up, or federal agencies may change their assistance policies. Your system may get too large or complicated to use volunteers. In short, many "free" things which you take for granted today (and are generally not shown in your budget) may not be free tomorrow.

You must know what such "free" costs are so that you can understand what will happen to your system if you have to pay for those items in the future.

Example: *the budget information gained by using full-cost figures*

You run a transportation system with four vehicles. A local Church donates space for your administrative staff and allows you to use the Church lot to park the vehicles at night. Your annual cost calculations do not include rent or overhead for these activities since they do not represent an actual expense to you.

Unfortunately, the Church's Board of Directors suddenly decides to ask you to pay rent for the office space and parking places that they provide.

You are in a quandry; you did not budget enough money for that expense (or you did not ask your funding source for enough). Moreover, you do not know whether you should pay the Church or try to find some other rental space.

If you had correctly identified these functions and the real costs associated with them, as described in this Chapter, you might have asked your funding source for enough contingency money, or you might have made a suitable contingency plan (like doing a quick estimate of rental costs elsewhere).

Certainly doing full-cost accounting is not going to make you any happier about the Church's actions. Understanding all the functions involved in providing transportation and the full costs of those responsibilities will make you far more prepared to deal with such situations.

WHY YOU NEED FULL-COST FIGURES  
TO COMPARE YOUR SYSTEM TO OTHERS

Comparing your transportation system to other systems or services in your community is a very difficult task. It is always hard to know if other systems have different cost patterns or productivity levels because they are more (or less) efficient than you are or because they face totally different operating environments. Therefore, most inter-system comparisons should be done cautiously.

However, inter-system cost comparisons will be totally meaningless if your idea of a "cost" is different than that of the comparable system. The only way you can meaningfully compare system cost patterns is to use exactly the same measures. You must know your full costs and those of the system(s) to which you are comparing yours to do so.

Example: *using full-cost figures to compare system operations*

You operate a congregate meal service for the elderly in a small urban area. You operate four vans which are driven by paid drivers. Your offices are in a local community center which charges you no rent or utility costs.

You transport 40 people to and from the meal site each day, three days a week. In an average year you budgeted (and spent) resources totalling \$17,460.

You hear that in a nearby community, very much like yours, a similar system is transporting approximately the same number of people but their total budget is only \$11,010 a year. Are you doing something wrong?

Before you get upset, you have to know what costs are and are not included in the other system's figure. When you look you find that not included in their total are any driver salaries. That is because they used volunteer drivers and did not show any of those costs in their budget (because they did not pay for them). ➡

If you found that the actual monetary value of the "free" driving time was approximately \$6,400 (at current and comparable salary levels) you might not worry that they were operating more efficiently than you were (and, of course, you might investigate using volunteer drivers!).

Example: *another look at using full-cost figures to compare system operations*

You are operating the system described in the example above. You hear of another similar system offering exactly the same services, carrying the same number of people, but their annual system budget is \$18,500 (compared to yours of \$17,460). You feel wonderful; you must be very efficient!

Then someone mentions that included in the other system's budget are office rent and utilities of \$3,000 per year. When you add the actual value or cost of the office space and utilities provided to you "free", you find that your total or full costs are \$20,200!

Now, you begin to wonder if the other system is operating more efficiently; although they have higher out-of-pocket costs, they are really spending less money than you are to provide comparable services!

There may be an explanation for this difference. For example, that system may have other, hidden "free" services which are included in the budget. Upon investigation, you may find that the other system is or is not more efficient than yours, but you would not have known to ask if you had not done full-cost calculations.

Note: This section is not saying that you should not take advantage of "free" or donated services or facilities. Obviously, it is to your advantage to lower your out-of-pocket costs as much as possible. This Chapter is saying that you must know what costs are really incurred in providing transportation services, even if you do not currently pay them. Such an understanding of your system is vital to you.

WHY YOU NEED FULL-COST FIGURES  
TO EVALUATE YOUR ALTERNATIVES

Example: *using full-cost measures to compare alternatives to your present system*

You operate a service that provides demand-responsive transportation services to handicapped clients. You use three vans that were generously donated to you by a local automobile dealer two years ago. Your total annual system budget, which of course includes no vehicle purchase costs, is \$11,000.

A coordinated transportation system has gotten underway in your community. They offer to carry your existing clients for a total of \$16,500 a year. (This is a simplified example; rarely would an offer come like this, but let's keep it simple for the time being.) You refuse -- since your current services are cheaper, why should you change?

However, a few months pass and it becomes very clear that your current vans will not last much longer. The generous auto dealer is not in a position to give you anything but a discount on new vehicles. Now you calculate the costs of vehicle purchases into your projected budget. You find that your projected costs will be \$18,000 a year. Now the coordinated system's offer looks a lot better.

CLOSING THOUGHTS AND  
A PREVIEW OF THE NEXT CHAPTER

This Chapter has two very clear messages:

- You must identify all the functions that you perform in providing transportation services and must understand how those functions create costs for your agency.
- You must calculate or estimate the full costs of providing transportation services. In fact, accurate full-cost accounting depends on a comprehensive understanding of all the functions that you provide.



The Chapter has given you some very simple and basic examples of the value of these principles. Each of the examples has to be very straightforward and uncomplicated because you have not yet been exposed to the more complex side of these issues. For instance, each example concentrated on only one system function or only one or two cost items. Most examples greatly simplified the cost elements involved.

In the "real world", however, when you evaluate your own system you must identify all the functions you perform and calculate all your costs. When you anticipate changes over time, you may face changes in a number of cost categories at once (and they may not all move in the same direction). We use the simple examples in this Chapter to give you a grasp of the basic principles and the promise that they offer you.

In the next Chapter, the Manual goes into greater detail on the many facets of the activities and functions that you perform. Worksheets and materials in the coming Chapters will give you the techniques and tools with which to understand the complexities of your system in the "real world". Examples in the next two Chapters will be more complicated and more representative of the problems that your system faces. In particular, these examples will illustrate the implications for your system of simultaneous changes in a number of system cost categories.

## Chapter Four.

# Calculating Annual System Costs and Expenses

### WHAT THIS CHAPTER WILL DO FOR YOU

This Chapter presents an analytical procedure for determining or predicting your annual system costs, a procedure which is based on the work that you have already undertaken in previous Chapters. You must have already performed the calculations described earlier in order to understand and perform the cost analyses described in this Chapter.

The procedure described in this Chapter allows you to identify the costs and the expenses involved in all the activities that you perform and to compute total annual costs by function. From these functional totals you can calculate annual system costs and expenses. These calculations can be used in Chapter Five to compute the important unit cost figures, which in turn can be used to compute performance and productivity measures.

## CALCULATING YOUR COSTS IF YOU NOW PROVIDE SERVICE

If you are currently providing transportation services to your clients, you should follow a four part process in evaluating and calculating your total annual system costs:

- first, take all your known aggregate budget figures, like salaries and wages, rent, utilities, etc. and apportion them among the various cost categories and among the various activities under those cost categories;
- second, use Worksheets One and Two to make sure that you are not incurring other expenses that are not included in your aggregate budget figures. If you are, make sure you attribute those expenses to the correct cost category;
- third, using Worksheet Three, identify and calculate the value of resources that are real costs but do not represent expenses in your budget and attribute those reconstructed costs to the correct cost categories (Worksheet Four); and
- finally, total both the expenses and the full costs of performing each of the major functions. (Worksheet Five).

The purpose of this exercise is to give you a fairly good idea of what you actually spend to perform each of the functions that make up your transportation system. At the same time you will gain an equivalent knowledge of what it actually costs, in full, to run your system.

The process probably sounds more complicated than it is. Figure 4 illustrates this process for the three major activity-related cost categories; Overhead and Administration, Operations, and Maintenance.

### DIVIDING KNOWN EXPENSES INTO COST CATEGORIES; OVERHEAD AND ADMINISTRATION

As Fig. 4 illustrates, you must apportion, for example, all the salary expenses that fall into the overhead and administration category among the seven functions that make up that category. You will also divide up other figures such as rent and travel

MAJOR COST ITEMS			COSTS BY FUNCTIONS		
<i>COSTS</i>	<i>CORRESPONDING TO</i>	<i>FUNCTIONS</i>	Out-of Pocket Exp. Only	Recon- structed Costs	Full Costs (Col. 1 plus Col. 2)
<b>OVERHEAD AND ADMINISTRATION</b>					
Activities					
a. Salaries (for functions 1-8)	}	1. start-up (a-g)			
b. Fringe benefits on salaries (for functions 1-8)		2. client screening and eligibility (a-g)			
c. Office rent and utilities (for functions 1-8)		3. trip reservations (a-g)			
d. Communications (for functions 1-8)		4. issuing travel documents (a-g)			
e. Travel expenses (for all functions)		5. accounting (a-g)			
f. Interest payments (on any costs)		6. analysis of operating data (a-g)			
g. Contract Fees and Charges (for functions 1-8)		7. monitoring and evaluation (a-g)			
Purchases		8. Non-attributable costs and expenses			
h. All purchases (for functions 1-8)					
		<b>TOTAL OVERHEAD &amp; ADMINISTRATION</b>			
<b>OPERATIONS</b>					
Activities					
a. Salaries (for functions 1-6)	}	1. scheduling and routing (a-d)			
b. Fringe Benefits (for functions 1-6)		2. dispatching (a-d)			
c. Rent and Utilities (for functions 1-6)		3. driving (a-d)			
Purchases		4. escort service (a-d)			
d. All Purchases (for functions 1-6)		5. training (a-d)			
		6. Non-attributable (a-d)			
		<b>TOTAL OPERATIONS</b>			
<b>MAINTENANCE</b>					
Activities					
a. Salaries (for functions 1-4)	}	1. preventative maintenance (a-f)			
b. Fringe Benefits (for functions 1-4)		2. motor repair (a-f)			
c. Rent and Utilities (for functions 1-4)		3. vehicle and accessory repair (a-f)			
Purchases		4. Non-attributable (a-f)			
d. Materials and Parts (for functions 1-4)					
e. Contract Charges (for functions 1-4)					
f. All Other Purchases (for functions 1-4)		<b>TOTAL MAINTENANCE</b>			

Figure 4  
ILLUSTRATION OF THE ANALYSIS PROCESS FOLLOWED IN THIS PROCESS

expenses. Sometimes, of course, the process might work in reverse; you might know, for example, that one of the drivers spends ten percent of his/her time doing client screening. Then you would show ten percent of his/her salary and benefits under that function.

In other instances you will apportion an administrative person's salary and benefits according to the average percentage of his/her time that he/she spends on each of the overhead functions. (And you may find that he/she spends some of his/her time doing activities that fall into other cost categories, such as dispatching.)

Again, the question arises; how detailed a breakdown of costs by function or activity is required? Do you have to divide the rent up among the seven functions? Do you really have to figure how much postage or how many of the telephone charges are attributed to each of the seven functions?

The answers depend on the amount of money with which you are dealing and how much you really can separate costs and expenses. If all of the overhead and administration functions, for example, seem on serious reflection to contribute equally to telephone or rent costs, then you might simply show them as a total in the row called "non-attributed costs".

However if, as you think through this analysis, you realize that most of the office staff taking up space are engaged in accounting activities, you might want to apportion a specific percentage of the rent to that particular function. If you find that client screening is taking up about 60% of the time spent on the telephone, it would be useful to attribute that percentage of the telephone costs and expenses to that one activity.

It is extremely important for you to understand what each activity costs you to perform. If you do not, you cannot properly manage your system and your system expense, you cannot budget for or prepare for growth or system change, you cannot figure out

the real impact of other transportation alternatives, and you cannot understand what coordination would mean to your system.

Example: *how to divide expenses among cost categories*

You operate a system which provides transportation for retarded adults. You employ three people.

You are the director of the program and perform all the administrative and overhead duties; in total you spend about 45% of your time on these duties.

Forty-five percent of your \$11,000 yearly salary plus \$1,700 per year in benefits should be attributed to the Overhead and Administration cost category.

$$.45 \times (\$11,000 + \$1,700) = \$5,715$$

You spend approximately half of the Overhead and Administration time on client screening, about one-fourth of the time on trip reservations, and the other one-fourth equally divided among all the other functions (no start-up activities are involved).

\$5,715 Overhead and Administration

50% or \$2,857.50 Client Screening (#2 on Fig. 4)  
 25% or \$1,428.75 Trip Reservations (#3)  
 25% or \$1,428.75 on four remaining activities is:

$$\frac{\$1,428.75}{4} = \$357.19 \text{ to Issuing Documents (\#4)}$$

" Accounting (\#5)  
 " Analysis (\#6)  
 " Monitoring (\#7)

The remainder of your time, and thus your salary and benefits is spent actually driving vehicles.

$$.55 \times (\$11,000 + \$1,700) = \$6,985$$

\$6,985 Operations

100% or \$6,985 Driving (#3)

You would show that figure under the Operations cost category, attributing it to the activity "Driving".

### ESTIMATING THE VALUE OF NON-EXPENSE ITEMS

Worksheet Three is designed to alert you to expenditures of time, money, and energy that are required to operate your system but do not currently show up as an expense in your budget. This can include a donated vehicle, a volunteer driver or escort, or "free" parking space. You are indeed fortunate to get such resources and this Manual does not argue otherwise.

What this Manual does claim is that you must know exactly what resources are required to operate your system, whether you pay for them or not. You must understand those required activities that do not cost you anything just as you must understand how some required activities do cost something.

Using Worksheet Three you should consider all the activities and purchases that are made on behalf of or for your system. Sometimes it is easier to divide up these full costs, once you have identified them, than it is to divide known aggregate budget expenses. If someone drives three hours per day as a volunteer you should include a value for his/her time under the "driving" activity (#3) of the Operations function. If a local Church gives you a place to park your vehicles overnight, you should give a rent value to that donation and include it in the "rent" category of the Operations function (probably as a non-attributed cost).

The hardest part of this process is estimating a value for such donations and gifts. First, it is often hard to overcome the common feeling that such an analysis is a waste of time. For reasons already given in Chapter Three, such a procedure is a valuable experience. It is a good management technique to have to determine what parking spaces are renting for and how much social service agency drivers get paid in your community. Chapter Three gave a number of detailed examples of how to estimate the value of non-expense costs and why that exercise will be of value to you.

### HOW TO HANDLE EQUIPMENT DEPRECIATION\*

Depreciation is one of those costs that most agencies perceive but do not really know how to handle. It seems somewhere between an actual expense and a reconstructed cost. As you use a bus or a radio over time it rapidly loses value; at some point the vehicle no longer functions and it has little or no value. Additional funds are then required to purchase a replacement.

Vehicle purchases, and radio and other equipment costs to a lesser extent, are a major system expenditure. This type of expenditure is made only once every two to three years. The time varies, of course, with the use to which each vehicle is put. But it is a difficult problem to account for these equipment costs.

The problem of allocating the cost of equipment whose life is longer than the budget period is normally solved by industry with the use of depreciation allowances. If the average life of a vehicle used for client transportation is four years (a figure which seems reasonable on the average, but which can differ from system to system according to the intensity of use), then, using the most common form, straight-line depreciation, the purchase price should be divided equally and assigned to each year.

If the full price of any vehicle is charged to the budget of the year in which the equipment is bought, it will raise the budget beyond a reasonable level. Since at the end of the year the equipment would still be available, the first year would have been charged for more than its share of wear and tear on the vehicle.

On the other hand, if equipment purchase cost is left completely out of the picture and never included in any budget, this would represent a cost of the service which is artificially low. Vehicles are needed to run the service, and if they had not been purchased they would have been rented. The cost of the equipment should, therefore, be included, especially if you are evaluating alternative ways for your agency to provide transportation services.

\*See Appendix for a fuller discussion of depreciation.



Example: how to depreciate new vans

If you have just bought six vans at \$15,000 each, their total price of \$90,000 should be divided by the average life of four years. In each year's budget the item "equipment depreciation" will be included for a value of

$$\frac{\$90,000}{4} = \$22,500$$

It is even a greater problem to handle vehicle or other acquisition costs if you have received financial assistance to purchase them. As with all of your costs you must account for the real cost of equipment depreciation whether you paid for that equipment in full or in part. However, this particular cost item has received considerable attention from the Federal government and the Office of Management and Budget has made some rules regarding the accounting of such costs. For a fuller discussion of this issue see Refs. 1 and 2.

Application of the basic principle becomes slightly more complicated in the case of equipment purchased with the help of federal funds. Some general cases can be identified for which we can suggest an appropriate behavior. First, consider the case where no federal funds are involved.

Social Service Agency Purchases Equipment with Its Own Funds or It is Donated by a Private Source

In this case the full purchase price should be depreciated as in the example above.

This procedure will guarantee that if your agency is providing transportation to others under a contractual agreement, the full cost of the service will be charged to them. If you did not include depreciation there would be no compensation to you for the equipment wear and tear in providing the service.

At the same time, if you set aside funds through a depreciation allowance equivalent to one-fourth of the cost of the equipment every year, at the end of four years when the vehicles are

worn out there will be a fund equivalent to the old purchase price. This fund can be used for the acquisition of new vehicles.

Note that the depreciation may be handled differently by accountants than by economists. Both see it as a real cost but accountants often handle it differently. It is wise to check with your accountants on how to handle this cost item.

Your Agency Received Federal Funds  
to Cover Part of the Equipment Cost

In this case, according to regulations issued by the Office of Management and Budget (OMB), only the local share can be depreciated: such depreciation can eventually be charged to other federal agencies. The rationale behind this regulation is that since the agency did not pay for the part of the equipment subsidized through federal funds, it should not be able to recover money it has not spent in the first place.

Example: *how to depreciate vans purchase partially  
with federal funds*

To return to our earlier example, if the six vans (value \$90,000) have been bought with a matching grant (80% federal money, 20% local share), only the local share can be depreciated. In this case, \$18,000 (20% of \$90,000) will be depreciated over four years, and the item "equipment depreciation" will be \$4,500 per year.

There is some indication that OMB may be changing its position and allowing agencies to indirectly charge federal agencies, other than the one buying the equipment, for depreciation as a valid operating expense. You should check with your regional representative if this is a possible situation for you.

**ESTIMATING YOUR COSTS AND EXPENSES  
IF YOU ARE CONSIDERING PROVIDING SERVICES**

If you are not now providing transportation services in your own vehicles, but you are considering doing so, you can use the same procedure outlined previously to estimate your potential

costs. In some ways the process is easier for you. However, it is often difficult and very time-consuming to estimate how many expenses you will incur. For example, it is difficult to predict maintenance costs and that has been a serious problem for many agencies.

In order to estimate potential, you should:

- first, use Worksheets Two and Three to alert yourself to all the activities you will perform and all the purchases you will make;
- second, assign a time and cost figure to all functions to be performed and a cost to all purchases to be made;
- third, consider which if any of these costs can be born externally (examples are vehicle grants and donated office space) and separate the known costs into reconstructed costs and expenses (Worksheet Four); and
- finally, total the costs and the expenses involved in performing each function and for the proposed system as a whole using summary Worksheet Five.

Several published reports might make the job easier for you; especially useful are Refs. 5 and 2. Also useful is a series of calls to similar providers in your community. You can ask them, for example, about their maintenance and operating costs, about their vehicle purchases, and radio acquisition costs. You can make a guess about how successful you will be in getting volunteers to drive or be escorts. You can call several insurance agents and ask about the different rates and the conditions under which those rates apply.

To give guidance to both those currently providing services and to those only considering direct transportation provision, the next section of this Chapter will work through the cost and expense patterns of two actual systems, using a new Worksheet which is designed to help you think through your actual or proposed system cost patterns.

## THE PROCESS OF CONVERTING YOUR COSTS AND EXPENSES INTO FUNCTION TOTALS

Figure 5 shows you how to use the previous Worksheets to key yourself to Worksheet Four. Worksheet Four is a lengthy tool which gives you a way to match-up all your costs and expenses with the various activities and functions that create them. Using Worksheet Four you can calculate annual system costs and expenses for each of the major cost categories and for each of the functions falling into those categories as well as your total system costs and expenses.

Once you have filled out Worksheet Four you can return to it later to compute costs under alternative future scenarios, to calculate the impact of other transportation alternatives, and to compute prices to charge other systems if you sell them transportation services. You can use the function totals and the total system costs to compute unit cost figures as shown later in Chapter Five.

Worksheet Four is a practical way to record and follow through on the process already identified in this Chapter. The only problem you may have initially is in actually seeing how various cost items such as salaries were divided up in a cost category like Overhead and Administration. This cost category has so many activities among which salaries could be divided. The confusion might be heightened because Worksheet Four must extend over several pages.

The Sample Worksheets, therefore, will include fairly comprehensive descriptions of how cost items were divided among activities. Actually it would be useful for you to also keep very detailed notes on how you divided up such cost items; your memory may not be sufficient.

Figure 5

ILLUSTRATION OF THE COST ANALYSIS APPROACH

Worksheet Four

OVERHEAD AND ADMINISTRATION

COSTS BY FUNCTIONS

COST ITEM		Method of Pro-Rating	Function Summary	Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
Expense	Reconstructed Cost					
a) Salaries			1) Start-up			
b) Fringe Benefits						
c) Rent, Utilities						

**I. OVERHEAD AND ADMINISTRATION FUNCTIONS**

COST ITEMS	Start-Up		Client Screening		Trip Reservations		Issue Documents		Accounting		Analysis		Monitoring		Other and General	
	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs
a. Salaries																
b. Fringe Benefits																
c. Rent, Utilities																
d. Communications																
e. Travel																
f. Interest																
g. Contract Fees & Charges																
h. Other & General																

**II. OPERATIONS FUNCTIONS**

COST ITEMS	Scheduling and Routing		Dispatching		Driving		Escorts		Training		Other and General	
	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs
a. Salaries												
b. Fringe Benefits												
c. Rent, Utilities												
d. Communications												
e. Travel												
f. Interest												
g. Contract Fees & Charges												
h. Other & General												

**III. MAINTENANCE FUNCTIONS**

COST ITEMS	Preventative		Vehicle Repair		Body & Accessory Rep.	
	Expenses	Costs	Expenses	Costs	Expenses	Costs
a. Salaries						
b. Fringe Benefits						
c. Rent, Utilities						
d. Communications						

COMPREHENSIVE LIST OF ACTIVITIES & ASSOCIATED COSTS  
 Worksheet Three

# Worksheet Four

## OVERHEAD & ADMINISTRATION

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
a) Salaries			1. Start-up			
b) Fringe Benefits			2. Client Screening			
			3. Reservations			
c) Rent, Utilities			4. Issue Travel Documents			
			5. Accounting			

# Worksheet Four

## OVERHEAD & ADMINISTRATION

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of Pocket Exp. Only	Recon-structed Costs	Full Costs (Col. 1 plus Col. 2)
d) Communications			6. Analysis			
e) Travel			7. Monitoring			
f) Interest			8. Others and General			
g) Contract Fees						
h) Other & General Supplies, Parts						
			TOTAL			

# Worksheet Four

OPERATIONS			COSTS BY FUNCTIONS			
COST ITEM		Method of Pro-Rating	Function Summary	Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
Expense	Reconstructed Cost					
a. Salaries			1. Scheduling & Routing			
b. Fringe Benefits;			2. Dispatching			
c. Rent, Utilities;			3. Driving			
d. Contract Fees & Charges;			4. Escorts			
e. Other & General			5. Training			
			TOTAL			



# Worksheet Four

## MAINTENANCE

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
a) Salaries			1. Preventive Maintenance			
b) Fringe Benefits						
c) Rent, Utilities			2. Motor and Vehicle Repair			
d) Contract Fees			3. Body and Accessory Repair			
e) Parts						
			TOTAL			

# Worksheet Four

## EQUIPMENT & DEPRECIATION

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
a) Vehicles						
b) Modifications						
c) Radios						
			TOTAL			

# Worksheet Four

## FUEL & OIL, INSURANCE & OTHER FEES

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
<b>FUEL &amp; OIL</b>						
a) Fuel						
b) Oil						
			TOTAL			
<b>INSURANCE &amp; OTHER FEES</b>						
a) Insurance						
b) Other Fees						
c) Licenses,						
			TOTAL			

## Worksheet Five

### SUMMARY ANNUAL EXPENSE AND COST CALCULATIONS

Function	Out-of-Pocket Expenses	Reconstructed Costs	Full Costs
I. Overhead and Administration			
II. Operations			
III. Maintenance			
IV. Equipment and Depreciation			
V. Fuel and Oil			
VI. Insurance and Licenses			
TOTAL			

## SYSTEM A

### THE COST PATTERNS OF AN ACTUAL AGENCY

System A is part of an agency which provides a variety of services to elderly people in a town of about 40,000 inhabitants and the surrounding rural county. Beside providing transportation to and from an elderly nutrition program, System A has contractual agreements to transport Department of Human Resources Title XIX Medicaid recipients in the county, and handicapped students of a State University between dormitories, classes, and other facilities.

Approximately one-third of the trips provided are of the one-to-many or many-to-many type (nutrition program, trips to shopping centers, nursing homes, etc.), while the remaining two-thirds are individual, demand-responsive trips. The service is available to persons who are handicapped or over 60 years of age; it provides door-to-door service and requires 24-hour advance reservation.

At the time of the study, the system operated three lift-equipped vans and one station wagon. The following statistics refer to one year of operations:

• One-way passenger trips	22,839
• Vehicle miles	70,321
• Vehicle hours	8,000

The agency's director and office manager dedicate part of their time to the administration of System A's transportation program. There is a dispatcher who also receives trip reservations and compiles operating statistics.

Four full-time drivers are employed for the operation of the vehicles. Maintenance is contracted to a service station in town for a flat monthly fee plus the cost of labor and parts for special repairs.

During the year considered, the summary budget is shown below.

### Worksheet Five SYSTEM A

<u>Function</u>	<u>Out-of-Pocket Expenses</u>	<u>Reconstructed Costs</u>	<u>Full Costs</u>
Overhead and Administrative	\$ 2,825	\$14,803	\$17,628
Operations	\$28,384	—	\$28,384
Maintenance	\$ 3,186	—	\$ 3,186
Equipment Depreciation	\$ 76	\$ 8,330	\$ 8,406
Fuel and Oil	\$ 4,498	—	\$ 4,498
Insurance and Licenses	\$ 1,079	—	\$ 1,079
	<u>\$40,048</u>	<u>\$23,133</u>	<u>\$63,181</u>

Sample Worksheet Four for System A shows how these category and column totals were calculated, using a summary worksheet, Five.

# Worksheet Four

## OVERHEAD & ADMINISTRATION

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS			
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)	
a) Salaries	\$10,586 \$2,275 = 1/2 of dispatcher salary	<u>Salaries</u> \$5,246 Director 100% to monitoring (#7) Col. 2 \$5,340 manager 2,670 - 50% to analysis (#6) 2,670 - 50% to accounting (#5) Col. 2 \$2,275 dispatcher 1,138 - 50% to reserv. (#3, Col. 1) 1,137 - 50% to analysis (#6, Col. 1)	1. Start-up	—	—	—	
b) Fringe Benefits		<u>Benefits</u> \$577 Director 100% to monitoring (#7) Col. 2 \$587 Manager 293 - 50% to analysis (#6) Col. 2 294 - 50% to accounting (#5) Col. 2 \$250 dispatcher 125 - 50% to reserv. (#3) Col. 1 125 - 50% to analysis (#6) Col. 1	2. Client Screening	—	—	—	
c) Rent, Utilities		\$1,456 = rent & utilities based on number of rooms used	<u>Rent &amp; utilities</u> 1,456 100% to General (#8) Col. 2	3. Reservations Expenses to Col. 1 Salaries 1,138 Benefits 125	1,263	—	1,263
			5. Accounting Expenses to Col. 1 Contract fees \$300 Costs to Col. 2 Salaries 2,670 Benefits 294	4. Issue Travel Documents	300	2,964	3,264
						cont'd	

# Worksheet Four

## OVERHEAD & ADMINISTRATION

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
d) Communications [donated by agency]	\$940 = phone, postage & copier	<u>Communications</u> \$940 100% to General (#8) Col. 2	<u>6. Analysis</u> <u>Costs to Col. 2</u> Salaries 2670 Benefits 293 <u>Expenses to Col. 1</u> Salaries 1137 Benefits 125 7. Monitoring	-	2963	4226
e) Travel			<u>Costs to Col. 2</u> Salaries 5246 Benefits 577 8. Others and General	-	5823	5823
f) Interest			<u>Costs to Col. 2</u> Rent & Utilities 1456 Communications 740 Supplies 657	-	3053	3053
g) Contract Fees \$300 = financial audit		<u>Contract fees</u> \$300 100% to Accounting (#5) Col. 1				
h) Other & General Supplies, Parts	657 = office supplies	<u>Supplies</u> \$657 100% to General (#8) Col. 2				
			TOTAL	\$2825	\$14,803	\$17,628



# Worksheet Four

## OPERATIONS

## COSTS BY FUNCTIONS

COST ITEM		Method of Pro-Rating	Function Summary	Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
Expense	Reconstructed Cost					
a. Salaries		<u>Salaries</u> \$23,296 = 4 drivers @ 2.80/hr Full time 2,275 = dispatcher 100% to driving (#3) Col. 1	1. Scheduling & Routing <u>Expenses to Col. 1</u> Salaries 1137 Benefits 125	1262	-	1262
b. Fringe Benefits;		\$2,275 dispatcher 1137 - 50% to scheduling (#2) 1138 - 50% to dispatching (#2) Col. 1	2. Dispatching <u>Expenses to Col. 1</u> Salaries 1138 Benefits 125	1263	-	1263
c. Rent, Utilities;		<u>Benefits</u> \$2,563 drivers 100% to driving (#3) Col. 1	3. Driving <u>Expenses to Col. 1</u> Salaries 23,296 Benefits 2,563	25,859	-	25,859
d. Contract Fees & Charges;		\$250 dispatcher 125 - 50% to scheduling (#2) 125 - 50% to dispatching (#2) Col. 1	4. Escorts	-	-	-
e. Other & General			5. Training	-	-	-
			TOTAL	\$28,384	-	\$28,384

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# Worksheet Four

## MAINTENANCE

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
a) Salaries			1. Preventive Maintenance <u>expenses to col. 2</u> contract fees 681 parts 403			
b) Fringe Benefits						
c) Rent, Utilities			2. Motor and Vehicle Repair <u>expenses to col. 1</u> Contract fees 1043 parts 866	1084	-	1084
d) Contract Fees		Contract fees \$1917 - expenses to col. 1 681 - to preventive maintenance (#1) 1043 - engine + motor repairs (#2) 193 - paint job to #3	3. Body and Accessory Repair <u>expenses to col. 2</u> Contract fees 193	1909	-	1909
		Parts \$1469 - expenses to Col. 1 403 - tires, phys to preventive maintenance (#1) 866 - engine + other repairs to #2		193	-	193
			TOTAL	\$3186	-	\$3186

\$1917  
 \$600 = regular checks + lube  
 \$81 = tune-ups  
 \$1236 = repairs  
 e) Parts  
 \$1469

# Worksheet Four

## EQUIPMENT & DEPRECIATION

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
a) Vehicles	\$8024 = yearly depreciation on 6824 - vans 1200 - wagon	<u>Depreciation - vehicles</u> 100% of yearly depreciation to cost column (2) (bought entirely with Federal money)				
b) Modifications			<u>Vehicle Depreciation</u> 8024 to Col. 2			
c) Radios	\$76 = 20% of yearly depreciation 1 base station = 1098 4 portable units = 2720 depreciated over 4 years	<u>Depreciation: radios</u> \$76 = 20% to col. 1 \$306 = 80% to col. 2	<u>Radio Depreciation</u> \$76 to Col. 1 306 to Col. 2			
			TOTAL	\$76	\$8330	\$8406

# Worksheet Four

## FUEL & OIL, INSURANCE & OTHER FEES

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of Pocket Exp. Only	Recon-structed Costs	Full Costs (Col. 1 plus Col. 2)
<b>FUEL &amp; OIL</b>						
a) Fuel \$4123 = gas bills			Fuel, expenses to Col. 1	4123	-	
b) Oil \$375 = oil bills			Oil, expenses to Col. 1	375		
			TOTAL	4498		\$4498
<b>INSURANCE &amp; OTHER FEES</b>						
a) Insurance \$771 = 3 vans @ 277.04 308 = station wagon						
b) Other Fees						
c) Licenses,			<u>Insurance</u> expenses to Col. 1	1079	-	1079
			TOTAL	\$1079	-	\$1079

## SYSTEM B

## THE COST PATTERNS OF AN ACTUAL AGENCY

System B is part of a social service agency providing senior citizens programs in a three-county area. It is extensively involved in transportation for nutrition programs and other purposes. All of its trips are of the one-to-many or many-to-one kind, and there is no great difference in the routes served every week.

Most of the clients are over 60 years of age. Since some clients are mobility impaired, the vehicles are lift-equipped. At the time of the study the system operated 16 buses, four vans, and one station wagon. During this six-month period the operating statistics were as follows:

• One-way passenger trips	122,114
• Vehicle miles	132,640

The system is administered by agency personnel. Part of the drivers are paid with CETA funds and volunteer escorts are available on the nutrition trips. Maintenance is performed by agency mechanics, but the cost of the necessary parts is charged to the transportation budget.

The summary budget for the period considered is shown below.

## Worksheet Five

### SYSTEM B

<u>Function</u>	<u>Out-of-Pocket Expenses</u>	<u>Reconstructed Costs</u>	<u>Full Costs</u>
Overhead and Administrative	\$ 0	\$18,085	\$18,085
Operations	\$59,657	\$37,284	\$96,941
Maintenance	\$15,720	\$13,548	\$29,268
Equipment Depreciation	\$ 4,107	\$16,428	\$20,535
Fuel and Oil	\$20,027	\$ 0	\$20,027
Insurance and Licenses	\$ 2,939	\$ 0	\$ 2,939
	<u>\$102,450</u>	<u>\$85,345</u>	<u>\$187,795</u>

Sample Worksheet Four for System B shows how these costs were calculated.

# Worksheet Four

## OVERHEAD & ADMINISTRATION

COST ITEM 6 months		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
a) Salaries [everyone salaried to other agency programs]	\$2298 - 25% of Director's time \$3000 - 50% of Supervisor's time \$2080 - 50% of bookkeeper's time \$4158 - 100% of clerk's time	Salaries - based on duties in a sample week (all to Col. 2, costs) #2298 Director 1149 - 50% to monitoring (#7) 1149 - 50% to General (#8) #3000 Supervisor 1500 - 50% to analysis (#6) 1500 - 50% to monitoring (#7) #2080 bookkeeper 100% to accounting (#5) #4158 clerk 2079 - 50% to analysis (#6) 1039 - 25% to reservations (#3) 1040 - 25% to client screening (#2)	1. Start-up  2. Client Screening - Costs to Col. 2 Salaries \$1040 Benefits 177 Rent 143 Comm. + Supplies 268  3. Reservations - Costs to Col. 2. Salaries \$1039 Benefits 177 Rent 144 Comm. + Supplies 269	-	-	-
b) Fringe Benefits	\$391 - director \$520 - supervisor \$354 - bookkeeper \$707 - clerk	Fringes - same ratio as salaries all costs to Col. 2 #391 Director 195 to monitoring (#7) 195 to general (#8) #520 Supervisor 260 to analysis (#6) 260 to monitoring (#7) #354 bookkeeper 100% to accounting (#5) #707 clerk 353 to analysis (#6) 177 to reservations (#3) 177 to screening (#2)	4. Issue Travel Documents  5. Accounting - Costs to Col. 2 Salaries \$2080 Benefits 354 Rent 303 Comm. + Supplies 566	-	1628	1628
c) Rent, Utilities [donated by agency]	\$1188 Rent 408 Utilities			-	1629	1629
				-	-	-
				-	3303	3303

cont'd

# Worksheet Four

## OVERHEAD & ADMINISTRATION

COST ITEM <i>(6 months)</i>		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
d) Communications [donated by parent agency]	<i># 1843</i> telephones copier + postage	<i>Rent - based on % of salaries devoted to each activity</i> <u><i># 1596</i></u> <i>1188 Rent</i> <i>408 Utilities</i>	6. Analysis - <i>Costs to Col. 2</i> <i>Salaries # 3579</i> <i>Benefits 613</i> <i>Rent 559</i> <i>Comm. + Supplies 1043</i>	—	5794	5794
e) Travel		<i># 143 - 9% to Screening (#2)</i> <i>144 - 9% to Reservations (#3)</i> <i>303 - 19% to Accounting (#5)</i> <i>559 - 35% to Analysis (#6)</i> <i>271 - 17% to Monitoring (#7)</i> <i>176 - 11% to General (#8)</i>	7. Monitoring - <i>Costs to Col. 2</i> <i>Salaries # 2649</i> <i>Benefits 455</i> <i>Rent 271</i> <i>Comm. + Supplies 508</i>	—	3883	3883
f) Interest		<u><i>Communications # 1842 and Supplies 1140</i></u> <i>2982</i>	8. Others and General - <i>costs to Col. 2</i> <i>Salaries 1149</i> <i>Benefits 195</i> <i>Rent 176</i> <i>Comm. + Supplies 328</i>	—	1848	1848
g) Contract Fees		<i># 269 - 9% to Screening (#2)</i> <i>268 - 9% to Reservations (#3)</i> <i>566 - 19% to Accounting (#5)</i> <i>1043 - 35% to Analysis (#6)</i> <i>508 - 17% to Monitoring (#7)</i> <i>328 - 11% to General (#8)</i>		—		
h) Other & General Supplies, Parts [donated by agency]	<i># 1140</i> office supplies					
			TOTAL	—	<i># 18,085</i>	<i># 18,085</i>



# Worksheet Four

OPERATIONS				COSTS BY FUNCTIONS		
COST ITEM 6 months		Method of Pro-Rating	Function Summary	Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
Expense	Reconstructed Cost					
a. Salaries \$48,360 = 15 full-time drivers	\$18,096 = 6 CETA drivers \$15,080 = volunteer escorts	<u>Salaries</u> \$48,360 driving expenses (#3) Col. 1 \$18,096 CETA salaries to driving costs (#3) Col. 2 \$15,080 to escorts (#4) Col. 2	1. Scheduling & Routing - costs, Col. 2 rent + parking 780	-	780	780
b. Fringe Benefits; \$8,221 = 17% of drivers' salaries	17% of salaries \$3076 - CETA drivers 2548 - escorts	<u>Benefits</u>	2. Dispatching - costs to Col. 2 rent + parking 780	-	780	780
c. Rent, Utilities;	1/3 of building + space rent \$1560	\$8221 on full-time drivers to driving (#3) Col. 1 \$3076 on CETA drivers to driving (#3) Col. 2 \$2548 on escorts to escorts (#4) Col. 2	3. Driving expenses to Col. 1 salaries + fringes costs to Col. 2 salaries + fringes 18,096 4. Escorts - costs to Col. 2 salaries 15,080 fringes 2,548 5. Training	59,657	18,096	77,753
d. Contract Fees & Charges;		<u>Rent</u> \$1560 rent + parking 780 - 50% to Scheduling (#1) Col. 2 780 - 50% to Dispatching (#2) Col. 2		-	-	-
e. Other & General						
TOTAL				\$59,657	\$37,284	\$96,941

# Worksheet Four

## MAINTENANCE

COST ITEM (6 months)		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
a) Salaries [services donated by agency]	\$887 - 3 mechanics (prorated by 21/36 because we own 21 of the agency cars)	<u>Salaries</u> \$887 mechanics 2942 - 1/3 to preventive (#1) 5885 - 2/3 to repair (#2) Col. 2	1. Preventive Maintenance expenses to Col. 1 parts 2888 costs to Col. 2 salaries 2942 benefits 500 rent 811 \$4253	2888	-	
b) Fringe Benefits	\$1501 = 17% of mechanics' salary	<u>Benefit</u> \$1501 - Col. 2 500 - 1/3 to preventive (#1) 1001 - 2/3 to motor repair (#2)		-	4253	7141
c) Rent, Utilities	\$3120 = 2/3 of building rent	<u>Rent</u> \$3120 - Col. 2 based on expense patterns 811 - 26% to preventive (#1) 2309 - 74% to repair (#2)	2. Motor and Vehicle Repair expenses to Col. 1 parts 11,551 costs to Col. 2 salaries 5885 benefits 1001 rent 2309 9295	11,551	-	
d) Contract Fees \$1281 = repairs on lifts		<u>Contract fees</u> \$1281 - Expenses, Col. 1 100% to accessory repair (#3)	3. Body and Accessory Repair expenses to Col. 1 Contract fees 1281	-	9295	20,846
e) Parts \$14,439 from invoices		<u>Parts</u> - based on actual bills \$14,439 - Expenses to Col. 2 2888 - preventive (#1) 11,551 - repair (#2)				
TOTAL				\$15,720	\$13,548	\$29,268

# Worksheet Four

## EQUIPMENT & DEPRECIATION

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
a) Vehicles \$4,107 = 20% local share, yearly depreciation of 16 buses, 4 vans, 1 station wagon	6 months \$16,428 = 80% federal share of yearly depreciation		Equipment Depreciation	4107	16428	
b) Modifications				—	—	—
c) Radios				—	—	—
			TOTAL	\$4107	\$16,428	20,535

# Worksheet Four

## FUEL & OIL, INSURANCE & OTHER FEES

### COSTS BY FUNCTIONS

COST ITEM		Method of Pro-Rating	Function Summary	Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
Expense	Reconstructed Cost					
<b>FUEL &amp; OIL</b>						
a) Fuel \$18,357 = invoiced gas			<u>expenses to Col. 1</u> gas 18,357	18,357		
b) Oil \$1,670 = invoiced oil			oil 1,670	1,670		
TOTAL				\$20,027	-	\$20,027
<b>INSURANCE &amp; OTHER FEES</b>						
a) Insurance \$2,837 2140 buses 496 vans 181 wagon			<u>expenses to Col. 1</u> insurance 2837			
b) Other Fees			licenses 102			
TOTAL				\$2,939	-	\$2,939
c) Licenses, \$102 license plate stickers						

## SUMMARY AND PREVIEW OF THE NEXT CHAPTER

This Chapter has described and demonstrated a process for identifying the costs and expenses created by the performance of all agency functions. These calculations were illustrated for two actual transportation systems.

The process allows you to calculate an annual total system cost and a total system expense figure as well as to calculate annual costs and expenses for each of the six major cost categories.

Each of these figures has a value to you in evaluating and analyzing your system.

- Annual system figures can be used to report financial data and to prepare budgets.
- Annual system cost data can be used to compare your cost patterns to comparable systems, and to develop meaningful performance measures.
- Annual cost and expense figures can be used internally for comparisons of your system over time.

The next Chapter of this Manual will show you how to convert system totals into unit cost figures. It will also describe the value of unit cost figures in analyzing the performance and productivity of your system.

## Chapter Five.

# How to Calculate Unit Cost Figures; A Preliminary Review

### WHAT THIS CHAPTER WILL DO FOR YOU

Chapter Four illustrated how to calculate annual system costs and expenses. This Chapter will show you how to take those annual cost figures and relate them to three important components of the service provided by your transportation system:

- Passengers
- Hours of Service
- Miles of Service

Unit cost measures are used for many purposes. In general, they give you a way to relate your costs to measures of the service you provide. This allows you to evaluate the performance and productivity of your service against yourself over time, and with great care against comparable systems.

It is not very useful to compare your total annual costs to those of another system if you operate ten vehicles and the other

system operates two. You must have some comparison of the measures of the service provided for the money and resources expended. Unit cost measures are just such figures.

Unit cost measures are often used when agencies buy or purchase transportation service from one another. You may well be quoted a unit cost price as a fare; for example, a dollar figure per one-way passenger trip or per vehicle hour. Initially, you need to understand what these figures represent and how to compute your own unit cost figures to serve as a basis of comparison.

Unfortunately, this Manual can give only a summary overview of the way to calculate unit cost measures from the annual cost data that you have already computed. Most meaningful calculations require a set of operating statistics which we have not discussed or described in this Manual. Here, to allow a calculation of unit costs, we will have to assume that you have or know how to get certain summary operating data. A later Manual in this series will focus on how you can evaluate the performance of your system and it will explain the kind of comprehensive operating data you will need to record as well as the best way to obtain that data.

Unit cost figures are also used to compare the costs of various system alternatives. Again, we can only discuss the outline of these comparisons and suggest ways in which you can compare alternatives to your present service model. A later Manual in the series will focus on the wide range of options you have which have been called transportation coordination. They include both buying and selling transportation services to and from other agencies. You can see how many of the cost analyses described in this Manual are designed to support the comparative process described in the Coordination Manual.

The descriptions and definitions given in this Chapter are designed to give you familiarity with key unit cost terms and to

assist you to understand how those terms are computed. To use those measures to the fullest, you must investigate later Manuals in the series.

### WHAT ARE UNIT COSTS?

Unit costs provide a way to relate the costs of operating a transportation service to the measures of performance for that service. In other words, unit costs are a type of efficiency or output measure.

There are three performance dimensions of unit costs:

- Passengers: Generally unit costs are expressed in one-way passenger trips. By focusing on passengers carried we can see how much the system expends per passenger for a certain class of trip (or overall).
- Hours of Service: By examining this time-related measure of performance, we can get an idea of the output of each service hour and of the general resources required to operate the service for a given unit of time. Vehicle hours and driving or passenger hours are both used as denominators for unit cost measures.
- Miles of Service: Both vehicle miles and passenger miles can be related to the cost of service to provide a unit cost. These measures allow an examination of key costs in relation to actual miles traveled.

### WHAT ARE THE UNIT COSTS MEASURES THAT YOUR AGENCY WILL USE?

There are five basic unit cost measures:

- cost per one-way passenger trip
- cost per vehicle hour
- cost per loaded or revenue vehicle hour
- cost per vehicle mile
- cost per occupied vehicle or passenger mile

Each will be discussed briefly below.



### Cost Per One-Way Passenger Trip

Cost per one-way passenger trip measures the cost to the system for each passenger carried from pick up to destination. This figure is a reliable measure of cost and is used by transportation systems around the country. It can be figured in this way:

$$\frac{\text{Total annual cost or expense of system}}{\text{Total one-way passenger trips}} = \text{cost or expense/pass. trip}$$

Note that the number of people carried is not equivalent to the number of one-way trips. If you carried two people roundtrip to the doctor you would have four one-way passenger trips.

Example: *expense/cost per one-way passenger trip*

An agency spent \$40,000 on its transportation system during a six-month period. During the same six-month period, it carried 16,000 passenger trips. What is the cost per one-way passenger trip?

Answer:  $\frac{\$40,000}{16,000} = \$2.50$  (expense) per one-way passenger trip

### Cost Per Vehicle Hour

This figure relates the system's cost or expense pattern to the total number of vehicle hours accumulated by the service. The cost per vehicle hour figure is a good measure of the amount that it costs to keep one of your agency's vehicles on the road during your system's operating hours. Cost per vehicle hour can be figured in this manner:

$$\frac{\text{Total annual system cost or expense}}{\text{Total vehicle hours}} = \text{cost or expense/vehicle hours}$$

Usually an agency is also concerned with occupied or loaded vehicle hours; this is more difficult to compute without good trip records. The procedure is the same, however, whether all hours or only loaded hours are considered.

Example: *expense/cost per vehicle hour*

An agency spent \$52,000 in a six-month period to operate its transportation system. During that six-month period, it operated for a total of 3,400 vehicle hours. What is the cost per vehicle hour?

Answer: 
$$\frac{\$52,000}{3,400 \text{ vehicle hours}} = \$15.29 \text{ per veh. hour}$$

#### Cost Per Loaded or Revenue Vehicle Hour

Cost per loaded or revenue hour relates the cost of your transportation system to the hours of vehicle operation when at least one passenger is actually on board the vehicle. This measure allows a comparison of passenger related costs to the costs accrued from simply maintaining a vehicle on the street.

When compared with the cost per vehicle hour, the cost per revenue hour figure can give an indication of the possible efficiency of your transportation system.

This measure can be calculated in basically the same way as cost per vehicle hour:

$$\frac{\text{Total annual system cost or expense}}{\text{Total loaded or revenue hours}} = \frac{\text{cost or expense per loaded}}{\text{or revenue hour}}$$

Example: *expense/cost per loaded or revenue hour*

A social service agency spent \$52,000 in a six-month period to operate its transportation system. During this period, the system accrued 2,600 revenue hours. What is the cost per revenue hour?

Answer: 
$$\frac{\$52,000}{2,600 \text{ hours}} = \$20 \text{ per loaded or revenue hour}$$

### Cost Per Vehicle Mile

The unit cost measure called cost per vehicle mile measures system costs in relation to total vehicle miles traveled. This is a realistic figure of the actual system costs as related to vehicle reliability, productivity and mileage. Cost per vehicle mile can be calculated in the following way:

$$\frac{\text{Total annual system cost or expense}}{\text{Total Vehicle Miles}} = \text{cost per vehicle mile}$$

Example: *expense/cost per vehicle mile*

An agency wishes to determine the cost of running a vehicle one mile. The total transportation cost for one year was \$128,000. During that year, agency vehicles traveled 315,000 vehicle miles. What is the cost per vehicle mile?

Answer: 
$$\frac{\$128,000}{315,000 \text{ vehicle miles}} = \$0.40 \text{ per vehicle mile}$$

### Cost Per Occupied Vehicle or Passenger Mile

Cost per occupied vehicle mile is a ratio of total system costs to vehicle miles accrued with passengers aboard. The cost per passenger mile is a useful figure especially for comparison with the cost per vehicle mile. The first is always a higher figure; but the extent to which it is higher than cost per vehicle mile gives an idea of vehicle productivity and utilization for passengers.

Cost per occupied vehicle mile is calculated thus:

$$\frac{\text{Total annual system cost or expense}}{\text{Total occupied miles}} = \text{cost or expense per occupied vehicle mile}$$

Example: *expense/cost per occupied vehicle mile*

An agency operated its transportation system at an annual cost of \$128,000. The total occupied vehicle miles traveled during the same year was 205,000 miles. What is the cost per occupied vehicle mile? →

$$\text{Answer: } \frac{\$128,000}{205,000 \text{ miles}} = \$0.62 \text{ per occupied veh. mile}$$

## HOW ARE UNIT COST FIGURES USED?

### COMPARING ALTERNATIVES

Unit cost figures are useful in comparing the cost of your system with a contract alternative or with the costs of entering into a coordinated system. You can then make a more informed decision about the value of these transportation alternatives.

Two important qualifications should be mentioned here. First, your agency will probably want to use out-of-pocket expenses as a basis for comparison as these are the costs which actually affect your budget. However, if certain funding sources may not be available, or certain costs may affect your agency in the future, the reconstructed costs of these items should be included in the unit cost measures.

In making a comparison to the costs of an alternative system, it is important to find out if that system's cost figures or estimations are based on the same assumptions as your own. To compare costs, then, your agency should ask some hard questions:

- Are full costs included in the alternative system's costs?
- Do these cost figures appear realistic? If not, what is the discrepancy?
- What are the assumptions or methods by which the alternative system derived its costs?

Unit costs can be used to compare transportation alternatives to determine which alternative is most economical and best suited for your needs. Such a comparison should be attempted, however, with the best information possible and with comparable unit costs.

Service variables have to be examined to see if unit figures are really comparable. If one system only operates six hours a

day as compared to 10 hours for your current system, system costs would not be comparable. Important service variables to consider when making a comparison include hours of service, size of service area, types of assistance offered by the driver, advance time needed for reservations, the types of vehicles, and response and waiting time.

An examination of these factors can lead to a better understanding of the reasons behind any system's unit cost figures. A system's cost per vehicle mile might be low only because that system is not using lift-equipped vehicles, for example. Another example is a system with a low passenger per vehicle hour ratio due to the fact that drivers routinely help passengers inside their front door.

The most important fact to keep in mind when comparing alternatives by examining unit costs is the fact that the data must be comparable. The type of service should be roughly similar, the functions performed by the service basically the same, and the unit cost measures must be of the same type.

Differences in the system mean differences in the cost. If an alternative system does not perform a function that your agency does perform, then in order to contract with that alternative system, your agency must either perform that function at an additional cost or discontinue the function.

It might even be helpful to share this report with other providers involved so that all cost evaluation can be performed on a similar basis.

#### ANALYZING COST COMPONENTS

Unit cost measures can be helpful in analyzing the cost of your service in terms of the six cost categories outlined above in the costing Chapter: overhead and administration, operations, maintenance, equipment and depreciation, fuel and oil, and insurance and licenses.

Breaking unit costs into these categories is especially useful in terms of the cost per mile category, for this enables evaluation of vehicle reliability (maintenance costs) and vehicle operations (fuel and oil). Such a breakdown of unit costs into categories is also useful in terms of cost per vehicle hours and driving hours. This breakdown would allow examination of driver salaries in terms of hours actually on the road.

Example: *how to use unit costs by functional category*

Fuel and oil costs for a transportation system stand at \$400 a month. During that month the agency vehicles accumulated a total of 1,330 vehicle miles. What is the cost per vehicle mile of fuel and oil?

Answer: 
$$\frac{\$400}{1,330 \text{ miles}} = \$0.03 \text{ per vehicle mile for fuel and oil}$$

This process may be figured in basically the same way for all six categories and all five unit cost measures. Simply substitute the total cost in each category for the system cost and follow the instructions for figuring each unit cost.

#### WATCHING CHANGES OVER TIME

Unit cost measures are an extremely effective way of measuring the way in which your system's costs and expenses change over time. You can then relate those cost changes to any improvements or changes in the service itself. Such changes as decreased ridership, increased fuel costs or labor costs, or changes in service hours can all be monitored through examination of unit costs. Unit cost measurement is thus an essential part of operating, maintaining, planning, and evaluating a special transportation system.

#### SUMMARY AND REVIEW OF THE NEXT CHAPTER

This Chapter has defined five major unit cost measures and has explained how you can calculate your own system costs in that

manner. You will be able to use unit cost measures to evaluate your system's performance, to consider your system's productivity, and to suggest ways in which your system's costs could be reduced or its performance increased.

Just as significantly, alternative providers often provide service based in some way on unit cost measures; for example, taxis generally charge for one-way passenger trips. Therefore, you will need to know your own comparable unit cost figures to be able to evaluate the options offered you.

Understanding the unit cost measures defined briefly here is the first step in analyzing the performance of your system, as described in the Fifth Manual in this series, and to compare coordination alternatives as described in the second Manual in the series.

## Chapter Six

# Comparing Your System to Other Systems; Some Preliminary Approaches

### WHAT THIS CHAPTER WON'T DO FOR YOU!

Most agencies or systems that are currently providing client transportation services want to know how well they are doing. After having spent some considerable time in performing the annual cost and unit cost calculations described in previous Chapters, they want to know how their costs compare to other systems. This Chapter won't and really can't give you the ways to compare your costs, your performance, or your productivity to that of comparable systems in your community or across the country.

We can't give you really meaningful ways to compare your system now because

- you need more system operating data than you probably have or that we have been able to explain in this Manual



- you need data from systems very closely related to yours, serving the same type of passengers, in the same way, in the same kind of climate and demography; that data does not exist at this time
- you need to have two sets of data -- cost and performance data -- as well as the skill to relate one data set to the other in order to develop comparable performance measures.

One of the problems with most reported data is that it is not very descriptive of the type and range of services that generated the costs.

You probably recognize that it is cheaper per passenger to serve a group of people who live at the same place or who are leaving from the same place, all of whom are traveling to the same destination than it is to carry extremely handicapped people living at a variety of destinations traveling to a variety of destinations, on a random demand-responsive basis. The second type of service usually generates very high per passenger trip costs. In order to be able to compare your system to other systems you would need to know exactly what services are being provided by the other systems.

In addition, in order to compare your system to others in key performance areas, you must have good records which will allow you to generate the unit cost data described in the previous Chapter. You must know, for example, the vehicle mileage and passenger statistics discussed there. Most systems with which we dealt did not have the records that allowed calculations. In fact, most agencies requested assistance in setting up their recordkeeping systems so that they could generate the necessary information in the future to do these performance and productivity evaluations.

Lastly, most systems do not currently have the data or expertise to use both cost measures and service measures to develop reliable indicators of their system productivity. This means that reported and published data with which to compare your system are scarce and generally suspect. Moreover, you probably do not now have productivity data on your own system.

### HOW TO GET THE ASSISTANCE YOU WANT

Many agencies want to understand their system performance, and want to be able to evaluate their system over time to detect growth or problems. Many agencies want to compare their systems to other systems to gauge their efficiency and effectiveness. The cost calculations and analyses which have been presented in this Manual will allow exactly those comparisons, when they are combined, in the right way, with operating data.

The analysis of system performance and productivity is not an extremely complex one. But it would add too much additional information and too many calculations to this Manual to explain those analytical procedures here. Instead, we have devoted an entire Manual in this series, How to Make Your Transportation System More Efficient and Effective, to assist you in these important analytical processes. In addition, that Manual will present the latest available cost and productivity data for a number of systems recently surveyed.

Many agencies also want to consider and compare the costs of involvement in coordinated transportation services. They want to know what impact involvement in a number of coordination possibilities will have on their costs and their operating patterns. These important issues and the analytical procedures that will allow an evaluation of various coordination systems will be discussed and described in another individual Manual in this series, How to Evaluate the Costs and Benefits of Participating in Coordinated Transportation Services.

### WHAT THIS CHAPTER WILL DO FOR YOU

This Chapter will give you enough information to use the cost data developed in earlier Chapters to do three kinds of preliminary comparative analyses. The Manual will assist you

- to compare your overall incidence of costs to those found in a national survey
- to compare three of your system's unit cost measures to some measures calculated for a small sample of like systems
- to compare the unit cost prices offered to you by another provider or carrier with your own current costs.

#### A COMPARISON OF YOUR SYSTEM'S COST PATTERNS WITH NATIONAL FIGURES

Costs are influenced to a great extent by local factors, such as the type of clients, the setting (urban or rural), the size of the system, area wage scales, etc. Therefore, actual dollar cost figures for various systems will not be of much use to you. "Average" or even "optimal" dollar amounts will be meaningless. It will be useful, however, to look at how much of their total transportation budget was spent by a number of agencies on each of the six major cost items discussed in earlier Chapters.

This approach will allow you to compare the incidence of the six major cost items for your system with the incidence registered by many agencies engaged in direct provision throughout the United States. The information provided in this section will permit you to gain at least a general frame of reference.

Table One presents data collected from a number of different types of social service agencies all over the United States during 1977-78; more detailed descriptions of these findings are presented in Ref. 1. These data have not been expanded to allow for inflation and increasing gas prices. These costs may well have increased from 25% to 35% since the year they were collected.

The table presents the percentage composition of the transportation budgets of surveyed social service agencies which directly provide transportation to their clients. The first column in this table is based on the costs actually reported by the agencies surveyed. These data have very limited value because some agencies included more items in their transportation budgets than others

TABLE ONE. Cost Patterns for Systems in a National Sample, 1977-78

MAJOR COST CATEGORIES	Costs Initially Reported As Percentage of Total Costs			Reconstructed Costs As Percentage of Total Costs		
	Minimum	Maximum	Average	Minimum	Maximum	Average
I. Overhead and Administration	0	18	10	17	42	25
II. Operations	49	72	61	33	48	41
III. Maintenance	3	17	10	3	13	8
IV. Equipment and Depreciation	0	19	5	5	16	12
V. Fuel and Oil	6	16	12	6	14	10
VI. Insurance and Licenses	0	3	2	1	7	4

did (for example, the value of part time labor, equipment depreciation, etc.).

A more accurate assessment of the distribution of resources used in the direct provision of client transportation is shown in the second column of Table One. That second column was developed by reconstructing the "actual cost" of providing transportation services. All the resources actually involved in providing services for the agencies in question were inventoried and given a dollar value.

To reconstruct costs, all the cost items described in Chapter Three were included. For example, the total purchase price of all equipment was depreciated over a four-year period and added to the yearly budget. The value of part time contributions of existing staff was estimated and included. The time dedicated by volunteer workers was also estimated and included based on the going wage rate for that type of job and, if not available, on the minimum wage rate. In short, all the resources used by the agency's transportation system were considered.

Since there is considerable difference in local situations, a range of incidence as well as an average is presented. For example, the first column shows that equipment depreciation expenses were reported to represent from a minimum of 0% to a maximum of 19% of the total budget for the agencies surveyed: the average incidence reported was 5%.

#### AN ILLUSTRATION OF THE VALUE OF FULL-COST COMPARISONS

Table One gives a very clear illustration of why it is so necessary to include all costs, even those that an agency did not pay. You will notice that there are great differences between the first and second columns in Table One, between those expenses initially reported by agencies surveyed and those costs that were reconstructed to represent actual resources committed. Agencies

appear to have underestimated the value of some of the resources they consumed by between 15% and 25%.

If you have calculated your own costs in Table One in two columns, you will note similar differences between your expense and your cost patterns. Some of the differences between the columns in the table here are due to the addition of real but not paid-for expenses like volunteer drivers. Some of the discrepancies, it should be noted, are due to agencies not reporting out-of-pocket expenses that were really incurred (and charged to their budget) but not recognized or calculated. That is one reason why you should be very careful to list all functions you perform and all expenses and costs associated with those functions. You may discover that you too are incurring some actual expenses that you did not recognize before.

This Chapter uses full cost data because it allows you to use comparable data from other systems to spot problems or inefficiencies in your own operations. This is the purpose of this Chapter; to assist you in using the cost data from Worksheets Four and Five to perform a comparative analysis of your system.

To allow a comparison between systems with similar operating characteristics but with different funding sources and subsidies and staff available to them, it is necessary to reconstruct all the surveyed systems' costs so that all systems are being evaluated against a common set of criteria. It would be pointless to compare the costs incurred by two very similar systems if one had all its vehicles donated and the other had to purchase all its vehicles. However, if we reconstruct the vehicle costs for the first agency we can check the cost patterns of the two systems to see how they allocated their resources between and among the major cost categories.

The information presented in Table One will allow you to compare your allocation of resources among the major cost categories to the average of a large number of other providers. Obviously, there will still be regional differences in a number of cost

variables such as wage rates, which may explain some of the differences between your system and others. Still this exercise should be an interesting and useful indication of how your system compares with other systems.

HOW TO USE YOUR OWN FIGURES  
TO COMPARE AGAINST NATIONAL FIGURES

Worksheet Six allows you to use the cost figures you developed in filling in Worksheets Four and Five to calculate your own cost patterns. The blank Worksheet Six, which is for your use, is followed by a Sample Worksheet which shows you how some sample data were handled to develop figures needed for comparative purposes.

Once you have performed the calculations on Worksheet Six, simply transfer your figures to Worksheet Seven, which allows for an easy comparison of your cost figures with the national figures first presented in Table One.

Remember it is meaningless to compare your out-of-pocket expenses (Column 1) with either column in Table One. Your out-of-pocket expenses may include costs missing in the data reported initially by some of the agencies; conversely, your cost data may not include expenses that were reported by some of those agencies.

To compare your own unreconstructed or out-of-pocket expenses to the range of expenses initially reported by the other agencies would be like comparing apples and toasters; there is no common ground. It is only useful to compare your full reconstructed total costs, expressed as percentages with those appearing in the second column of Table One; that is what Worksheet Seven permits you to do easily. Only in this way do you have a common basis for comparison.

A significant discrepancy in the composition of your budget from the ranges and averages presented in Table One (or Worksheet Seven) may simply mean that your system has some unique characteristics which you should be able to identify. If you do not

## Worksheet Six

### CALCULATING EACH MAJOR COST CATEGORY AS A PERCENTAGE OF TOTAL COST

MAJOR COST CATEGORY	Total Amount for Each Item (Taken from Column 3, Worksheet Five)	Calculations (Item Cost Divided by Total Cost)	Cost Item as a Percentage of Total Cost
I. Overhead and Administration			
II. Operations			
III. Maintenance			
IV. Equipment and Depreciation			
V. Fuel and Oil			
VI. Insurance and Licenses			
TOTAL			



## Worksheet Seven

### A COMPARISON OF YOUR COST PATTERNS WITH NATIONAL FIGURES

MAJOR COST CATEGORY	Average Incidence of Costs as a Percent of Full Expenses and Reconstructed Costs	Your System's Full Cost Items as a Percent of Your Total Costs <sup>1</sup>
I. Overhead and Administration	25%	
II. Operations	12%	
III. Maintenance	41%	
IV. Equipment and Depreciation	10%	
V. Fuel and Oil	8%	
VI. Insurance and Licenses	4%	

<sup>1</sup>Taken from Worksheet Six, Based on Column 3 of Worksheet Five.

have some unique situation, then something may not be working right.

It is important to note that differences may simply be due to the characteristics of your system. It may turn out, for example, that a higher incidence of operating salaries arises from relatively high wage rates in your area when compared with the rest of the nation. If such an explanation can be found, and it is acceptable, there is no reason to be dissatisfied with your system.

Conversely, it may be that there are no easy explanations for a difference such as a much higher incidence of maintenance costs. It may be that you are performing inadequate preventative maintenance, so that frequent vehicle breakdowns and costly repairs tend to happen. Or it may be that your equipment is so old that it requires excessive attention in the shop which limits the availability of mechanical personnel to perform on-the-road service. By looking in more detail at the functions performed under this category, you may discover that having your own shop and mechanics is very costly; perhaps the mechanics are underutilized because your system is too small.

In all three cases, you detect a possible malfunction and take courses of action to correct it. You may decide to contract with a local garage to perform for your agency whatever maintenance is needed; you can switch emphasis from simple repair work to preventative maintenance; you can start actively looking for possible funding sources to purchase new vehicles.

This section can be useful in "troubleshooting" some of the problems of your system, if there are any. Besides comparing your data with those provided in this Manual, you can develop your own set of data, which will be even more meaningful since they refer to your own system and not a generic average.

## COMPARING YOUR UNIT COST FIGURES AGAINST VAGUELY COMPARABLE SYSTEMS

Table Two presents unit costs data for 56 systems or providers across the United States during 1977-78. It is probable that these figures would have risen 25% to 35% by 1981 considering general inflationary trends and sharp rises in the cost of petroleum products. For a number of reasons, it was not possible to reconstitute these figures for this Manual.

To give you an idea of how you compare to other U.S. systems you should compute your data for the following unit cost figures, as shown in Chapter Five:

- cost per vehicle hour
- cost per one-way passenger trip
- cost per vehicle hour

Then compare your current figures to the column which most represents your system or current method of transportation provision. If you currently purchase service, under contract from a non-lift-equipped provider (for example, a taxi operator) in an urban area, you would find that in 1977-78 comparable services averaged \$7.97 per one-way passenger trip.

Remember two important points

- all figures in Table Two are full-cost data; the value of all resources (including donated vehicles, volunteer labor, etc.) were added to originally reported expenses, and
- most of the figures in Table Two have increased by 10% to 12% a year since 1977.

Therefore, we might expect an average one-way passenger cost figure for an urban taxi operator selling service to be around \$10.40 in 1981 dollars. If your current (similar) arrangement is much cheaper, be sure you have included reconstructed costs for all the resources committed to your transportation system, as this Table has.

TABLE TWO. Full-Cost and Expense Unit Data for Classes of E & H Transportation Providers, 1977-78

Type of Cost (\$) Class of Provider	COST/VEHICLE MILE			COST/PASSENGER TRIP			COST/VEHICLE HOUR		
	min.	max.	avg.	min.	max.	avg.	min.	max.	avg.
SSA area averages	.73	.94	.80	1.79	4.42	2.81	4.82	13.18	10.34
	.46	.79	.67	1.50	4.19	2.54	4.05	12.49	8.91
SSA urban	.59	1.61	1.10	2.37	5.72	3.94	—	—	13.87 <sup>a</sup>
	.27	1.43	.69	1.09	5.08	2.78	—	—	11.23
SSA rural	.66	1.49	1.11	1.62	5.48	4.44	10.15	12.77	11.46
	.57	1.19	.74	1.29	4.77	2.91	5.27	11.11	8.19
Contract, urban non-lift	.53	1.55	1.08	1.48	10.80	3.70	n.a.	n.a.	n.a.
	.46	1.35	.89	1.16	8.62	2.83	n.a.	n.a.	n.a.
Contract, urban lift	.58	2.36	1.15	3.75	19.57	7.97	n.a.	n.a.	n.a.
	.38	2.10	.96	3.75	17.39	6.68	n.a.	n.a.	n.a.
Contract, rural lift	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	.10	3.21	.84	2.90	19.76	9.24	n.a.	n.a.	n.a.
Transit System, urban, lift	.65	2.76	1.64	1.12	10.84	6.16	9.84	27.54	17.86
	.54	2.54	1.48	1.02	9.06	5.12	9.84	25.97	16.61

Note: large numerals represent actual cost figures and small numerals represent perceived expenses.

<sup>a</sup>Only figures available for this category.

Source: Ref. 1.

Manual Two in this series, How to Evaluate the Costs and Benefits of Participating in Coordinated Transportation Systems, will give you a much more detailed description and explanation of the comparisons considered here.

#### COMPARING YOUR CURRENT COSTS TO COSTS PER PASSENGER TRIP OFFERED BY AN ALTERNATIVE PROVIDER

You may be considering direct transportation provision for the first time and wish to evaluate your alternatives. Or you may currently be providing client transportation services in your own vehicles, but you will need to buy new vehicles to continue that service. You may also wish to consider the other alternatives available.

Many community providers exist to provide alternative transportation services. Sometimes comparing their prices to your costs is a simple operation. If the alternative provider is offering exactly the same type and level of service to you as you currently provide, and it is offering to you a comparable unit cost figure, you can simply compare your costs to the price offered.

However, often a comparison of costs is more difficult. Sometimes alternative providers cannot provide exactly the same kind of service; although the difference in service may be acceptable to you, a comparison of your current costs to their prices for a different service level will not be fair. Sometimes a community provider wishes to sell you service on the basis of a different unit cost figure; a common example is a system which wants to sell you service based on vehicle hour charges. To compare your costs you generally need to know how many passengers will be carried in each vehicle hour and how that converted cost figure compares to your present cost per passenger trip.

One Manual in this series is devoted to the complex issue of buying and selling transportation services and how to compute and compare comparable cost figures. This Chapter can only help

you to assess alternative services in the most simple of the situations described above: the alternative provider offers you a price per one-way passenger trip, and the level and type of service are at least roughly equivalent to yours.

If you are offered a cost per vehicle mile or vehicle hour, you should remember that your current unit cost figures for these same measures will not usually be comparable to those of the alternative system. In almost all cases you will have to convert any other unit cost figure to costs per one-way passenger trip to make a meaningful comparison. The Second Manual in the series will show how and when to make such conversions.

A comparison in the simple situation is fairly straightforward:

- consider all the functions you will retain (if any) if you use an alternative transportation provider and add those costs to the total offered by the alternative provider;
- add to your current expense calculations any known changes in costs, such as increased gas prices, known salary increases, etc.; and
- compare your current annual costs (or your costs per one-way passenger trip) plus the costs of any functions retained with the costs offered by an alternative provider.

#### IDENTIFYING THE COSTS OF ANY FUNCTIONS RETAINED

This third comparison is one of the few comparative calculations that you can make with your out-of-pocket expense figures. That is because you won't need to compare more than what actually comes out of your budget to prices offered by alternative providers, if your cost patterns stay relatively stable. However, if some of your "free" services are likely to change, or you will shortly have to buy a vehicle and no grant money is available, you should at least add to your expense total the costs of these items.

Worksheet Eight will help you to identify any transportation-related functions that you may still perform even if you purchase all your services from an alternative provider. Many agencies,

# Worksheet Eight

## COMPARING CURRENT COSTS AGAINST ONE WAY PASSENGER TRIP COSTS OF ALTERNATIVE PROVIDERS

Option: _____	Retained?		Out-of-Pocket Expenses	Reconstructed Cost
FUNCTIONS	Expenses	Costs		
<b>I. OVERHEAD AND ADMINISTRATION</b>				
a) Start-up				
b) Client Screening				
c) Reservations				
d) Issue Travel Documents				
e) Accounting				
f) Analysis of Operating Data				
g) Monitoring and Evaluation				
h) Residual Costs				
<b>II. OPERATIONS</b>				
a) Routing				
b) Scheduling				
c) Dispatching				
d) Driving				
e) Escort Services				
<b>III. MAINTENANCE</b>				
a) Preventive Maintenance				
b) Motor Repair				
c) Vehicle Repair				
<b>IV. EQUIPMENT AND DEPRECIATION</b>				
<b>V. FUEL, OIL</b>				
<b>VI. INSURANCE</b>				
<b>SUBTOTALS</b>				

\_\_\_\_\_ contract rate X \_\_\_\_\_ one way passenger trips \_\_\_\_\_

+ subtotal retained out-of-pocket expenses \_\_\_\_\_

**TOTAL Cost to agency (with contract)**                      **CONTRACT TOTAL** \_\_\_\_\_

**Current total Cost to agency**                      **CURRENT TOTAL** \_\_\_\_\_

or

\_\_\_\_\_ Number one-way passenger trips

    X \_\_\_\_\_ current unit cost \_\_\_\_\_

# Worksheet Eight

## COMPARING CURRENT COSTS AGAINST ONE WAY PASSENGER TRIP COSTS OF ALTERNATIVE PROVIDERS

FUNCTIONS	Retained?		Out-of-Pocket Expenses	Reconstructed Cost
	Expenses	Costs		
<i>ABC Taxi Co</i> Option: <i>with our vans</i>				
<b>I. OVERHEAD AND ADMINISTRATION</b>				
a) Start-up		✓		\$ 1400.00*
b) Client Screening	✓			
c) Reservations	✓		\$ 1263.00	
d) Issue Travel Documents				\$ 2964.00
e) Accounting	✓	✓	\$ 300.00	\$ 2964.00
f) Analysis of Operating Data				
g) Monitoring and Evaluation	✓	✓	\$ 3400.00*	\$ 2423.00
h) Residual Costs				
<b>II. OPERATIONS</b>				
a) Routing				
b) Scheduling				
c) Dispatching				
d) Driving				
e) Escort Services				
<b>III. MAINTENANCE</b>				
a) Preventive Maintenance				
b) Motor Repair				
c) Vehicle Repair				
<b>IV. EQUIPMENT AND DEPRECIATION</b>	✓	✓	\$ 76.00	\$ 8330.00
<b>V. FUEL, OIL</b>				
<b>VI. INSURANCE</b>	✓		\$ 1079.00	
<b>SUBTOTALS</b>			\$ 6118.00	\$ 18,081

Sample

\* New cost for this option

# <u>0.50</u> contract rate X <u>22,839</u> one way passenger trips	114,195.00
+ subtotal retained out-of-pocket expenses	6,118.00
TOTAL Cost to agency (with contract)	CONTRACT TOTAL \$ 120,313.00 ←
Current total Cost to agency	CURRENT TOTAL \$ 102,450.00 ✓
or	
_____ Number one-way passenger trips	
X _____ current unit cost _____	



for example, still wish to do their own client screening; most systems will want to monitor the services provided by contractors.

In some cases the retained functions will generate actual out-of-pocket expenses for your agency. For example, you may have to hire someone part time to do accounting as well as screening clients for eligibility. In some cases the retained functions will be added to the responsibilities of a person who does not charge any salary or benefits to the transportation budget.

Worksheet Eight will help you to identify all the functions that you will continue to perform and to divide the associated costs into expenses and reconstructed costs. You will use the total of the actual expenses generated by the retained functions to add to the total costs offered to you by an alternative provider.

In addition, you can use the checks in the third column of Worksheet Eight for management purposes. Even if your agency incurs no expenses in performing retained activities, you will want to know that certain duties must still be performed. Moreover, as always, it is wise to remember that donated or "free" services can change status and suddenly become a real expense item in your budget. This Worksheet provides such a reminder.

## SUMMARY

Many agencies need assistance in identifying and analyzing their costs and this entire Manual has served that purpose. Many agencies and providers want to go much further; they want to evaluate the performance of their system and to increase its efficiency. Still more agencies want to consider alternatives to their present method of transportation provision. Still other agencies have been mandated by Congress or their State Legislatures to consider transportation coordination.

It is absolutely necessary to have the accurate cost and expense data discussed and explained in this Manual before

beginning any more sophisticated or complicated comparisons or system evaluations. In addition, it is important to have reliable data on how your system operates, measured in traditional transportation terms such as passengers per vehicle hour or vehicle mile.

**APPENDICES**

# Worksheet One

## CHECKLIST FOR IDENTIFYING ACTIVITIES AND COMMONLY ASSOCIATED COSTS

<i>COST ITEMS</i>		<b>I. OVERHEAD AND ADMINISTRATION</b>							
		<i>FUNCTIONS</i>							
Perform Functions?		Start Up	Client Screening	Trip Reservations	Issue Documents	Accounting	Analysis	Monitoring	Other and General
a. Salaries									
b. Fringe Benefits									
c. Rent, Utilities									
d. Communications									
e. Travel									
f. Interest									
g. Contract Fees & Charges									
h. Other & General									

<i>COST ITEMS</i>		<b>II. OPERATIONS</b>					
		<i>FUNCTIONS</i>					
Perform Functions?		Scheduling and Routing	Dispatching	Driving	Escorts	Training	Other and General
a. Salaries							
b. Fringe Benefits							
c. Rent, Utilities							
d. Communications							
e. Travel							
f. Interest							
g. Contract Fees & Charges							
h. Other & General							

<i>COST ITEMS</i>		<b>III. MAINTENANCE</b>		
		<i>FUNCTIONS</i>		
Perform Functions?		Preventive	Vehicle Repair	Body & Accessory Repair
a. Salaries				
b. Fringe Benefits				
c. Rent, Utilities				
d. Communications				
e. Travel				
f. Interest				
g. Contract Fees & Charges				
h. Other & General				

FUNCTIONS	DIRECT COSTS						
	Supplies	Parts	Contract Charges	Depreciation	Insurance	Licenses & Fees	Other & General
<b>I. OVERHEAD &amp; ADMINISTRATION</b>							
1. Start-Up							
2. Client Screening							
3. Trip Scheduling							
4. Issue Documents							
5. Accounting							
6. Analysis							
7. Monitoring							
8. Other & General							
<b>II. OPERATIONS</b>							
1. Scheduling & Routing							
2. Dispatching							
3. Driving							
4. Escort Services							
5. Training							
6. Other & General							
<b>III. MAINTENANCE</b>							
1. Preventative							
2. Vehicle Repair							
3. Body & Accessory							
<b>IV. EQUIPMENT PURCHASE &amp; DEPRECIATION</b>							
1. Vehicle							
2. Vehicle Modifications							
3. Radio							
<b>V. FUEL AND OIL</b>							
1. Fuel							
2. Oil							
<b>VI. INSURANCE AND FEES</b>							
1. Insurance							
2. Licenses							
3. Fees							

## Worksheet Three

COST ITEMS	I. OVERHEAD AND ADMINISTRATION															
	FUNCTIONS															
	Start-Up		Client Screening		Trip Reservations		Issue Documents		Accounting		Analysis		Monitoring		Other and General	
	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs
a. Salaries																
b. Fringe Benefits																
c. Rent, Utilities																
d. Communications																
e. Travel																
f. Interest																
g. Contract Fees & Charges																
h. Other & General																

COST ITEMS	II. OPERATIONS											
	FUNCTIONS											
	Scheduling and Routing		Dispatching		Driving		Escorts		Training		Other and General	
	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs	Expenses	Costs
a. Salaries												
b. Fringe Benefits												
c. Rent, Utilities												
d. Communications												
e. Travel												
f. Interest												
g. Contract Fees & Charges												
h. Other & General												

COST ITEMS	III. MAINTENANCE					
	FUNCTIONS					
	Preventative		Vehicle Repair		Body & Accessory Rep.	
	Expenses	Costs	Expenses	Costs	Expenses	Costs
a. Salaries						
b. Fringe Benefits						
c. Rent, Utilities						
d. Communications						
e. Travel						
f. Interest						
g. Contract Fees & Charges						
h. Other & General						

# Worksheet Four

## OVERHEAD & ADMINISTRATION

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
a) Salaries			1. Start-up			
b) Fringe Benefits			2. Client Screening			
			3. Reservations			
c) Rent, Utilities			4. Issue Travel Documents			
			5. Accounting			

# Worksheet Four

## OVERHEAD & ADMINISTRATION

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
d) Communications			6. Analysis			
e) Travel			7. Monitoring			
f) Interest			8. Others and General			
g) Contract Fees						
h) Other & General Supplies, Parts						
			<b>TOTAL</b>			



# Worksheet Four

OPERATIONS			COSTS BY FUNCTIONS			
COST ITEM		Method of Pro-Rating	Function Summary	Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
Expense	Reconstructed Cost					
a. Salaries			1. Scheduling & Routing			
b. Fringe Benefits;			2. Dispatching			
c. Rent, Utilities;			3. Driving			
d. Contract Fees & Charges;			4. Escorts			
e. Other & General			5. Training			
			TOTAL			

# Worksheet Four

## MAINTENANCE

COST ITEM		Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost			Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
a) Salaries			1. Preventive Maintenance			
b) Fringe Benefits						
c) Rent, Utilities			2. Motor and Vehicle Repair			
d) Contract Fees			3. Body and Accessory Repair			
e) Parts						
			TOTAL			

# Worksheet Four

## EQUIPMENT & DEPRECIATION

## COSTS BY FUNCTIONS

COST ITEM		Method of Pro-Rating	Function Summary	Out-of-Pocket Exp. Only	Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)
Expense	Reconstructed Cost					
a) Vehicles						
b) Modifications						
c) Radios						
			TOTAL			

# Worksheet Four

## FUEL & OIL, INSURANCE & OTHER FEES

COST ITEM			Method of Pro-Rating	Function Summary	COSTS BY FUNCTIONS		
Expense	Reconstructed Cost	Out-of-Pocket Exp. Only			Reconstructed Costs	Full Costs (Col. 1 plus Col. 2)	
<b>FUEL &amp; OIL</b>							
a) Fuel							
b) Oil							
				<b>TOTAL</b>			
<b>INSURANCE &amp; OTHER FEES</b>							
a) Insurance							
b) Other Fees							
c) Licenses,							
				<b>TOTAL</b>			

## Worksheet Five

### SUMMARY ANNUAL EXPENSE AND COST CALCULATIONS

Function	Out-of-Pocket Expenses	Reconstructed Costs	Full Costs
I. Overhead and Administration			
II. Operations			
III. Maintenance			
IV. Equipment and Depreciation			
V. Fuel and Oil			
VI. Insurance and Licenses			
TOTAL			

## Worksheet Six

### CALCULATING EACH MAJOR COST CATEGORY AS A PERCENTAGE OF TOTAL COST

MAJOR COST CATEGORY	Total Amount for Each Item (Taken from Column 3, Worksheet Five)	Calculations (Item Cost Divided by Total Cost)	Cost Item as a Percentage of Total Cost
I. Overhead and Administration			
II. Operations			
III. Maintenance			
IV. Equipment and Depreciation			
V. Fuel and Oil			
VI. Insurance and Licenses			
TOTAL			

## Worksheet Seven

### A COMPARISON OF YOUR COST PATTERNS WITH NATIONAL FIGURES

MAJOR COST CATEGORY	Average Incidence of Costs as a Percent of Full Expenses and Reconstructed Costs	Your System's Full Cost Items as a Percent of Your Total Costs <sup>1</sup>
I. Overhead and Administration	25%	
II. Operations	12%	
III. Maintenance	41%	
IV. Equipment and Depreciation	10%	
V. Fuel and Oil	8%	
VI. Insurance and Licenses	4%	

<sup>1</sup>Taken from Worksheet Six, Based on Column 3 of Worksheet Five.

# Worksheet Eight

## COMPARING CURRENT COSTS AGAINST ONE WAY PASSENGER TRIP COSTS OF ALTERNATIVE PROVIDERS

Option: _____	Retained?		Out-of-Pocket Expenses	Reconstructed Cost
FUNCTIONS	Expenses	Costs		
<b>I. OVERHEAD AND ADMINISTRATION</b>				
a) Start-up				
b) Client Screening				
c) Reservations				
d) Issue Travel Documents				
e) Accounting				
f) Analysis of Operating Data				
g) Monitoring and Evaluation				
h) Residual Costs				
<b>II. OPERATIONS</b>				
a) Routing				
b) Scheduling				
c) Dispatching				
d) Driving				
e) Escort Services				
<b>III. MAINTENANCE</b>				
a) Preventive Maintenance				
b) Motor Repair				
c) Vehicle Repair				
<b>IV. EQUIPMENT AND DEPRECIATION</b>				
<b>V. FUEL, OIL</b>				
<b>VI. INSURANCE</b>				
<b>SUBTOTALS</b>				

\_\_\_\_\_ contract rate X \_\_\_\_\_ one way passenger trips \_\_\_\_\_

+ subtotal retained out-of-pocket expenses \_\_\_\_\_

TOTAL Cost to agency (with contract) CONTRACT TOTAL \_\_\_\_\_

Current total Cost to agency CURRENT TOTAL \_\_\_\_\_

or  
\_\_\_\_\_ Number one-way passenger trips

X \_\_\_\_\_ current unit cost \_\_\_\_\_



A WORD ABOUT SECTION 15 REPORTING REQUIREMENTS  
AND THE COST CATEGORIES PRESENTED IN THIS MANUAL

Some agencies receive financial assistance for operating expenses from the Urban Mass Transportation Administration. These agencies and transportation operators are required to submit detailed reports using a format established by Section 15 of the 1964 UMTA Assistance Act as amended. If you are one of those agencies you will know it.

However, even if you are not, you may be under contract to a transit operator or agency which is subject to Section 15 reporting requirements. Thus, while you are not required to keep your data in that format, the contracting agency may ask that you do so to help them out. Or they may want to know how to convert the records and data that you do keep for the contract services that you provide to them into the data necessary for their reports to UMTA.

This topic was discussed at length in Ref. 1. Here we will only reiterate the following way to match the cost categories presented here with Section 15, Level C reporting requirements:

MAJOR COST CATEGORIES AND CORRESPONDENCE TO SECTION 15 FUNCTIONS

<u>Manual</u>	<u>UMTA Section 15, Level C</u>
Equipment and Depreciation	reconciling item
Overhead and Administration	general administration
Insurance	non-vehicle maintenance
Maintenance	vehicle maintenance
Operations, Fuel, and Oil	vehicle operations

## ANOTHER FEW WORDS ABOUT DEPRECIATION

Some commentators on this Manual have asked us to say a few more words about equipment depreciation. Actually we have already said a great deal about equipment depreciation in Ref. 1 (pp. 30-56) and we urge the reader with a deep interest in the subject to obtain that reference (see References list for availability). Here we'll try to answer some common questions and clear up some general misunderstandings.

### WHAT IS DEPRECIATION REALLY?

It is the loss in value of those capital facilities or equipment that do decline in value over time because of use, age, decay, or technological obsolescence. Since your equipment loses value over time because you use it, you should count the monetary equivalent of the lost value as a cost.

### DOES COUNTING DEPRECIATION AUTOMATICALLY CREATE MONEY TO BUY NEW EQUIPMENT?

NO!

### WHY NOT?

Because depreciation in general, and in the public sector in particular, means different things to different people. In most businesses depreciation is a) the way that firms distribute the purchase cost of new equipment over several years so it does not unduly raise the budget of any one year, and b) the way that firms show the capital cost of producing revenue. Private firms are subject to tax laws which allow them to offset profits with depreciation costs; they only pay taxes on the difference.

Depreciation can be used to establish a fund to buy new vehicles in either the private or public sector but it doesn't

happen automatically. If you wish to put aside money to buy new vehicles or radios, for example, you should have your accountant help you to set up a reserve fund or depreciation account.

WHAT HAPPENS TO THE MONEY IF IT ISN'T  
USED TO BUY NEW EQUIPMENT

In the private sector there are a number of ways that accountants deal with depreciation; see Ref. 1 for a full discussion. Most social service agencies which received funds for depreciation simply use the money as it comes in to operate their system; many small business people do the same thing.

This is perfectly legal; we don't advise it, however. We believe that it is better for most community providers to establish an account to hold any money collected for depreciation costs. In this way such providers can use those monies to purchase new equipment when the time comes.

We know that many community providers have that intention but their cash flow problems are so bad that they can't help but spend the money as soon as it comes in. One option is to establish a depreciation account and use that account to borrow against from banks and lending institutions. Very small operators won't be able to use this option but larger community providers might be able to do so. Again, seek guidance from your accountant on how to handle cash flow problems in a way that safeguards the monies collected for depreciation.

WHY IS DEPRECIATION HANDLED  
DIFFERENTLY IN THE PUBLIC AND PRIVATE SECTORS?

In part, because business people are subject to tax laws which make the counting of depreciation a fairly important issue. However, just as important, many public analysts believe that depreciation of pure public sector investments is not appropriate since the government is not in the business of making a profit and

need not off-set profits with costs. There are a number of fascinating issues in this discussion; again, we refer the interested reader to Ref. 1 for a comprehensive discussion of this issue. However, for our purposes, depreciation is different in the public sector because of the existence of capital grants from Federal and other governments to small community providers like yourself to buy equipment.

#### WHY IS DEPRECIATION CHANGED BY THE EXISTENCE OF GRANTS?

Remember that depreciation is the dollar amount of the value that your equipment has lost; however, if you didn't pay for that equipment that loss isn't yours. A principle which can be detected in Federal policy about grants (from any source) is that if you didn't pay for all or part of a vehicle you shouldn't be allowed to collect money from anybody for the depreciation costs on that part of the vehicle for which you didn't pay. This holds if the buyer was a state agency, a local charity, or a church group. You should know that that principle is often ignored or not enforced.

An allied principle in Federal thinking which has been more strictly enforced is that if you take depreciation for a vehicle or radio, etc. which was purchased in part with Federal funds, you cannot charge that cost back to the Federal government. If you did so, the Federal government would be paying twice for the same equipment! If you follow this rule you could depreciate the local share of your equipment and that cost could be charged in fares or appear in the operating assistance a Federal agency gave you.

#### WHAT REALLY HAPPENS?

Just about every combination of violations of the two rules above. In the transportation field the issue is confused because

transit operators who receive both Federal capital and operating assistance are never allowed to charge or calculate depreciation. UMTA's Section 15 reporting requirements contain no category for depreciation.

#### WHAT SHOULD SMALL SOCIAL SERVICE AGENCIES DO?

We suggest that you violate the first rule above for a number of reasons; no matter who paid for your equipment other than the Federal government you should depreciate it and charge that cost in your fares and in your operating budget.

If a Federal agency like the Administration on Aging bought your vehicles and also pays your operating expenses, you should calculate the depreciation but not show the depreciation on the Federal share in your operating budget. But if you provide rides to other community agencies you should depreciate the entire purchase price of the equipment and let it be contained in your charges.

The interesting question at which the text of the Manual hints is: what should you do if, for example, UMTA bought you a vehicle but the Administration on Aging pays your operating expenses? The Federal Office of Management and Budget guidelines say that depreciation may only be charged on the non-Federal share of the cost of vehicle and equipment. There is some feeling that it is permissible to charge the AoA the depreciation costs of the entire vehicle. Moreover, OMB has taken the apparent position that in agreements between state and local agencies, there are no Federal guidelines since the Federal government isn't directly involved. You probably received your UMTA 16(b)2 vehicle from the State Transportation Department and the Aging money from the State Aging unit. What rule do you think applies?

CAN'T WE GET A BETTER ANSWER THAN THAT?

Depreciation is a real cost and we would like to see every social service and community provider recognize that. We also think that it is necessary for such providers to recognize that there are some relevant Federal guidelines which are not completely clear but which nevertheless govern the kind of depreciation charges they can make. Whether you can charge for it or not, you must recognize the cost. Having said that, we think the next thing to do is meet with your accountant and with the relevant auditors in your funding agency and work out the particular details of depreciation accounting for your system. The Manual has already presented three separate examples illustrating the general principles discussed here.

WHAT SHOULD PRIVATE OR NON-PROFIT AGENCIES DO ABOUT DEPRECIATION?

Tax laws really govern the behavior of these providers. Certainly the principle of calculating depreciation is the same but the method, for private firms, may be governed by a myriad of tax laws. If you are a profit-making entity, you need your own accountant to discuss these details. Non-profit agencies must investigate the relevant state and local regulations on their behavior to know if they should act in the same manner as social service agencies or as profit-making entities.

## References

1. Cost-Effectiveness Measures for Transportation Services for the Elderly and Handicapped, Sandra Rosenbloom, et al, for the U. S. Department of Transportation, Urban Mass Transportation Administration, Austin, Texas, October 1979 (NTIS PB 80-141-880).
2. Equipment and Maintenance Requirements for Light-Weight Accessible Bus Operations, Department of Civil and Sanitary Engineering, Michigan State University, for the U. S. Department of Transportation and the Michigan Department of Transportation, East Lansing, Michigan (available through NTIS, number unknown).
3. Michigan Small Bus Program Management Handbook, Bureau of Urban and Public Transportation, Michigan Department of State Highways and Transportation, June 1978 (available from Technology Sharing).
4. A Model Uniform Billing and Accounting System for Coordinated Transportation Systems, Sue F. Knapp, Ecosometrics, Inc., for the U. S. Department of Transportation, Bethesda, Maryland, January 1979 (available through NTIS, number unknown).
5. Paratransit Handbook: A Guide to Paratransit System Implementation, Systan, Inc., for the U. S. Department of Transportation, Vols. I and II, Final Report, February 1979 (available through NTIS, number unknown).
6. Planning and Coordination Manual, Vol. I: Joint HEW-UMTA Evaluation of Elderly and Handicapped Transportation Services in Region IV, Carter-Goble-Roberts, Inc., Atlanta, Georgia, January 1979 (available from Technology Sharing).

7. Planning Handbook: Transportation Services for the Elderly, Joseph Rivas, Institute of Public Administration, November 1975 (NTIS PB 247-958).
8. The Social Service Insurance Dilemma: Problems, Analysis and Proposed Solutions, The University of Tennessee, for the U. S. Department of Transportation, Knoxville, Tennessee, March 1979 (available through NTIS, number unknown).

#### AVAILABILITY

Documents with an NTIS number are available to the public from the National Technical Information Service, 5825 Port Royal Road, Springfield, Virginia 22161. Those without numbers can be obtained if you will write to NTIS and be sure to include the full title and the author(s) name. Generally, both paper and microfiche copies are available; costs vary with the length of the document.

Documents identified as available through Technology Sharing may be obtained, as long as copies are available, from

The Office of Technology Sharing  
U. S. Department of Transportation  
400 7th Street, SW  
Washington, D. C. 20590



# **Cost-Analysis for Social Service Agency Transportation Providers**

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