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Accessible Buses in a Commercial Environment

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ABSTRACT:

This paper considers the operation of accessible urban buses in a commercial environment with particular reference to the provision of services in Wellington, New Zealand. The goal of achieving fully accessible urban public transport is shared by government authorities in many OECD countries. This goal has been expressed in both specific legislation that relates directly to urban transport (eg the "Americans with Disabilities Act" (ADA)) or in the adoption of board human rights policies that imply such accessibility (eg the Australian "Disability Discrimination Act 1992" (DDA)).

The implementation of this policy has given rise to widespread controversy in regard to practicality; cost effectiveness; reverse discrimination against other transport users; and ultimate financial responsibility. This controversy has been fuelled by the broad range
of goals on the part of accessibility advocates, from those who are intent on developing a working transport system that provides a wider range transport options for the disabled, to those who see accessibility as a "right" that cannot be compromised by practical or
financial issues.

This paper addresses these issues firstly from the perspective of the operator who provides service in a commercial, competitive environment, and highlights the contrast between this environment and that in the United States, Europe and Australia where different regulations apply. Secondly, the broad issues of accessibility in buses are discussed. Thirdly, the impact that accessibility requirements will have on bus design and urban transport infrastructure are outlined, with an emphasis on the impact on smaller and medium sized buses. Fourthly, the capital and operating costs are quantified. Finally, the resolution process that has been implemented in Australia to replace legal argument is described.

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1. BACKGROUND

The Institute of Transport Studies has been approached to prepare a paper on the issues relating to the operation of accessible urban buses in a commercial environment, with a particular reference to the provision of services in Wellington, New Zealand.

The goal of achieving fully accessible urban public transport is shared by government authorities in many OECD countries. This goal has been expressed in both specific legislation that relates directly to urban transport (eg the "Americans with Disabilities Act" (ADA)) or in the adoption of broad human rights policies that imply such accessibility (eg the Australian "Disability Discrimination Act 1992" (DDA)).

The implementation of this policy has given rise to widespread controversy in regard to practicality; cost effectiveness; reverse discrimination against other transport users; and ultimate financial responsibility. This controversy has been fuelled by the broad range of goals on the part of accessibility advocates, from those who are intent on developing a working transport system that provides a wider range transport options for the disabled, to those who see accessibility as a "right" that cannot be compromised by practical or financial issues. On the other hand, the response of operators has been largely dictated by the regulatory and subsidy environments they operate in, with those operators that are fully compensated from Government funds concentrating solely on the engineering and operating issues, whilst those that have no safety net of this kind expressing grave doubts about the viability of the policy. A wide range of self interested parties have also entered the debate, ranging from manufacturers who believe accessibility will give their products a commercial edge, to operators who see that accessibility will turn the international trend towards opening urban bus services to the pressures of competition and privatisation.

This paper addresses these issues firstly from the perspective of the operator who provides service in a commercial, competitive environment, and highlights the contrast between this environment and that in the United States, Europe and Australia where different regulations apply. Secondly, the broad issues of accessibility in buses are discussed. Thirdly, the impact that accessibility requirements will have on bus design and urban transport infrastructure are outlined, with an emphasis on the impact on smaller and medium sized buses. Fourthly, the capital and operating costs are quantified. Finally, the resolution process that has been implemented in Australia to replace legal argument is described.

2. URBAN BUS SERVICES IN A COMMERCIAL ENVIRONMENT

The environment in which urban bus services are provided in New Zealand contrasts markedly with that applying in most OECD countries, particularly those that are implementing accessible bus services.

Urban bus services in OECD countries are characterised by both government regulation aimed at the prevention of competition, and high levels of capital and operating subsidies. Ownership of operating companies varies, but where private companies provide service they are generally protected from competition (through licensing or franchise arrangements) and depend on Government payments. These payments may be in the form of direct operating subsidies; of indirect subsidies for certain classes of passenger; or in contractual payments for services provided. Where operating companies are owned by local government or the State, they either receive these payments, or direct payments from the public budget to cover capital costs; operating deficits; or other areas of expenditure that are considered separate from the specific transport task (eg superannuation payments at public sector levels). Whilst there has been an international trend towards transparent accounting and the separation of regulatory and operating functions, it remains true that most urban operators are underwritten by public subsidies in one form or another.

However, urban bus operators in New Zealand operate under a unique regulatory model that was implemented under the Transport Law Reform Bill (1989). Two key elements of this model are the application of Competitive Pricing Procedures (CPPs) to all payments to operators and the use of "net tenders", whereby the operator tenders on the basis of retaining fare revenues. Urban bus operators in New Zealand are thus subject to full competitive processes in obtaining their bus services (through the CPP process), and to full commercial risk taking in the level of revenue received (through the net tender process)[1].

It is impossible to address the accessibility issue without taking full cognisance of this commercial environment. Bus operators in the countries that are most committed to accessibility - such as the United States, Germany and Sweden - generally face neither competition nor take commercial risks. Where private contractors are utilised to provide services, they are engaged on the basis of gross tenders, that exclude commercial risk. In these environments simple mechanisms exist to enable the Government to bear the cost of implementing accessibility provisions. Countries that regulate urban bus services in such a way as to have operators bear the commercial risk (such as the United Kingdom) have resisted the implementation of strict accessibility standards.

It is for this reason that simple contrasts between operators in New Zealand and either the United States and Germany are misleading. Operators in these latter countries are essentially concerned with meeting public policy objectives, and measure their success in political terms. Operators in New Zealand are required by law to function as commercial entities, and measure their success in terms of providing a effective service in a way that earns reasonable returns for shareholders.

This has four fundamental implications for this discussion on accessibility. In all areas relating to costs, higher costs in the United States or continental Europe mean higher costs to Government; in New Zealand, higher costs mean higher cost to a commercial entity that requires balancing revenues to remain viable. Secondly, arguments relating to "Cross Sector Benefits", ie that the additional costs incurred in implementing accessible bus transport will be balanced by savings in Government budgets in for paratransit; employment support or home care[2], are irrelevant to the commercial bus operator in New Zealand unless a guaranteed mechanism exists to ensure that these benefits are transferred back to the operator who has born the cost of accessibility. Thirdly, the existence of a competitive environment requires that any standard applied to one commercial operator be applied to all operators, to ensure that the competitive process is not compromised. Finally, this commercial environment places a different interpretation on the meaning of "reasonable" as used in the Human Rights Act (1993)[3] than would apply to an operator that received subsidies for any additional costs incurred.

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[1] Knight, F., "Structural Reform in New Zealand's Passenger Transport Industry", Transit New Zealand, 1991.

[2] Vintila, P., "Affidavit of Peter Vintila in Support of Application for Interim Orders", 10, Perth 1994 and Henderson, D.E., "Affidavit of David Neil Henderson in Support of Application for Interim Orders", 5, Auckland 1995.

[3] Human Rights Act, 1993, Section 43, subsections (2) and (3).

This paper has been prepared from the perspective of commercial bus operators who provide services in an environment of both competition and commercial risk taking on fare revenue and capital and operating costs. Operators in such an environment face different issues in addressing the accessibility issue than do operators that are protected from competition and/or receive revenue that is not directly related to passenger fares. This distinction impacts on all comparisons between operators in New Zealand and those that have implemented accessibility standards in the United States and Europe.

3. DEFINING ACCESSIBILITY FOR URBAN BUSES

"Accessibility" in urban buses is usually defined in broad terms as the absence of barriers to passengers with handicaps. Barriers may exist in the form of steps (for wheelchair users); an absence of stanchions (for those with walking difficulties); a requirement to depend on sight to determine destinations and location (for the blind); the high positioning of bell-cords for stopping (for those too short to reach); a requirement to be able to hear a bell once the cord has been activated (for the deaf); or the need for a certain level of literacy or capacity to speak (for the intellectually handicapped). As the accessibility discussion is increasingly driven by a "rights based" approach - that is, the right of every citizen to use public transport - so the range of potential barriers increases.

This process requires that at some point "accessibility" will be denied to certain categories of handicapped citizens. This is recognised in the U.S. ADA, by mandating that a paratransit service be implemented parallel to accessible route services to ensure mobility for those who cannot use regular (accessible) buses[4]. It has also been recognised in the United Kingdom, where the preparation of standards by the UK Disabled Persons Transport Advisory Committee (DPTAC) has concentrated on barriers to disabled bus users other than those in wheelchairs. The recent report by the Taskforce on Accessible Transport to the Australian Transport Council[5] highlights the impossibility of catering for the full range of wheelchair sizes and types[6]. During the consultation process for the preparation of this report, the Transport Lobby Group expressed concern that motorised scooters (which cannot be occupied whilst on a bus) may be excluded from the standards set for accessibility. This report concluded that wheelchairs would be required to meet certain dimensions (the T90 definition) and standards (such as brakes); and that wheelchair users be capable of climbing a nominated slope unassisted.[7]

These limitations have been recognised by authorities charged with implementing accessible transport policies. The necessarily involve the denial of access to certain groups of handicapped people. The simple fact is that the use of bus services requires a certain level of skill and mobility, and that there are members of the community that cannot reach these

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4 Human Rights and Equal Opportunities Commission (HREOC) (1993), "Issues Paper: Disability Standards Under the Disability Discrimination Act".

5 "Accessible Transport: The Way Forward", NSW Department of Transport, April 1995.

6 Ibid., 13.

7 Ibid., 22-23.

standards. These standards have been set at different levels in different countries, with the United States concentrating on wheelchair users, whilst the United Kingdom concentrating on a far broader range of disabilities, but not mandating wheelchair accessibility.

This paper will use the definition that has been accepted by the Australian Transport Council, which includes wheelchair accessibility, but limits this to wheelchairs of predetermined dimensions and capabilities[8]. However, there is no particular logic in drawing the line at this level, and the UK approach that concentrates on the needs of the 90% of disabled population that do not use wheelchairs has much to commend it.

A second point of discussion is the definition of "access". Many bus designs lend themselves to forms of access that require different boarding techniques for wheelchair bound passengers than for non handicapped passengers. Thus a bus built on a centre-engined chassis (such as the Volvo B10M) can accommodate wheelchairs through a door entrance to a drop-frame section at the rear of the bus; a forward-engined minibus (such as the Mercedes 0.814) can be adapted in a similar fashion; and a rear-engined midibus (such as the MAN 11.190) can accommodate wheelchairs through the centre door. However, many wheelchair users regard any limitation on the door used as discriminatory, and constituting a barrier to their use of buses. Similarly, the "parking arrangements" for wheelchairs once on board the bus can involve wheelchairs facing forward, sideways or rearwards. The European model is for wheelchair users to face to the rear. Notwithstanding the fact that regular seats on buses can face in all three directions, many wheelchair users contend that a requirement for them to face rearwards (as in Europe) or to the centre of the bus (to minimise the impact of acceleration and deceleration) is discriminatory. Furthermore, it has been suggested that if the driver fails to assist the wheelchair user to park and secure the wheelchair, this is further discrimination (such assistance is mandatory in the United States under the ADA[9].

This paper will define access as being through the forward door of the bus with the wheelchair parked in a forward facing position. This is the preferred option of Disabled Persons Assembly (New Zealand) Incorporated[10] and is favoured by operators who utilise fare collection systems that are controlled by the driver. Using the definitions accepted above, an accessible urban bus would be characterised by step free entry from the kerbside (by use of a ramp) and a step free interior for a sufficient area to accommodate two wheelchairs. Access to the bus would be through the forward door and wheelchairs would be parked in a forward facing position. This definition has a significant impact on the discussion on bus capacities in Sections 4 and 5.

4. DESIGN

The provision of accessible buses requires that two principle design issues be addressed - the design of the bus, and the design of the essential infrastructure required for bus operations (eg bus stops; footpaths; and roads).

4.1 Bus Design

[8] Ibid.

[9] Americans with Disabilities Act Regulations 49 CFR Part 37.

[10] Affidavit of Ross Thomas Martin on behalf of the Defendant, 19, Wellington 1995.

A discussion on bus design must address the three distinctive types of buses that are used in urban bus services. These buses are used to respond to different market and operating conditions. A feature of urban bus operations in a commercial environment has been the greater use of a variety of bus types, in order to provide cost effective service. Operators that are underwritten by Government subsidies generally use only a "standard bus". Operations in the UK and New Zealand are characterised by variety; those in Europe and the United States by standardisation. Each bus type has distinctive engineering characteristics, which determine the type of adaptations required for accessibility.

The three types are distinguished by capacity and size. The "standard city bus" is generally 11.0 to 12.2 metres in length; has a rear mounted engine; a low floor; and has a maximum seating capacity of 53. The seating capacity varies with the height of the floor; the configuration of seats; and the number of doors. Examples of these buses are MAN SL202; Volvo B10L; and the Mercedes 0405. These standard buses dominate non commercial city bus fleets in Europe, Australia and the United States, as they did in New Zealand before the advent of the Transport Law Reform Bill (1989). Discussion on accessible urban buses usually assumes that urban transport will be provided by this type of bus, as it is the dominant form,

The "minibus" is 6.0 to 9.0 metres in length; mounted on a small truck based chassis; with a forward engine; a single door; and a seating capacity between 25 and 33. An example is the Mercedes 0812. These buses are used extensively in commercial bus operations in the UK, where the substitution of high frequency services in small buses has been found to generate greater patronage than less frequent services provided by standard city buses. This operating model has rarely been adopted by non commercial bus operators, where the relationship between revenues and costs is not a critical issue. There is a substantial difference in both capital and operating costs between standard city buses and minibuses.

Between these two extremes is the "midibus". This category refers to a "smaller" city bus, with a rear engine, low floor and seating for between 30 and 40 (eg MAN 11.190). These buses generally have lighter weight componentry and less sophistication than standard city buses, and offer significantly lower operating and capital costs than standard buses, but with less of a drop in passenger capacity. Buses of this type constitute the largest category in the UK urban bus market.

4.1.1 Standard City Buses

4.1.1.1 Floor Height and Seating Capacity

The standard city bus has evolved to the point where standard production models are accessible to wheelchairs through the front doorway. This evolution has lowered the floor line from 880mm (1975 Leyland Leopard) to 740mm (1995 standard Mercedes 0405) to a minimum of 320mm (MAN NL202 or Mercedes 0405N). Buses with these floor lines are referred to as "Super Low Floor" (SLF) buses. At 320mm a small ramp fitted under the door can provide access to a wheelchair from a standard kerb. Floor heights lower than this are impractical due to road clearance requirements.

The extent to which this 320mm height can be utilised is dependent on the geometry of the roads and the prevalence of dish drains (see discussion below, section 4.2.3. In areas where road clearance is inadequate, the air suspension of the bus must be adjusted to ensure road clearance, and this may require buses to operate with a 370mm clearance.

SLF standard city buses are currently available from the major urban bus chassis suppliers. However, there are clearly limitations on the areas where they can operate effectively, generated by road and drainage environments. A commercial operator would not contemplate the introduction of SLF buses unless the they could be effectively operated on the majority of routes.

The low floor line on SLF buses has implications for seating. Bus design dictates that certain components intrude on the passenger compartment. These consist of the fuel tank; the engine; the gearbox; and the wheel arches. The former are generally accommodated under the rear of the bus, with the floor stepped or sloped to gain clearance. This precludes wheelchair users from the rear section of the bus (generally behind the centre door). The latter create a major intrusion, particularly as provision must be made for the turning range of the front wheels. On a bus with a moderate floor level (eg 750mm) it is possible to mount seats on the wheel arch in such a way as to minimise any loss of capacity. As the floor is lowered, these seats become higher relative to the floor, and a footrest is required as passengers' legs cannot reach the floor. With an SLF design, the wheel arch is too high to position a seat on top. Thus there is a substantial loss in seating capacity. Whilst a standard 12.2m Mercedes 0405 can seat 53 passengers[11], a SLF Mercedes 0405N has a maximum seating capacity of only 45. This constitutes a loss of 15% of capacity. The addition of wheelchair bays increases this loss. The space to fit two T90 wheelchairs removes eight conventional seats. These can be replaced by "tip up" seats, that can be used when no wheelchairs are being carried. The net effect is a loss of a further 4 seats to a capacity of 41, or a loss of 23% of overall seating capacity. It is likely that safety regulations would require that standees be limited in the area forward of the wheelchair bays, which would reduce standing capacity by a similar proportion.

It is not possible to make direct comparisons to European seating layouts of similar buses. In Europe, handicapped groups have accepted centre door access and rearward facing travel, which limits the seat and standee area loss. Furthermore, the loss of seating capacity is less relevant in Europe, where journey lengths are short and standing on buses is both encouraged by operators and accepted by passengers. Neither is the case in New Zealand. The Transport Research Board report on Low-Floor Transit Buses[12] indicates seating capacities on SLF buses in the US as between 39 and 43, and in Europe between 30 and 44 (in both cases without wheelchair bays).

Henderson's comments[13] reveal a lack of understanding of the effect of wheel arch intrusion. The 23% reduction in seating capacity is a significant drop for an operator whose viability is dependent upon the sales of that seating capacity. The loss of seats has proven less of a concern in Europe due to different expectations of passengers and different operating patterns (1.2a, 1.2e).

Vintila's comments[14] accept that seating losses will occur, and refers to these as "marginal". Operators working in a commercial environment would not concur that a 23% loss in capacity was marginal. He also sees revenue enhancement from the opportunity for more passengers to stand. In the New Zealand context, a large proportion of patronage is elderly, and Vintila's own studies have indicated that there will be a substantial increase in this component in the

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11 Current 0405 buses delivered to Busways Pty Limited, Sydney NSW, excluding effects of luggage bay.

12 Ibid, 13-15.

13 Henderson, op. cit., 9.

14 Vintila, op. cit., 4.

future[15]. Furthermore, recent surveys have emphasised the extent to which the non wheelchair bound disabled person is disadvantaged by standing. It has been estimated that :

> "Among public transport users with disabilities, twenty percent could not stand without discomfort for more than four minutes and another fourteen percent could not stand for more than nine minutes. Among the generally more severely disabled people who were using fully accessible services the majority (sixty one per cent) could not stand for more than four minutes, with a further sixteen per cent able to manage no more than nine minutes"[16].

Improving access for wheelchair users will clearly have severe implications for other disabled passengers, if seated capacity is to be replaced with standing capacity. Furthermore, as a greater proportion of this seating will be at the rear of the bus, and as the intrusion of the engine and gearbox make the use of either a ramp or steps necessary at the rear, a greater proportion of these passengers will be using internal steps in the bus. They will be substituting the use of entry and exit steps whilst the bus is stationery for the use of internal steps whilst the bus is moving. Henderson[17] shows little concern for this effect (1.2d and 1.2e).

4.1.1.2 Wheelchair anchorage

A related concern generated by the provision of wheelchair bays is that of anchorage. In the European context, wheelchairs enter and depart through the centre door, and "park" in the space opposite this door. The occupant faces the rear of the bus, and a small bulkhead provides protection against the impact of deceleration. The wheelchair brakes are considered an adequate protection against acceleration. However, in the United States there is a requirement for the driver to provide assistance in anchorage if required. If wheelchairs are parked at the front of the bus and are forward facing, it is to be expected that anchorage points will be necessary. Anchorage points are specified in the Vehicle Design Specification for Local Service Buses produced by the Australian National Accessible Transport Committee[18].

The requirement for anchorage raises issues relating to the disposition of this equipment whilst the wheelchair bay is not in use, and in particular for the possibility of standing passengers injuring themselves on the anchorages. Examples of practical experience by European operators that are not required to anchor wheelchairs cannot be directly transferred to the New Zealand environment if such anchorages are required.

Henderson dismisses the concept of requiring anchorages[19]. However, he appears to be unaware of the need for anchorage if the European option of centre door entry and exit is rejected, as the Disabled Persons Assembly (New Zealand) has done.

4.1.1.3 Internal Stanchions

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15 Vintila, P. "Transport for People with Disabilities in Western Australia", Institute for Science and Technology, Perth (1993).

16 Barham, P., Oxley, P. and Shaw, T. (1994), "Accessible Public Transport Infrastructure, Guidelines for the Design of Interchanges, Terminals and Stops", study for the Mobility Unit of the Department of Transport and the Passenger Transport Executive Group, United Kingdom.

17 Henderson, op. cit., 9-10.

18 Vehicle Design Specification for Disability Specific Bus, Demand Responsive Feeder Vehicle, Local Service Bus and Coaches", National Accessible Transport Committee, Canberra, 1995.

19 Henderson op. cit., 9.

One of the key areas of progress in bus design in recent years has been the introduction of strategically positioned stanchions to assist passengers to move from the front door to the body of the bus. Improving stanchions has been one of the foci of the DPTAC recommendations in the UK, and has been included in the vehicle standards for urban commercial contractors in NSW.

Stanchions serve two functions - they assist passengers when entering or exiting the bus, particularly when there is a height differential between the floor of the bus and the ground level. Secondly, they assist passengers when moving through a moving bus. In the urban context, it is necessary for buses to move away from stops before all passengers are seated, and most passengers leave their seats in advance of arriving at their alighting point. The combination of stanchions and hand rails at the top of seats provides support for passengers whilst the bus is moving. This support is particularly important for elderly passengers.

The impact of both SLF designs and wheelchair accessibility is to reduce the opportunity to position stanchions. In fact, there will be a substantial area between the front door and the first row of seats that will be required to be free of any encumbrance to wheel chairs. This creates a distance of 1.5 to 2.0m that lacks support[20]. This will seriously hamper the mobility of passengers whilst the bus is in motion.

Henderson[21] dismisses this argument, on the basis that flat floors will remove the need for stanchions. Whilst the flat floor will make entering and alighting from the bus simpler, it will do nothing to assist the stability of passengers moving through a mobile bus. Henderson sees no requirement for central support when side supports exist, but this ignores the need by many passengers to use both hands whilst manoeuvring. As with the issue of seating, it appears that improving the needs of wheelchair users will have a detrimental impact on the safety, comfort and physical security of the majority of handicapped passengers.

4.1.2 Midibuses

The development of standard city buses has led to the mass production of SLF alternatives. However, this has not been matched with midibuses. There are two principle reasons for this. Firstly, the proportionate impact of seat losses in midi buses is far greater than in standard buses, as a similar number of seats are foregone at the front of the bus. This reduces the capacity to such an extent that manufacturers do not see a viable market in accessible buses of this size. Secondly, the principle market for midibuses is the United Kingdom, where no requirement exists for wheelchair accessibility.

The one production vehicle in this category illustrates the capacity problem. The Neoplan N2009 midibus was launched in the United Kingdom in March 1995. This vehicle is of similar length to the MAN 11.190, but provision for only sixteen regular seats and either four "push-up" seats or two wheelchairs. The seating capacity of the bus is reduced from 39 to 18, a loss of 64%. Furthermore, all but three of the regular seats are in the raised section at the rear of the bus, which can only be entered by the use of two steps. Thus while the front section of the bus is stepless, the area where most passengers will sit has one more step than the MAN

20 TCRP op. cit., 17.

21 Henderson op. cit., 9.

11.190, with a less than of the capacity. This is the vehicle promoted by Vitner as an improved alternative to the MAN 11.190[22].

Both Vitner[23] and Henderson[24] also promote the Omni Coach from the UK as an alternative midibus. The Omni Coach has been developed primarily as a welfare vehicle for transporting mobility impaired passengers. Recently, a version has been produced to cater for the urban bus market, and 20 of these have entered service. The vehicle has 16 standard seats and provision for either four "tip up" seats or two wheelchairs[25]. As such, it has only 46% of the seating capacity of the MAN 11.190. This vehicle is not a midi bus in either design or capacity, and cannot be considered as a substitute for the MAN vehicles in service with Wellington City Transport (WCT).

Neither of these accessible buses offers a reasonable alternative to the low floor MAN 11.190 that WCT is introducing.

4.1.3 Minibuses

The appeal of standard minibuses is that their capital and operating costs are low. These savings can be used to develop high frequency services, which may in turn generate increased patronage. As such, they have been widely used in the UK, and are being introduced in increasing numbers in Australia.

The standard minibus chassis is based on a light commercial truck. The low cost of the chassis is dependent on the high production runs that can be achieved with standard trucks. This advantage would dissipate if the chassis was substantially modified for bus use.

The position of the mechanical components on the chassis precludes accessibility for wheelchairs through the front entrance. Mercedes 0814 vehicles of this type are currently being introduced in Brisbane, Australia, with an accessible entrance through a second door to a drop-floor section at the rear of the bus[26]. In this configuration the bus will seat 20 and carry two wheelchairs - a 41% reduction in seating from a standard production model that seats 29.

The Omni Coach is an option for an accessible minibus. However, the move from a mass produced truck chassis to a custom built specialised bus chassis has major cost implications (see Section Four). Furthermore, as the primary operating restraint with minibuses is the lack of capacity, the small carrying capacity of either the Omni Coach or the accessible Mercedes 0814, there is little opportunity to substitute these buses for standard minibuses.

In summary, this review of the impact of accessibility on the design of urban buses establishes that it can only be achieved by substantially reducing the seating capacity of the bus. This reduction ranges from 23% with standard city buses, to 43% for midibuses, to 40% for minibuses. Both Henderson and Vitner have failed to understand that a commercial bus operator will define capacity in terms of available seating, and that on this definition the only

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22 Vitner, op. cit., 7.

23 Ibid.

24 Henderson, op. cit., 10.

25 Discussions with Mr Grant Lockhardt, Managing Director, Omni Coach Ltd, May 1995.

26 Australian Bus and Coach, May 1995.

accessible alternative to the MAN 11.190 is a standard city bus. Smaller accessible buses cannot perform the task of this bus as their capacities are barely above half.

Table 1 Bus Seating Capacity

Bus Type	Standard	SLF	SLF with wheelchairs	Capacity Reduction
City Bus	53	45	41	-23%
Midi Bus	39	24	20	-49%
Mini Bus	29	na	20	-31%

4.2 Infrastructure

4.2.1 Bus Stops

The above discussion of the design requirements for accessible buses assumes that wheelchair entrance to the bus will be by way of a ramp to a step-free area of the bus. This contrasts with the use of wheelchair lifts, which are the dominant means of achieving accessibility in the United States. Lifts have been discredited for cost, maintenance and reliability reasons, and this has led to the development of the SLF bus using a ramp.

The ramp is generally housed underneath the door step and is extended to make connection with the footpath. There are limitations as to the flexibility of these ramps and to the angle from the footpath that can be safely and adequately negotiated by wheelchair users. An SLF bus has a floor height of between 320 and 370mm from the roadway, determined by the road clearances required in the area of operations. The use of kneeling devices can reduce this a further 80mm. The remaining distance between the step and the footpath is between 140 and 190mm. The ramp is not adequate to bridge this height. Thus it is essential that ramp equipped buses operate to bus stops which are raised by 90 to 140mm above the road level. Furthermore, as the driver must ensure that the bus is adequately positioned at the stop, it is important that the stop layout be standardised.

Bus stop standards for ramp equipped buses have been developed which specify that the stop be raised to ensure that the distance between the stop platform and the bus floor be no greater than 50mm, and that the bus stop platform be not less than 2m wide, with a slope not exceeding 4%[27]. Few bus stops in Wellington would meet these standards. Given that this infrastructure is necessary for the safe operation of accessible SLF buses, it would be irresponsible for accessible bus services to be implemented until such stopping platforms are in place. As the responsibility for these platforms rests with the Wellington City Council and not the bus operator, there would be little sense in proceeding to deploy SLF buses until a commitment existed from Council to ensure that the footpaths at all bus stops met the required standard. The recent Australian report "Accessible Transport: The Way Forward" acknowledges the need for Government funding for infrastructure development[28]. Difficulties

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[27] Blennermann F. "The Low Floor Bus Concept - Advantages for the Elderly and Handicapped". PTRC SAM Seminar J, 1991.
[28] NSW DOT op. cit., 24.

with the accessibility of bus stops have also been raised as a restriction on the use of SLF buses in North America[29].

A further major obstacle to the safe operation of ramp equipped SLF buses is the freedom of buses to use designated stops. Any intrusion on the bus stop or the approach and departure areas by parked cars or other obstacles would prevent the driver from adequately positioning the bus to use the ramp. If a stop could not be accessed, an alighting wheelchair passenger would be required to be carried to the next available stop, and an intending wheelchair passenger could not join the bus. This is a far greater problem than with non-wheelchair bound passengers, who can generally alight from or join buses away from the stop, albeit with some inconvenience. The practice of cars parking on bus stops is widespread, particularly outside of the city centre area,. Without revised arrangements to ensure that stops are clear, the safety and convenience of wheelchair bound passengers could not be guaranteed. Again, without commitments from both Council and the Police to guarantee accessibility to bus stops, the introduction of ramp-equipped SLF buses would be inappropriate.

Henderson[30] cannot see the problem with parked cars, and assumes that enforcement will be adequate. This displays a lack of understanding of the limitations of ramp technology, and minimises the distress and inconvenience that would result to a disabled passenger who was denied access or egress from a bus at their stop.

Vintila[31] acknowledges that "inconvenience" will be caused, but sees the resulting anger and frustration as a useful motivator for upgrading urban infrastructure in general. Whilst this may be true in the long term, it would appear to be an irresponsible use of the distress of stranded handicapped bus users to force through change.

The purpose of deploying ramp equipped SLF buses is to improve the accessibility of the bus network to handicapped passengers. Unless the required infrastructure and parking enforcement practices are in place to ensure that the ramps can be used, there is no value in mandating an SLF bus design.

4.2.2. Footpaths

The ADA recognised that the provision of accessible buses would not resolve the mobility problems of those whose handicap prevents them from reaching the bus stops. For this reason, a parallel paratransit service was mandated, that requires door-to-door service be provided within a 1.5 mile envelope for each bus route[32].

Wheelchair users may be prevented from reaching a bus stop due to physical barriers between the stop and their origin/destination, or the distance alone may create a barrier. It has estimated that 60% of wheelchair users have difficulty moving more than 180m, and 85% have difficulty over 360m[33]. The generally accepted standards for bus stop positioning assume that 400-800m is a reasonable walking distance.

29 TCRP Synthesis 2: "Low-Floor Transit Buses", Transportation Research Board, Washington 1994, 16.

30 Henderson op. cit., 11.

31 Vintila op. cit., 8.

32 Americans with Disabilities Act, Title II, Section 23.

33 Barham et al, op. cit

Thus even the construction of adequate platforms at bus stops will not resolve the accessibility requirement. There is a clear need for either a parallel transport system (as in the United States) or the effective provision of accessible footpaths between the bus stops served by accessible buses and the origins and destinations of passengers. As is the case with bus stop platforms, this requires a commitment by the Council, without which the introduction of ramp-equipped SLF buses would be a token gesture.

4.2.3. Roads

SLF buses can operate effectively only in areas where road geometry provides adequate clearance for a 320mm floor line. The extent to which this 320mm height can be utilised is dependent on the geometry of the roads and the prevalence of dish drains. In Germany, where urban infrastructure is well developed and where low rainfall precludes the need for extensive drainage systems, buses can operate at 320mm. However, even in Germany 34% of urban buses in 1992 were not to SLF specification, due to "less improved roads"[34]. In Sydney, Australia, floor heights are required to be set at 350 to 400mm, in order to provide adequate clearances and approach angles[35]. Trials with an SLF Man 10.180 in Sydney revealed problems with dish gutters, roundabouts and speed humps[36]. In Brisbane, Australia, difficulties encountered with road camber and drainage precluded the use of SLF buses[37]. The value of SLF buses in Wellington would be dependent on the geometry of the city's roads and the prevalence of drains and roundabouts that may restrict operations.

5. COSTS

The net costs of introducing accessible urban bus transport fall into four categories: the capital costs of SLF buses against conventional low floor buses; the capital costs of infrastructure improvements; the operating costs of accepting wheelchair users; and, as an offset, the potential revenue gains from wheelchair users.

5.1 Capital Costs of SLF Buses

An analysis of the capital costs of SLF buses in relation to conventional low floor buses vary by category of bus (Regular, Midi and Mini - see Section 4.1 above). As the basic engineering of these three categories is distinct, so the relative costs vary substantially between the three types. The criteria used to compare costs will be the cost per seat. Analysis which compares the relative costs of vehicle types but ignores seating capacity fails to take account of the commercial imperatives that underlie urban bus operation in New Zealand. Furthermore, comparisons based on standing capacity are not relevant in a market where passengers expect to be seated. For many passengers, a seat is a necessary minimum requirement for a comfortable bus journey (see Section 4.1.1.1. above). This contrasts with the European market, where buses are used primarily for short distance transport, and where passengers accept "crush loading" conditions.

5.1.1. Regular Buses

34 TCRP op. cit., 4.

35 Discussions with Mercedes Benz Commercial Division, Sydney, May 1995.

36 Johnson, G., "Low Floor Accessibility", Truck and Bus Transportation, May 1994, 54-56.

37 Information provided by the Australian City Transit Association, February 1995.

The costs comparisons between SLF and regular buses are based upon Australian prices as indicated in the recent Brisbane Transport tender. This tender called for quotations for both SLF and LF bus chassis from each manufacturer. As such, it provides the most accurate comparison between the two types of buses. The prices are converted from Australian dollars. It is acknowledged that the prices of equivalent chassis in New Zealand will differ from these prices, but it is to be expected that the relativities will remain constant.

Table 2 - Bus Prices (Australian Dollars)[38]

Chassis Mfg	Low Floor	Number of seats	Cost per seat	SLF	Number of seats	Cost per seat	Increase Chassis	Increase per seat
M-Benz	252693	45	$5615	256118	37	$6922	1.0%	23.3%
Volvo	241688	49	$4932	264248	37	$7142	9.3%	44.8%
MAN	257331	45	$5718	267535	37	$7231	4.0%	26.5%
Average	**250571**		**$5422**	**262634**		**$7098**	**4.8%**	**30.9%**

Notes
1. 'Number of seats' refers to the number of passenger seats plus two wheelchair bays. Each wheelchair bay replaces four seats.
2. Gross seat numbers vary from those for 0405 in Section 4.1 above due to operator specification.

The additional cost of purchasing SLF buses over LF buses are therefore in the order of 5% for the bus, but 31% for the capacity in the bus. As the business of a bus company is to sell capacity, it is the second figure that is relevant.

Statements by Henderson[39] and Vintila[40] that there is no necessary increase in capital costs ignore the issue of the cost per seat provided, which is the critical figure for a commercial bus operator.

5.1.2 Midibuses

The capital cost differential for midibuses is magnified by the absence of an equivalent accessible chassis that can offer front door entrance. Wellington City Transport is currently

38 Correspondence from Mercedes Benz (Aus) Pty Ltd and Volvo Bus Australia to the Australian Bus and Coach Association February 1995.

39 Henderson, op. cit., 11.

40 Vintila, op. cit., 5.

introducing 39 seat MAN 11.190 midibuses. The highest capacity accessible midibus is the Neoplan N4009, which seats 18. The Omni Coach, referred to by both Henderson[41] and Vintila[42], seats 18. (In both instances capacity is taken as regular seating plus two wheelchair spaces). Neither bus can be considered a substitute for the 39 seat MAN 11.190.
The only type of accessible bus that can substitute for the MAN 11.190 in terms of seating capacity is a standard bus. The purchase price would increase from $NZ197500 to $NZ325000 (65%), with a per seat cost increasing from $5064 to $8784 (73%).

Henderson[43] fails to understand that accessible buses are required to be both larger and heavier, not because of accessibility per se, but to compensate for the loss of revenue earning capacity that the adjustments for accessibility mandate. Vintila[44], compares the 18 seat Omni Coach with the 39 seat MAN 11.190. The price differential between these buses is NZD138200 (Omni) or $7677/seat to NZD197500 (MAN 11.190) or $5064/seat - an increase in cost for the Omni of 52%. Thus the operator is faced with an increase in per seat costs of 73% if a similar capacity accessible bus is purchased, or 52% if the far smaller bus suggested by Vintila is purchased. Neither alternative is viable for a commercial operator.

A more efficient solution is possible if wheelchair accessibility is through the centre door, an option rejected by the Disabled Persons Assembly (DPA). The MAN 11.190 can be produced in a SLF version and adapted to accommodate two wheelchairs opposite the centre door. The SF modifications reduce the seating to 33, and the two wheelchairs reduce it further to 27 (including the two wheelchair bays) - a reduction of 64%. The accessible bus would, however, increase in price to NZD237500[45], giving a cost per seat of $8796, or a 74% increase. This is an equivalent per seat cost to an accessible standard bus.

5.1.3 Minibuses

The standard production minibus available in Australia is the 29 seat Mercedes Benz 814. This costs AUD150000. An accessible version of this bus is available, with wheelchairs entering through a rear door to a drop section behind the regular passenger compartment. This arrangement is unlikely to be acceptable to the DPA. The seating capacity of the bus is reduced to 20 plus two wheelchairs. The cost increases to AUD165000[46]. The per seat cost increases from AUD5172 to AUD7500, or 45%.

5.1.4 Summary of Bus Capital Costs

The cost per seat of a regular bus adapted for wheelchair use is increased by 31% ;
The cost per seat of a midi bus adapted for wheelchair use is increased by 73% if a centre entrance bus is used, or 74% if an equivalent number of seats are offered on a regular bus;
The cost per seat of a mini bus adapted for wheelchair use through a rear door is increased by 45%.

It has been estimated that the purchase price of a bus represents 15% of the whole of life costs. The increase in costs for providing for wheelchair accessibility will therefore range from

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[41] Henderson, op. cit., 10.
[42] Vintila, op. cit., 7.
[43] Henderson op. cit., 10.
[44] Vintila, op. cit., 7.
[45] Martin, R.T., "Afadavit of Ross Thomas Martin on behalf of the Defendant", Wellington, April 1995, 17.
[46] Discussions with Mercedes Benz (Aust) Pty Ltd May 1995.

4.6% (where standard buses are currently used) to 11.0% (where midi buses are currently used). In addition, substantial additional costs would be incurred by an operator that moved from midi buses to standard buses in the areas of running costs and road taxes. Given that all urban transport in New Zealand is conducted in a competitive environment, the imposition of an 11%+ cost penalty on one operator would most likely result in a failure to regain any services once they are tendered. If the provision of accessible buses were to be made a condition of future urban bus tenders, it would be expected that the cost of these would increase by a minimum of 11%, in order to justify the increase in capital cost.

5.2 Infrastructure Costs

Section 4.2.2. above outline the modifications that would be required to bus stops to ensure the safe operation of accessible buses with ramps. These modifications have been estimated to cost $2200/stop[47]. In a city the size of Wellington, with 1000 bus stops, this cost would amount to $2.2 million.

In addition to this, there is the requirement to improve access to bus stops from residential areas and to destinations, such as centres of retailing, employment and health care. It has been suggested in Australia that the total cost of infrastructure modifications would be AUD220 million[48]. This would be equivalent to a cost in Wellington of $4.8 million[49].

5.3 Operating Costs

The introduction of accessible bus transport will have two direct impacts on operating costs.

The first relates to the loss of seating capacity due to the impact of the SLF design and the provision of wheel chair bays. This loss could be compensated for either by the operation of additional services or by the use of larger buses. In the Wellington situation, there would be a choice between doubling service levels at peak periods (to compensate for the difference between 39 seat MAN 11.190s and 20 seat MB814s or Omnis) or by the use of 37 seat standard buses. The latter would have an impact on fuel costs and road service charges. The former would amount to a 15% reduction in fuel efficiency. As fuel costs constitute 13% of total costs, this would lead to an increase of 2% in total costs[50].

The second impact relates to the effect of SLF designs and wheelchair accessibility on operating speeds. An urban bus spends a high proportion of operating time at bus stops ("dwell time"). This will vary depending on the traffic conditions; the level of usage; the fare system; the type of passenger; and the design of the vehicle. In the North American context, it has been estimated that 66% of dwell time relates to the fare collection process[51]. This proportion is likely to be higher on systems that issue either tickets and/or give change, neither of which occurs on North American systems.

The SLF design can substantially reduce boarding times for passengers, particularly those who are elderly; are handicapped; or are carrying luggage or supervising small children. This saving

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47 Travers Morgan Pty Ltd., "Transport Framework Directions Project - Stage 1. Working Paper A1: Mainstream Bus-based Systems", February 1995, 24. (Original reference is Vintila).

48 NSW DOT, op. cit, 30.

49 Assuming the population of Wellington as 2% that of Australia, and an exchange rate of 1AUD to 1.09NZD.

50 Confirmation from WCT here?

51 TCRP op. cit., 27.

has been measured at between 8% and 36% in Canada, or an average of 0.8 seconds per passenger[52]. Other surveys have indicated a smaller saving of 0.35 seconds[53] and 0.2 seconds[54] In the United Kingdom, trials with SLF buses have concluded that there is a time saving, but that it is not statistically significant[55]. Whilst the actual boarding time may be reduced, the absence of stanchions and passenger seats in the forward section of the bus would retard the progress of elderly passengers, and delay the bus departure. It is therefore probable that there would be minor savings during commuter hours, and balancing effects at other times. The range of boarding time savings recorded indicates that no firm conclusions have been reached on the impact of the SLF design on boarding times. It is certain, however, that these possible savings are not the guaranteed "minutes mean millions" promised by Vintila[56].

On the other hand, the carriage of passengers in wheelchairs will lead to delays. Such delays would be minimised where the wheelchair was not secured and could be manoeuvred into position by the user. They would increase with a requirement for securing, as would be necessary with forward entrance. They would increase substantially if there was a requirement for driver involvement in the securing process, as safety demands would require that the vehicle be shut down and the driver leave the driving compartment.

The time period for a wheelchair user to enter a bus has been measured at between sixty and ninety seconds[57], compared to 0.3 seconds for an ambulatory adult and 6 seconds for a passenger with a child[58]. Operators in the United States (using lift equipped buses) allow seven minutes for a wheelchair user to enter a bus[59]**.** It is therefore difficult to estimate the time that would be taken in Wellington. Given minimal usage by wheelchair users of the system, it is likely that occasional disruptions to schedules of between one and three minutes will occur. These are within the range of unexpected delays that occur under normal operating conditions. This estimate assumes that wheelchair users can enter and secure their wheelchair - with driver involvement the delay could be doubled, and this would lead to delays. The principle problem with an intermittently delay is that it must be allowed for in timetables whether or not it occurs, and this will build inefficiencies into the operating system.

It is therefore likely that the introduction of accessible SLF buses will have no significant impact on bus operating speeds and thus operating costs, unless drivers are required to assist passengers in securing the wheelchair.

5.4 Summary of the impact on urban bus costs

The use of accessible SLF buses of a similar capacity to the MAN 11.190 operated by Stagecoach is likely to increase operating costs by 14%, consisting of 11% in capital costs; 2% in fuel costs and 1.0% in road taxes. This increase would make any company uncompetitive in bidding for service rights under New Zealand CPPs, unless all operators

52 TCRP op. cit., 23.

53 TCRP op. cit., 23.

54 TCRP op. cit., 23.

55 Oxley, P. addendum to "Appraisal of Overseas Programmes: European Experience", cited in "Transport Framework Policy Directions Project - Stage 2", National Accessible Transport Committee, 1995.

56 Vintila op. cit., 3.

57 TCRP op. cit., 17.

58 TCRP op. cit., 2

59 Benger, KA. "Evidence to HREOC Hearing", Adelaide, October 1994.

were required to meet the accessibility standard. If such a standard were made a condition of tenders, there would be either a substantial fare increase or an increase in subsidy payments.

In addition to increased subsidy payments, substantial costs would be incurred by Wellington City Council in providing accessible infrastructure, in the form of modified bus stops and footpaths. On the basis of Australian estimates, these would total $4.8 million.

5.5 Additional Revenue from Accessible Buses

Claims have been made that substantial patronage growth will result from the implementation of accessible bus services. Vintila estimates that the implementation of these services would "easily result in a 20% expansion of the market"[60] and that this growth would generate revenues that would more than cover the costs of implementing accessible bus transport.[61]

Estimates of wheelchair usage can be derived from comparative statistics from the United States. Table 3 summarises the key findings of three studies:

Table 3 Use of Accessible Buses by Wheelchair-bound Passengers

City	Population[62]	Passengers Monthly	Wheelchair Boardings Monthly	Percentage of Population	Percentage of Existing Passengers
New York	n/a	n/a	n/a	1.29%	n/a
Philadelphia	n/a	n/a	n/a	0.14%	n/a
Seattle	700000	n/a	8000	1.14%	n/a
Sacramento	300000	n/a	3300	1.10%	n/a
Austin	492000	2251378	4330	0.88%	0.19%
Champagne/ Urbana	99884	911347	1518	1.52%	0.17%
Eugene	407000	4947000	4700	1.15%	0.10%
Denver	484000	3500000	6500	1.34%	0.19%
Los Angeles	3490000	364000000	9200	0.26%	0.03%

Sources : New York and Philadelphia - Wendell Cox Consultancy (1994); Seattle and Sacramento - "Transport Systems for the Transport Disabled, Working Group Report, January 1995; and for Austin, Champagne-Urbana, Eugene, Denver and Los Angeles - Rosenbloom, S. "North American Policies and Practices", National Accessible Transport Committee, Transport Framework Policy Directions Project - Stage 1, Working Paper W: North American Policies and Experience.

With the exceptions of New York and Philadelphia, this data is drawn from cities that operate fully accessible bus systems and have a reputation for promoting use of the system by wheelchair users. There is a consistent rate of monthly ridership of either between 0.88 and 1.52% of population (excluding Los Angeles), and between 0.10 and 0.19% of ridership (again excluding Los Angeles). Caution must be exercised in translating these figures into the Wellington context, as the ridership expressed as a percentage of the population encompasses all modes (bus, light rail and rail). Thus, if wheelchair usage of public transport in Wellington followed the pattern in the United States, between 3200 and 5500 trips would be made

60 Vintila, op. cit., 3.

61 Ibid., 6.

62 Population statistics from "Statistical Abstracts of the United States, Annual Official Statistics Guide, 1992.

monthly on the rail and bus systems[63], and between 940 and 1800 trips per month on the bus system[64] .

It has been estimated that 1.1% of the population of New Zealand uses wheelchairs[65]. This is comparable to the Australian figures of between 0.5%[66] and 0.8%[67] of the population. Furthermore, the as the elderly population in New Zealand are disproportionately represented in the major cities[68], it is reasonable to assume that 1.0% of the population of Wellington are wheelchair users (3600 people). Given that only 2.4% of journeys in New Zealand are made by bus[69], a usage figure of 1800 passengers per month would assume a total mobility by wheelchair users of between 11 and 21 trips per person per month[70]. Given that wheelchair users have no history of using bus services, and given that the accessibility of the bus is only one barrier that a wheelchair user must overcome to use buses, it is unlikely that bus usage by wheelchair users would exceed the general level of bus usage in the community.

It is thus reasonable to assume that with the implementation of a fully accessible bus service in Wellington that patronage levels would reach the levels attained by similar systems in the United States. These levels of ridership would be reached by the year 2015, given a twenty year phase in period. It is the experience in the United States that patronage increases disproportionately as a greater proportion of the network is accessible[71]. Thus, patronage levels would approach the projected levels only as the greater part of the bus route network became accessible.

These low figures of usage can be confirmed from European sources. In Gothenberg (Sweden) wheelchair users make "negligible" use of the fully accessible "service routes" operated in the city[72]. A broad survey conducted by the International Union of Public Transport (UITP) found that the revenue impact of accessible buses and services was "insignificant"[73]

It can be seen from these figures that the revenue enhancement that will accrue from the introduction of accessible SLF buses will be negligible. The increase of between 940 and 1800 passengers per month will add a maximum of between 1 and 2% to patronage. As many of these passengers will be eligible for concession fares, the revenue impact will be between 0.5 and 1%. This contrasts with an operating cost increase of 14% (Section 5.4 above).\

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63 A range of 0.88% to 1.52% of the Wellington city population of 360000.

64 A range of between 0.10% and 0.19% of the current monthly bus ridership of 943000. This ridership figure was supplied verbally by Wellington City Transport in May 1995.

65 "Transport Systems for the Transport Disadvantaged", Working Group Report, 1995, 58.

66 Australian Bureau of Statistics, "Disability, Ageing and Carers Australia, Summary of Findings", Cat. No. 4430.0, 1993.

67 Street, Ryan and Associates with assistance from Travers Morgan Pty Ltd., "Accessible Transport for People with Disabilities, An Action Plan for Victoria", 1988.

68 "Transport Systems for the Transport Disadvantaged", op. cit., 19.

69 Ibid., 23.

70 Assuring that between 940 and 1800 trips represents 2.4% of the total journeys made by 3600 wheelchair users per month in Wellington.

71 Rosenbloom, S. "North American Policies and Practices", National Accessible Transport Committee, Transport Framework Policy Directions Project - Stage 1, Working Paper W: North American Policies and Experience.

72 Stahl, A. and Forsberg, S., "Service Routes in Boras", Boras Lokaltrafik AB, 1988.

73 Australian City Transit Association, "Review of Policy for Handicapped People Using Wheelchairs", UITP Conference, Sydney, 1993.

6. CONCLUSION

The debate on the accessibility of bus systems to the disabled centres on two contrasting approaches.

The first is to draw attention to the large and growing needs of disabled people in general to have access to regular public transport. This approach draws attention to the expense and the inappropriateness of meeting their needs with a "welfare based" transport system, and advocates that bus operators increase their efforts to adapt vehicles and operating methods to a growing market. This approach is exemplified in the DPTAC standards from the UK, which aim to address the difficulties created by a wide range of handicaps.

Most responsible bus operators would agree that insufficient attention has been paid to disabled passengers in the past, and the DPTAC standard has been voluntarily accepted by many commercial bus operators in both the UK and Australia. Wellington City Transport is the leader in responding to the needs of this group in New Zealand, and the MAN 11.190 buses currently being delivered have been carefully designed with the requirements of the broad disabled population in mind.

The second approach is to focus on one small group of disabled persons - wheelchair users - and require that their needs take precedence over all existing passengers, including the 90% of disabled that are not wheelchair users. Thee is no evidence that the adaptation of bus services to this group will lead to any significant increase in bus patronage. However, the radical redesign of bus bodies that is required to meet the needs of this group, will substantially reduce the seats available to other groups and will add inconvenience to all passengers in negotiating bus aisles. Furthermore, the substantial increases in bus operating costs will most likely be either passed on to existing bus users in form of higher fares; or recouped through poorer service levels; or avoided through the non replacement of ageing and unsuitable buses currently in service. There can be no doubt that the impact of meeting the "rights" of wheelchair users will be to discriminate against members of all other group in the community that either use buses or support their operation through tax based subsidies.

Such an approach may have some justification if it could be shown that a substantial number of wheelchair users will make use of bus services. However, the existence of a wide range of barriers to wheelchair use that are external to the bus; the ongoing provision of door-to-door "paratransit" services; and the continued usage of existing informal transport arrangements; will make bus travel an unattractive option. The losses to all groups in the community through higher fares. ;lower service quality and less convenient buses will not be matched by equivalent benefits to wheelchair users. The only balancing item will be the existence of a new "right" of wheelchair users - a "right" that will be rarely exercised.

The appropriate response of public transport operators to the needs of the disabled is the concentration of scarce resources on the adaptation of conventional bus systems to meet the needs of ambulatory passengers. This approach is exemplified in the current fleet replacement policies of Wellington City Transport Ltd.

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