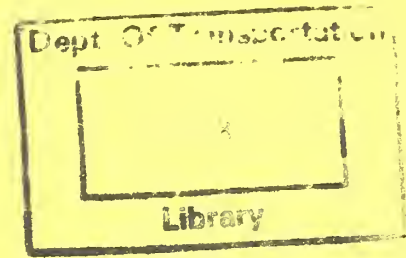


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REPORT NO. UMTA-MA-06-0049-77-8



## UMTA/TSC Transit Dependent Transportation Series

# San Diego Wheelchair Accessible Bus Study

Interim Report  
September 1977

### Service and Methods Demonstration Program



U.S. DEPARTMENT OF TRANSPORTATION  
Urban Mass Transportation Administration  
and Transportation Systems Center

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16. Abstract This study was performed as part of a series of wheelchair accessible bus implementation. It describes the implementation and early operation of a pilot project of fixed-route, wheelchair accessible bus service. An update of the information contained in this paper is planned in the near future.  In 1976, the San Diego Transit Corporation (SDTC), implemented a pilot program to demonstrate the need for a bus wheelchair lift. Two heavily patronized routes were selected for this service. During the first week of the service, ridership averaged slightly less than two trips per day. Shortly thereafter, ridership had dropped to about one person per week. The factors that may explain this include: 1) a lack of advertising of the lift service due to budget constraints; 2) the limited origins and destinations served by wheelchair buses; 3) the difficulty of accessing the bus stops or destinations near the bus stops due to street curbs and hilly terrain; 4) the competition from social service agency transportation services and from the City of San Diego Dial-A-Ride; and 5) the initial unreliability of the service due to late delivery of some of the vehicles and the absence of a back-up vehicle when the lift design improvements were being incorporated. In this study all relevant aspects of the current operation are covered, such as service and equipment, level of service, economics, demand, impacts, attitudes, and implications for transferability. The report also contains Appendix A, which is a Dial-A-Ride Passenger Survey. The conclusion is that the lift is workable, and is being continually improved, but that a true measure of handicapped and elderly ridership will not be determined until a major portion of the external travel barriers are removed.			
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15. Supplementary Notes					
16. Abstract <p>This study describes the implementation and early operation of a pilot project of fixed route, wheelchair accessible bus service on two routes of the San Diego Transit system. Five buses of the Transit Authority fleet were retrofitted with wheelchair lifts by the lift manufacturer. Four lift equipped buses are used in the service with one bus held as a spare.</p> <p>Relatively few lift problems have been encountered. Nevertheless, lift design improvements have been and are continually being made to improve its performance and usability. Ridership by wheelchair confined persons has been low and a number of possible reasons for this are enumerated.</p> <p>Wheelchair accessible bus service will incur added operational costs but insufficient experience has been generated to permit estimation of the annual amount.</p>					
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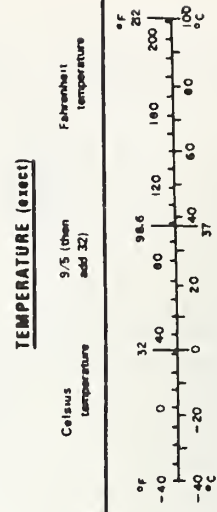
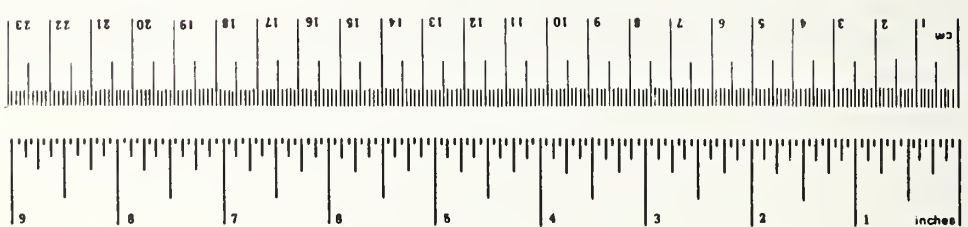
## Preface

This paper was prepared under the Service and Methods Demonstration Program PPA UM-727. The work was performed as part of a series of studies of wheelchair accessible bus implementations. This paper is based on site visits and discussions with several individuals in the San Diego area. An update of information contained in this paper is planned in about six months time.

The author is particularly indebted to Mr. Roger Snoble of San Diego Transit Corporation for his time and helpfulness in supplying information for this paper. Special acknowledgement is also due to Mr. Mark Lowthian of San Diego Transit Corporation, Mr. Tim Price and Mr. George Franck of the Comprehensive Planning Organization of the San Diego Region, Mr. Les Smith of Transportation Design and Technology, Inc., and Mr. Jack Riley of the City of San Diego Transportation Department for their assistance in providing information and relevant background material, and to Mr. Joseph Sturm of the Transportation Systems Center who assisted in the field work and in preparing material on the mechanical aspects of the wheelchair lift operation.

# METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures			Approximate Conversions from Metric Measures			
Symbol	When You Know	Multiply by	To Find	Symbol	When You Know	
<b>LENGTH</b>						
in	inches	2.5	centimeters	cm	millimeters	0.04
ft	feet	30	centimeters	cm	inches	0.4
yd	yards	0.9	meters	m	feet	3.3
mi	miles	1.6	kilometers	km	yards	1.1
					miles	0.6
<b>AREA</b>						
in <sup>2</sup>	square inches	6.5	square centimeters	cm <sup>2</sup>	square centimeters	0.16
ft <sup>2</sup>	square feet	0.09	square meters	m <sup>2</sup>	square meters	1.2
yd <sup>2</sup>	square yards	0.8	square meters	m <sup>2</sup>	square yards	0.4
mi <sup>2</sup>	square miles	2.6	square kilometers	km <sup>2</sup>	square kilometers	0.4
	acres	0.4	hectares	ha	hectares (10,000 m <sup>2</sup> )	2.5
<b>MASS (weight)</b>						
oz	ounces	28	grams	g	grams	0.035
lb	pounds	0.45	kilograms	kg	pounds	2.2
	short tons	0.9	tonnes	t	short tons	1.1
	(2000 lb)					
<b>VOLUME</b>						
tsp	teaspoons	5	milliliters	ml	milliliters	0.03
Tbsp	tablespoons	15	milliliters	ml	fluid ounces	2.1
fl oz	fluid ounces	30	milliliters	ml	quarts	1.06
c	cups	0.24	liters	l	gallons	0.26
pt	pints	0.47	liters	l	cubic feet	35
qt	quarts	0.95	liters	l	cubic yards	1.3
gal	gallons	3.8	liters	l		
ft <sup>3</sup>	cubic feet	0.03	cubic meters	m <sup>3</sup>		
yd <sup>3</sup>	cubic yards	0.76	cubic meters	m <sup>3</sup>		
<b>TEMPERATURE (exact)</b>						
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C	Celsius temperature	9/5 (then add 32)
					Fahrenheit temperature	





## TABLE OF CONTENTS

	<u>Page</u>
1.0 EXECUTIVE SUMMARY	1
2.0 SETTING	2
2.1 General Description	2
2.2 Size and Geographic Distribution of the Handicapped and Elderly Population	2
2.2.1 Elderly	2
2.2.2 Handicapped	3
2.3 General Transportation Characteristics	4
2.3.1 Transit	4
2.3.2 Taxis	4
2.4 Existing Handicapped and Elderly Transportation Services	6
2.4.1 City of San Diego Dial-A-Ride	6
2.4.2 Agency Transportation	7
2.4.3 Taxis	7
3.0 WHEELCHAIR ACCESSIBLE BUS IMPLEMENTATION	7
3.1 Project Development	7
3.2 Exogenous Factors	9
4.0 SUPPLY	11
4.1 Service	11
4.2 Equipment	11
4.2.1 Lift Design	11
4.2.2 Safety Features	11
4.2.3 Retrofit Installation	16
4.2.4 Wheelchair Securement	19
4.2.5 Lift Operation	19
4.2.6 Problem Areas	19
5.0 LEVEL OF SERVICE	29
5.1 Coverage	29
5.2 Loading/Unloading Time	32
5.3 System Effects	33
6.0 ECONOMICS	33
6.1 Capital Cost	33
6.2 Operating Costs	34
6.3 Productivity	34

	<u>Page</u>
7.0 DEMAND	35
7.1 Wheelchair Users	35
7.2 Elderly and Other Handicapped	35
8.0 IMPACTS	35
8.1 Mobility Changes for Handicapped and Elderly	35
8.2 Non-Target Group Riders	36
8.3 Cost of Service	36
8.4 Institutional	37
9.0 ATTITUDES	37
9.1 Handicapped and Elderly	37
9.2 Transit Management	38
10.0 IMPLICATIONS FOR TRANSFERABILITY	38
APPENDICES	
A. DIAL-A-RIDE PASSENGER SURVEY	A-1
B. NEWSPAPER ARTICLES	B-1

## 1.0 EXECUTIVE SUMMARY

On February 6, 1976, San Diego Transit Corporation (SDTC) implemented a pilot program to demonstrate the need for wheelchair accessible transit buses. This was the first known U.S. implementation of full sized, wheelchair lift equipped buses in regular fixed route service. Five GMC transit coaches were retrofitted with wheelchair lifts by Transportation Design and Technology, Inc., the manufacturer of the wheelchair lift equipment. Four of the buses provide approximately hourly service on two heavily patronized routes of the SDTC System; the fifth bus is a spare.

There have been relatively few mechanical problems in the operation of the lift equipment. Small design changes have been made, however, -i.e., reducing the height of the lift platform edge, and relocating hydraulic lines-to improve the operational performance or usability of the lift. Further improvement in lift design can be expected as added operational experience is gained.

The provision of wheelchair lift bus service has some operational and financial impacts. Initially, there is the cost of retrofitting the transit buses. In addition, the system operating cost will increase somewhat due to the added maintenance required for the lift. Seating capacity will be slightly reduced since four to six seats will be lost depending on the utilization of the wheelchair tie down positions. However, for the foreseeable future, it seems unlikely that the seat reduction or the added dwell time for loading and unloading wheelchair patrons (or the elderly that would need the lift) will necessitate the placement of extra vehicles in service to maintain capacity and schedule reliability.

During the first week of lift bus service ridership averaged slightly less than two trips per day. In early April, ridership had dropped to about one person per week. A number of factors may explain the low initial utilization of the service. These include: a lack of advertising or marketing of the wheelchair lift service by SDTC due to budget constraints; the limited origins and destinations served by wheelchair buses; the difficulty of accessing the bus stops or destinations near the bus stops due to street curbs and the hilly terrain found in many sections of San Diego; the competition from social service agency transportation services and from the City of San Diego Dial-A-Ride; and the initial unreliability of the service due to late delivery of some of the vehicles and the absence of a back-up vehicle when the lift design improvements were being incorporated.

The handicapped and elderly community is pleased that a start has been made in the provision of accessible buses in fixed route service. All recognize, however, the limitations of the present service. SDTC views the service as a pilot project. A fixed budget for capital and operational expenditures restricted the amount of lift bus service that SDTC could provide.

All factors considered, it is not surprising that initial handicapped ridership on the lift equipped buses has been low. In addition to the possible reasons previously mentioned, travel habits cannot be expected to change rapidly, especially for those with other means of travel. Furthermore, a true measure of handicapped ridership will not be determined until a major portion of the external travel barriers are removed. Consequently, cities contemplating or implementing wheelchair accessible fixed route bus service should not be deluded into expecting high initial ridership by the disabled. The bus service might well be a catalyst, however, for the initiation of efforts to alleviate the other travel barriers for the handicapped and elderly.

## 2.0 SETTING

### 2.1 General Description

San Diego County is situated at the southernmost extremity of California. Geographically, it is bounded on the north by coastal hills and mountain ranges, on the east by desert, on the south by the Mexican border, and on the west by the Pacific Ocean. Composed of 13 cities and numerous unincorporated areas, it has an overall population of 1.56 million. Its land area is over 4,000 square miles with an average density of 319 people per square mile. By 1995, overall population of 2.4 million is predicted.

Center city San Diego is the major employment, cultural, and financial center of the region. With a population of 770,000 it ranks as the second largest city in California and the ninth largest in the nation.

### 2.2 Size and Geographic Distribution of the Handicapped and Elderly Population\*

#### 2.2.1 Elderly

The regional population of persons age 60 and over in 1975 was 203,813, and grew faster than the general population over the

\* SOURCE: De Leuw Cathur & Company in Association with Bigelow-Crain Associates, Study of Improved Transit Services for Handicapped and Elderly, for Comprehensive Planning Organization, October, 1976.

past five years:

	<u>Regional Population</u>	<u>Elderly Population</u>
1970 (U.S. Census)	1,357,854	165,678
1975 (Special Census)	1,559,505	203,813
Percent Change	14.9	23.0

Some of this growth was due to increasing longevity; a large though unknown amount, however, is also due to in-migration from other regions. Both factors will contribute to continued increases in the number of elderly persons in the future.

The geographic distribution of elderly in the region in 1970 shows that the residences of older persons are scattered throughout the region, but that there are greater concentrations in Chula Vista, the coastal and peninsula areas, El Cajon, Escondido, Vista, Oceanside, and especially the City of San Diego. To the extent that age is an indication of public transportation need, this distribution immediately indicates that transportation needs may exist throughout the region, so that improved transportation services must be capable of operating in all areas, to some degree or another.

### 2.2.2 Handicapped

Statistical information on the number of handicapped persons is generally limited to that for work-related disabilities -- and does not cover the full range of handicaps. Nevertheless, employment disabilities are a reasonable indicator of handicap with respect to use of public transportation. The 1970 U.S. Census reported a total of 60,749 persons aged 16 through 64 in the region who were limited in or prevented from working due to a disability. Using general population growth rates to 1975, and eliminating the age group of persons 60 through 64 which are included as elderly, a total of 70,046 handicapped persons age 16 through 59 were calculated for 1975.

The location of handicapped persons' residences are rather heavily concentrated around municipal centers, with the largest share of the total in downtown San Diego. Furthermore, handicapped persons tend to live in lower income areas of the respective jurisdictions.

The age group excluded from the above is persons age 15 and younger. A County-wide total of about 4,000 youth are reported by the State Department of Education as enrolled in public school Special Education programs in San Diego in kindergarten through 12th grade. Of these, about 1,200 are physically handicapped and

2,800 are mentally retarded. No figures are available for the number or residence locations of handicapped youth in private schools.

### 2.3 General Transportation Characteristics

#### 2.3.1 Transit

SDTC (or more commonly SDT) is the main operator in the County, providing approximately 90 percent of all bus service. It provides local and express service on 40 regular weekday routes in 9 cities and the County of San Diego (Figure 2-1).

The bus fleet as of December 1976 was composed of 351 buses; 51 of these were the small Mercedes Benz buses and 25 were flexible standard-size express buses. The remaining 275 were standard-size GMC 51 passenger coaches. All buses are radio equipped.

San Diego Transit has an exact change flat fare with no transfer charges. SDT also sells a monthly pass. The fares are as follows:

	<u>Cash Fare</u>	<u>Passes</u>
Regular Riders	35 cents	\$14/month
Students through the 12th Grade	25 cents	\$10/month
Seniors over 60 years of age and Handicapped Persons	15 cents	\$ 6/month

#### 2.3.2 Taxis

The City Transportation Department has authority to issue 410 taxicab certificates. Approximately 380 have been issued to date. San Diego Yellow-Cabs, Inc. has 280 of the certificates. There are eight other taxicab companies with certificates to operate within the City, but the second largest company is Checker with 13 certificates. Thirty certificates have been issued to individual owner/operators. San Diego Yellow Cabs, Inc. experienced financial difficulties last year and was forced to declare bankruptcy, but is now operational once again.

Present taxi fares are 70 cents for the first 1/7 mile and 10 cents per 1/7 mile thereafter.

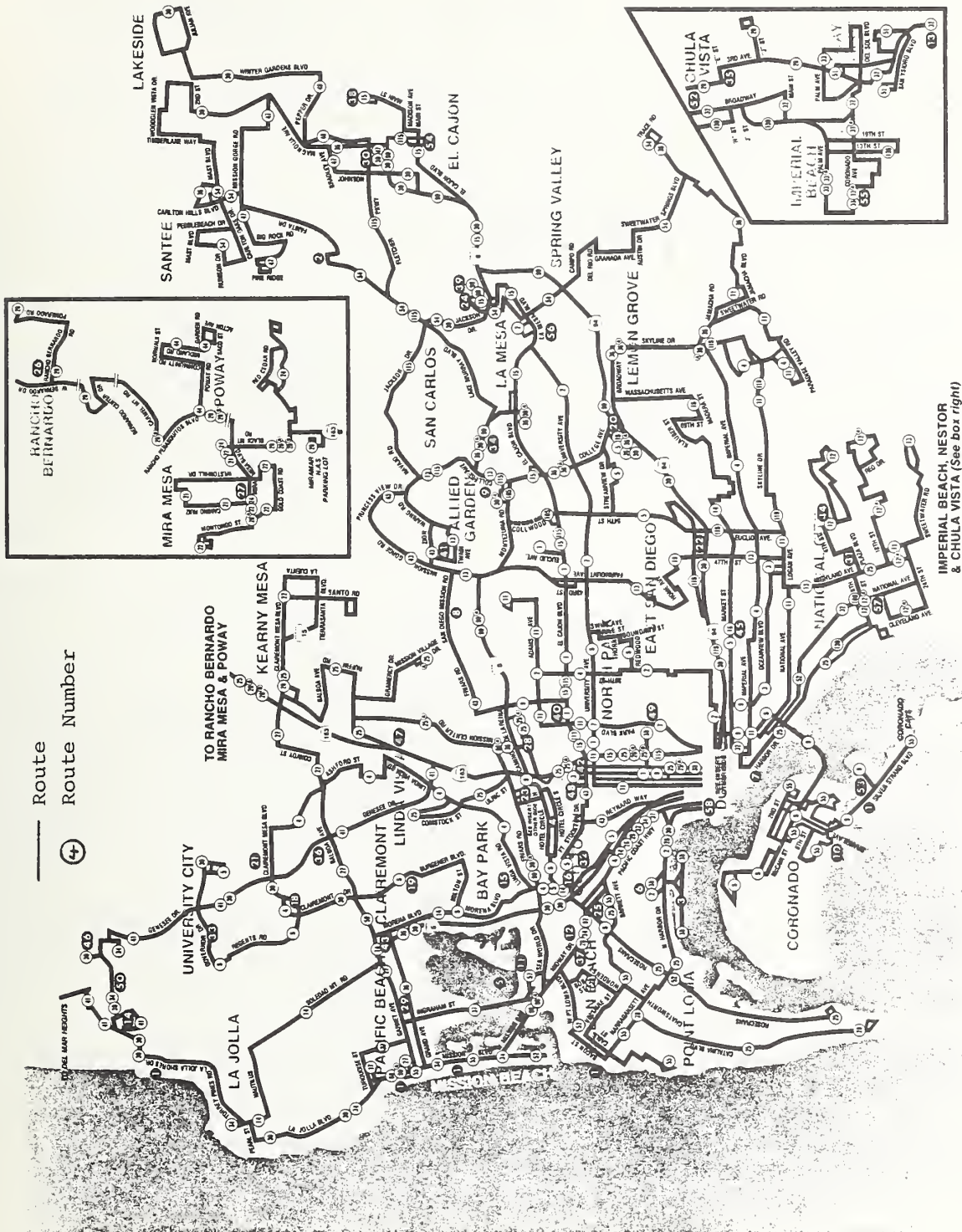


FIGURE 2-1. SAN DIEGO TRANSIT SYSTEM 1976

## 2.4 Existing Handicapped and Elderly Transportation Services

The handicapped and elderly in San Diego have a reasonable set of travel options. The City Dial-A-Ride, agency transportation services and taxis can accommodate many, but not all, of the trips which the handicapped and elderly desire to make.

### 2.4.1 City of San Diego Dial-A-Ride\*

The largest single supplier of public handicapped and elderly transportation in the region (exclusive of school bus service) is the City of San Diego through its Dial-A-Ride Program. Equipment consists of 12 Mercedes-Benz minibuses and 9 vans. Service is provided on a door-to-door basis for seniors and handicapped with a mandatory fare of 25¢. Current system operational data is included in Table 2-1.

TABLE 2-1. SAN DIEGO DIAL-A-RIDE DATA

Service Area	93 sq. mi.
Target Group Population	15,000 - 17,000
Target Group Population Density	1043/sq. mi.
Vehicle Fleet	21
Vehicle Type	10 passenger vans + 18 passenger mini buses
Fare Structure	25¢
Vehicle Response Time	45 minutes
Passenger Wait Time	30 minutes
System Productivity	3.5 pass/veh.-hr.
System Costs	\$0.61/veh.-mi.

Use of the City's Dial-A-Ride is open to seniors, defined as all persons sixty years and older, and handicapped, defined as those persons who, by reasons of illness, injury, age, congenital malfunction, or other permanent or temporary incapacity or disability, are unable even with special planning or design, to utilize mass transportation facilities as effectively as persons who are not so affected. The number of people who actually need Dial-A-Ride service is estimated to be roughly in the neighborhood of 15,000 - 17,000 persons. By the end of FY76, Dial-A-Ride patrons generated slightly over 120,000 passenger trips with an average of 10,000 trips per month or 386 trips per

\* SOURCE: City of San Diego, Department of Transportation, Dial-A-Ride Report, June 1976.



day. Appendix A presents the results of an on-board survey of user characteristics and attitudes.

#### 2.4.2 Agency Transportation\*

A survey by the City Dial-A-Ride Office revealed 23 agencies with 117 vehicles (80 belong to the school district) providing service exclusively for handicapped and elderly and another 41 vehicles of other agencies used in services not solely dedicated to the handicapped and elderly.

It is difficult to calculate the total service provided by social service agencies, church groups, etc., but it would appear to be rather substantial albeit restricted in many cases to specific clientele and limited areas of operation. Most volunteer and social service agency cars are used for agency clients; few are available for non-agency-related needs such as shopping.

#### 2.4.3 Taxis

Another travel mode available to the elderly and handicapped is taxis. These provide the great majority of door-to-door service at present, but at rates that are prohibitively high for low income persons. These vehicles are physically well suited to the demand-responsive needs of many elderly and handicapped, and suggest themselves as a potential major element in providing improved services for these groups. Regulatory codes in the region would probably require revision to permit shared ride operation, however.

### 3.0 WHEELCHAIR ACCESSIBLE BUS IMPLEMENTATION

#### 3.1 Project Development

The impetus for the provision of special transit services or equipment for handicapped and elderly persons in San Diego gathered momentum in 1974. Backed by the UMTA Sec. 16 requirements, senior citizens and handicapped groups began strong lobbying efforts to secure greater accessibility to mass transportation. It was in this year that the city took over the Model Cities, Linda Vista and Senior citizens Mobility Project

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\* SOURCE: City of San Diego, Department of Transportation, Dial-A-Ride Report, December 1976.

dial-a-ride systems. Pressure was also exerted on San Diego Transit for accessibility to regular transit buses. The SDT Board of Directors was in sympathy with this position. Three of the nine member Board were themselves senior citizens. However, after searching the industry, no acceptable wheelchair lift was found that fit a regular transit bus and met SDT's requirements for safety and reliability.

It was not until 1976 that a local company, Transportation Design & Technology, Inc. (TDT), developed a wheelchair lift that met these requirements. Subsequently, the UMTA Capital Grant to San Diego was amended to include the retrofitting of 5 existing buses with wheelchair lifts. Orders were placed with TDT on September 20, 1976. Unfortunately, the delivery of the retrofitted vehicles lagged behind schedule and the service was begun on the advertised date (February 6, 1977) without a back-up vehicle. As of mid-April, there is essentially still no back-up vehicle. The fifth retrofitted bus was delivered on the last week of February but one vehicle at a time is being modified with lift and retrofit improvements. This has resulted in periods wherein one of the wheelchair vehicles was not in service when it was supposed to be due to some malfunction. During the shakedown period, which in SDT's case occurred during actual operations, it was not surprising that malfunctions occurred due to operators relative unfamiliarity with the equipment (even though they were giving training) or some difficulty with the retrofits themselves.

Prior to final outfitting of the accessible buses, a modified bus was brought to the transit property for testing. The bus was also brought to the handicapped group at San Diego State University for testing. As a result of these tests modifications were made to the lift and securement mechanisms. This lift is still undergoing design changes and improvements and has not yet reached the stage where a completely satisfactory lift has been produced. It should be noted, however, that many of the difficulties or problems have been overcome and most of them have been remedied rather easily.

The lift manufacturer has been exceedingly responsive to SDT, possibly in part because, even though TDT lifts are in operation at other locations, the lift is still in a sort of experimental stage. SDT offers a close laboratory for testing and improvement of the product. TDT personnel are on call at all times for repair or correction of any malfunction of the equipment which SDT cannot fix themselves.

Before service was actually put on the street, articles appeared in the local newspapers announcing that the wheelchair equipped bus service would begin (Appendix B). During the week

before the service began, a public demonstration of the wheelchair lift bus was held at City Hall. However, no newspaper ads have been placed. Due to their fixed budget constraint SDT is not advertising and marketing the service as yet but is planning to do so. Schedules for the Route 3 and Route 7 wheelchair buses have been distributed and are available at 200 locations throughout the City.

The buses have the internationally recognized handicapped symbol displayed on a large sign on the front of the bus (Figure 3-1).

### 3.2 Exogenous Factors

Handicapped persons confined to wheelchairs will have difficulty in using the lift equipped buses at present due to the problem of getting to and from the bus. Currently, only a 6 by 22 block area in the downtown area, several intersections in the area near University Hospital, and a few isolated intersections at other locations along the routes served by the lift vehicles have been outfitted with ramps for wheelchairs. Since all intersections, even in the residential areas, have concrete curbs, mobility by wheelchair bound persons along the street is very limited unless accompanied by another person who can lift the wheelchair over curbs.

The City of San Diego has a program to eliminate the curb barrier for wheelchairs, but this is restricted by the funds available each year. To eliminate the curb barrier on just the streets served by the bus routes is a formidable task since the two routes cross over 250 intersections, most of which would require modifications to four curbs. Even this would allow bus access and egress only to those that live within one block of a bus route. Obviously, elimination of all curb barriers for potential wheelchair bus users is a long way off.

Another deterrent to handicapped use of the bus system is the terrain. Parts of San Diego are quite hilly; so hilly, in fact, that many wheelchair confined persons (especially those with reduced upper body strength) are unable to negotiate the grades. Motorized wheelchairs can eliminate this obstacle, but motorized wheelchairs are expensive. Since public transportation was not, in general, previously available to these people their choice of residence did not take into consideration sidewalk mobility. As more bus routes become available to them, choice of residence location may well take into account access to public transportation.



FIGURE 3-1. WHEELCHAIR ACCESSIBLE BUS DISPLAYING HANDICAPPED SYMBOL

## 4.0 SUPPLY

### 4.1 Service

The lift equipped buses run on two routes (Figures 4-1 and 4-2) passing through the CBD of San Diego. Available funds from the UMTA Capital Grant permitted only 5 vehicles to be outfitted with wheelchair lifts. The SDT staff reviewed each of their routes and finally selected two routes which would offer a good destination choice set for handicapped and elderly, serve areas where a reasonable number of handicapped and elderly might live, and fit a four lift bus operation with reasonable headways. Fares for handicapped and elderly throughout the SDT system are 15 or 20 cents less than the regular fare. There is no extra charge for use of the lift bus. The retrofitted buses were 51 seat, 102 inch wide, standard GMC transit coaches.

### 4.2 Equipment

#### 4.2.1 Lift Design

The unique feature of the TDT lift is the double hinged assembly which forms the vehicle entrance/exit stairs in the stowed position and the lift platform in its handicapped accessible configuration. In the lift's lowered, extended position, the upper step and riser join with the lower step to form the lift platform. A telescoping ramp extends beyond the 36 inch long platform provided by the steps and the riser (See Figures 4-3 and 4-4). The ramp provides easy access and egress for wheelchair patrons.

The TDT lift is hydraulically operated and electrically controlled. The lift's 7 hydraulic cylinders raise, lower, extend and retract various parts of the lift and activate the safety flap on the ramp. The main lift cylinders can lift a weight of over 1,000 pounds. The vehicle's electrical system supplies the power needed for the various relays, valves, and switches.

#### 4.2.2 Safety Features

The TDT wheelchair lift design has incorporated several necessary safety features. The lift platform and ramp edges are fitted with pressure sensitive tape switches along their edges. When an obstacle is encountered, e.g., the ground, curb, or a person, the lift stops automatically. This feature precludes serious physical harm to persons and objects by the careless use of the lift. After a handicapped patron has maneuvered his

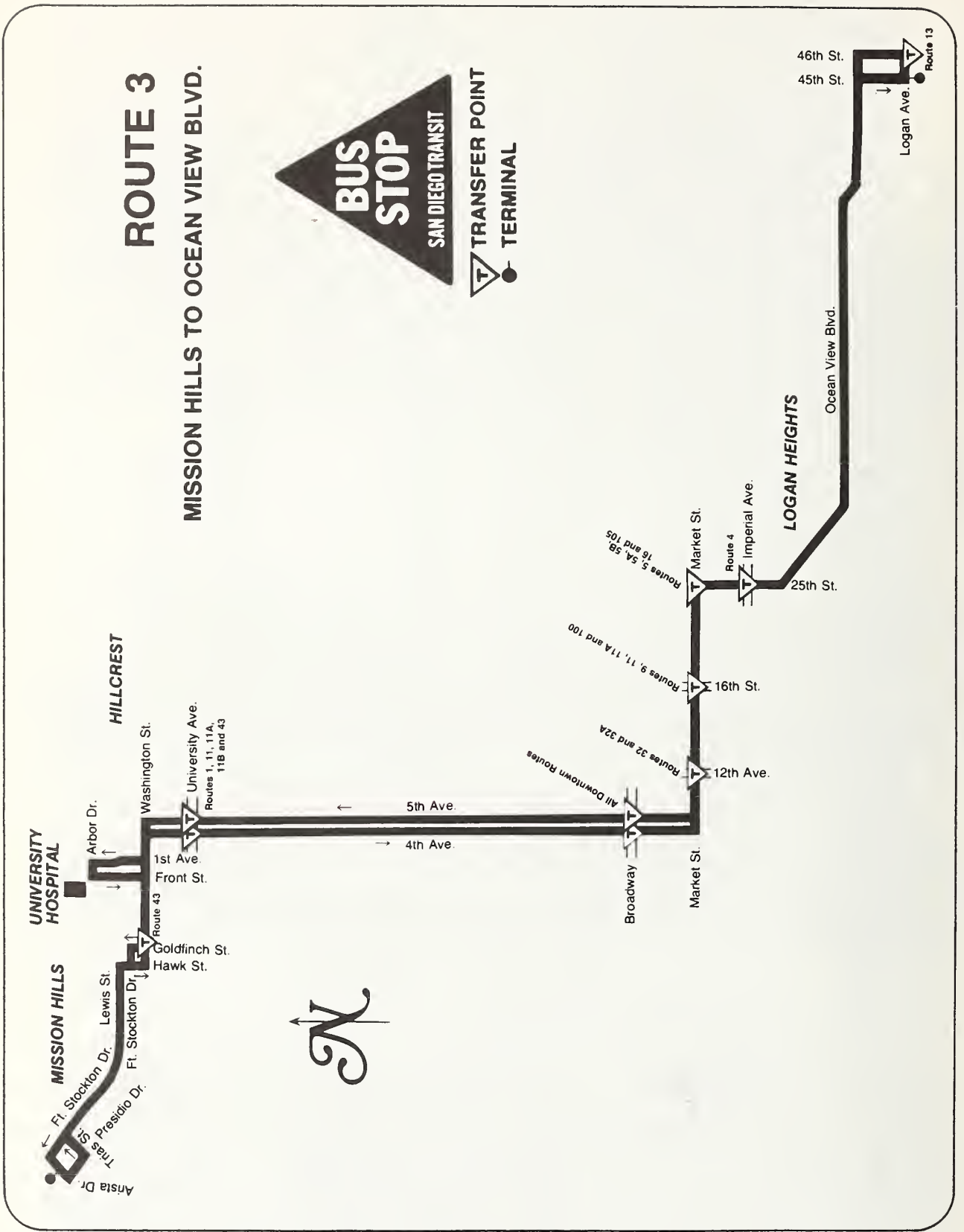
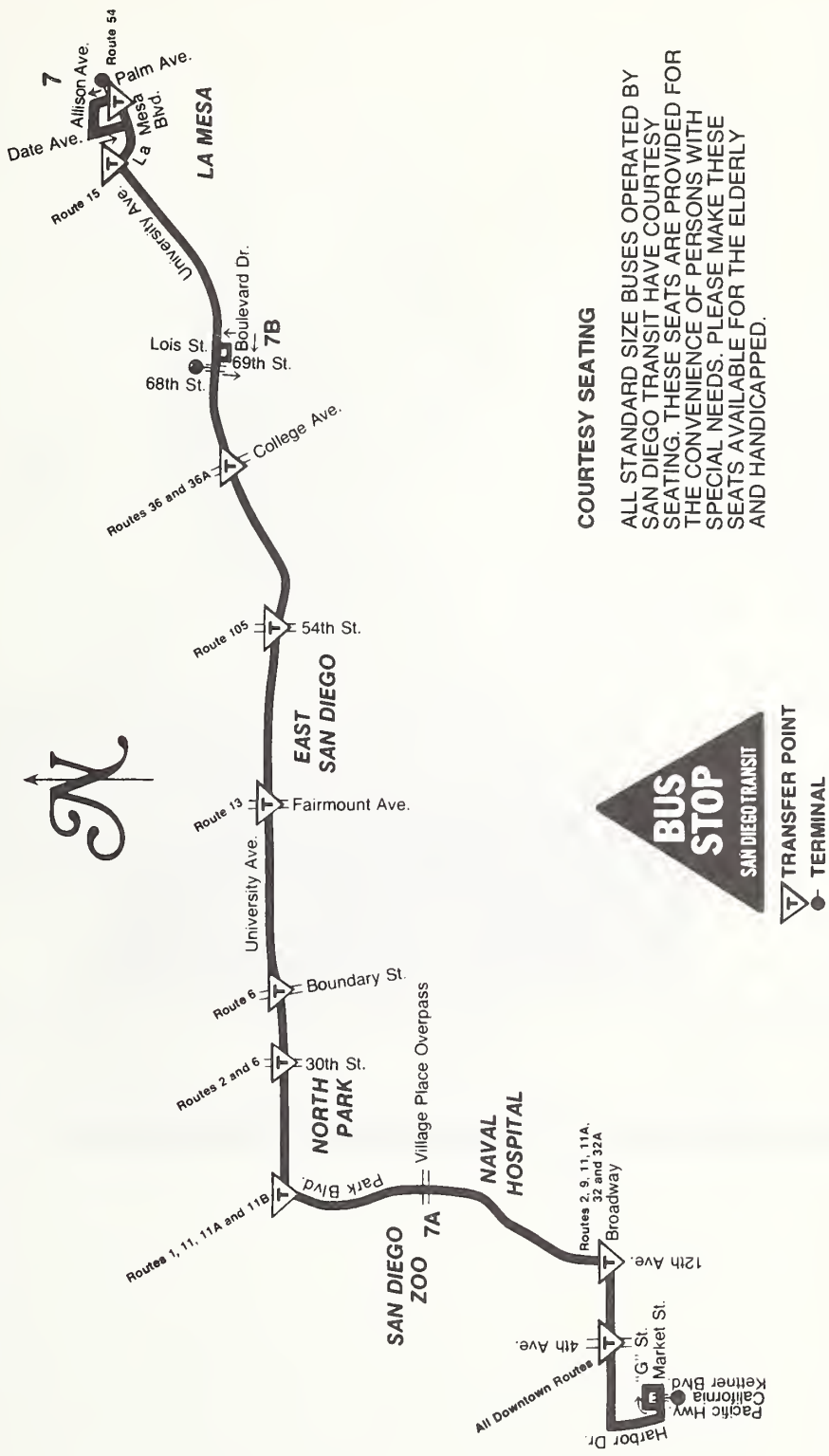


FIGURE 4-1. MAP OF ROUTE 3

# ROUTE 7

**DOWNTOWN TO 69TH & UNIVERSITY**  
(WITH EXTENDED SERVICE TO LA MESA)



### COURTESY SEATING

ALL STANDARD SIZE BUSES OPERATED BY SAN DIEGO TRANSIT HAVE COURTESY SEATING. THESE SEATS ARE PROVIDED FOR THE CONVENIENCE OF PERSONS WITH SPECIAL NEEDS. PLEASE MAKE THESE SEATS AVAILABLE FOR THE ELDERLY AND HANDICAPPED.



FIGURE 4-2. MAP OF ROUTE 7

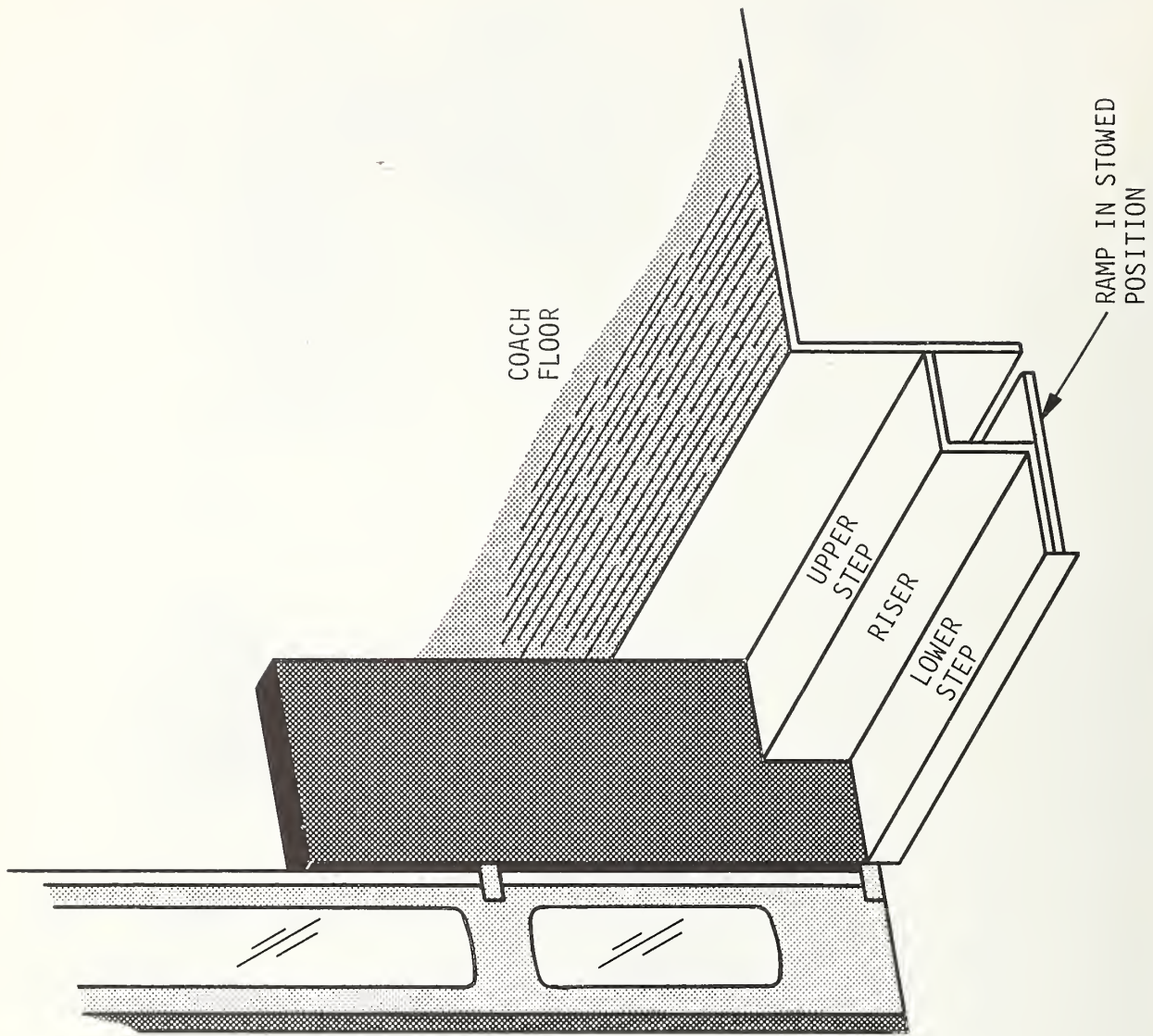


FIGURE 4-3. SKETCH OF LIFT IN STOWED/STAIR CONFIGURATION



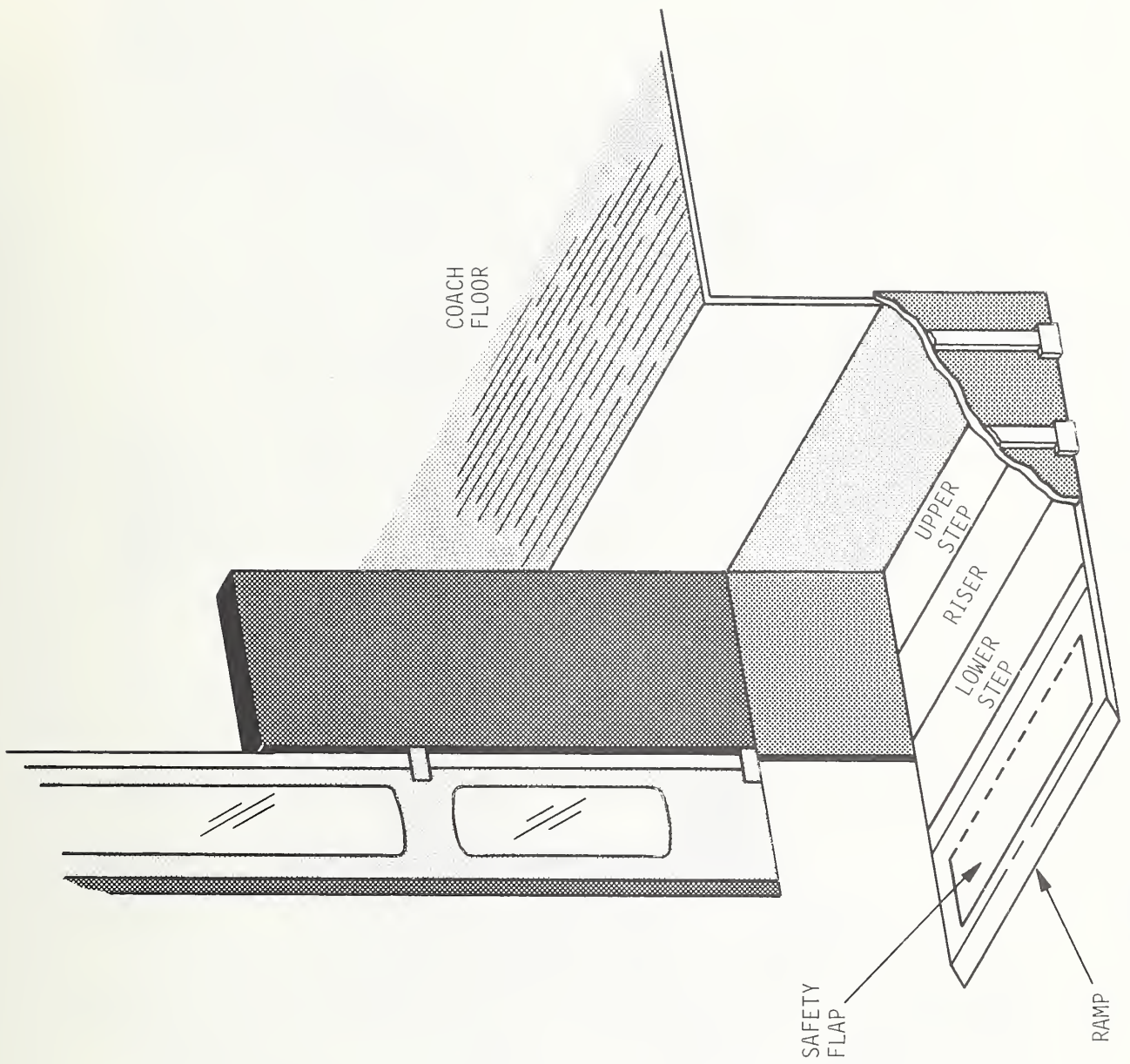


FIGURE 4-4. SKETCH OF LIFT IN LOWERED POSITION

wheelchair onto the lift, a safety flap is activated (Figure 4-5). This safety flap forms a two to three inch barrier preventing a wheelchair from rolling off the platform while the lift is being raised or lowered. Interlocks and check valves are integral design features. Whenever power is applied to the lift by activating the master control switch, the vehicle's brakes are set and the engine speed is restricted to an idle. If for some reason power, either electrical or hydraulic is lost, or the system's function interrupted, check valves inhibit the backflow of hydraulic fluid thus freezing the lift in position.

Other safety features include non-skid surfaces on the ramp, platform and steps, sheet metal closeout panels which prevent transit patrons from coming into direct contact with any of the lift's moving parts, and the placing of all of the lift's functions under the control of the bus driver.

The lift can also accommodate handicapped patrons other than those confined to wheelchairs. For example, a person with a walker can simply stand on the lowered platform and be raised to the height of the bus floor. It was observed that a standee on the lift platform should move onto the platform as far as possible in order to gain clearance between his head and the bus frame over the doors.

#### 4.2.3 Retrofit Installation

The TDT lift is mounted in the front stairwells of the transit coaches. To provide a minimum platform clearance width of 35 inches, standard bus doors and stairwells must be widened approximately five inches. The widening is accomplished by first removing the vehicle's front doors and stairwell. Next, the 'B' or '2nd' vertical side post is removed and the appropriate amount of sheet metal (usually about five inches) is cut away. The 'B' post is then secured in its new position with proper support members added as necessary. A horizontal support member is placed over the doors connecting the roof rafters and the 'A' and 'B' vertical posts. This horizontal support compensates for the 5 inch offset of the 'B' post (Figure 4-6).

The TDT lift is securely mounted to the main frame bumper extensions and auxiliary support members. Appropriate close out panels in the vehicle's interior serve a cosmetic function of concealing major parts of the lift and a safety function of covering several moving parts.

Sheet metal spacers are added to each door to compensate for the widening of the door frame. These spacers are added between the center door edge and the rubber gasket.

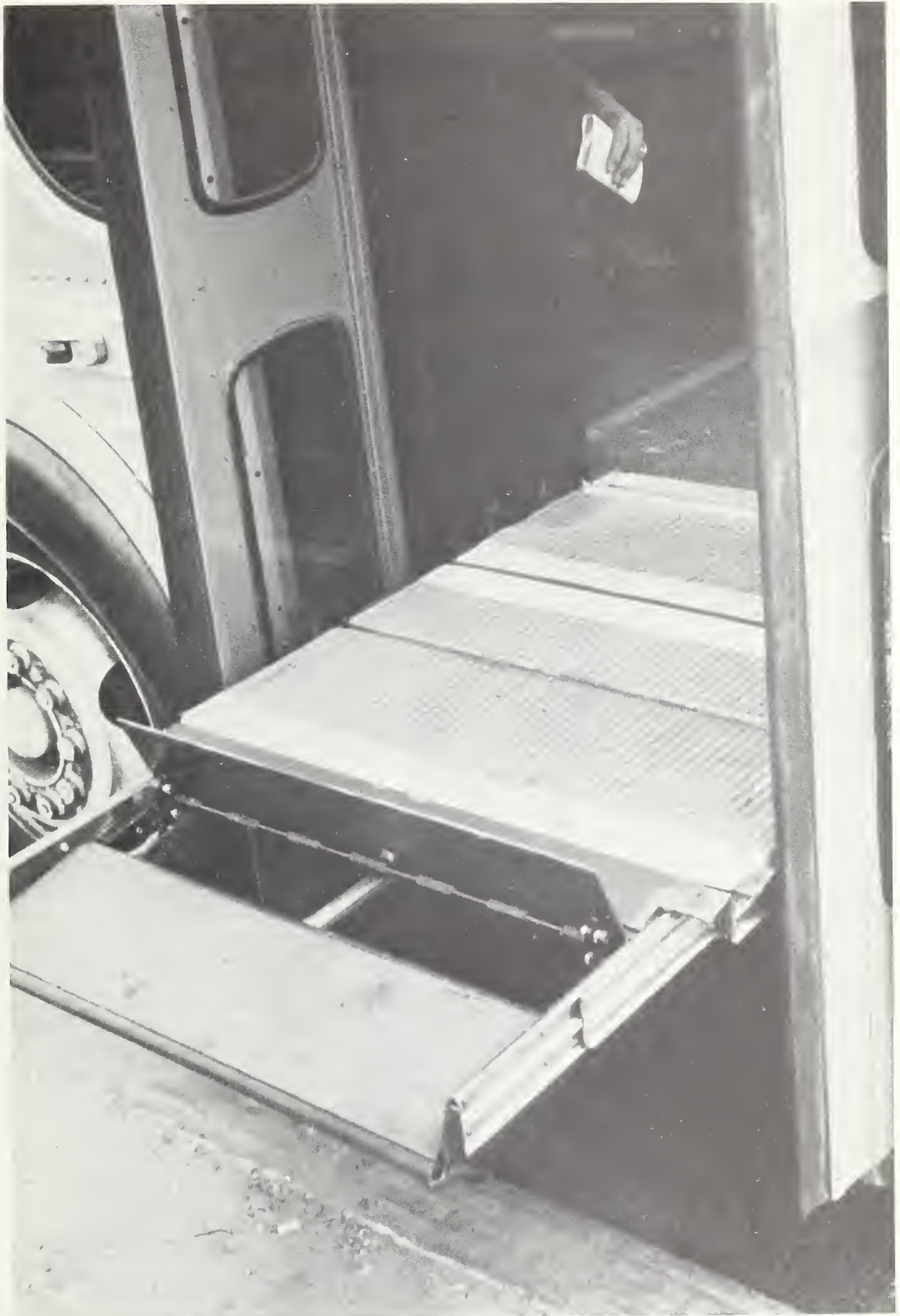


FIGURE 4-5. SAFETY FLAP IN RAISED POSITION

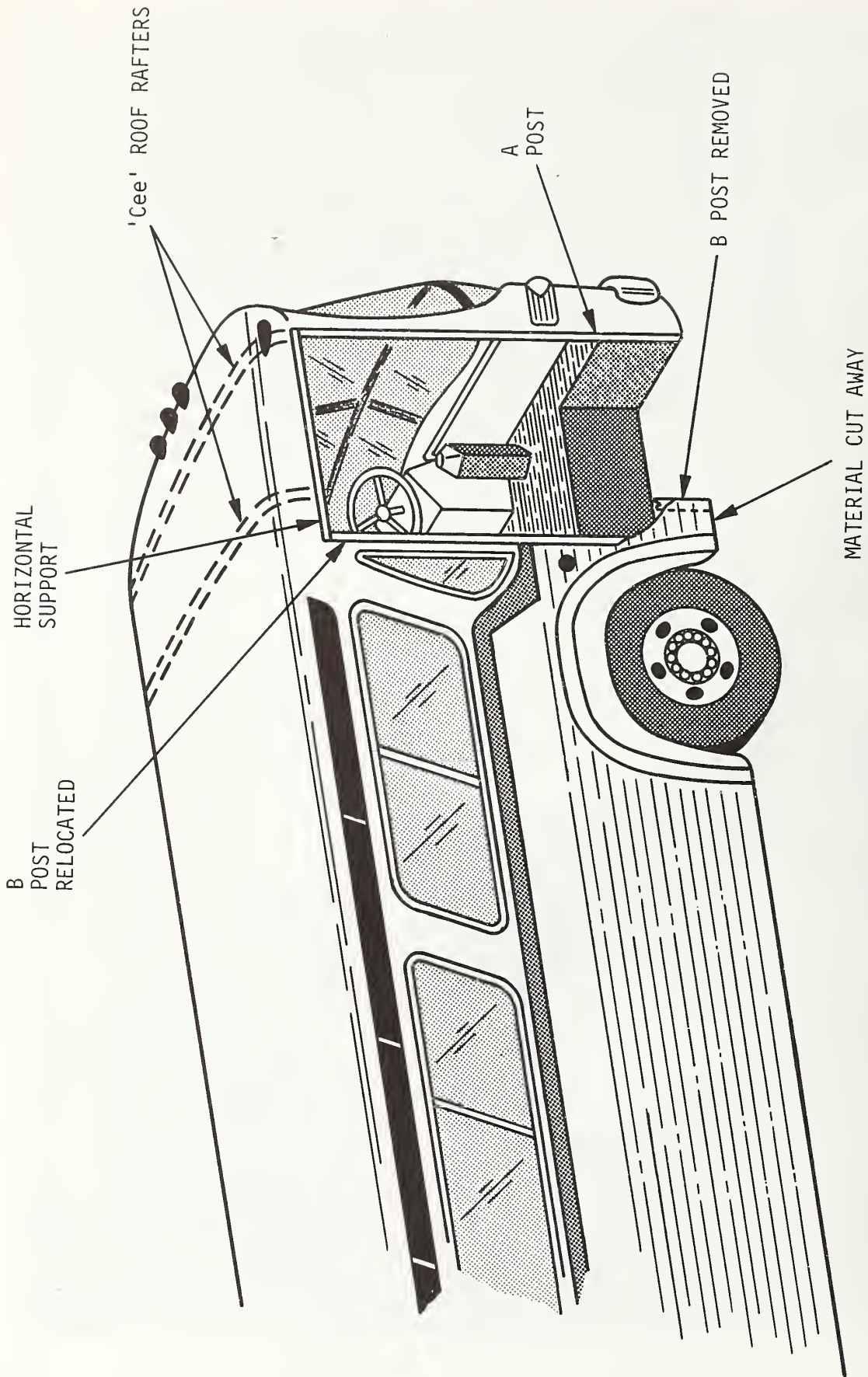


FIGURE 4-6. STRUCTURAL MODIFICATIONS FOR LIFT RETROFIT

Existing bench seats are removed from the coach to provide space for wheelchairs. San Diego Transit has provided 2 wheelchair securement locations. The wheelchair areas are located directly behind the front wheel wells as shown in Figure 4-7. Four coach bench seats were removed and replaced with 2 folding seats (Figures 4-8 and 4-9). The installation of folding seats permits use by non-handicapped passengers when there are no wheelchair patrons on board.

#### 4.2.4 Wheelchair Securement

Wheelchairs are held in place by three different mechanisms which insure that a handicapped person is not injured or thrown from his wheelchair as the transit bus stops, starts and negotiates corners. A latch mechanism on the folding seat (Figure 4-10), engages the wheel of the chair securely as the wheelchair is backed into position. The brake on the wheelchair is a second securement device. The third is a safety belt (Figure 4-9). San Diego Transit has provided an option of using the safety belt as a lap belt or a shoulder belt.

#### 4.2.5 Lift Operation

The operation of the TDT wheelchair lift is under the control of the driver at all times. The lift control panel is mounted on the vehicle's dash to the right of the driver (Figure 4-11). The lift operation is controlled through several buttons and switches (Figure 4-12). Operation can be best illustrated by a simple example of boarding a wheelchair patron. As the vehicle comes to a rest at the bus stop, the doors are opened. The platform ramp extends outward to its full extension and moves to curb (Figure 4-13) or street level. The lift stops when one of the pressure sensitive edges detects a fixed object. Once the patron is on the lift and the wheelchair brake is set, the driver activates the Safety Flap. The lift is raised to the bus floor and stops (Figure 4-14). The patron unlocks the wheelchair brake, rolls off the lift platform and proceeds to the securement position. The driver returns the lift to its stair configuration (Figure 4-15) and the doors can be closed. The bus is not moved from the curb until the patron is in the proper location and secured. Deboarding a wheelchair patron is similar with some obvious lift operations in reverse.

#### 4.2.6 Problem Areas

In spite of recent improvements to the lift, there are some difficulties that remain. Most, but not all, wheelchairs will

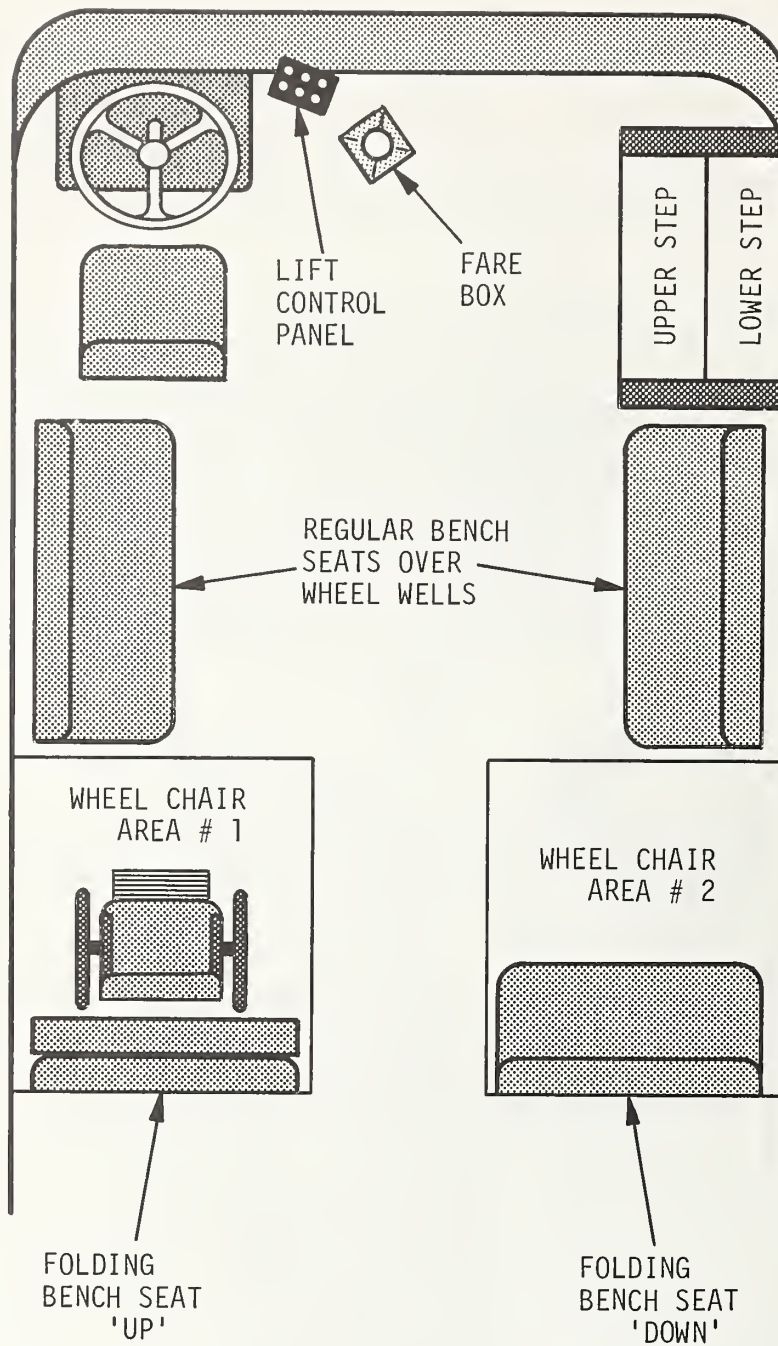


FIGURE 4-7. WHEELCHAIR ACCESSIBLE BUS FLOOR LAYOUT

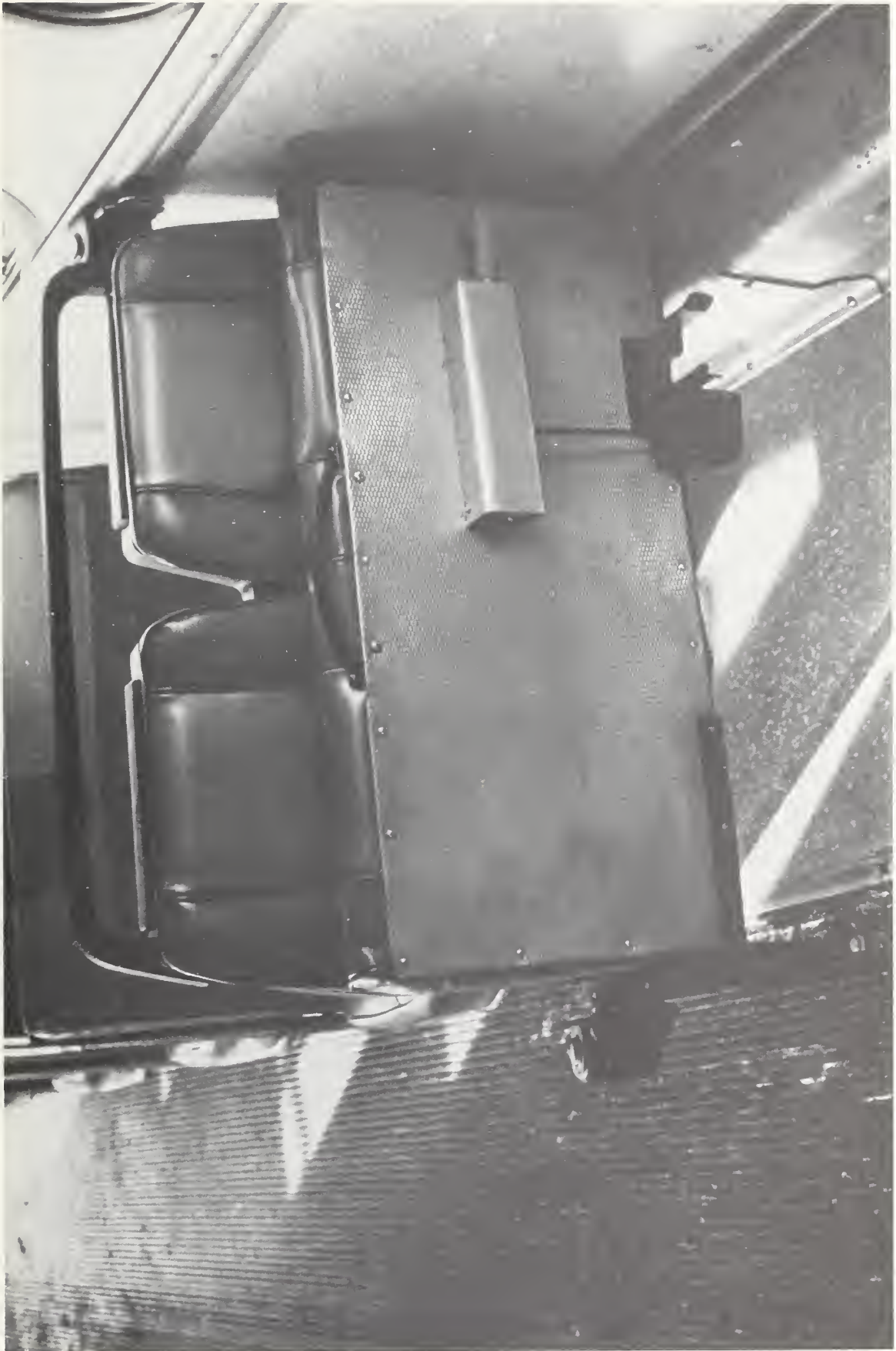


FIGURE 4-8. JUMP SEAT IN RAISED POSITION



FIGURE 4-9. JUMP SEAT IN DOWN POSITION





FIGURE 4-10. WHEELCHAIR LATCH MECHANISM

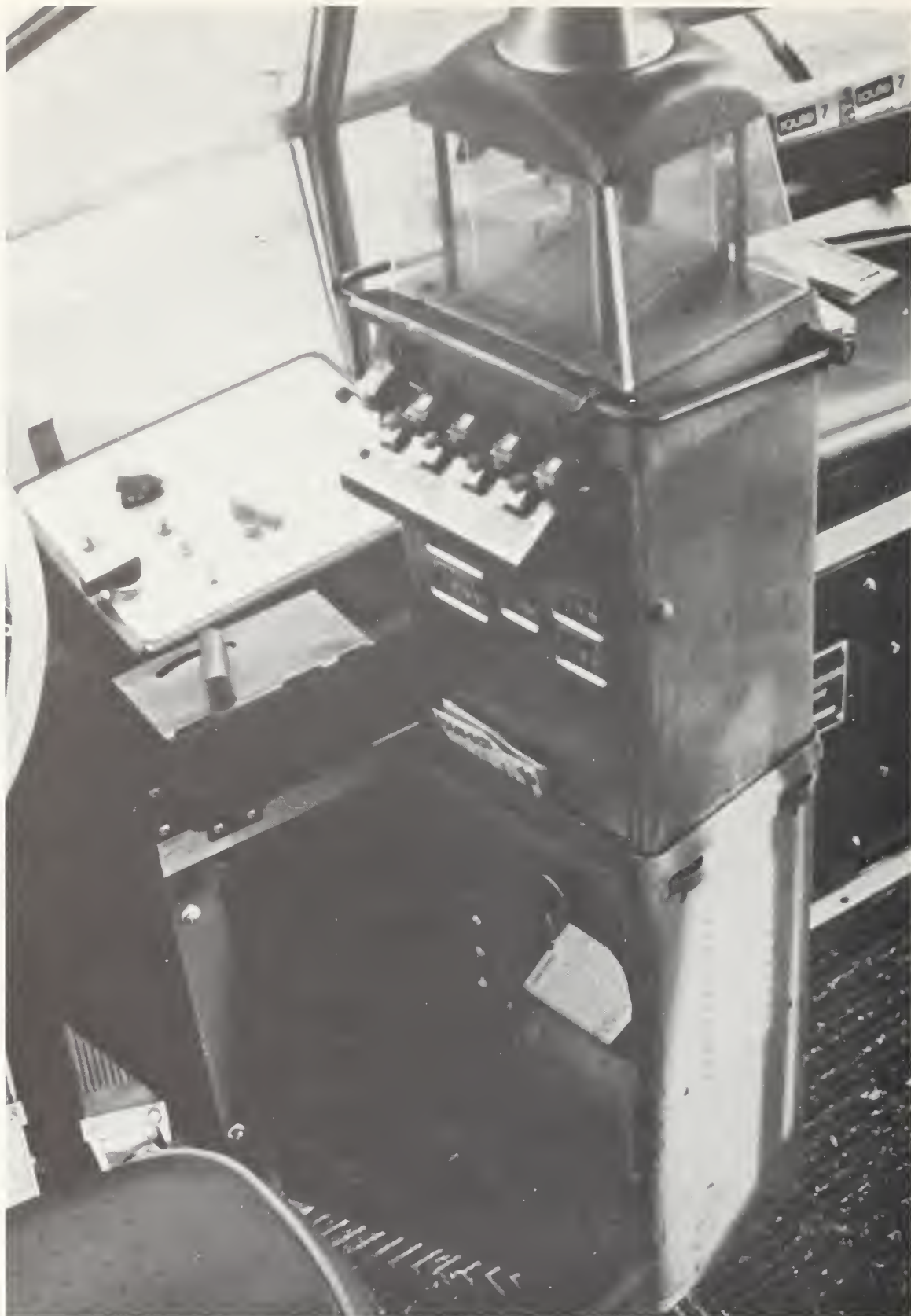


FIGURE 4-11. CONTROL PANEL LOCATION



FIGURE 4-12. FACE OF CONTROL PANEL



FIGURE 4-13 LIFT PLATFORM AT CURB LEVEL



FIGURE 4-14 LIFT PLATFORM AT BUS FLOOR LEVEL



FIGURE 4-15. PHOTOGRAPH OF LIFT IN STOWED POSITION

fit safely onto the lift. A few extra sized wheelchairs will not fit between the safety flap and the inside edge of the lift platform. Earlier versions of the lift also had a leading edge which was difficult for many to roll over because of its height. This edge has been lowered and modifications are in progress to make the edge even thinner. The difficulty in making the edge thin is that this edge has to be sensitive to contact with an object in both the horizontal and vertical directions and yet be sturdy enough to withstand contact with curbs or street pavements.

Interior modifications have also been suggested. SDT has placed diagonal handrails on the sides of the stairwell to provide a device for persons to grasp while the lift platform is in motion. Complaints have also been voiced about the possible difficulty for some wheelchair users in reaching the lever which releases the wheelchair latching mechanism. SDT staff state that the release lever was intentionally put out of the way so that it could not be accidentally struck by an inadvertent arm movement. At present, there are not plans to change the location of the lever.

## 5.0 LEVEL OF SERVICE

### 5.1 Coverage

Lift equipped buses run over 22.7 line miles or about 3 percent of the SDT system miles. Nineteen runs are made in each direction on both routes (Figures 5-1 and 5-2).

Service begins inbound on Route 3 from the southeast (Ocean View Boulevard) at 5:10 am with exactly 60 minute headways until 5:10 pm. Headways are then reduced to slightly less than an hour until the last bus at 11:58 pm. Service inbound on Route 3 from the northwest (Mission Hills) begins at 6:10 am with exactly 60 minute headways until 7:10 pm. Service is basically on the hour thereafter until the last bus at midnight. Route 3 traverses a low income area to the southeast of downtown, passes along a commercial street just south of the downtown core, turns north and passes through the downtown core, continues through an older residential and retail area, thence turning northwest, detouring to a major hospital, and ending in an upper income, older residential neighborhood to the northwest. Aside from a 6 block area through downtown and in the area near the hospital, there are only a few isolated locations where wheelchair ramps have been cut into intersection sidewalks. Most public, retail or commercial buildings along this route are accessible by wheelchairs. However, all the streets have curbs and, consequently, most intersections cannot be traversed by persons

MISSION HILLS TO DOWNTOWN SAN DIEGO  
AND OCEAN VIEW BOULEVARD

MONDAY THROUGH SATURDAY SCHEDULE

Ansta & Hickory	Hawk St. & Ft. Stockton	4th & University	4th & Laurel	4th & Broadway	16th & Market	25th & Imperial	45th & Logan
5:30	5:34	5:45	5:51	5:57	6:03	6:08	6:17
5:50	5:54	6:05	6:11	6:17	6:23	6:28	6:37
* 6:10	6:14	6:25	6:31	6:37	6:43	6:48	6:57
6:30	6:34	6:45	6:51	6:57	7:03	7:08	7:17
6:50	6:54	7:05	7:11	7:17	7:23	7:28	7:37
* 7:10	7:14	7:25	7:31	7:37	7:43	7:48	7:57
7:30	7:34	7:45	7:51	7:57	8:03	8:08	8:17
7:50	7:54	8:05	8:11	8:17	8:23	8:28	8:39
* 8:10	8:14	8:25	8:31	8:37	8:43	8:48	8:59
8:30	8:34	8:45	8:51	8:57	9:03	9:08	9:19
8:50	8:54	9:05	9:11	9:17	9:23	9:28	9:39
* 9:10	9:14	9:25	9:31	9:37	9:43	9:48	9:59
9:30	9:34	9:45	9:51	9:57	10:03	10:08	10:21
9:50	9:54	10:05	10:11	10:17	10:23	10:28	10:41
* 10:10	10:14	10:25	10:31	10:37	10:43	10:48	11:01
10:30	10:34	10:45	10:51	10:57	11:03	11:08	11:21
10:50	10:54	11:05	11:11	11:17	11:23	11:28	11:41
* 11:10	11:14	11:25	11:31	11:37	11:43	11:48	12:01
11:30	11:34	11:45	11:51	11:57	12:03	12:08	12:21
11:50	11:54	12:05	12:11	12:17	12:23	12:28	12:41
* 12:10	12:14	12:25	12:31	12:37	12:43	12:48	1:01
12:30	12:34	12:45	12:51	12:57	1:03	1:08	1:21
12:50	12:54	1:05	1:11	1:17	1:23	1:28	1:41
* 1:10	1:14	1:25	1:31	1:37	1:43	1:48	2:01
1:30	1:34	1:45	1:51	1:57	2:03	2:08	2:21
—1:50	1:54	2:05	2:11	2:17	2:23	2:28	2:41
* 2:10	2:14	2:25	2:31	2:37	2:43	2:48	3:01
2:30	2:34	2:45	2:51	2:57	3:03	3:08	3:21
2:50	2:54	3:05	3:11	3:17	3:23	3:28	3:41
* 3:10	3:14	3:26	3:31	3:37	3:43	3:48	4:02
3:30	3:34	3:46	3:51	3:57	4:03	4:08	4:22
3:50	3:54	4:06	4:11	4:17	4:23	4:28	4:42
* 4:10	4:14	4:26	4:31	4:37	4:43	4:48	5:02
4:30	4:34	4:46	4:51	4:57	5:03	5:08	5:22
4:50	4:54	5:06	5:11	5:17	5:23	5:28	5:42
* 5:10	5:14	5:26	5:31	5:37	5:43	5:48	5:58
5:30	5:34	5:45	5:50	5:55	6:01	6:05	6:16
5:50	5:54	6:05	6:10	6:15	6:21	6:25	6:36
* 6:10	6:14	6:25	6:30	6:35	6:41	6:45	6:56
6:25	6:29	6:40	6:45	6:50	6:56	7:00	7:11
6:45	6:49	7:00	7:05	7:10	7:16	7:20	7:31
* 7:10	7:14	7:25	7:30	7:35	7:41	7:45	7:56
7:30	7:34	7:45	7:50	7:55	8:01	8:05	8:16
* 8:05	8:09	8:19	8:24	8:29	8:35	8:39	8:50
8:25	8:29	8:39	8:44	8:49	8:55	8:59	9:10
* 9:00	9:04	9:14	9:19	9:24	9:30	9:34	9:45
* 10:00	10:04	10:14	10:19	10:24	10:30	10:34	10:45
* 11:00	11:04	11:14	11:19	11:30	11:36	11:40	11:51
* 12:00	12:04	12:14	12:19	12:35	12:41	12:45	12:56

\*—Provides Lift Service

All P.M. times are in the shaded areas.

OCEAN VIEW BOULEVARD TO DOWNTOWN  
SAN DIEGO AND MISSION HILLS

San Diego Transit—ROUTE 3

45th & Logan	32nd & Ocean View Boulevard	25th & Imperial	16th & Market	5th & Broadway	5th & Laurel	5th & University	Ansta & Hickory
4:30	4:40	4:45	4:51	4:59	5:06	5:11	5:23
* 5:10	5:20	5:25	5:31	5:39	5:46	5:51	6:03
5:30	5:40	5:45	5:51	5:59	6:06	6:11	6:23
5:50	6:00	6:05	6:11	6:19	6:26	6:31	6:43
* 6:10	6:20	6:25	6:31	6:39	6:46	6:51	7:03
6:30	6:40	6:45	6:51	6:59	7:06	7:11	7:23
6:50	7:00	7:05	7:11	7:19	7:26	7:31	7:43
* 7:10	7:20	7:25	7:31	7:39	7:46	7:51	8:03
7:30	7:40	7:45	7:51	7:59	8:06	8:11	8:23
7:50	8:00	8:05	8:11	8:19	8:26	8:31	8:43
* 8:10	8:20	8:25	8:31	8:38	8:44	8:50	9:02
8:30	8:40	8:44	8:50	8:57	9:03	9:09	9:21
8:50	9:00	9:04	9:10	9:17	9:23	9:29	9:41
* 9:10	9:20	9:24	9:30	9:37	9:43	9:49	10:01
9:30	9:40	9:44	9:50	9:57	10:03	10:09	10:21
9:50	10:00	10:04	10:10	10:17	10:23	10:29	10:41
* 10:10	10:20	10:24	10:30	10:37	10:43	10:49	11:02
10:30	10:40	10:44	10:50	10:57	11:03	11:09	11:22
10:50	11:00	11:04	11:10	11:17	11:23	11:29	11:42
* 11:10	11:20	11:24	11:30	11:37	11:43	11:49	12:02
11:30	11:40	11:44	11:50	11:57	12:03	12:09	12:22
11:50	12:00	12:04	12:10	12:17	12:23	12:29	12:42
* 12:10	12:20	12:24	12:30	12:37	12:43	12:49	1:02
12:30	12:40	12:44	12:50	12:57	1:03	1:09	1:22
12:50	1:00	1:04	1:10	1:17	1:23	1:29	1:42
* 1:10	1:20	1:24	1:30	1:37	1:43	1:49	2:02
1:30	1:40	1:44	1:50	1:57	2:03	2:09	2:22
1:50	2:00	2:04	2:10	2:17	2:23	2:29	2:42
* 2:10	2:20	2:24	2:30	2:37	2:43	2:49	3:02
2:30	2:40	2:44	2:50	2:57	3:03	3:09	3:22
2:50	3:00	3:04	3:10	3:17	3:24	3:30	3:43
* 3:10	3:20	3:24	3:30	3:37	3:44	3:50	4:03
3:30	3:40	3:44	3:50	3:57	4:04	4:10	4:23
3:50	4:00	4:04	4:10	4:17	4:24	4:30	4:43
* 4:10	4:20	4:24	4:30	4:37	4:44	4:50	5:03
4:30	4:40	4:44	4:50	4:57	5:04	5:10	5:23
4:50	5:00	5:04	5:10	5:17	5:24	5:30	5:43
* 5:10	5:20	5:24	5:30	5:36	5:43	5:48	5:59
5:30	5:37	5:41	5:46	5:52	5:59	6:04	6:15
5:50	5:57	6:01	6:06	6:12	6:19	6:24	6:35
* 6:05	6:12	6:16	6:21	6:40	6:47	6:52	7:03
6:23	6:30	6:34	6:39	7:00	7:07	7:12	7:23
6:43	6:50	6:54	6:59	7:15	7:22	7:27	7:38
* 7:03	7:10	7:14	7:19	7:35	7:42	7:47	7:58
7:18	7:25	7:29	7:34	7:55	8:02	8:07	8:18
7:38	7:45	7:49	7:54	8:10	8:17	8:22	8:33
* 8:03	8:10	8:14	8:17	8:30	8:36	8:40	8:51
8:23	8:29	8:33	8:36	8:52	8:58	9:02	9:13
* 8:57	9:05	9:09	9:11	9:16	9:22	9:26	9:37
9:17	9:23	9:27	9:30	9:46	9:52	9:56	10:07
* 9:52	9:58	10:02	10:05	10:21	10:27	10:31	10:42
* 10:52	10:58	11:02	11:05	11:30	11:36	11:40	11:51
* 11:58	12:04	12:08	12:11	12:27	12:33	12:37	12:48

\*—Provides Lift Service

FIGURE 5-1. ROUTE 3 SCHEDULE





in wheelchairs without assistance. Route 3 is the eighth most heavily patronized route on the SDT system and has a reasonably good destination choice set including the downtown core and University Hospital. It also serves a large segment of senior citizens and low income people.

SDT Route 7 operates between North San Diego Bay, just west of downtown, and the city of La Mesa, about 9 miles northeast of the downtown area. However, only two runs of the lift buses go as far as La Mesa. All others turn back at the San Diego City Limits. Inbound service on Route 7 begins at 5:25 am and continues until 12:30 am with headways varying from 57 to 80 minutes. Outbound service runs from 6:42 am to 1:18 am with a similar variability in headways. An equal number of bus runs are operated on weekends on both routes but the scheduled departure times are somewhat changed. Route 7 is the second most heavily patronized SDT route. Beginning at the San Diego City Line, Route 7 runs westbound along a major arterial consisting of strip commercial surrounded by high density residential land uses, turns south passing through a major public park containing the world famous San Diego Zoo and close to the U.S. Naval Hospital, thence turning westward once again and traversing the busiest CBD street all the way to the waterfront. This Route also serves the downtown core and a major hospital as well as the middle income neighborhoods in the northeast sector of the City. As with Route 3, there are very few curb cuts with wheelchair ramps except in the downtown area.

## 5.2 Loading/Unloading Time

During the first week of operations, it was not feasible to try to find and clock a wheelchair passenger boarding the lift equipped buses. Consequently, all that can be stated at this time are the lift cycle times which were measured and total boarding and tie down times related by SDT staff.

Measured time to perform all the sequential steps necessary to move the lift through its entire cycle was 45 seconds. This time can be shortened if some of the maneuvers are done in combination rather than in sequence.

No measurements were possible for total dwell time for loading and securing a wheelchair passenger. However, SDT claims that this can regularly be done in 90 to 120 seconds (including tiedown) after the wheelchair passenger has become accustomed to the process. It is likely that older or weaker wheelchair passengers would take longer. It should be noted that the cycle time of the lift is adjustable and can be set according to the lift speed desired by the transit operator.

### 5.3 System Effects

In line with the above cited dwell times, any bus carrying a wheelchair passenger would be subject to an added travel time of at least 3 minutes since boarding and deboarding times are presumably about equal. Since the majority of the layover times at the ends of Routes 3 and 7 are only 7 to 8 minutes, the carriage of more than two wheelchair passengers per run would put the bus behind schedule. It is unknown whether such a situation will ultimately occur or not. Based upon current experience in San Diego, it is very unlikely that this would happen.

There will be some loss in system reliability due to the conveyance of wheelchair passengers. The exact amount is yet to be determined. In addition to the added travel time for some bus runs, there is the possibility of malfunctions of the lift which will cause buses to become inoperable on the route. Because the lift is also the step, any damage to the right front area of the bus (i.e., striking a high curb) will likely put the lift and, consequently, the bus out of commission. Reliability will have to be measured over an extended time period in order to obtain meaningful conclusions concerning the true impact on system operations.

Regardless of the usage of the lift there will be a loss of seating capacity on the wheelchair buses. When both wheelchair tie down positions are installed in the buses, a total of 8 permanent seats will be removed. If the wheelchair positions are not occupied, fold down seats will accommodate 4 persons. Seating capacity is, consequently, reduced by 4 to 6 seats depending on whether either or both of the wheelchair positions are occupied. If the tie down positions are not being utilized by wheelchair passengers, total capacity will not be reduced since there will be added standing room. In the present operating mode the loss of seating capacity would be less than 2 percent of the total Route 3 or 7 capacity even if the wheelchair tiedown positions were continuously in use.

## 6.0 ECONOMICS

### 6.1 Capital Cost

The cost of retrofitting the five full sized transit coaches was \$48,000. Transportation Design & Technology did the entire retrofit. The San Diego warranty was 12 months or 40,000 miles. In February 1977 TDT was quoting a price of \$4500 for a single lift with closure panels (excluding installation). The price for 200 units would have been \$3600 per unit. A twelve week delivery time was the estimate for a lift at that time.

The initial cost of the lift and its installation is likely to be the only capital investment required for some time barring lift damage beyond repair. In the short term, it is unlikely that wheelchair patronage will rise to the extent that extra buses would be required to maintain schedules. However, this is a possibility at some future time.

## 6.2 Operating Costs

Lifts will definitely add to the maintenance cost of a bus. However, insufficient operational data is presently available to make an estimate of the annual cost of lift maintenance and repair with any degree of confidence.

## 6.3 Productivity

It is unlikely in the San Diego Transit situation that systemwide cost or passenger productivities will be changed in the foreseeable future or until lift buses are added to other routes. There will be differences in productivities between lift and non-lift buses. The added maintenance costs would make cost per passenger and per vehicle mile greater for lift buses. These differences may be small, however. Unless handicapped usage rises to the point where running times of lift buses are regularly longer than for non-lift buses, there should be little difference in passenger productivities between the two. However, if that point is ever reached, there may well occur a situation in which regular riders will avoid use of the lift buses (for those that know the schedule) and passenger productivities between lift and non-lift buses may be different.

Productivities for the system and for Routes 3 and 7 are shown in Table 6-1.

TABLE 6-1. FY 76 SDT PRODUCTIVITIES

	<u>Annual Passengers</u>	<u>Annual Miles Operated</u>	<u>Passengers per Vehicle-Mile</u>
Systemwide	35,793,000	15,171,000	2.36
Route 3	1,665,000	343,000	4.85
Route 7	3,248,000	679,000	4.78

## 7.0 DEMAND

### 7.1 Wheelchair Users

It is far too early to say anything meaningful concerning usage of the service by wheelchair confined persons. There are a number of reasons, many of them previously mentioned, why many potential wheelchair passengers are not effectively able to use the system. It will take months and possibly years before other travel barriers are removed so that the disabled have a true public transportation alternative for many of their trips. Only then will ridership measures be meaningful. Even so, there have been trips made by wheelchair patrons during the first few weeks of operation. During the first week of operation an average of slightly less than 2 trips per day were being made. As of early April, ridership was only about one passenger per week.

### 7.2 Elderly and Other Handicapped

The number of persons that would benefit from the provision of a lift on transit buses is very difficult to predict. The elderly as well as the ambulatory and semi-ambulatory handicapped have some similar and some different difficulties in using public transportation. Many have difficulty in walking and climbing steps or stepping up onto curbs. Some have difficulty in standing for any length of time. While all SDT buses have priority seating for handicapped and elderly, not all bus stops have benches to use while waiting. Penetration of the target group population will not be known in San Diego, but ridership among these groups certainly will. Currently over 21,000 elderly persons use the SDT system daily.

## 8.0 IMPACTS

### 8.1 Mobility Changes for Handicapped and Elderly

The current wheelchair accessible bus service offered by SDT is unlikely to have any significant immediate effect on the mobility of transportationally disadvantaged handicapped and elderly people. The limited origins and destinations served and the aforementioned obstacles in getting to and from the buses virtually insure that there will be little change in handicapped and elderly travel. A more extensive network of wheelchair accessible bus routes and removal of other travel obstacles will be necessary before any significant change in handicapped and elderly travel would be possible.

For those able to make use of the lift buses, a lowered cost of travel will result. Riding a bus at a 15 cent fare is cheaper than driving a car, taking a taxi or a medi-cab. The cost is also lower than being driven by a friend or relative if the convenience and travel cost to the other person is considered. Travel by bus will in all likelihood take longer than the other modes, however.

## 8.2 Non-Target Group Riders

The possible impact on transit travel time and reliability has been discussed previously. Until usage by the disabled builds up there will be minimal changes in travel time or reliability. Lift operation for more than two passengers during a single bus run would definitely impact both riders and bus operations. Regular usage in this amount does not appear imminent.

Seating has been affected to an extent. Four seats are lost (six if both wheelchair positions are occupied) on every bus outfitted for wheelchair use. As most buses are crowded and standing is prevalent on Routes 3 and 7 during peak periods particularly, the loss of seats is an inconvenience to some. However, this loss is only about 2 percent of the available seats on these routes and should not be a major item. If the number of buses converted for wheelchair accessibility expands considerably, this could become a more important issue. If every bus was converted, the reduction in the seating capacity would range from 9 to 13 percent.

## 8.3 Cost of Service

The cost of providing wheelchair accessible transit is definitely higher than that of regular transit service. The amount is unknown as yet. For the initial San Diego service the extra cost should be minimal. The 5 retrofits cost \$48,000, 80 percent of which was paid for through the UMTA Capital Grant. The added maintenance costs will also be shared by UMTA by means of Section 5 operating fund reimbursements. The existing lift bus services have not required additional buses, consequently, operating cost changes have been small. For other transit systems the costs could be much higher. Variables include the percentage of the fleet converted; service strategy employed; extra buses and/or drivers required (possibly a function of handicapped usage); maintenance and repair required for different types of lifts; union workrules (possibly extra pay); driver training; extra insurance; and added promotion and advertising.

#### 8.4 Institutional

The configuration of the present service is such that there would be minimal affects on private operators such as taxis or medi-cab type services. Expanded service combined with a curb elimination program could be expected to have a significant impact on the private providers. However, the amount of the impact would depend on the number of trips diverted.

There appears to be no reason why the various local social service agencies should not cooperate with SDT and, in fact, many of them have been doing so. Several groups were represented on the Policy Advisory Committee of the CPO and some have tested the wheelchair lift and suggested modifications prior to its introduction into service. While some agencies might be protective of their own transportation services or budgets and might be reluctant to surrender this activity to the local transit authority, most agencies provide client transportation only for agency related activities and not for other trips. The primary assistance that the social service agencies could provide would be to provide information to their clients about the service and how to use it and to encourage usage where it is possible to do so.

There was no apparent difficulty with the drivers union, Amalgamated Transit Union, Local 1309, in the implementation of the lift equipped bus service. SDT called in the Union and told them what was planned and that there would be no possibility of paying extra for the drivers to operate the lifts. Given the tight SDT budget and the political attitude toward handicapped and elderly service, the Union accepted this position.

San Diego Transit is partially self insured. They cover anything up to \$25,000 for each accident. Insurance companies cover the rest or up to \$5,000,000 per accident. There was no increase in the rates as a result of the implementation of the lift equipped buses. Accident experiences could change this situation in future years.

#### 9.0 ATTITUDES

##### 9.1 Handicapped and Elderly

In general, handicapped groups are pleased that a start has been made in the provision of lift bus service. Some have expressed dissatisfaction with the amount of service that has been offered and the fact that many disabled have difficulty in getting to the bus due to other travel barriers. The opinion has been voiced that dial-a-ride feeders to the fixed route system

would be necessary for full accessibility to public transit for all those who would want to use it and that every bus should be equipped with a lift. There has been some difference of opinion within the disabled community concerning whether to praise rather than criticize the new service in spite of its limitations or whether to forcefully lobby for more service.

## 9.2 Transit Management

SDT views the current wheelchair bus service as a test of the concept. However, there have been no criteria established against which to judge its success or failure. Neither has any formal evaluation plan been devised. The feeling of some of the SDT Staff is that they would like to put lift buses on more routes. However, the currently available funds do not permit it.

The transit authority management is aware of the problems of the disabled in getting to and from the buses as well as the lift modifications required to make it easier or safer to use and accessible to a larger number of potential disabled users. Nevertheless, with the exception of lift modifications, SDT is powerless to do much more. They have asked the City of San Diego to give priority to eliminating curb barriers along the routes which have lift buses. With 250 or so intersections along the two routes even this would take considerable time.

## 10.0 IMPLICATIONS FOR TRANSFERABILITY

This is the first known implementation of full sized wheelchair equipped buses in fixed route transit service in this country. The scope of the current service is such that only limited handicapped and elderly ridership would be expected. Other travel barriers must also be removed for the provision of fixed route, lift buses to be given a valid test. Nevertheless, there are some things that can be learned.

It will be valuable to compare the San Diego experience with other wheelchair accessible bus strategies that will be implemented in other cities within the next year, including subscription services, other partial fleet outfitting (a larger percentage of the fleet) and full fleet outfitting.

Other cities implementing wheelchair accessible bus service should not expect high early usage by the disabled. It takes time for travel habits to change, especially for those people with other means of taking trips. Furthermore, factors such as origin-destination limitations, terrain, curbs, competing services and weather will also restrict disabled ridership.



San Diego weather is perhaps close to ideal for the operation of lift bus services. It is easy to speculate that fixed route lift bus service would not be as suitable in sections of the country prone to snow and ice or even very rainy or cold weather. In such areas demand responsive services might be more appropriate.

Lift bus service will definitely be more costly than regular bus service due to the cost of the equipment and the added maintenance requirement. Another potential extra cost item would be the need to add buses and drivers in order to maintain schedule adherence if usage of the lift by wheelchair or semi-ambulatory elderly patrons causes the buses to become irreversibly behind schedule. It is too early to tell whether this will happen in other locations or not. It appears unlikely in San Diego with the present service offered.

The TDT lift appears to be a good and workable model. It is being continually improved as testing and operating experience is gained. The operation and maintenance of the lift under adverse weather conditions may potentially be a problem though TDT has lifts on small buses in Michigan.

Malfunctions of the lift device due to driver error can probably be expected. While regular lift bus drivers can be expected to become proficient in the set of sequential button pushing and knob twisting actions required to operate the lift, relief drivers, substitute drivers, and changes in drivers due to the drivers run picks which occur three times a year almost guarantee that there will be drivers who are not as proficient or familiar with lift operations who will be called upon to perform this task. In spite of the training that each driver receives, unless a certain frequency of operation is maintained, human errors resulting in lift malfunctions can occur.

SDT found themselves in a situation wherein the service was to begin on February 6 and the fifth or back up vehicle had not arrived as promised by the lift manufacturer. As a result there were periods when one of the lift buses was out of service and a non-lift bus had to take its place. Other transit authorities should take all precautions to insure that sufficient vehicles are available before the service is initiated.



APPENDIX A

APPENDIX A

DIAL-A-RIDE PASSENGER SURVEY

<u>Number Sampled</u>	201		
<u>Categories</u>			
Able Seniors	99 - 49.2%		
Handicapped Seniors	78 - 38.9%		
Other Handicapped	24 - 11.9%		
 <u>Average Age</u>			
Able Seniors	71.5		
Handicapped Seniors	69.5		
Other Handicapped	31.5		
 <u>Economic Factors</u>	<u>Able Seniors</u>	<u>Handicapped Seniors</u>	<u>Other Handicapped</u>
Income Below \$4,000	85/90%	69/91%	23/96%
Income Above \$4,000	9/10%	7/9%	1/4%
 Can Afford 50¢ Fare			
NO	75/76%	62/79%	15/63%
YES	24/24%	16/21%	9/37%
 <u>Travel Mode Prior to D-A-R</u>			
Own Car	3/2%	2/2%	1/3%
Friends	22/17%	12/14%	5/15%
Family	28/21%	46/53%	13/40%
City Bus	57/44%	9/11%	9/27%
Taxi	11/8%	12/14%	3/9%
Other	10/8%	5/6%	2/6%
 <u>Travel Reason/Habits</u>			
Use D-A-R- to go to:			
Doctor/Therapy	46/32%	54/59%	13/38%
Shopping	46/32%	18/19%	4/12%
Visiting	12/8%	5/4%	3/9%
Education	3/2%	-0-	10/29%
Job/Work	3/2%	-0-	2/6%
Other (Recreation/ Personal)	34/24%	17/18%	2/6%
 <u>Time of Day Travel Desired</u>			
Outbound - AM	69/85%	71/93%	18/86%
- PM	12/15%	5/7%	3/14%
Inbound - AM	18/22%	11/14%	1/5%
- PM	63/78%	65/86%	18/95%

Reaction to Policy Change

Could use city bus if  
D-A-R furnished trans-  
portation to bus stop.

YES	24/24%	29/37%	6/25%
NO	75/76%	49/63%	18/75%

Would be satisfied with  
sector operations (i.e.  
2 or 3 mile trip):

YES	28/28%	32/41%	1/4%
NO	71/72%	46/59%	23/96%

D-A-R should serve only  
low income citizens:

LOW INCOME YES	21/25%	19/28%	5/22%
RESPONSE NO	64/75%	50/72%	18/78%
HIGH INCOME YES	1/11%	-0-	-0-
RESPONSE NO	8/89%	7/100%	7/100%

D-A-R should serve only  
those with disability  
that prevents them from  
riding the City bus.

YES	13/13%	21/27%	10/42%
NO	86/87%	57/73%	14/58%

D-A-R Usage:

More than once a week	62/63%	55/71%	16/67%
Once a week	33/33%	13/17%	7/29%
Once a month	2/2%	9/11%	1/4%
Less than once a month	2/2%	1/1%	-0-

Miscellaneous

Does D-A-R meet your needs?

YES	73/74%	61/78%	21/87%
NO	26/26%	17/22%	3/12.5%

Do you have a handicap  
that prevents you from  
riding the City bus?

YES - 91  
NO - 110



APPENDIX B

# Not all try to make life easier for disabled

By BARBARA HERRERA

When Mary Thielen, teacher, drives to the supermarket and finds that able-bodied people have parked in all the spaces reserved for the handicapped, she has to drive on to another grocery.

Thielen — one of about 75,000 people in San Diego County confined to a wheelchair — needs a wide parking space to accommodate the wheelchair lift on her specially equipped van.

But what really upsets Thielen is when she comes, package-laden, from a store and finds a motorcycle or small foreign car jammed in between her van and the next car.

"This happens more than you'd think," Thielen said.

"I then have to go back into the store and ask the manager to back my van from the parking spot so that I can get into it."

Thielen, vice chairman of the county's Standing Committee on the Handicapped, said in an interview yesterday she hopes activities here next week will make able-bodied people more aware of this problem and other problems facing the handicapped.

Jim Bates, chairman of the county Board of Supervisors, this morning proclaimed next week Human Rights for the Handicapped Week. The observance begins Sunday.

"We want to make San Diegans aware that their respect for the rights of the handicapped can make the difference between a person's dependence or independence," Thielen said.

Thielen, 42, a University City area resident with three children, teaches classes for the orthopedically handicapped in the special education department at Mesa College.

"I think that people don't purposely create problems for the handicapped by, for instance, parking in reserved spaces," Thielen said. "Most people don't realize and we hope people will become more aware."

(She can spot an able-bodied person's car illegally parked in a handicapped space by the license plates. Handicapped drivers in California have specially coded license plates.)

Promoting public awareness of what the able-bodied can do to help the handicapped be more independent — including hiring them — will be the focus of several events planned next week.

County supervisors Tuesday morning will consider a proposal from David Speer, county chief administrative officer, to include the handicapped in the county's affirmative action hiring program.

And local business people have been invited to a lunch conference at noon Thursday to hear about the benefits of hiring the handicapped and to talk about some of the misconceptions. The conference has been called jointly by the Governor's Committee for Employment of the Handicapped and by the standing committee.

"A lot of employers think that the handicapped are accident prone," said Thielen, whose own handicap was caused by polio at age 16 and more recently by arthritis. "But that's not true."

"A lot think the handicapped don't qualify for state workers' compensation. That's not true, either."

"The handicapped are conscientious, punctual, hard workers. By

the time we get a job, we've worked hard enough to get to that point that we want to keep progressing."

Still, she's not one to go on about problems.

"If I had my choice of any place in the nation to live as far as advantages for the handicapped are concerned, I'd stay right here in San Diego," Thielen said. "We have extremely cooperative public officials and some extremely progressive programs going here."

Thielen praised public officials for programs here, including the construction of downtown wheelchair ramps grooved into the cement curbs. So far 375 new wheelchair ramps have been built downtown with 270 more to be finished in March. A major portion of the cost is being paid with federal funds.

# Not all try to ease life for disabled

CONTINUED FROM PAGE B-1

The other day Stan Hecker, a wheelchair-confined member of the city's ad hoc committee on architectural barriers, rolled eight miles through downtown and the surrounding area without hitting a curb to demonstrate the convenience of the ramps.

Another advancement for the handicapped here is the installation of wheelchair

lifts on five San Diego Public Transit buses. Two of the buses will be unveiled at a press conference Wednesday and a public demonstration is planned during the conference being held by the Governor's committee Thursday.

Transportation to the conference is being arranged for the handicapped by the county standing committee. Those who need transportation can call the county Human Resources Agency's Standing Committee on the Handicapped.

Other events scheduled for the observance next week include:

— Open house from 3 to 8 p.m. Sunday at San Diego

County Service Center for the Blind, 5922 El Cajon Blvd.

— A public meeting at 7 p.m. Tuesday of the Developmental Disabilities Board, Grossmont Work Training Center, 230 Jamaica Rd., El Cajon.

— Conducted tours from 10:30 a.m. to 3 p.m. Wednesday of the Goodwill Industries downtown facilities, 402 Fifth Ave.

— A \$10-a-ticket appreciation dinner at 8 p.m. Thursday held in the Sheraton Harbor Island Hotel by Friends of the Handicapped Children.

— San Diego County Assn. for the Retarded bowling tournament beginning at 9 a.m. Friday at University Lanes, 5933 University Ave.

— Bowling tournament banquet and awards at 6 p.m. Saturday in the Al Bahr Temple, 5440 Kearny Mesa Rd.

In addition, recreation activities for the handicapped are being planned all next week by the Vista Recreation Department, 160 Recreation Dr., Vista.



**SPECIAL BUS SERVICE STARTS FEB. 6**

# Handicapped To Get A Lift

By **CARL RITTER**

Staff Writer, The San Diego Union

Buses equipped with specially designed mechanical lifts to accommodate persons confined to wheelchairs will go into regular operation Feb. 6 on two San Diego routes.

This will be a first — not only for San Diego but for any city in the United States.

Other cities which have provided transportation for the handicapped in wheelchairs have done so only on a call basis, according to Thomas O. Prior, the San Diego Transit Corp. general manager.

He said five retrofitted transit buses will serve Routes 3 and 7 on fixed schedules, with the company dedicated to getting feedback from handicapped persons using the system and "making improvements as we go along."

Route 3 serves Mission Hills via downtown and Ocean View Boulevard, Hillcrest, Market Street and Logan Heights. Route 7 serves downtown San Diego via University Avenue and La Mesa via University Avenue and Balboa Park.

The new lift operates at the front door of the buses, where handicapped passengers boarding and alighting are fully observed by the drivers at all times.

Bus interiors have been modified to permit wheelchairs to be locked down in

vacant areas behind the two regular front seats.

Marc Sandstrom, the transit firm's board chairman, said the company found that equipment needed to accommodate the handicapped was not available when the project was conceived, but decided to go ahead.

Transportation Design & Technology, Inc., a San Diego company, developed the original designs and prototype equipment.

## EARLY TESTING

"We have taken these buses to various handicapped centers including the City Rehabilitation Center and have received a great deal of exceptional constructive criticism and suggestions for improvements," Prior said.

He said research is continuing and that the company expects to lead the way for the entire transit industry in such mode of transportation.

A demonstration, with several handicapped persons on hand, was held yesterday at

transit headquarters on 16th Street.

After Mary Thielen boarded one of the buses in her wheelchair, she noted it was the first time she had been on a bus in 26 years. This was before she came down with polio.

She now instructs in a Mesa College program for the orthopaedically handicapped.

## DRIVER CONTROL

Phil Giannino, a college student, also tried out the new equipment. When he and Mrs. Thielen had to try two or three times to get over the beveled lower front surface of the lift step from the street, he commented that they had found no problem on the sidewalk where the persons in wheelchairs normally will board.

The lift resembles a normal front step when not in use as an elevator. When a wheelchair passenger wishes to board, the bus driver actuates the lift mechanism that converts the step into a level platform which is then

lowered to the required height.

With the passenger on the platform, the driver actuates the lift's upward motion and a lip rises immediately behind the wheelchair to prevent it from rolling off the lift.

Drivers are being given special instruction and training in safe and efficient use of the lifts.

Expanded use is planned after potential problems are identified and solved, transit administrators said.

Inquiries about the special equipment has come from as far away as Spain, France, England and Belgium, they said.



— Staff Photo by Ted Winfield

Philip Giannino leaves one of five San Diego Transit buses fitted with wheel-

chair lifts to accommodate handicapped passengers.

## Bus Routes Lengthened, Wheelchair Lifts Added

Buses with wheelchair lifts on Routes 3 and 7, extended routes, and new express stop signs are just some of the changes made to improve service, the San Diego Transit Corp. has announced.

Routes 21 and 41 will be extended beginning Sunday to include service to Del Mar with connections with the new North County Transit District, and the Veterans Hospital and other stops in the La Jolla-Torrey Pines area, respectively.

Designated express stops now are marked by painted red bands across the bottom of the regular blue and white signs, a transit spokesman said.

Express buses will load and unload beginning Sunday only at express stops.

Previous express markers were stickers which were often pulled off, making it hard to find express stops, the transit spokesman said.

The new lifts installed on five route 3 and 7 buses resemble a normal step, but when

wheelchair passengers wish to board, a mechanism converting the step to a platform is operated by the driver.

Once the passenger is on the lift it raises to the bus floor level, with a safety lip behind the wheelchair to prevent it from rolling off.

Other changes announced by the transit company include 30-minute service on route 25 between Fashion Valley and Kearney Mesa; relocation of the Route 25 terminal to South Mission Beach, and the elimination of Route 22.

Also changed was the direction of a loop along Route 33A in Otay Mesa, which was reversed; shift to hourly service on Route 51 which was also extended to the international border at San Ysidro, and the elimination of a little used loop on Route 54 along Sweetwater Springs Road.

New schedules for the routes affected are available on all express buses and will be available Thursday on all other buses.





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