

Carriage of Mobility Scooters on Public Transport - Feasibility Study

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Executive Summary

1 MVA was commissioned by the Department for Transport's Mobility and Inclusion Unit to carry out research in order to ascertain whether the existing policy that 'mobility scooters are not suitable for public transport' remains appropriate. This study involved discussions with UK public transport operators and mobility scooter manufacturers and an international literature review.

2 The primary objectives of the research were to:

- establish in what circumstances it would be reasonable for transport operators to allow disabled people using some models of mobility scooter to use the wheelchair spaces or other suitable areas aboard transport vehicles or to permit the carrying of scooters as luggage;
- make any recommendations - if sufficient evidence is available - about changes to the Public Service Vehicles Accessibility Regulations 2000 (PSVAR) and Rail Vehicle Accessibility Regulations 1998 (RVAR) or other regulations; and
- provide research based evidence to inform guidance documents for mobility scooter users and the transport industry.

3 Discussions with mobility scooter manufacturers and suppliers indicated that four-wheeled mobility scooters are the most common form and are predominantly purchased for use in the built environment rather than for journeys that involve use on public transport. Of the most common models identified in this research, at least eight fit within the dimensions of the reference wheelchair which is used as a basis for the dimensions in the UK vehicle accessibility regulations.

4 It was apparent from feedback received from public transport operators that there is a degree of uncertainty whether to permit the carriage of mobility scooters and, if carriage is permitted, what - if any - restrictions should be imposed. Most light and heavy rail operators are content to carry mobility scooters that fall within the size of the reference wheelchair. However, some operators prohibit larger models due to their lack of manoeuvrability and sheer size. All train operating companies allow the carriage of folding mobility scooters as luggage. Most coach and bus operators do not accept unfolded mobility scooters based on health and safety considerations, while taxi drivers can use their own discretion. Many operators stated that there is not enough information regarding the risk associated with the carriage of mobility scooters and are waiting for guidance from the DfT prior to developing or amending a formal policy.

5 The review of other countries' regulations identified that very few have standards or policies covering the use of mobility scooters on public transport. Most European countries do not distinguish between mobility scooters and electric wheelchairs and therefore do not have separate regulations. There has been a lack of research on this topic, particularly in Europe and Asia. Canada, USA and Australia are the only countries identified to have regulations covering the use of mobility scooters on public transport and to have completed a number of studies.

6 The literature review identified few relevant studies for both light and heavy rail with respect to mobility scooters. Experience in the UK indicates that mobility scooters are currently being carried on tram systems without major incident. The only issue seems to be stability under emergency braking and concern by some operators about the amount of room larger models occupy. A number of train operating companies in the UK have undertaken trials with mobility scooters. The findings indicated that stability or securement is not a central concern. Manoeuvrability of most three- and four-wheel models with articulated wheels that have a triangular footprint (within specifications of the reference wheelchair) was considered satisfactory when navigating in the rail vehicles sampled. However, manoeuvrability of Class 3 four-wheeled models in particular can pose problems. The ability to board and alight safely where the gradient of a ramp exceeds 8 degrees, the safe angle recommended by DfT, was of concern to some operators.

7 A significant amount of research has been undertaken on buses and coaches regarding the transportation of mobility scooters. The majority is related to passive and active securement restraint systems on transit buses in North America. The US has adopted active restraint systems, whereas Canada has embraced both active and passive measures.

8 Evidence from Canada would suggest that the rear-facing protected position (passive approach) is a suitable securement measure for mobility scooters. Very few incidents involving injury using this position have been reported. However, stability (particularly of three-wheeled models) remains a concern. Other issues identified included the difficulty in adapting or developing a restraint system that is suitable for a variety of mobility aids and that the application of those systems can be time consuming and cumbersome with the number of straps and belts required. Passengers can also be reluctant to use such systems.

9 Few studies and little experience were available regarding the carriage of mobility scooters in taxis. Available documents indicate that mobility devices, particularly mobility scooters, cannot be fitted or safely secured in most taxis due to their dimensions or construction. In Australia, for example, it is recommended that passengers relocate and occupy a passenger seating position, with the mobility device secured separately.

10 An important finding of the research was the apparent lack of information on the topic. This could infer two points. Firstly, that the scope of research is new and there have been few studies undertaken elsewhere. This is most likely the case for Europe, but not North America where mobility scooters have been carried on public transport for the last 15 years. Secondly, that certain issues of interest such as the carriage of scooters as luggage, weight issues and safety of power systems have not provoked sufficient concern to warrant numerous research studies. Although it would be inappropriate to draw firm conclusions due to a lack of evidence, some weight should be given to this finding. However, based on the discussions with public transport operators in the UK and the results of the literature review, there is sufficient evidence to make sound recommendations on certain aspects concerning the carriage of mobility scooters on different modes of public transport. However, there are also clear gaps where further research is required.

11 Evidence from the research suggests that the regulated mobility scooters that are carried on public transport in the US (whose specifications are similar to the UK's reference wheelchair) have not caused significant issues for carriage on any mode of transport. In addition, it is clear from the trials undertaken by rail operators in the UK that mobility scooters that are within the envelope of the reference wheelchair can be accommodated by most classes of train, particularly those newer models that comply with RVAR. Therefore, mobility scooters that are within the following threshold (which are the same as reference wheelchair, although this does not include a weight criterion) should be considered for use on public transport services in the UK.

- Height - 1,350mm
- Length - 1,200mm
- Width - 700mm
- Weight (including occupant) - less than or equal to 300kg

12 In addition, the mobility scooter should have a maximum turning circle diameter of 1,500mm. Whilst we believe that all three- or articulated four- wheeled mobility scooters that fit the space envelope described above are sufficiently manoeuvrable to be carried, it is clear that some standard four-wheelers do not. We recommend that trials be undertaken to establish the maximum length and/or width that a standard four-wheeler must remain within in order to achieve the 1,500mm turning diameter.

13 The dimensions, weight and manoeuvrability of a mobility scooter that falls within this threshold should not pose significant problems for heavy and light rail stock regulated by RVAR. However, there is a need for testing to identify whether there are manoeuvrability constraints for carriage on

buses, coaches and older trains. With respect to ramps, the research did not identify any significant issues in relation to boarding and alighting, except for the gradient on certain ramps. Existing ramps, therefore, should safely accommodate the recommended mobility scooters for carriage on regulated bus, coach and rail vehicles. There is insufficient evidence to take a view on the safe use of mobility scooters in taxis at this point.

14 The difficulty when drawing conclusions on the stability of mobility scooters lies with the fact that larger four-wheeled modes are more stable but less manoeuvrable, while the opposite is true for three-wheeled models. Experience from North American operators suggests there are concerns over the stability of three-wheel models on buses and coaches. All instances identified where tipping occurred involved three-wheeled models. There is a need, therefore, for more research on the risks associated with tipping on buses and coaches and the implications for securement. It may be more appropriate for the passenger to transfer to a seat as recommended in some provinces in Canada.

15 There do not appear to be any issues associated with stability for heavy rail. However, for light rail, there is a case for possible testing to understand the relationship between stability and securement under emergency braking conditions, although the results of the bus and coach trials could be carried over here. The research did not yield sufficient evidence to suggest that stability should prevent the carriage of mobility scooters in taxis. It is recommended, however, that a passenger transfers from the mobility scooter into a passenger seat and the device be secured or stowed separately. There is a case for trials to investigate whether the securement measures in place for wheelchairs are suitable for mobility scooters that achieve the size, weight and maneuverability limits described earlier.

16 There is insufficient evidence from the research to conclude whether a mobility scooter would have difficulty accessing public transport facilities (such as toilets and buffet car). These issues should be included in any future trials.

17 Other recommendations based on the findings of this research include that mobility scooters permitted for carriage on public transport should only utilise a dry cell or gel battery. In addition, all modes of public transport should be able to accommodate the carriage of fold-up mobility scooters as luggage.

18 Although there is evidence from UK operators and examples of research from other countries, there are clear gaps identified in the research. These need to be understood before sound policy decisions can be made. There is a need for the DfT to undertake a second stage of this research in the form of practical trials of mobility scooters that adhere to the size, weight and maneuverability limits discussed earlier on different forms of public transport. It is recommended, at minimum, that the following issues should be covered in those trials:

- entering and exiting wheelchair-accessible taxis in order to ascertain the usability of the ramp and whether securement measures are satisfactory;
- manoeuvrability within buses, coaches and taxis in accessing the wheelchair space and (including light and heavy rail but not taxi) reaching wheelchair accessible facilities on board; and
- assess the risks associated with tipping on buses, coaches and light rail. Determine whether the rear facing securement position is suitable or whether (alternatively or in combination) an active restraint securement system is required; and identify the stability risk under emergency braking conditions for light rail and whether securement measures are required.

19 It is also recommended that complementary research on mobility scooter use on public transport be undertaken. It is suggested that in-depth interviews are undertaken with representatives from a number of public transport operators. By gauging different operators' experiences, it should provide a clearer picture of any issues identified in dealing with mobility scooters as well as an understanding of existing demand by mobility scooter users. In addition, involving mobility scooter users themselves in a series of focus groups could provide a picture of preferences and priorities for travelling on different forms of public transport. Such research could further inform policy decisions, for example by identifying what issues would be involved if passengers were required to transfer to a seat.

20 Based on the findings of this report it is also recommended that the DfT amend the rail vehicle and bus and coach accessibility regulations to widen the definition of the reference wheelchair to include 'mobility aids' such as mobility scooters. It is also recommended that, to assist transport operators, the DfT (subject to further research) issue a guidance document outlining which mobility scooters currently available in the UK are suitable for carriage on public transport vehicles.

1 Introduction

1.1 Introduction

1.1.1 This report presents the results of the research into the suitability of mobility scooters for carriage on public transport, conducted by MVA and commissioned by the Department for Transport (DfT). The findings are based on discussions with UK public transport operators and mobility scooter manufacturers and the results of an international literature review. The overall aim of the research was to:

- ascertain whether the existing policy that 'mobility scooters are not suitable for public transport' remains appropriate.

1.2 Background to Mobility Scooters and Public Transport in the UK

1.2.1 The Office of Population, Censuses and Surveys (OPCS) national surveys of disability in Great Britain found that 13.5 per cent - which amounted to approximately six million people - of the adult population living in private households had some degree of disablement. Although the survey was embarked on ten years ago, the trend of an ageing population continues and the number of disabled people is increasing. Of the six million people almost 70 per cent, or over four million, have mobility impairments. A very small proportion of the people with the severest forms of locomotion difficulties are effectively housebound but the great majority can manage to get out and about albeit often with difficulty.

1.2.2 Since such a large number suffer mobility limitations, the provision of appropriate forms of motorised transport is of prime importance to disabled and mobility impaired people. The Government has made significant improvements in the past ten to fifteen years making considerable progress in both the development of special services and schemes to assist travel by disabled people and in adaptation of mainstream transport to remove barriers to travel. However, some commentators believe that much remains to be done for the mobility impaired to be able to travel freely within a fully inclusive public transport system.

1.2.3 Government initiatives have increased opportunities for disabled people. These include disability legislation, which has opened up accessibility to the built environment and provided further education, employment and recreational opportunities. Furthermore, a desire of many elderly people to be more mobile and have adequate access to transport itself is also associated with an improved quality of life.

1.2.4 The desire to be more mobile has led to the growth in the number of people using mobility scooters. They have become an increasingly popular and effective way to alleviate the impact of mobility limitations for many people in the UK. They offer improved movement and independence and are often viewed as less stigmatising than a conventional or powered wheelchair. Allowing mobility scooters on public transport could potentially improve the livelihoods of thousands of people in the UK and play an important role in maintaining independent mobility.

1.3 Types of Mobility Scooters

1.3.1 There are two main classes of mobility scooter: Class 2 mobility scooters can legally travel up to 6.4kph (4mph) on pavements and are allowed on the road to cross from one side of the road to the other. Within the category of Class 2 scooters some are more suited to indoor use as they are smaller and more compact. Class 3 mobility scooters generally have features similar to Class 2 mobility scooters, but tend to be larger and can be used on the roads where they can travel up to 12.8kph (8mph). Class 3 vehicle users do not require a driving licence but should obey the Highway Code at all times. This includes complying with relevant eyesight requirements and not driving under the

influence of alcohol, drugs etc. Class 3 mobility scooters are not allowed on motorways, bicycle tracks or bus/cycle lanes. Although legally allowed on dual carriageways, this is not recommended¹.

1.3.2 There are numerous models of mobility scooter currently on the market. There are three-wheeled models which are the most manoeuvrable and are ideal for riders who must operate in tight spaces. Their small turning radii allow for turns that most four-wheeled mobility scooters cannot achieve. Four-wheeled models are predominantly designed for stability and have less manoeuvrability. Many of the smaller Class 2 models can also fold-up easily to help individuals take mobility scooters when travelling². The following figure demonstrates some of the different classes and models currently on the market.

Figure 1.1 Different Classes and Models of Mobility Scooters

Class 2 (Articulated) Scooter



Class 2 (3 wheels) Scooter

¹ The Disabled Living Foundation (DLF), who assist people to find the most appropriate mobility device provides a useful summary of the components of a mobility scooter and is available from the following link: http://www.dlf.org.uk/factsheets/pdf/Choosing_a_scooter_or_buggy.pdf

² A detailed description of the make-up of individual components for a mobility scooter can be found at the following link: <http://www.themedsupplyguide.com/mobility-scooters/>



Class 3 (4 wheels) Scooter



Class 2 (4 wheels) Scooter



1.4 Existing Regulations

1.4.1 A recent report commissioned by DfT and undertaken by Transport & Travel Research Ltd (TTR)³ notes that in spite of being mechanically propelled, powered wheelchairs and mobility scooters are not regarded as being motor vehicles for the purposes of Road Traffic legislation. However, both classes of mobility scooter should comply with the requirements specified in the Road Vehicles Lighting Regulation 1984, as if a motor vehicle within the meaning of the Road Traffic Act 1972. An "invalid carriage" in this case having a maximum speed not exceeding 4mph is required by these regulations to be fitted with lamps and reflectors only when it is used on the carriageway of a road between sunset and sunrise, otherwise than for the sole purpose of crossing it. Furthermore, a four-wheeled Class 3 vehicle, or any other vehicle having a maximum speed not exceeding 25 mph, when being driven on a dual-carriageway road, must have at least one amber flashing beacon, unless the vehicle is on the road for the sole purpose of crossing it. The Road Vehicle Lighting Regulations 1989 introduced the requirement for an invalid carriage which can exceed 4 mph to be fitted with direction indicators and a hazard warning signal device.

1.4.2 Users are exempt, when using a powered wheelchair or mobility scooter on the road, from many of the obligations of other road users. The Chronically Sick and Disabled Persons Act 1970 restricts both Class 2 and Class 3 vehicles to single occupancy, but there are no regulations that govern the use of powered wheelchairs and scooters off the highway. In addition, there are no regulations governing the use of mobility scooters on public transport.

1.4.3 The TTR research further identifies that manufacturers of wheelchairs must adhere to the Essential Requirements of the Medical Devices Regulations 2002. Most manufacturers test their products in line with the British Standard BS EN 12184 "Electrically powered wheelchairs, scooters and their chargers: requirements and test methods" 1999. There are also regulations in place that refer to the design of, and material used for, any windscreen on vehicles, and minimum braking efficiency and gradient climbing requirements. The EU Medical Devices Directive 93/42/EEC, which came into force in June 1998, is also relevant. The Directive is designed to create a single market in medical devices by harmonising the essential safety requirements for these products. The Medical Device Regulations 2002 (SI 2002 No.619) bring the requirements of this Directive into force in the UK. The regulations have replaced the UK's voluntary manufacturer registration scheme and product approvals for ophthalmic appliances, instruments and equipment. The "CE mark" is the symbol used by manufacturers to show that a medical device meets the 'Essential Requirements' of the Regulations and that it is fit for its intended purpose.

1.4.4 The Medicines and Healthcare products Regulatory Agency (MHRA) is designated as the 'Competent Authority' in the UK for ensuring that the Directives are followed. The MHRA has the power to take action against manufacturers through the Courts. The MHRA presides over a vigilance and notification system, and monitors the extent to which devices, including powered wheelchairs and mobility scooters, continue to be appropriate and safe for use. The MHRA has undertaken some work in the area of mobility aids and has produced a guidance document⁴ which clearly states that mobility scooters should not be occupied while being transported.

³ Department for Transport. Review of Class 2 and Class 3 Powered Wheelchairs and Powered Scooters (Invalid Carriages). Transport and Travel Research Ltd, April 2005 - Paragraph 3.7.1

⁴ Guidance on the Safe Transportation of Wheelchairs, MHRA, Department of Health, March 2004. The full document can be viewed at the following link:
http://www.mhra.gov.uk/home/idcplg?IdcService=SS_GET_PAGE&useSecondary=true&ssDocName=CON007306&ssTargetNodeId=572

1.5 Mobility Scooters and Public Transport

1.5.1 Although mobility scooters are aimed at enhancing the quality of life for older and disabled people, the majority are not designed for use on the public transport network. They are designed to provide outdoor mobility as an alternative to other forms of private and public transport. They are primarily designed to be used on pavements and roads and are not designed to be carried on public transport vehicles. As a result they can be large, heavy and/or difficult to manoeuvre, and cannot easily be transported in vehicles. This view is shared by experiences of transport operators in the UK. Therefore, the DfT's current view, based on the experiences of operators, is that mobility scooters are not suitable for carriage on public transport.

1.5.2 However, improvements in scooter design have led to models that are comparable - in terms of weight, size and stability - to the reference wheelchair which is used as a basis for current public transport guidance and accessibility legislation. The dimensions of the reference wheelchair were derived from an International Standard on wheelchair dimensions (ISO 7193). The following figure provides the height, width and length specifications for the reference wheelchair.

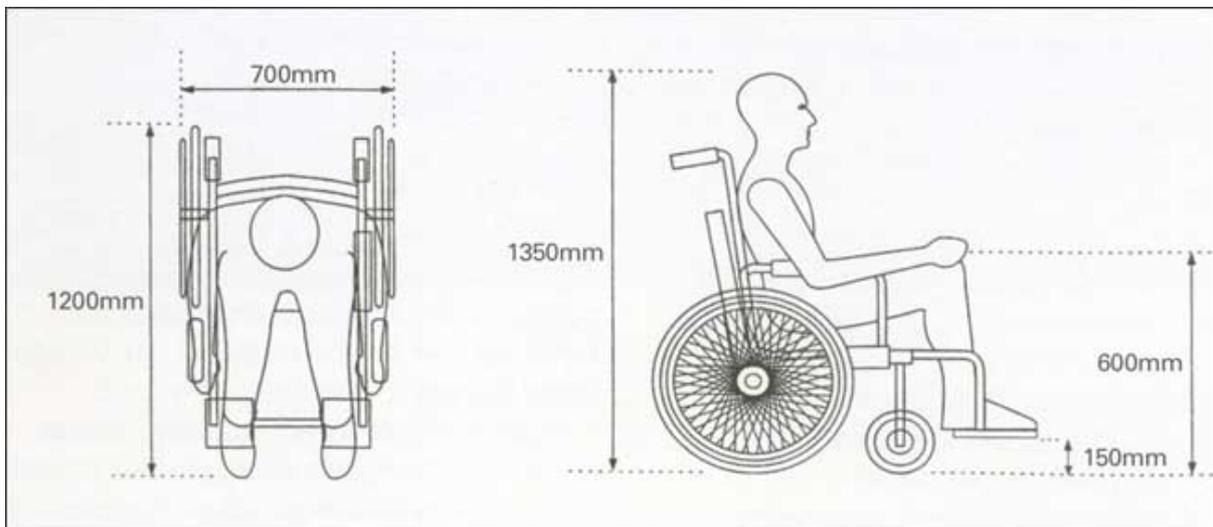


Figure 1.2 Reference Wheelchair Dimensions

Source: Rail Vehicle Accessibility Regulations 1998 (RVAR)

1.5.3 In the UK some rail, tram, taxi and coach operators now allow certain models on their services. However, there is no consistent policy amongst the various forms of public transport. This inconsistency is based both on physical differences between the types of public transport and on the variation and the number of different scooter models that are on the market. Although some models are becoming smaller and more manoeuvrable, others are becoming larger and heavier to accommodate larger users and those who want a mobility scooter with a greater distance range.

1.6 Transport Policy to Assist Passengers with Disabilities

1.6.1 In the last 10 years a number of national policies have been implemented by the Government to assist disabled people travelling on public transport. Part 3 of the Disability Discrimination Act 1995 (DDA 1995) gives disabled people a "right of access" to goods, facilities and services. Transport infrastructure, such as stations and airports, is already covered by these provisions but there is a specific exemption for any service "so far as it consists of the use of any means of transport".

1.6.2 The Disability Discrimination Act 2005 (DDA 2005) replaced that exemption with a more precise exclusion consisting of the provision and use of a vehicle included a power to enable regulations to be made allowing the provisions of Part 3 to be applied in whole or in part to different transport vehicles at different times. The Disability Discrimination (Transport Vehicles) Regulations 2005 will extend Part 3 to rail vehicles, buses, coaches, private hire vehicles, taxis, rental vehicles, breakdown services and vehicles used on leisure and tourism transport services.

1.6.3 The Regulations will come into force on 4 December 2006 and, from that date, it will be unlawful for a transport service provider to discriminate against a disabled person, treat disabled people less favourably or fail to make a reasonable adjustment. The duty to make physical adjustments will not be applied to transport service providers, except in the case of vehicle hire where this will ensure that disabled people are able to use these services more easily, as this would cut across the specific provisions of Part 5 of the DDA 1995 which enable separate accessibility regulations to be made ensuring that disabled people are able to access rail vehicles, buses, coaches and taxis.

1.6.4 Since 1 January 1999 all new rail vehicles have been subject to the Rail Vehicle Accessibility Regulations 1998 (RVAR)⁵. Regulation 15 of the RVAR ensures that trains, trams and other rail systems provide at least one wheelchair space, the number required depending on the number of vehicles in that unit. Regulation 16 sets out the dimensions for each wheelchair space, which is designed to accommodate the "reference" wheelchair defined in the RVAR. The DDA 2005 requires that all rail vehicles will have to comply with RVAR (or seek an exemption) by no later than 1 January 2020.

1.6.5 Similarly, since 31 December 2000, all new buses and coaches with a carrying capacity exceeding 22 passengers and used on a scheduled or local service have been subject to the Public Service Vehicles Accessibility Regulations 2000 (PSVAR)⁶. These regulations have required all new full-size buses to be wheelchair accessible since that date, and all new coaches and smaller buses to be accessible to wheelchair users from 1 January 2005. All buses and coaches meeting the above criteria will be required to comply with the PSVAR by 1 January 2020 (the end dates vary, with all full size single deck buses being compliant from 1 January 2016 and all full size double deck buses from 1 January 2017).

1.6.6 Neither the RVAR nor the PSVAR define a wheelchair for the purposes of the regulations and there is no requirement for regulated vehicles to carry mobility scooters.

1.6.7 Although regulations for taxis have yet to be introduced under Part 5, a number of licensing authorities across the country have introduced local requirements for accessible taxis (known as "mandatory policies"). The Public Carriage Office, which is responsible for licensing all taxis in London, has required vehicles to be wheelchair accessible since 1 January 2000.

1.6.8 In addition to the DfT's policy that mobility scooters are not suitable for carriage on public transport the Medical and Healthcare Products Regulatory Agency have issued advice that such mobility aids should not be occupied while they are being transported. Mobility scooters themselves are also subject to Section 20 of the Chronically Sick and Disabled Persons Act 1970 and the Use of Invalid Carriages on Highways Regulations 1988. These regulations make provision for three classes of invalid carriage, set conditions for their use, and lay out various requirements with which they must comply.

⁵ The RVAR can be viewed at the following link:
http://www.dft.gov.uk/stellent/groups/dft_mobility/documents/page/dft_mobility_503304.hcsp

⁶ The PSVAR can be viewed at the following link:
http://www.dft.gov.uk/stellent/groups/dft_mobility/documents/page/dft_mobility_503298.hcsp

1.7 Research Objectives

1.7.1 The primary objectives of the research were to:

- establish in what circumstances it would be reasonable for transport operators to allow disabled people using some models of mobility scooter to use the wheelchair spaces or other suitable areas aboard transport vehicles or to permit the carrying of scooters as luggage;
- make any recommendations - if sufficient evidence is available - about changes to the PSVAR and RVAR or other regulations; and
- provide research based evidence to inform guidance documents for scooter users and the transport industry.

1.8 Research Approach in Brief

1.8.1 The research approach involved three key phases. The first, development of a database of the most popular mobility scooter models in the UK, was designed to collate information such as: make, model, number of wheels, maximum user weight, length, width, battery type, maximum speed and safe climbing angle. This information would assist in making comparisons between international and UK models and also to compare the dimensions of various scooter models to that of the reference wheelchair (see Figure 1.2). This was achieved by contacting various scooter manufacturers and suppliers.

1.8.2 The second phase involved talking to public transport operators in the UK to identify what their existing policies, if any, are for the carriage of mobility scooters.

1.8.3 The final phase of the research included an analysis of international and domestic literature. This involved researching and identifying various electronic media, print media and grey literature⁷ to identify other nations' regulations and policies, and previous research on the use of mobility scooters on public transport.

1.9 Structure of Report

1.9.1 This report is divided into the following sections:

- Chapter Two outlines the methodology employed for undertaking the research.
- Chapter Three provides a summary of the different types of mobility scooter in the UK and the most common models purchased.
- Chapter Four identifies the key UK public transport providers' policies on the carriage of mobility scooters.
- Chapter Five summarises other countries' policies regarding the carriage of mobility scooters outlining any restrictions imposed.
- Chapter Six provides examples of studies identified in the literature review covering the carriage of mobility scooters for heavy and light rail. This chapter also includes a summary of trials undertaken by various train operating companies in the UK.
- Chapter Seven presents examples of experiences of the carriage of mobility scooters on buses and coaches.

⁷ Grey literature can include published works such as internal company documents, doctoral dissertations, master's theses, and conference proceedings and other documentation that is not usually available through published journals and official Government and Non-Government Organisation reports.

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- Chapter Eight looks at mobility scooter use on taxis.
- Chapter Nine draws together the findings of the literature review and provides recommendations and possible next steps to extend the research.

2 Methodology

2.1 Mobility Scooter Typology

2.1.1 Prior to undertaking the literature review, mobility scooter manufacturers and suppliers were contacted to establish a typology of the most common mobility scooter models⁸. For each model key information was obtained. This included: dimensions, weight, battery type, manoeuvrability (turning circle) etc. The typology provided an up- to-date database of mobility scooters in the UK and assisted in making comparisons with other UK and international models and also enabled comparisons with the 'reference wheelchair'.

2.2 Review of Policies and Practices of Key Countries

2.2.1 To prevent duplication it is important to learn from other countries' experiences. As a first step it was important to outline other countries' regulations, policies, and standards for the carriage of mobility scooters on public transport.

2.2.2 It was not feasible within the timescale of the research to identify and outline all countries' policies and regulations in relation to the use of mobility scooters on different forms of public transport. The research, therefore, sought to identify the various national regulations and policies for the following core countries: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Japan, Netherlands, Norway, USA, Singapore, Sweden, and Switzerland.

2.2.3 As the research involved an international element, MVA drew on the resources of its offices in Europe. Moreover, members of the study team had French and German language capabilities.

2.3 UK Public Transport Policies

2.3.1 The DfT's brief made reference to the fact that some public transport operators currently allow mobility scooters on their vehicles despite there being no government requirement. In addition, some train operating companies (TOCs) - South West Trains, Central Trains, Virgin Trains, First North Western (now operating as part of Northern Trains) - had undertaken their own trials which have informed their own policies.

2.3.2 It was not practicable to contact every public transport operator in the UK to identify their existing policy (especially in the taxi and bus sectors). Therefore, each of the above TOCs was contacted and information pertaining to their trials was obtained. Meanwhile, a list of 25 significant public transport operators - covering light rail, bus, coach, underground rail and taxi - was agreed with the DfT and contact established. Additionally, organisations such as the Association of Train Operating Companies, Public Carriage Office, National Taxi Association, Light Rail Association and the European Conference of Ministers of Transport's Group on Access and Inclusion were also approached to gauge their opinions on the subject.

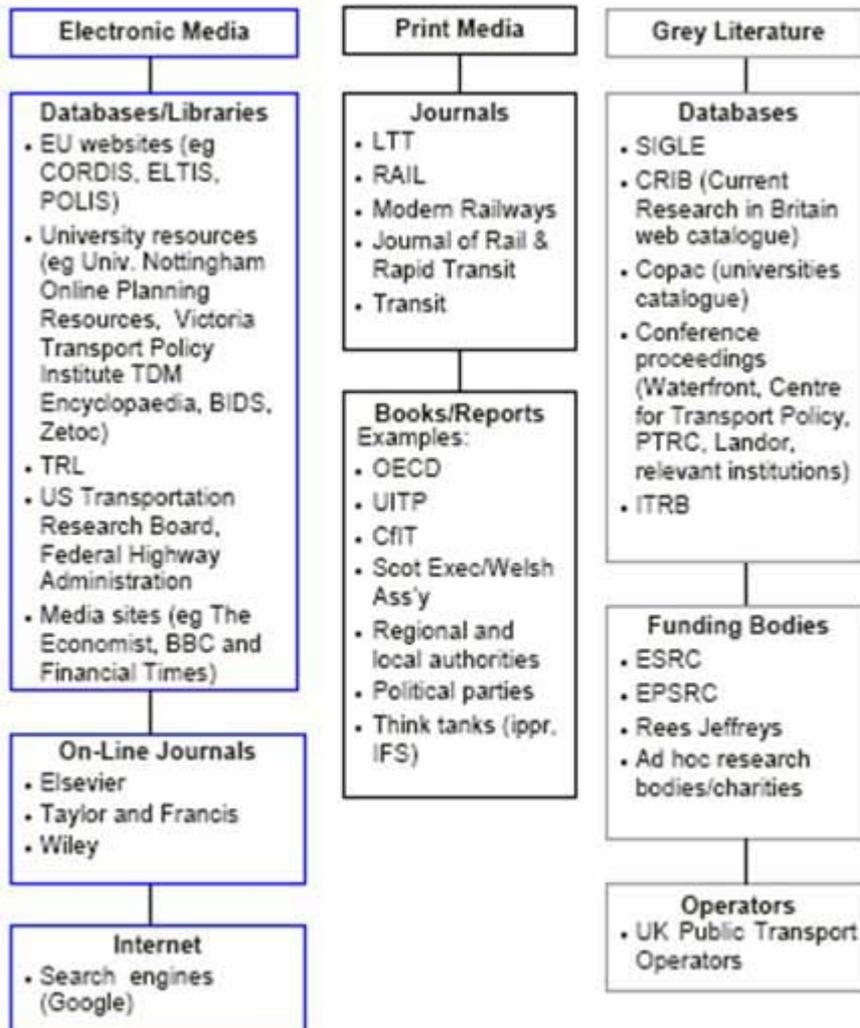
2.3.3 Each operator or organisation was asked to identify whether they have a policy for mobility scooters and, if so, provide details of any restrictions. If no policy existed, the company/organisation was asked to provide details on whether mobility scooters are permitted for travel and whether restrictions are imposed. The approach yielded fifteen responses, representing a 60 per cent response rate, and provided a general indication of the existing policies and experiences in the UK. A complete list of those contacted is available in Appendix A.

⁸ Manufacturers and suppliers were asked to identify the most commonly sold models in the last 3 years.

2.4 Literature Review Methods

2.4.1 The main element of research was a domestic and international literature review. The review utilised three search strategies, as shown in Figure 2.1.

Figure 2.1 - Search Strategy



2.4.2 The research involved searching various electronic media, print media and grey literature. Within each of these categories various sources were searched either successfully or unsuccessfully. A full list of sources searched is available in Appendix B.

On-line and Database Searches

2.4.3 There were a number of on-line resources that were used to identify useful material. Moreover, the study team had access to the academic databases available to Imperial College. The involvement of Imperial College in the research also provided access to the universities bibliographical services and lists of current and on-going academic research (grey literature).

2.4.4 The most prominent transportation database is the International Transportation Research Documentation (ITRD) database which reflects the transport research literature of 23 countries including many European countries, Australia, Latin America, Canada, China, and Japan. It also includes abstracts of transport literature published by other organisations/associations such as the US

Transportation Research Board (TRB), the European Conference of Ministers of Transport (ECMT) and the World Road Association (PIARC). As this database includes much of the print media and other transport databases that were going to be searched it was decided that, in first instance, a search of this database would provide an indication of how much research had been carried out. The search on the ITRD database provided 27 responses, of which less than half were relevant to the study.

2.4.5 Other key databases also searched included TransportDatabase (US), National Transportation Library (US), Transport Research Information Services - Online (US), Canadian Surface Transportation (Canada), Trans Guide (Sweden), CORDIS (EU), ELTIS (EU) and Australian Transport Index (Australasia).

2.4.6 Internet searches provided a number of relevant sites and sources of information. Google (specifically scholar Google) was useful to identify relevant reports and research. Keywords such as 'mobility scooter' led to many direct hits. Furthermore, other key words such as 'mobility devices' and 'disability and transport' also yielded many more hits.

2.4.7 Imperial College took the lead in searching academic and professional databases and journals (both on-line and hard copy). If a paper, report or publication was not available electronically every attempt was made to obtain a hard copy of the research. Where items were unable to be located or purchased, the DfT library was used as a last resort. There were a number of reports from the US and Canada that were not available on-line nor through MVA or Imperial College's subscriptions. These were purchased direct from the relevant authority. A number of articles were also purchased from the following organisations: American Public Transportation Association; Canadian Urban Transit Association; TRANSED - Transport Canada; National Technical Information Service and ASCE Research Library. Some conference papers were no longer available and a limited number of papers proved impossible to source. However, most of these were published in the early 1990s and related to securement so this was not perceived to be an issue as more recent reports/studies on the same subject were available.

2.4.8 Researchers were encouraged to identify any issues that they considered relevant to the brief when attempting to source relevant studies. However, the specific elements identified for interest by the DfT included the following key themes:

- issues associated with boarding and alighting (including ramps and lifts);
- issues associated with level access without a boarding aid;
- dimension, manoeuvrability and weight issues;
- stability (occupied and unoccupied) and securement (use of restraint systems) during a journey;
- compatibility with transport infrastructure;
- safety of power systems such as batteries;
- access to public transport facilities (such as toilets, buffet car, conductor etc);
- emergency evacuation procedures/implications; and
- carriage of mobility scooters as luggage.

2.4.9 To clarify and complement the information obtained in the research and literature review, a number of discussions were held with representatives from UK public transport operators, the US Department of Transport, the Chief Officer of Accessible Transportation (Transport Canada) and representatives from academic institutions.

2.5 Accurate Recording of Information

2.5.1 In order to undertake an efficient literature review it was extremely important to avoid duplicate searches by different researchers. To ensure that this did not take place, all relevant information identified was logged and catalogued onto a database.

2.5.2 The database contained information such as the title of report/research, the author and organisation, publication date and a brief summary outlining the research and key findings.

2.6 Methodology Limitations

2.6.1 The methodology employed was successful in identifying relevant studies in the public transport and mobility scooter field. However, most of those obtained were sourced from the US, Canada and Australia. Although there was an abundance of research studies from Europe on wheelchair carriage on public transport, none identified in this research made reference to mobility scooters. It would not had been feasible in the scope of this research to include wheelchairs, but it is conceded that some studies outside of North America may have been missed if they made a small reference to mobility scooters, but were primarily a wheelchair study.

3 Mobility Scooter Typology

3.1 Mobility Scooter Use in the UK

3.1.1 Recent research undertaken by Transport and Travel Research (TTR) on behalf of the DfT indicated that the number of powered wheelchairs and mobility scooters in use in the UK is expected to increase substantially in the near future. This is partly due to the continuing trends of an ageing population and the centralisation of retail facilities in fewer, bigger - but accessible - outlets. The research noted that there is a consensus of opinion among people in the industry that there has been a recent "boom" in the supply of powered wheelchairs and mobility scooters in the UK. There is an increasing market for such vehicles among people who have difficulty with walking, or standing, for long periods, but who would not otherwise consider themselves to be disabled. In many cases, a mobility scooter is reportedly seen as being a convenient alternative to public transport, which is still considered by many to be inaccessible, or a replacement for the private car, for shorter distances, when the user no longer feels confident enough to drive. There is a growing realisation in the powered mobility aid industry that the market for mobility scooters is developing among older people and, in a more recent development, among people who are obese.

3.1.2 TTR's research estimated that there are approximately 90,000 powered wheelchair and mobility scooter users in the UK. This was derived from the basis of OPCS data on the percentage of disabled people and wheelchair users in the population, and 2001 Census data. It is acknowledged, however, that this estimate might err on the side of being conservative due to unrecorded second hand sales.

3.1.3 The study also outlined that in terms of the different types of powered vehicle in use, it appears that it is mobility scooters, particularly the Class 2 variety that is leading the overall increase in numbers. Generally, sales of mobility scooters currently exceed sales of powered wheelchairs in a ratio of 4:1; the market for mobility scooters in the UK is estimated to be 25,000 per year⁹.

3.2 Demand for Use of Mobility Scooters on Public Transport

3.2.1 The TTR Research found that mobility scooter users were keen to use their vehicle on public transport, but were uncertain about the physical accessibility of stations, stops and vehicles and felt that service providers would be reluctant to allow mobility scooters onto public transport vehicles. Another specific issue raised during the consultation process for the study was the ability to take a mobility scooter on public transport: it was felt that when purchasing mobility scooters, buyers should be told specifically if the proposed model is suitable for carriage on public transport and whether modifications could make the proposed mobility aid public transport friendly. Of the consultation carried out by TTR, only one participant indicated that they used their mobility scooter on public transport (a low floor bus).

3.2.2 The DfT has recognised that disabled people need to have access to information about the suitability of mobility equipment for use on public transport. They recently commissioned Ricability to produce the guidance document 'Wheels Within Wheels', which gives disabled people this information. The guidance states that scooters are currently not regarded as suitable for widespread use on public transport¹⁰.

⁹ This estimate is from the TTR (2005) research and is based on personal communication with the organisation Motability. The Motability Scheme was established to provide disabled people with safe, reliable and affordable cars, wheelchairs and scooters.

¹⁰ The Guidance document is available following link:
<http://www.ricability.org.uk/reports/pdfs/wheels%20within%20wheels2005.pdf>

3.2.3 To determine the most common mobility scooter models used in the UK and to gain an appreciation of the demand for mobility scooters that might potentially be carried on public transport, various suppliers and manufacturers were contacted. These included:

- Scootermart;
- AJM Shopping;
- Pride Mobility;
- Factory Outlet Scooters;
- Fair Price Mobility Scooters;
- A1 Mobility; and
- Scooter Direct.

3.2.4 Each contact provided examples of the most common models, which have been summarised in Table 3.1. Where possible, the table highlights key information such as: make, model, number of wheels, maximum user weight, length, width, battery type, max speed, and safe climbing angle. From the discussions with suppliers for this research it appears that four-wheeled mobility scooters are the most common and that there is an even mix of Class 2 and 3 type mobility scooters. This indicates that mobility scooters are most likely being purchased in the first instance for the built environment to be used outdoors, rather than for journeys that involve use on public transport. It is also interesting to note that when comparing the different models to the reference wheelchair all are lower in height, all but one is less wide and eight are shorter in length than the reference wheelchair. Therefore, there are at least eight popular selling models that fit within the dimensions of the reference wheelchair¹¹.

3.2.5 The RVAR regulations state that manufacturers must ensure that there is sufficient clear space next to the wheelchair space to allow the reference wheelchair to make a 180 degree turn. The regulations also state that most people who use a wheelchair should be able to turn in a full circle with a diameter of 1,500mm. However, it notes wherever possible, manufacturers should provide a turning circle of 1,700mm. Of the common mobility scooters identified by the suppliers and where turning circle information were available, eight of the twelve are within 1,500mm, while all have a turning circle within 1,700mm.

3.2.6 The PSVAR regulations state that wheelchairs that are larger than the reference wheelchair and mobility scooters are not suitable for use on public transport. The requirements state that there must be a space for a wheelchair with suitable safety provisions. The space shall be not less than 1,300mm measured in the longitudinal plane of the vehicle; 750mm measured in the transverse plane of the vehicle; and 1,500mm measured vertically from any part of the floor of the wheelchair space. Unlike the RVAR there is no requirement for a turning circle although the PSVAR does require that a gangway should allow a reference wheelchair to move both from an entrance to the wheelchair space, and from the wheelchair space to an exit in a forward facing direction, thereby requiring a minimum area in which to perform a 180 degree turn.

3.2.7 Although it is recognised that this research is based on a small sample size it seems that it is likely that most mobility scooters are purchased for the built environment for the reasons discussed above. This was confirmed by some suppliers who indicated that they had rarely been asked whether a particular model was suitable for public transport.

¹¹ These results are contradictory to a study by TRL (1999) which indicated that mobility scooters taken from a sample were larger and wider than the reference wheelchair. In addition, the information provided by suppliers is not consistent with the TTR (2005) research which indicated an increase in Class 2 models.

Table 3.1 The Most Common Recently Sold Mobility Scooters (download)

4 UK Public Transport Operators' Policies

4.1 Introduction

4.1.1 Although the existing national policy is that mobility scooters are not suitable for carriage on public transport, there have been instances where mobility scooters have travelled freely on various forms of public transport.

4.1.2 In order to ascertain current policies towards the carriage of mobility scooters a number of public transport operators - covering light rail, bus, coach, underground rail and taxi - were contacted. The research did not include heavy rail as the Association of Train Companies had provided its policy document on this matter. Other relevant organisations such as the Public Carriage Office, National Taxi Association and the Light Rail Association were also contacted in order to gauge their opinions on the subject. Of the 25 approached, 15 responses were received which provided a general indication of the existing policies and experiences in the UK.

4.2 Heavy Rail

4.2.1 The accessibility regulations do not require train operating companies to carry scooters and, until recently, the majority would not carry such equipment because of concerns about size, manoeuvrability and/or stability. However, scooter design and technology is continuing to develop and smaller, lighter and more manoeuvrable scooters are now available and battery design has improved significantly. In the light of these developments, all train operators will now accept lightweight scooters, which can be folded and carried on board as luggage. The final decision on whether to carry a mobility scooter on a train rests with individual train operating companies as they are best placed to take into account the rolling stock they use and local conditions when making their decision.



4.2.2 The Association of Train Operating Companies (ATOC) established a "Scooter Group" with the objective of trying to create a nationwide policy for the rail network. Some TOCs have carried out rudimentary trials to establish the safety of driving various mobility scooter models on to the different trains they operate, and manoeuvring them into the wheelchair space. In light of the trials and the increased demand by passengers to use mobility scooters, ATOC has published a working policy and

individual requirements for each TOC with respect to the carriage of mobility scooters¹². This document can be seen in Appendix C.

4.2.3 The general policy states that train companies welcome disabled passengers and accommodate mobility scooters powered by sealed batteries where possible and all folding mobility scooters can be carried on board as luggage. However, the policy notes that it is not possible for all mobility scooters to be taken on every train because the dimensions of both the mobility scooters and train interiors differ.

4.2.4 The policy states that most trains can accommodate manual and powered wheelchairs up to a maximum width of 670mm and 1,200mm long (including footplates). However, if the mobility scooter or wheelchair is larger, then the relevant train company needs to be contacted to decide whether it will be allowed access to the train. The policy also states that the loaded weight of a mobility scooter should not be more than 230kg/36.2stone. This is the maximum weight that older ramps can safely accommodate. These limits are lower compared to those required by RVAR, but this reflects the need for the policy to include the capabilities of older units.

4.2.5 When analysing the individual TOC policies; of the 24 TOCS, 13 state that they will carry mobility scooters that are within the dimensions of the 'reference wheelchair'. A further two TOCs (ARRIVA Trains Wales and South West Trains) will consider the carriage of mobility scooters once the user has contacted the appropriate train company to discuss individual mobility scooter model specifications and a permit is issued. Another two TOCs (Central Trains and Hull Trains) will carry mobility scooters, but have slightly different length and width limits. The remaining seven TOCs will only allow mobility scooters that can be folded and taken on as luggage.

4.2.6 The general ATOC policy also identifies various safety rules which passengers are asked to adhere to. It asks users to:

- lower the speed of your mobility scooter to a brisk walking pace; make sure you stay clear of the platform edge until the train has come to a complete stand at the station;
- unload any bags/shopping etc. from the mobility scooter, as this can cause the mobility scooter to tip when going up/down ramps;
- if you have a folding mobility scooter, ensure that you are able to carry it without staff assistance when boarding and alighting from trains. Staff may not be available to help at many locations;
- many stations have limited level access. Please make enquiries with the relevant train company before travelling;
- before making any journey for the first time, contact the relevant train company to check what is possible on your chosen route; and
- follow staff instructions at all times.

4.3 Light Rail

Midland Metro

4.3.1 Promoted by Centro and the West Midlands Passenger Transport Authority, the £145 million Midland Metro opened in the summer of 1999. The Midland Metro route stretches 20.13 kilometres from Birmingham Snow Hill to Wolverhampton St George's and runs, in the main, along an old Great Western Railway route. The system offers level boarding resulting in access for disabled people,

¹² The most recent policy can be viewed at the following link:

http://www.nationalrail.co.uk/passenger_services/disabled_passengers/scooters.htm

parents with baby buggies and Senior Citizens. Each tram has 56 seats, can carry up to 208 passengers and has two dedicated wheelchair spaces.

4.3.2 Although it does not possess a formal policy, Midland Metro has nevertheless allowed carriage of mobility scooters for the past five years. Recently, however, there have been a number of incidents involving both three- and four-wheeled models where mobility scooters have tipped during travel which have resulted in a risk assessment being undertaken. The main problem identified is that when emergency brakes have been applied there have been examples where both three and four-wheeled models have tipped due to their high centre of gravity. In addition, the larger models park in front of the doors, especially when it is busy, which imposes a further safety concern.

4.3.3 Midland Metro has recently adopted an informal policy of advising staff not to allow the larger models on the trams due to safety concerns. However, Midland Metro is concerned that there will be repercussions of this decision from passengers and local councilors as it is a change in policy direction.

Croydon Tramlink

4.3.4 London Trams is responsible for managing the way tram services are provided in Croydon. The line is largely on a east-west axis through a central loop around Croydon. It supports on average 22 million passengers a year over a 28km (18.5 mile) tramway system.

4.3.5 Tramlink has been designed to be fully accessible to disabled passengers. All tram stops feature step-free access. At Wimbledon Station there are passenger lifts to provide connections to other rail services as well as to and from street level. To assist blind and partially sighted passengers, each stop has a tactile strip along its entire length, a safe distance from the platform edge.

4.3.6 The design of the tram makes special provision for disabled passengers. Wheelchair users can easily wheel on and off the trams and there is a space for them to travel in each section of the tram. Next to the wheelchair space is a specially sited intercom to speak to the driver in an emergency, and an easy reach stop request button. All doors have an opening button on them at an accessible height.

4.3.7 Croydon Tramlink does not have a formal policy regarding the carriage of mobility scooters. However, mobility scooters that are electrically powered are permitted on-board, but not fuel powered mobility scooters due to health and safety considerations.

Stagecoach Supertram

4.3.8 Stagecoach Supertram serves the city of Sheffield with three light rail routes covering 29km (50 per cent of the system is on street running with mixed traffic). The tram network links five park and ride sites with the city centre and provides access to the rail station, shopping areas, both of Sheffield's universities, the Cathedral, sports arenas and other entertainment venues.

4.3.9 Pedestrian access to tram-stops has been intensively researched to ensure maximum ease of access irrespective of passenger disabilities. Ergonomic studies have informed the layout features of the stops including two new types of tactile paving to locate the tram doors and define the platform edge, shallow approach ramps and differential coloured paving to indicate safe and unsafe areas. This has set the standard tram-stop layout to be adopted throughout the system but has created slight specific problems on-street due to lack of road width or adverse impacts on the threshold of adjacent premises. In these cases specific solutions, such as lowering the highway rather than building up the platform on the foot-way, have been adopted.

4.3.10 Although mobility scooters can be carried on Stagecoach Supertram, this is not documented in a formal policy. On-board conductors use their discretion to refuse entry based on the size or suitability of a mobility scooter that is being used on the system. The factors that can influence the decision include the physical size of the mobility scooter, the number of passengers already on board and the number of passengers expected to board. Staff are trained to offer guidance to mobility scooter users as to the safest position and area to park.

Tyne and Wear Metro

4.3.11 Nexus is the Tyne and Wear Passenger Transport Executive and administers funds on behalf of the Tyne and Wear Passenger Transport Authority. The Tyne and Wear Metro is the backbone of the area's public transport network and supports 40 million journeys a year. Metro operates over 77km of route serving 58 stations. It was designed and built to be accessible to disabled passengers.

4.3.12 Tyne and Wear Metro state in its Disabled People's Protection Policy (DPPP) that mobility scooters that are within the overall dimensions of 1,400mm long and 700mm wide are permitted so long as they do not have a rain cover. However, mobility scooter users are encouraged to contact the station beforehand as boarding assistance is not provided except in exceptional circumstances. Passengers can sit on their mobility scooter during their journey.

4.4 London Underground Limited (LUL)

4.4.1 London Underground is a major business, with over 3 million passenger journeys a day with 500 peak trains serving 275 stations. Many people cannot use the London Underground because they are unable to access the stations and trains. This is largely due to the age of the network, which was designed at a time when access for all was not an issue. However, there is a strategy 'Unlocking London for All: our plans for a more accessible Underground network' which sets out plans to improve and modernise the system to make it accessible.

4.4.2 It covers more than facilities for wheelchair users; many groups of customers or potential customers will benefit:

- those who are permanently mobility impaired due to physical, mental or sensory disabilities;
- those with temporary disabilities;
- frail older people;
- those travelling with luggage or heavy shopping; and
- those accompanying young children.

4.4.3 There is no formal policy regarding the carriage of mobility scooters, although LUL are considering introducing one. However, at present, mobility scooters are allowed on the system without restrictions at stations where there is step free access.

4.5 Bus

Stagecoach Group

4.5.1 Stagecoach (which also includes Megabus and Oxford Tube) runs a fleet of around 8,000 buses and coaches which connect to 100 towns and cities in the UK. Two million passengers travel on Stagecoach services every day, using a network stretching from Devon to north of Inverness.

4.5.2 Every one of Oxford Tube coaches can carry a wheelchair. However, if the space is occupied the wheelchair must wait for the next coach. Megabus cannot accommodate wheelchairs.

4.5.3 Stagecoach Group do have a policy regarding the carriage of mobility scooters and that indicates that they are generally allowed on PSVAR compliant buses. However, the decision can be subject to size and the driver's discretion.

Arriva Bus

4.5.4 Arriva is one of the UK's largest bus operators with more than 6,000 vehicles providing services to customers in the North East, North West and South East of England, Yorkshire, the Midlands, Scotland and Wales. The Group is the largest bus operator in London, where they run over 1,400 buses under contract to Transport for London.

4.5.5 On wheelchair accessible buses, drivers will assist all customers with disabilities (not just wheelchair users), provided it is safe to do so.

4.5.6 Arriva Buses stated that its policy is not to carry mobility scooters based on their size. However, the company states that the policy will be reviewed if and when mobility scooters become available within the reference wheelchair size and specification¹³.

First Group

4.5.7 First Group is largest bus operator in the UK running more than 1 in 5 of all bus services and carrying 2.8 million passengers every day.

4.5.8 First Group indicated that they have a Disabled Passenger Access and Carriage Policy which describes its position on mobility scooters. In brief, the policy in the Bus Division is not to carry mobility scooters for health and safety reasons relating to their size, weight, fuel and stowage requirements.

Brighton & Hove Bus Company

4.5.9 Brighton & Hove Bus Company run a fleet of over 250 modern buses on local bus services as well as 10 luxury coaches. The buses run a network of local bus routes serving the conurbation of Brighton and Hove from Shoreham through to Newhaven as well as longer distance routes to Eastbourne, Lewes and Tunbridge Wells. Many of the buses come equipped with easy access low floors so that push chairs, prams and wheelchairs can be accommodated.

4.5.10 Brighton and Hove commented that its policy is not to accept mobility scooters, but only to accept battery powered wheelchairs which are considered more maneuverable.

4.6 Coach

National Express

4.6.1 National Express is the largest scheduled coach service provider in Europe. In the UK, National Express coaches operate to 1000 destinations and carry over 16 million customers a year. National Express coach services also serve the major UK airports with additional dedicated 'on-airport' coach and bus services operated by Airlinks who are based at Heathrow and Gatwick.

4.6.2 National Express does have a policy for the carriage of mobility scooters. Passengers are requested to contact the Disabled Persons' Helpline and inform the company when they wish to travel. They are also asked to identify the model of mobility scooter they possess to enable National Express to make sure that it can be accommodated. The passenger must also confirm that there will be someone available to assist with getting the mobility scooter in and out of the hold of the coach. Furthermore, if the mobility scooter is too large or cannot be unassembled, then they reserve the right to refuse carriage.

4.6.3 Passengers also cannot be carried on the mobility scooter during the course of the journey as it must be stowed in the luggage hold. National Express indicate that even if passengers could travel on the mobility scooter, with current models they are uncertain as to whether the mobility scooter would have the strength to withstand the forces generated in an accident at 100kph.

4.7 Taxis

4.7.1 The Chairman of the National Taxi Association indicated that there is no existing policy and that carriage of mobility scooters is subject to drivers' discretion based on health and safety considerations.

¹³ This was the stated position of Arriva Buses at the time of the research. It appears that Arriva are not fully aware of the types of mobility scooters currently available.

4.8 Summary

4.8.1 Feedback from the various public transport operators indicates that there is a great deal of confusion over whether to permit the carriage of mobility scooters. Most light and heavy rail operators are content to carry mobility scooters that fall within the size of the reference wheelchair. Tram operators are more likely to allow the carriage of all models. However, a number of incidents have occurred which has led to ad-hoc decisions to prohibit most larger models. Coach and bus operators do not generally accept mobility scooters based on health and safety considerations, while taxi drivers can use their own discretion. Most operators stated that there is not enough information regarding the risk associated with the carriage of mobility scooters and are waiting for guidance from the DfT prior to developing or amending a policy.

5 Other Countries' Regulations and Policies

5.1 Introduction

5.1.1 This chapter outlines other countries' regulations and policies with respect to the carriage of mobility scooters on public transport. A number of key countries were identified at the outset that may have existing regulations, policies and standards in relation to the different forms of public transport. A number of countries do have regulations, however, most pertain to wheelchair use. Only a few outline specific standards or policies for mobility scooter users.

5.1.2 The research found that most European countries do not distinguish between mobility scooters and electric wheelchairs and therefore do not have separate regulations for mobility scooters. The lack of research on this topic was confirmed when attempting to identify European studies for the literature review. This was also the case for Japan and Singapore. Canada, USA and Australia were the only countries known to have separate regulations covering the use of mobility scooters on public transport and to have also completed a number of studies.

5.1.3 The following sections outline, where possible, policies and regulations for the carriage of mobility scooters on public transport. Although wheelchairs were not within the scope of this research, this report, where possible, briefly outlines general disability policy and especially those governing the carriage of electric wheelchairs.

5.2 North America

United States of America

5.2.1 A recent report on the current state of transportation for disabled people in the US (National Council on Disability, 2005) notes that there are currently six million Americans with disabilities who have difficulty obtaining the transportation they need to live independently and have productive lives¹⁴.

5.2.2 In the USA the Americans with Disabilities Act 1990 (ADA) prohibits discrimination and ensures equal opportunity for disabled people. Under the Department of Transport's (DoT) regulations implementing the ADA, public transit providers are mandated to accommodate 'common' wheelchairs (which includes some mobility scooters) on fixed route buses and trains. Commuter rail cars and buses also have accessibility guidelines and are required to have a platform lift and allow sufficient manoeuvring space to allow a 'common wheelchair' to reach the securement area. There are many regulations covering each form of public transport, but the most specific areas cover securement of the common wheelchair for buses and vans.

Common Wheelchair Specifications

5.2.3 Section 37.3 of the DoT's ADA regulations (49 CFR Parts 27, 37, and 38) defines a 'common wheelchair' as a mobility aid belonging to any class of three or four-wheeled devices, usable indoors, designed for and used by individuals with mobility impairments, whether operated manually or powered. A 'common wheelchair' does not exceed 30 inches (762mm) in width and 48 (1,219mm) inches in length measured two inches above the ground, and does not weigh more than 600 pounds (273kg) when occupied¹⁵.

¹⁴ A report by the US Disabilities Statistics Centre (Kaye et.al, 2000) indicated that four-fifths of wheelchair users reported that their local public transport system is difficult to use or get to. Among mobility device users, two-thirds reported difficulty.

¹⁵ This specification is quite similar to that of the UK reference wheelchair (see Figure 1.2). There is no height restriction imposed on the common wheelchair, but the length and width is only a few

5.2.4 Therefore, if an electric scooter or other mobility device meets the physical specifications of a common wheelchair as defined by the DoT's ADA regulations, it must be treated as a common wheelchair and must be carried on public transport¹⁶.

5.2.5 However, the US National Council on Disability (NCD)¹⁷ notes that, at the time the ADA regulations were developed in 1990 and in the intervening years, increasing numbers of individuals are no longer accommodated by the ADA definition, as wheelchairs, mobility scooters and similar devices have become more varied, and as Americans' body sizes have continued to increase.

5.2.6 Although the unaccommodated group is still relatively small, it includes more disabled individuals every year. The NRC notes that there is a need for the Government to revisit these standards, just as other ADA technical standards are periodically revised, to ensure that as many disabled people as possible continue to enjoy the protections of the ADA, which should ensure their right to public transportation¹⁸.

Securement

5.2.7 Transit operators (which includes bus, coach and heavy rail service providers) can require common wheelchairs (and hence mobility scooters) to be secured to the vehicle providing the operator has a policy detailing such a requirement. Section 37.165(c) (3) of the DoT's ADA regulations allows a transit operator to establish a policy that requires all riders to have their common wheelchairs secured while aboard a transit vehicle. This generally includes the individual occupying the wheelchair or mobility scooter. Therefore, the operator may decline to provide service to a rider who refuses to allow his or her common wheelchair to be secured. Alternatively, transit operators may adopt a policy that allows common wheelchairs to ride unsecured (while occupied). If the rider wishes his or her wheelchair to be secured, however, the operator's personnel must provide the requested assistance.

5.2.8 Although the operator may choose to have a policy which allows wheelchairs to ride unsecured, section 38.23(d) of the DoT's ADA regulations outlines the type of securement which must be provided. All ADA-compliant vehicles must have a two-part securement system, one to secure the common wheelchair, and a seatbelt and shoulder harness for the wheelchair user. Section 38.23(a) requires vehicles over 22 feet in length to have enough securement locations and devices to secure

millimetres larger on the US wheelchair. Another difference is that the UK reference wheelchair user does not impose a weight restriction like the US wheelchair, although the maximum weight that a wheelchair must not exceed is 300kg (which is 27kg greater than the US wheelchair) when being used on ramps and lifts, on regulated vehicles in the UK.

¹⁶ Public transportation in the US means transportation provided by a public entity (other than public school transportation) by bus, rail, or other conveyance (other than transportation by aircraft or intercity or commuter rail transportation) that provides the general public with general or special service, including charter service, on a regular and continuing basis. The same regulations apply to commuter rail transportation. However, it is defined as short-haul rail passenger service operating in metropolitan and suburban areas, whether within or across the geographical boundaries of a state, usually characterised by reduced fare, multiple ride, and commutation tickets and by morning and evening peak period operations.

¹⁷ National Council on Disability, The current state of transportation for people with disabilities in the United States, June 13th 2005.

¹⁸ A study by the Centre for Inclusive Design and Environmental Access (Steinfeld et.al, 2005) agrees with these conclusions and has made recommendations (based on research and studies from Australia, UK and Canada) for revised standards and anthropometry (the measurement of body sizes and physical abilities) for accessible design. The recommendations include mobility scooters.

two common wheelchairs, while vehicles 22 feet and under must be able to accommodate at least one common wheelchair¹⁹.

5.2.9 A transit operator cannot deny boarding to a rider whose common wheelchair is difficult to secure. Regulations require transit personnel to use their best efforts to secure any mobility device. Given the diversity of "common" wheelchairs, the regulations recommend that transit operators should consult with the manufacturers of securement devices and wheelchairs, as well as the owner of the wheelchair, to determine the best means of securement. There is no evidence indicating the practicability of this approach.

Seatbelts and Harnesses

5.2.10 Under the broad non-discrimination provisions in Section 37.5 of the DoT's ADA regulations, a transit operator is not permitted to mandate the use by wheelchair users of seatbelts and shoulder harnesses, unless the operator mandates the use of these devices by all passengers, including those sitting in vehicle seats. For example, on fixed route buses, if none of the other passengers are required to wear shoulder belts then neither can the person in the mobility device be required to do so. Transit operators, however, may establish a policy that requires the seatbelt and shoulder harness to be used by all riders, including those who use wheelchairs as well as those who use vehicle seats, if seatbelts and shoulder harnesses are provided at all seating locations. In some cases, state law could require an operator to adopt such a policy.

Staff Training

5.2.11 Because safe and nondiscriminatory transportation is the responsibility of the transit operator, Section 37.173 of the DoT's ADA regulations requires transit operators to train their personnel to properly assist and treat individuals with disabilities with sensitivity, and to operate vehicles and equipment safely. This includes training personnel to use the accessibility equipment and to accommodate the different types of common wheelchairs. Attendant-type services (e.g., carrying passengers, personal baggage, or suitcases) are not required, but assistance with boarding and disembarking, including pushing a manual wheelchair up a particularly steep ramp, is required.

5.2.12 It is important to note that only buses, vans and over-the-road buses (equivalent to coaches) are required to have active securement systems. Although there are general requirements for assisting people who use mobility aids on rapid rail vehicles and commuter rail vehicles, there is no requirement, or specification for, securement and restraint systems for these vehicles²⁰.

Other Requirements

5.2.13 The DoT's ADA regulations' definition of a common wheelchair does not include a requirement for brakes or any other equipment. A transit operator may not deny transportation to a wheelchair user because the wheelchair does not have brakes or the user does not choose to set the brakes.

5.2.14 Regulations allow wheelchair users to transfer to a vehicle seat, if one is available. Such a move is the rider's decision and the transit operator cannot force a rider to transfer to a vehicle seat, although the transit operator can suggest a transfer in a non-coercive way.

5.2.15 The purpose of Part 37 - Transportation Services for Individuals with Disabilities - is to implement the transportation and related provisions of titles II and III of the ADA 1990. The purpose

¹⁹ Further information regarding the securement of common wheelchairs is available at the following link: http://www.fta.dot.gov/civilrights/ada/civil_rights_3905.html

²⁰ The complete regulations, standards and technical specifications including, for example, lift and securement specifications are outlined in Part 37 and Part 38 of the ADA and can be viewed at: http://www.fta.dot.gov/civilrights/ada/civil_rights_3906.html. Part 38 can be viewed at: http://www.fta.dot.gov/civilrights/ada/civil_rights_3905.html

of Part 38 - Accessibility Specifications for Transportation Vehicles is to provide minimum guidelines and requirements for accessibility standards in Part 37 for transportation vehicles required to be accessible by the ADA. Specific sections include buses, vans which provide details on boarding device specifications (including design load and ramp slope), securement design and seat belt and shoulder harness requirements.

5.2.16 For disabled people who are unable to transfer from their wheelchairs/mobility aid when travelling in motor vehicles, the wheelchair/mobility aid must serve as the vehicle seat and after-market equipment must be installed to secure the wheelchair and provide occupant restraint. Standard No WC-19 "Wheelchairs Used as Seats in Motor Vehicles" was approved by the American National Standards Institute (ANSI) in May 2000, and is now a voluntary US national standard. It specifies strength and geometric requirements for at least 4 securement points and occupant restraint anchorage points that can withstand the forces of 30mph and 20g impact. In preparing the standard, it was recognised that there are many makes, models, and styles of wheelchairs/mobility aids in use, and that few, if any have been designed to serve as a seat in a motor vehicle. There does not appear to be widespread adoption of the standards, in particular for mobility scooters²¹.

Canada

5.2.17 Two sets of regulations regarding accessible transportation were implemented by the Canadian Transportation Agency (CTA). One set - Personnel Training for the Assistance of Persons with Disabilities Regulations - ensures that personnel in the federal rail (as well as the air and federal marine) transportation network have the knowledge, skills and attitudes necessary to assist disabled passengers in an effective and sensitive fashion. The other - Air Transportation Regulations, Part VII, Terms and Conditions of Carriage of Persons with Disabilities - ensures that air carriers provide uniform services to disabled passengers travelling in Canada on aircraft with 30 or more passenger seats. CTA have also developed a Code of Practice for Passenger Rail Car Accessibility and Terms and Conditions of Carriage by Rail of Persons with Disabilities (the Code).

5.2.18 Transport Canada is responsible for national policies for rail, air and intercity (coach) public transport. Transit, or city bus, regulations are the discretion of each individual province. Unlike the US and the UK, Canada does not have a national 'reference' or 'common' wheelchair specification for carriage on public transport. In the process of conducting this research, a spokesperson from the Accessibility Division (Transport Canada) commented that they are commissioning similar studies on the risk associated with the carriage of mobility scooters on public transport. This is related to the increase in demand (predominantly by the elderly) and the concern by operators that mobility scooters are becoming heavier and larger.

Passenger Rail Car Accessibility and Terms and Conditions of Carriage by Rail of Persons with Disabilities

5.2.19 The Code sets out accessibility criteria for all types of passenger rail cars and specific sections for coach cars with a wheelchair tie-down. It also provides information for wheelchair-accessible sleeping cars. A 'wheelchair tie-down' is a space to accommodate an occupied 'personal wheelchair' and or a service animal. In most instances this space will be large enough to accommodate a mobility scooter. All passenger trains in Canada provide a wheelchair restraint system. Wheelchair passengers are permitted to remain within their wheelchair during the journey, while mobility scooter users are not. If a person chooses to remain in their wheelchair for a trip, then it must be tied down. On the most modern trains, a belt is used which passes from the floor on one side of the wheelchair through the frame, and secures to the floor on the other side. The restraint system the older rail cars is also a tie down system using physical restraints.

²¹ Further information on the standard can be obtained from the following link:
http://www.wheelchairstandards.pitt.edu/WCS_T/WCS_T_RESNA/WCS_T_RESNA_SOWHAT/WCS_T_RESNA_SOWHAT_Intro.html

5.2.20 The Code states that when advance notice is given, a rail carrier should accept for carriage an electric wheelchair, a mobility scooter, a manually-operated rigid-frame wheelchair, a manually-operated folding or collapsible wheelchair, any device that assists a person to communicate better and any prosthesis or medical device. The carriage of these aids should be without charge and in addition to the free baggage allowance permitted to a passenger.

5.2.21 In addition when advance notice is given and unless the wheelchair or mobility scooter has to be carried in a rail car other than the one in which the person is travelling, a rail carrier should permit a person who uses a wheelchair or mobility scooter to remain on it:

- where facilities permit, while the person is moving between the station and the train;
- where space and facilities permit, while the person is moving between the station and the passenger seat; or
- where facilities permit, and a tie-down is available, while the person is moving between the station and the tie-down.

5.2.22 When advance notice is given and space permits, a rail carrier is also required to permit a person who uses a wheelchair or mobility scooter to store it in the passenger rail car in which the person is travelling. Also, a carrier should permit a person who uses a small aid to retain the aid in their custody during the trip. An exception to the above provisions relates to the carriage of an electric wheelchair, a mobility scooter or a manually-operated rigid-frame wheelchair. A rail carrier is not required to carry one of these large mobility aids if it cannot be transported on the same train on which the person is travelling because that train does not have either a passenger rail car or a baggage car that can accommodate it. In this instance, however, a rail carrier should advise the person about other arrangements that can be made to transport the aid²².

5.2.23 Practically all VIA Trains (Rail Canada) are accessible to passengers in wheelchairs and are equipped with wheelchair tie downs. For electric wheelchairs, total weight must not exceed 68kg and they must not be wider than 810 mm and no more than 1,820 mm in height or length.

5.3 Europe

5.3.1 There are variations in regulations and legislation between different countries in Europe for mobility scooters. In Norway, for example, the Ministry of Transport has defined powered mobility aids in terms of dimensions and requirements for lighting when they are used outdoors. France has regulations on construction, lighting, weight, dimensions and turning space, whilst in Denmark and Sweden powered wheelchairs and mobility scooters have to comply with the technical requirements for bicycles with regard to construction and equipment. In Switzerland, powered wheelchairs and mobility scooters are included in the definition "Motorfahrräder" (a special kind of mobility scooter). In Germany, there are detailed requirements in the STVZO (Straßenverkehrs-Zulassungs-Ordnung) regarding regulations for vehicles for disabled people²³.

5.3.2 Although there are a number of regulations governing the carriage of wheelchairs on public transport and the use of mobility scooters in the built environment, there do not seem to be any regulations stipulating their use on public transport. This could be due to the fact that, unlike in the UK where there is a desire to make mainstream public transport accessible to all users, a common approach in Northern Europe is to identify particular passenger groups and then to target an appropriate Special Transport Service (STS) for that passenger group.

²² The Code of Practice can be viewed at the following link http://www.cta-otc.gc.ca/access/codes/rail/index_e.html

²³ The regulations can be viewed at the following link: <http://www.verkehrsportal.de/stvzo/stvzo.php>

5.3.3 A representative of the European Conference of Ministers of Transport Minister's Group for Accessible Transport shared this view, remarking that the carriage of mobility scooters on public transport is uncommon and that they were not aware of any countries in Europe which have specific policies. It was noted that there are no specific EU directives or policy recommendations with regard to the carriage of mobility scooters on public transport. However, there is a trend towards continuing to work with disabled people and industry to implement appropriate solutions to the requirements both for wheelchair users and older and disabled people. More specifically, there is a need to facilitate and encourage the design of vehicles for all which take into account the needs of an ageing population²⁴.

5.3.4 A full summary of recent accessibility developments can be viewed at the European Conference of Ministers of Transport's website²⁵.

Sweden

5.3.5 It does not appear that there are regulations for the carriage of mobility scooters on public transport in Sweden. However, there are many accessibility policies devised to improve access for those with disabilities. The general aim of Swedish accessibility policy is to make the public transport system accessible for everyone by 2010. To this end, a number of projects and initiatives have been set up over recent years to ensure this policy can be implemented effectively.

5.3.6 In general, there are three levels of service. The first involves traditional, fixed route services, serving the majority of the population with little or no mobility limitations. The second involves 'service routes' which utilise smaller and more accessible buses, and aim to bring the service as close to people's homes as possible. Thirdly, there are 'special transportation services' (STS - mainly taxi-vehicles) for those with very restricted mobility. All Swedish municipalities have to provide their citizens with STS if required. There has also been an attempt to shift more people into the second (and where possible the first) categories, in order to increase choice and amount of travel possible, as part of the overall aim of accessibility for all by 2010.

5.3.7 However, whilst there is a drive towards more accessible transport, such as low floor buses and more accessible trains, there is little concrete information about what this means in practice. Dr. Agneta Ståhl of Lund University, who has carried out research into the travel needs of elderly and disabled people, confirmed that very little research has been done on this topic.

5.3.8 Jan Petzäll of the Vehicle Technology Section at the Swedish National Road Administration confirmed, however, that the problem regarding the use of mobility scooters on public transport vehicles is being discussed in Sweden among the Special Transport Service operators, the Swedish Handicap Institute and the Swedish Road Administration. He noted that the Special Transport Service operators have vehicles equipped with space and securement systems for wheelchairs. However, they have found that mobility scooters are difficult to secure with the available systems and the stability of a mobility scooter is unsatisfactory. Moreover, it is difficult to fit the seat belt on a user sitting in a mobility scooter and the user could be injured by the mobility scooter in the event of an accident. Some of the Special Transport Service operators do not allow people to travel sitting in the mobility scooter but require them to move to an ordinary seat in the vehicle. He confirmed that there are regulations for wheelchair spaces, securement systems, and seat belts, for example, but there are no regulations or policies on types of wheelchair (including mobility scooters) that are suitable for use in public transport vehicles.

²⁴ Consolidated Resolution No 2001/3 on Accessible Transport.

²⁵ Link to ECMT's website: <http://www.cemt.org/topics/handicaps/developopt.htm>

Norway

5.3.9 Norway's National Transport Plan (covering the period 2006-2015) became statutory in 2004, and includes an accessible programme (known as the BRA programme). The aim is to make the total transport chain accessible by improving infrastructure, rolling stock, buses and information, although the main focus is increased accessibility for the railways. It is part of the concept of 'Universal Design' to ensure that products, buildings and the environment used by the public are equally accessible to all people in society. As with Sweden there is a general aim to make standard public transport services as accessible as possible, decreasing people's reliance on Special Adapted Transport Services (AT-Services).

5.3.10 There is significant information available on the 'Universal Design' concept, but little on the transport sector and mobility, including wheelchair and mobility scooter use. Although there is legislation, policy and action plans in place to make transport as accessible as possible, there is little information available detailing what this means in practice.

5.3.11 In terms of current practice, Norwegian State Railways have compartments on most long and medium haul trains for wheelchair users and a companion traveller. The maximum loading on the train wheelchair lifts is 350kgs²⁶. No information is provided on the use of mobility scooters.

5.3.12 An express bus service operates between cities in Norway and is accessible to wheelchair users, but tickets need to be booked prior to the journey and the booking clerk informed. The toilet facilities on the buses are not accessible to wheelchair users. Local bus services are not all fully accessible, although the largest towns often have low floor buses. However, there is no specific information on mobility scooter use.

Denmark

5.3.13 There is less information readily available on Danish accessibility policy and studies/research into improving accessibility and mobility compared to other Scandinavian countries. In 1987 the Danish Parliament passed a resolution on improving physical accessibility for disabled people and achieving equal access to the transport system. There are no specific national regulations or policies for the carriage of mobility scooters on public transport.

5.3.14 Low floor buses have been introduced in many cities, although coverage varies. Many transport services are accessible to wheelchair users, although often with conditions attached (eg for rail services it is required that a passenger books 2 days in advance and waits at the front of the platform and signals to the driver that assistance is required). Regional trains are accessible to wheelchair users, although this is not always the case for local trains. Information is not specifically available for mobility scooters.

5.3.15 On regional trains assistance on entering/exiting the platform and boarding/alighting trains is available. Walkers, rollators and folding wheelchairs are treated as hand luggage. However, wheelchairs over 1,250mm in length require a lift on the platform to obtain access to the train. The trains have space for wheelchairs in 'flex areas' near modified toilets. Some trains have low floor carriages (Oresund trains) to make boarding easier. Double deck trains have built in lifts operated by train staff. Regional trains have a ramp suitable for manual, but not electric wheelchairs. Wheelchair users need to face the front coach and signal the driver for help when boarding as well as informing the driver at which stop they intend to alight. The stations themselves are wheelchair accessible, with lifts or level access.

5.3.16 Most buses in Copenhagen have step-free access, with a ramp available at the middle doors - users need to use a special button outside the middle door to ask the driver to activate the ramp.

²⁶ More information can be obtained from the following websites
<http://www.visitnorway.com/templates/NTRarticle.aspx?id=37390> and <http://www.nsb.no>

Wheelchairs must be secured using the safety belts. Again there is no specific reference to mobility scooters.

The Netherlands

5.3.17 The general policy on accessibility stipulates that transport by bus must be accessible by 2010 and by rail in 2030. There have been a number of studies into what this means in practice and how it can be implemented, including whether special transport services can be better integrated with mainstream public transport.

5.3.18 There has been extensive research into the costs and benefits of making public transport more accessible, following on from the recommendations of COST-335 and COST-322 (European accessibility standards), and research into safety issues for wheelchair users, such as, wheelchair restraint systems.

5.3.19 Although the Dutch have carried out a number of projects and studies into mobility issues, including cost-benefit analysis, safety issues and surveys of users' needs, there has been little mention of mobility scooters ('scootmobiel'). They are often only briefly referred to within the context of wheelchair studies, and it appears that there are no specific regulations outlined for the carriage of mobility scooters on public transport. However, most public transport operators refer to the scootmobiel and the electric wheelchair when outlining provisions.

5.3.20 The Netherlands Railways (NS) website, for example, notes that "you may take a scootmobiel (powered wheelchair) on the train" providing that the scootmobiel does not exceed 1,500mm in length and 750mm in width; there is enough manoeuvring room on the platform and in the train; the lift at the station (if applicable) is large enough; and the passenger can drive the scootmobiel on and off the train themselves". The answers to these questions are assessed when the passenger arranges in advance their booking through the Disabled Assistance Office (Bureau Assistentieverlening Gehandicaptent)²⁷.

5.3.21 It should be noted that these dimensions are the same specified for wheelchairs, but that for the latter it is also specified that the wheelchair may not exceed 1,200mm by 700mm for seating in a compartment and use of the modified toilets. The wheelchair and user may not exceed 250kgs.

5.3.22 The website www.leefwijzer.nl provides information for disabled people, including transport accessibility by wheelchair. It notes that in Rotterdam all metro stations are accessible for wheelchair users due to presence of level access lifts, and that 'scootmobiel' are allowed. In Amsterdam all metro stations have been modified for wheelchair users, and 'scootmobiel' are also allowed. Bus travel websites indicate that ramps can lift up to 300 kgs, and should be able to transport wheelchairs with dimensions up to 1,300mm by 750 mm.

5.3.23 A report²⁸ outlining current and future accessibility for different mobility groups, including wheelchair users, motorised wheelchair users and mobility scooter users, by mode (at station/stop and on vehicle), shows no change for mobility scooter users by 2030. It also notes that wheelchairs other than the default sizes such as the 'scootmobiel' provide more problems than the default-sized wheelchair because they need more space to maneuver. The report notes that the presence of 'scootmobiel' also influences the number of seats available for the general public. Provisions for motorised scooters are possible in the Netherlands on public transport, but usually only after their appropriateness has been checked and approved by the operator.

²⁷ More information can be obtained from the following link:
http://www.ns.nl/servlet/Satellite?cid=1112162723884&pagename=www.ns.nl%2FPage%2FArtikelPage_www.ns.nl&lang=en&c=Page

²⁸ 'Beperkte mobiliteitsbehoefte' (Rooij and Tacken, 2001)

Germany

5.3.24 Under German law, disabled people are entitled to help and assistance in order to avert, eliminate or alleviate their disability. The general goal is to overcome, as much as possible, the disability's effects and to enable disabled people to participate in all areas of society. The Federal Government is obliged to provide barrier-free design and construction.

5.3.25 The Equal Opportunities for Disabled People Act 2002 (Behindertengleichstellungsgesetz) is the main regulation which stipulates the requirements for public transport. Consequences for not creating barrier-free access are not mentioned. The Act states that in the areas of public transportation, all facilities and means of transportation (bus, train, and aircraft) are required to be barrier-free²⁹.

5.3.26 It also states that disabled people who are considerably limited in their walking mobility enjoy almost free transport in the public transportation system. Disabled people who are not able to use public transportation, their own car, or taxis because of their disability are offered special transportation services by local institutions. There are no specific references to mobility scooters.

5.3.27 The decisions whether and how wheelchairs are permitted on public transport vehicles seems to be with the operators and can be found in the respective conditions of carriage (Allgemeine Beförderungsbedingungen) that each operator must publish.

5.3.28 Barrier-free wheelchair access is common. The Deutsche Bahn has its own mobility service website that provides disabled people with information to assist their journey³⁰. In addition, most trains, trams and buses are already suitable for wheelchair users and timetables often indicate wheelchair friendly services. Although there is significant information from operators on wheelchair use, it seems that there is not a separate policy for mobility scooters. It appears that there is no specific distinction between the terms mobility scooter and electric wheelchair. This was confirmed via personal talks with German transport experts who suggest that mobility scooters are included under the term of 'electric wheelchair'. The Dresden University of Technology's Department for Transport confirmed that there have been no recent studies on the subject of mobility scooters in combination with public transport³¹.

Austria

5.3.29 The rights of disabled people are protected by a combination of specific and general legislation. The judicial mechanism available to protect the rights of disabled people is a recourse procedure by a special agency dealing with anti-discrimination issues.

5.3.30 There are recommendations for ensuring accessibility of the built environment establishing national design standards requiring that public places, the outdoor environment, and housing are made accessible.

5.3.31 There do not appear to be specific regulations for the carriage of disabled people on public transport. However, there are special transport arrangements for disabled people which include the requirement for:

- fare reduction for special groups of disabled persons;
- provincial Governments to offer social services including transport services; and
- special transport is available for: medical treatment, education, work and recreational purpose.

²⁹ Sourced from the German Law Journal - <http://www.germanlawjournal.com>

³⁰ Deutsche Bahn website for accessibility: <http://www.bahn.de/S:PtVOZ9:dE@S6NNNhvN@,NNNNNtM/p/view/mobilitaet/handicap/handicap.shtml>

³¹ Link to Dresden University: <http://www.vkw.tu-dresden.de/index.php?lang=eng&menu=&>

5.3.32 From the research, there do not appear to be any specialist requirements for the use of mobility scooters on public transport.

France

5.3.33 The debate on accessibility of public transport for disabled people has recently made a significant step forward with the passing of the laws 'The Equality of Rights and Opportunities' as well as the 'Involvement and Citizenship of Disabled People' which were passed in February 2005. Public transport systems are required to be made accessible to disabled people by 2020. It seems that the French Government perceives 'accessible' as a system that allows disabled people to move in a 'reference wheelchair' and travel freely. Although there is a reference wheelchair in France, these standards are not used to restrict the access to public transport and are only used as a benchmark in the design of transport facilities. There is no exclusion to using a bigger wheelchair provided it can get into the vehicle.

5.3.34 From investigation of the Acts and discussions with political and technical bodies, associations for disabled people's rights and public transport operators, it appears that there are no regulations in France either allowing or forbidding the access of mobility scooters for carriage on public transport.

5.3.35 It is likely, therefore, that if a mobility scooter is compatible with the public transport infrastructure there is no reason why mobility scooters should be banned from public transport. However, some French transport operators (SNCF for trains, RATP for Paris' bus and underground) are concerned about the ever increasing size of the vehicles used by disabled people and have started to think about setting a seal of approval for the wheelchairs to be used in public transport, which would state an upper limit for mobility vehicles designed for public transport use.

5.3.36 Therefore, it does not appear that there are any specific regulations for mobility scooters in France. This was confirmed by a representative from CERTU, the main technical body dealing with transport in France who stated that there is no official paper which would apply to mobility scooters and regulate their access to public transport. It was also commented that there have been no studies or reports on the subject.

Belgium

5.3.37 The regulatory framework in Belgium is less detailed than many other European countries. There does not appear to be an obligation for public transport to be accessible to mobility impaired people. However, most public transport providers are progressively adapting their vehicles and infrastructure in order to meet the needs of disabled people. Currently there is no deadline for accessible transport vehicles, but it is likely this will tie in closely with the programme to renew public transport vehicles.

5.3.38 The STIB which operates buses, trams and underground in the Brussels region drew up a plan in 2002 with the objective of improving the accessibility for mobility impaired people. Targets were set for buses based on ISO 7193. To this extent, there does not seem to be any reference to using mobility scooters. This appears to be the case for all public transport, where there is no reference to mobility scooters.

Switzerland

5.3.39 The Federal Act on the Elimination of Discrimination against People with Disabilities 2004 represents the most significant legislation to date for disabled people living in Switzerland. The aim of this Act is to establish basic equal rights between disabled and non-disabled people in all areas of public life, including public transport.

5.3.40 It places the Swiss government, cantons and communes, as well as private institutions that offer public services, under an obligation to introduce measures in favour of disabled people. Since public transport constitutes an important area of public life, the Act places particular emphasis on this subject, prescribing that public transport be equipped to fulfill the needs of disabled people by 2023.

5.3.41 In order to attain this goal, the legislation requires that all newly acquired vehicles and newly-constructed or renovated buildings and facilities must be designed to meet the needs of people with mobility impairment including wheelchair users, people with visual impairments, people with hearing impairments and, as far as possible, people with learning disabilities. Public transport vehicles and buildings not renewed within the twenty-year deadline have to be adapted accordingly. The legislation also grants individuals the right to take legal action, and national organisations for disabled people the right of appeal. However, the Act also includes a clause stating that the adoption of measures is not mandatory if the cost of implementation is grossly disproportionate to the expected benefit to the disabled person.

5.3.42 The regulations contain detailed information on technical and operational requirements such as the maximum admissible gap between the edge of the platform and the vehicle or the requirements relating to the print layout on customer information systems. These draft regulations will come into force in mid July 2006³².

5.3.43 An example of a program of measured improvements can be seen in Zurich. There the official body for integrated public transport, the Zürcher Verkehrsverbund (ZVV)³³, together with Verkehrsbetriebe Zurich (VBZ)³⁴ (which operates trams and buses in the city) have embarked upon schemes to improve local travel for disabled passengers. The completion date for fully upgrading facilities and rolling stock in the city (including the phasing out of older units) is scheduled for 2014.

5.3.44 The improvement program includes phasing out inaccessible buses for new low-floor buses (Niederflurbus). Improvements were also made to the city's tram network in 2005 with Bombardier Transportation providing 68 low-floor Cobra trams. There has also been an increase in the number of wheelchair-friendly taxis. Although there is considerable reference to disability and wheelchair standards, there does not appear to be any specific regulations or policies on the carriage of mobility scooters.

5.4 Asia and Australasia

Singapore

5.4.1 Although Singapore has a modern and technologically advanced transport system, it is not easily accessible. There have been accessibility improvements in recent years, however, the transport system largely caters for its majority of non-disabled citizens. There does not appear to be a legal requirement for public transport operators to enable use by mobility scooter users. Neither its underground Mass Rapid Transit system nor its public bus service is easily accessible to wheelchair users. Moreover, taxi drivers can view wheelchair users as burdensome. The Disability Portal³⁵ website notes that there is difficulty accessing some bus stops and in boarding and alighting from the some buses. However, the situation is improving with some bus companies moving to low-floor buses in accordance with the Ministry of Transport requirement that all models be gradually changed to low-floor buses. In addition, the Singapore Mass Rapid Transit (SMRT) system is currently upgrading all its stations to make them accessible to disabled people and others with impaired mobility. All stations would be fitted with passenger lifts by 2005. The stations on the newer northeast line are designed with access features such as Braille, tactile flooring and passenger lifts.

³² An English version of the standards was not available. Text in French and German is available at the following link: <http://www.bav.admin.ch/mobile/01244/index.html?lang=fr>

³³ Link to ZVV's website: <http://www.zvv.ch/aktuell.asp>

³⁴ Link to VBZ's website: http://www.vbz.ch/vbz_opencms/opencms/vbz/deutsch/index.html

³⁵ The Disability Portal is a joint community service project by the Ministry of Community Development, Youth & Sports (MCYS) and the National Council of Social Service (NCSS), and managed by the Disability Information & Referral Centre (DIRC). <http://www.disability.org.sg>

5.4.2 Other improvements include refurbishment of older train stations to cater to the needs of all commuters and the introduction of modern trains that provide a wheelchair space.

Japan

5.4.3 The Barrier-Free Transportation Law was established in 2000 which requires Japan to have barrier-free transportation by 2010. Barrier removal efforts are being made in various public transport fields, aiming to promote social participation by disabled people and the elderly.

5.4.4 Barrier removal efforts in public transportation are progressing rapidly. The number of lifts installed at railway stations is significantly increasing. For example, as of the end of 2004, 40 per cent of underground and 16 per cent of railways stations have lifts. There are wheelchair accessible toilets installed on 23 per cent of domestic railway stations and 81 per cent of underground stations. Low-floor vehicles have been introduced and over 7,000 out of 9,544 stations in Japan have installed portable ramps. With respect to passenger buses, over 7,700 out of a total of 58,000 buses in Japan are now non-step buses. With one-step ramp buses added, the number is estimated to exceed 15,000.

5.4.5 Taxis do not have to adhere to the Barrier-Free Transportation Law. However, roving taxis equipped with a lift have begun to operate in Tokyo (although these currently only represent around two per cent of the fleet) and streetcars (similar to mobility taxis) are available for private hire. In various regions in Japan, local governments provide a reservation system for accessible taxis to cater for disabled citizens and the elderly. In addition, in recent years local governments have also begun to operate community buses (equipped with a ramp or a lift) to transport the elderly and disabled people within their areas³⁶.

5.4.6 Until recently rail and buses were only required to carry "normal", (standard) non-electric wheelchairs and it was left to the driver's discretion whether electric wheelchairs were permitted for travel on rail and bus. However, in 2004 a panel of experts under the Ministry of Land, Infrastructure and Transport proposed to allow the use of electric wheelchairs at stations where differences in level of the floor had been eliminated. As of June 2004, the use of electric wheelchairs was allowed at about 1,300 railway stations nationwide. It is estimated that electric wheelchairs are currently being used by about 150,000 people in Japan including the elderly, and an estimated 6,000 disabled people nationwide are anticipated to be in need of such wheelchairs³⁷.

5.4.7 In late 2004, the Justice Ministry urged the Central Japan Railway Company to allow the use of scooter-type electric wheelchairs by disabled people at its train stations and that the company's ban on their use constitutes a "serious violation of human rights." The Ministry issued a recommendation to the Nagoya-based railway company, known as JR Tokai, that it should permit the use of mobility scooters at its 400 stations. The Ministry called the ban by JR Tokai "unreasonably discriminatory treatment" for disabled people. However, there do not appear to be regulations and standards imposed based on this recommendation. In addition, it does not appear that the recommendation has been carried through to buses and coaches.

Australia

5.4.8 The Disability Discrimination Act 1992 (DDA) sought to eliminate discrimination against disabled people as far as possible. The cause for accessible transport was further extended with the introduction of the Disability Standards for Accessible Public Transport 2002 (DSAPT) regulations (the Standards). The Standards provide transport operators and providers with certainty about their obligations under the Act and give information to enable operators to eliminate, to the extent possible, discrimination in their provision of public transport services on the grounds of a person's disability. Compliance with the relevant requirements will provide protection from a complaint of unlawful

³⁶ Sourced from the Japan International Corporation Agency: <http://www.jicafriends.jp>

³⁷ Kyodo News International (Tokyo, Japan) (via Knight-Ridder/Tribune Business News); 12/16/2004

discrimination in the provision of public transport services. There are several Standards specific to mobility aids and scooters.

5.4.9 The Standards establish minimum accessibility requirements to be met by providers and operators of public transport conveyances, infrastructure and premises. The Standards take into account the range of disabilities covered by the DDA and apply to the full range of public transport premises, infrastructure and conveyances, with some limited exceptions.

5.4.10 The Standards prescribe detailed requirements in relation to accessibility issues such as access paths, manoeuvring areas, ramps and boarding devices, allocated spaces, handrails, doorways, controls, symbols and signs, the payment of fares, the provision of information, belongings etc. If the Disability Standards do not deal with an issue in relation to public transport, the requirements of the Disability Discrimination Act 1992 apply in relation to the issue.

5.4.11 The Disability Standards operate in conjunction with other laws, regulations and codes that apply to public transport. In 2004, the DSAPT Guidelines (the Guidelines) were published which accompany the Transport Standards. The Guidelines provide further information and comment on the Transport Standards. Further guidelines were published in 2004 to incorporate amendments.

5.4.12 The Standards throughout provide requirements for wheelchairs and mobility aids. Scooters are defined as mobility aids. Table 5.1 outlines the criteria for mobility aids as defined in the Disability Standards Guidelines³⁸.

5.4.13 The Standards apply to buses, ferries, trains, trams and light rail. Specific references to mobility aids in the Standards include:

- the circulation space for wheelchairs should be at least a 180 degrees;
- passengers in wheelchairs or mobility aids must be able to enter and exit at conveyance and position their aids in the allocated space. If this is not practicable, operators must provide equivalent access by direct assistance; and
- if toilets are provided, there must be at least one unisex accessible toilet without airlock available to passengers using wheelchairs or mobility aids.

Table 5.1 Australian Criteria for Mobility Aids

Criteria	Specification
Weight	The total weight to be supported by a boarding device needs to be not more than 300kg
Width	The overall width of the mobility aid needs to be less than 800mm
Height	Until 31 December 2012, the maximum door clearance into a taxi is 1,400mm while the internal head height is 1,410mm. These heights both increase to 1,500mm after that date

³⁸ The complete DSAPT Standards (Amended 2004) and DSAPT Guidelines can be viewed at the following link: http://www.ag.gov.au/www/agd/agd.nsf/Page/Humanrightsandanti-discrimination_Disabilitystandardsforaccessiblepublictransport

Manoeuvrability	The mobility aid would need to be capable of turning through 180 degrees within an area of 2,070mm by 1,540mm
Allocated Space	The space for stationary mobility aids is 800mm wide by 1,300mm long
Wheels	A mobility aid should be able to: (a) cross a horizontal gap up to 40mm wide; (b) mount a vertical rise (bump) up to 12mm; and (c) cross grating gaps up to 13mm wide and 150mm long
Brakes	Mobility aids need to have effective braking systems to maintain stability and be able to withstand acceleration, braking, cornering and pitching of conveyances
Anchoring Devices	If anchoring devices are required by regulation, mobility aids need to be able to accept and travel with anchoring devices fitted
Ramps	Mobility aids should be able to negotiate: (a) a 1 in 14 ramp unassisted; and (b) a 1 in 8 grade where the ramp is less than 1,520mm
Batteries	Electric mobility aids may need to comply with regulations governing the carriage of batteries on public transport. Batteries need to be adequately secured while gel or solid state options should be considered.

5.4.14 Division 9.2 of the Guidelines addresses restraints. The Guidelines state that "The Disability Standards recognise the use of both active and passive restraining measures". The requirements include:

Active restraining systems

- an active restraint anchors a wheelchair or similar mobility aid into an allocated space. Anchorage belts are an example of active restraints.
- regulations that normally require passengers to wear safety belts apply equally to all passengers. This means that operators of services on which safety belts are mandatory must provide restraints for use by disabled people. Similarly, passengers need to use safety belts if they are compulsory, unless the passengers have a dispensation through normal channels.

Passive restraining systems

- a passive restraining system contains movement of a wheelchair to within an allocated space. A vertical surface that restricts the movement of a wheelchair is an example of a passive restraint.
- an operator may rely on the sides of a conveyance, or a padded rail, to act as passive restraints against excessive sideways movement of a mobility aid. The allocated space could be located behind a bulkhead to prevent forward movement. The passive restraints bounding an area of this kind would then prevent a wheelchair from rolling or tipping.

5.4.15 The carriage of mobility scooters in accessible taxis is accepted but can be subject to the driver's discretion.

6 Heavy Rail and Light Rail

6.1 Introduction

6.1.1 The following sections of the report outline findings from the literature review with regard to the carriage of mobility scooters on heavy and light rail. The literature review only identified one relevant study for each of light and heavy rail with respect to mobility scooters.

6.1.2 Although very few studies were identified through the course of the search, a number of train operating companies in the UK have undertaken trials with mobility scooters and their experiences are also reported in this chapter.

6.2 Heavy Rail

6.2.1 A theme which has been evident in much of the literature identified and through discussions with transport operators is the concern that mobility devices, in particular mobility scooters, are increasing in size and weight and that the existing wheelchair regulations are dated. This is highlighted in Australia where a recent study (Hunter, 2003) notes that the Australian Codes on spatial provisions for wheelchairs do not reflect contemporary wheelchair designs or mobility scooter usage. The study states that railway infrastructure cannot cope with larger mobility scooters and that the Victorian Government must decide what proportion of the wheelchair and mobility scooter using population is to be catered for, so the infrastructure and vehicles can be amended. Such a decision is hampered by the absence of suitable Australian and international data enabling determination of spatial requirements for mobility scooters.

6.2.2 A further issue highlighted is the specifications for railway crossings³⁹. These are considered critical issues for the Victorian Government's railway crossing safety project because, if pedestrian mazes are too small, wheelchair and mobility scooter users may resort to using the road, which may increase the level of risk to injury or death. Railway stations and crossings and associated facilities are required under the Disability Discrimination Act 1992 to be accessible by disabled people, including therefore people who rely on wheelchairs and scooters for mobility.

6.2.3 The study highlights that current industry data does not reflect the proportion of different types of mobility scooters used and does not indicate the dimensional variations amongst mobility scooters due to accessories and adaptations. The report highlights that there is a need to conduct mobility scooter-driving trials to establish margins that need to be incorporated in minimum space formations.

6.2.4 The report concludes by stating that in identifying the particular proportion of wheelchair and mobility scooter using population to be catered-for, the requirements of minimum sized circulation spaces at railway stations, crossing and associated facilities can be established. Moreover, an intended percentage of mobility aid population can be derived as a given percentile⁴⁰.

6.3 UK Mobility Scooter Trials on Heavy Rail

6.3.1 An article in Modern Railways (September 2005) asks the question "how will trains designed to accommodate the 'reference wheelchair' cope with the larger electric mobility scooters?" This is a question the rail industry in the UK is currently attempting to answer in order to avoid possible complications when Part 3 of the Disability Discrimination Act 1995 (which covers access to goods, facilities and services), is extended to rail vehicles by the Disability Discrimination (Transport Vehicles) Regulations 2005 which comes into force on 4 December 2006.

³⁹ These are known as barrow or level crossings in the UK.

⁴⁰ The typical rationale behind a percentile reference is that a certain percentage of the population should be catered for and conversely, that society cannot afford to cater for more than that.

6.3.2 The article notes that in July 2005 the Disability Rights Commission (DRC) published for consultation a draft Code of Practice⁴¹ to assist affected service providers in understanding their obligations under the new legislation. Whilst the Code does not impose legal obligations, it does have a statutory basis and includes examples of real life situations to illustrate how the legislation might be applied in practice.

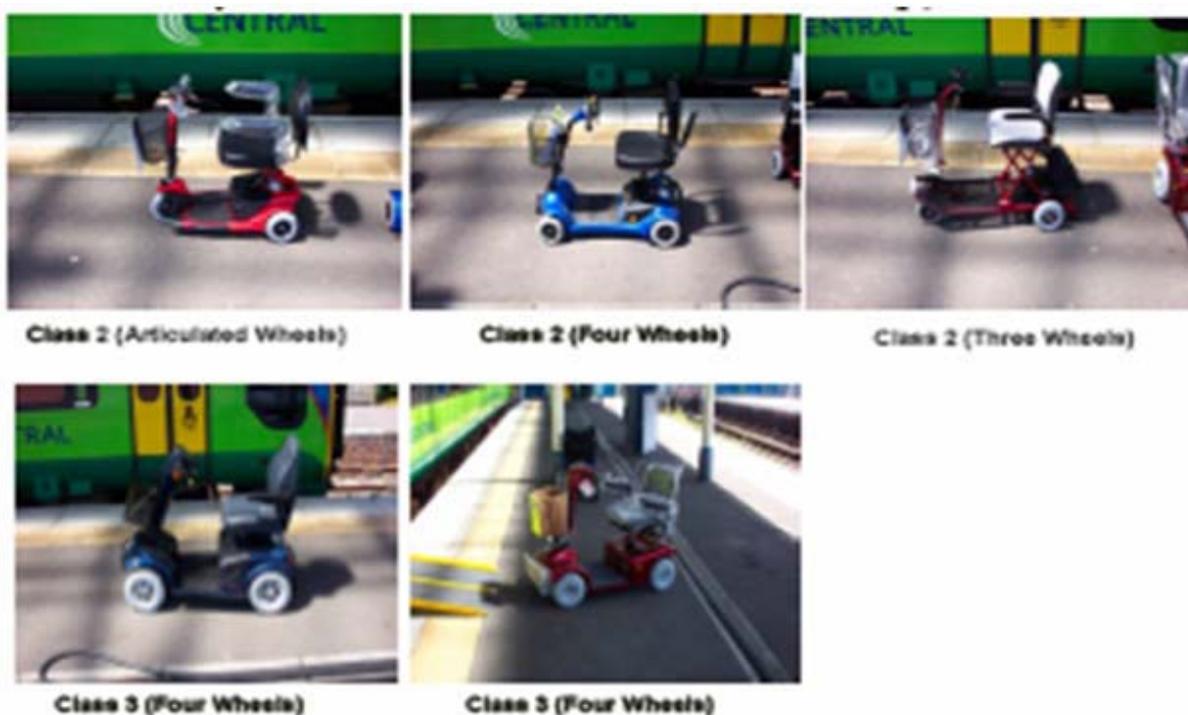
6.3.3 Service providers are only required to do what is 'reasonable', although there is no definition of 'reasonableness' which remains an evolving issue. The DRC state that transport providers should be planning 'continually' for the reasonable adjustments they need to make for disabled people. The actions taken by the ATOC Scooter Group (see Appendix C for further information) and individual TOCs who have undertaken usability trials could be viewed as a first step in seeking to improve services for the increasing number of disabled people who use mobility scooters.

6.3.4 The Modern Railways article further suggests that there are additional problems associated with the creation of a national policy for mobility scooters due to the variety of sizes, weights and wheel configurations of these vehicles and the range of pre- and post-RVAR rolling stock dimensions and layouts.

6.3.5 The following is a summary of each TOC that has conducted trials with various scooter models.

Central Trains

6.3.6 Central Trains (CT) undertook a variety of trials with Class 153, 156 and 158 rolling stock. These older types were chosen as CT thought there could potentially be difficulties in accommodating mobility scooters. The trial made use of a number of different Class 3 and 2 mobility scooter models as shown in the following pictures.



⁴¹ The Code of Practice can be viewed at the following link: http://www.drc-gb.org/library/publications/services_and_transport/code_of_practice_rights_of_ac.aspx

6.3.7 The findings of the trials indicated that all CT units can accommodate wheelchairs and mobility scooters up to 1,000mm length and 700mm width. Larger four-wheeled mobility scooters were too large to manoeuvre into the wheelchair space. However, the smaller four-wheeled mobility scooter and the three-wheeled models could be accommodated. Based on the trials, CT decided that it was not feasible to accommodate mobility scooters or wheelchairs over 1,000mm in length or wheelchairs over 700mm in width and mobility scooters that are not car portable (i.e. can fold up). The smaller dimensions are incorporated in order to cater for older rolling stock and the fact that CT does not operate dedicated RVAR compliant stock on particular routes which may result in a passenger becoming stranded. In addition, when it is necessary to introduce replacement bus services the buses may not accommodate mobility scooters, but can accommodate fold-up scooters.

First North Western (findings apply to Northern Trains)

6.3.8 In March 2003, First North Western (now part of Northern Trains) undertook a project to evaluate the loading and unloading of motorised wheelchairs and mobility scooters. The study was undertaken on platforms 1 and 2 at Blackpool North station and included two four-wheeled motorised mobility scooters. The units used in the study were Class 142; 150/1; 153; 156; 158 and 175. The mobility scooters used in the trial (unfortunately the specifications of the models were not provided) were able to access Class 142s where there was suitable storage space for stowage. However, the mobility scooter was too large to access the toilets and navigate the aisle. Access was not possible on the Class 153 as the mobility scooter was unable to turn into the saloon. The same problem occurred for the Class 156. For the Class 158 access was only possible through the bicycle entrance. For the Class 175 the mobility scooter required manual handling to enable it to exit from the unit.

Virgin Trains, TransPennine and Northern Trains

6.3.9 In 2005, Virgin Trains undertook two separate trials in March and July at Manchester Piccadilly station with cooperation from TransPennine and Northern Trains.

March Trials

6.3.10 The March trials involved testing two models of mobility scooter. The four-wheeler model used was 'The Trainrider Senior'⁴² (length 1,280mm: width 540mm) and the three-wheeler model was the 'Go Go 3'⁴³ (length 940mm: width 480mm).

6.3.11 The trials were conducted on rolling stock classes 158, 150, 323, 142 and Voyager 220/221. The main focus of the trials was to test the maneuverability of the three-wheeled model. During the trials, the 'Go Go' model was found to be generally suitable for all types of train tested. It was found to be highly maneuverable with a good turning circle. The view was that carriage of this model of mobility scooter should not present any greater difficulty to a train operator than a standard wheelchair.

6.3.12 The Trainrider Senior (a larger mobility scooter) was found to be significantly more cumbersome to accommodate than a standard wheelchair, due to its relatively poor manoeuvrability in tight spaces. Throughout the trials the mobility scooter had to be physically handled in order to manoeuvre around some corners. It was not always possible to stow the mobility scooter such that it would not cause an obstruction. For these reasons, it was not a model which would be recommended for use on trains.

July Trials

6.3.13 The July trials again took place at Manchester Piccadilly station. The trial explored two types of powered mobility scooter: The Trainrider, a large three- or four-wheeled mobility scooter (designed

⁴² Similar to the Sovereign 4 outlined in the Scooter Typology (Chapter 3)

⁴³ See Scooter Typology for additional specifications.

to be within the reference wheelchair dimensions - 700mm by 1,200mm) and a lighter four-wheeled model (length 1,000mm: width 480mm) shown in Figure 6.1.

Figure 6.1 Mobility Scooters Used in Virgin Trains' Trials



6.3.14 The trials highlighted very few problems with boarding, manoeuvring (as shown in picture below) and accommodating the small four-wheeler, which was tested on the Pendolino, Voyager and Class 158 and 175 units.



6.3.15 However, the main focus of the trial was to examine the acceptability of the Trainrider. Its key feature was that it was within the reference wheelchair dimensions. The design of the mobility scooter was such that it was possible for the mobility scooter to be converted from a four-wheeled configuration to a three-wheeled configuration. Those present at the trial agreed that a journey could only be practicably made with the mobility scooter in its three-wheeled configuration due to the size of its attachments and practicability of transporting both the mobility scooter and spare attachment.

The Trainrider (with threewheels) could be manoeuvred within the train without any physical handling so long as the driver had a reasonable degree of skill. No attempt was made to board a Northern Train with this mobility scooter since it was clear that it would not be able to access the wheelchair space on a Class 156 or 158 and would have been at risk of falling down the footwell of a Class 142 or 144 during manoeuvring when on board.

6.3.16 There were a few tests of the Trainrider in its four-wheeled configuration. It was found that due to its much increased turning circle, it was not practicable to accommodate the model within the saloon. Consideration was therefore given to the practicability of accommodating it within the stowage area of the front of the Pendolino. While boarding was not a problem, lack of maneuverability on board meant that it could not be put into this position.

6.3.17 The trials concluded that the smaller four-wheeled model was found generally suitable for all classes of rolling stock tested. It was found to be highly maneuverable with a good turning circle and should not present any great difficulty to a train operator than a reference wheelchair. However, the report did mention that this mobility scooter only had a battery range of 8 miles (as opposed to the Trainrider's 40 miles). The Trainrider (in three-wheel configuration) was found to be more cumbersome to accommodate, but nevertheless, could be maneuvered within a Pendolino without any physical handling so long as the driver had a reasonable degree of skill.

6.3.18 It should be noted that the trials were undertaken in perfect conditions with no other customers in the vicinity and on trains which were stabled in the station. Therefore, trials that replicated operating conditions could possibly unearth further problems.

South West Trains (SWT)

Phase One Trials

6.3.19 In early 2002, in light of the fact that slam-door trains were being withdrawn from service, SWT reinforced its policy not to allow mobility scooters onto its network. However, in light of passengers' concerns, a review of the mobility scooter policy was commissioned which involved two trials of various mobility scooter models and class of trains to ascertain if there was scope to move away from the complete ban.

6.3.20 The first trial assessed boarding and alighting, maneuverability and speed of three different types of mobility scooters. And the second trial considered stability of a mobility scooter on a moving train.

6.3.21 The first trial assessed six different types of mobility scooter. The mobility scooters used were considered to be fairly representative of mobility scooters that were available on the market. They included Class 2 vehicles with three and four wheels and a Class 3 vehicle with four wheels. The following table details the main specifications of the six different mobility scooters used in both trials.

Table 6.1: Specification of the various mobility scooters used in the trials.

Carriage of Mobility Scooters on Public Transport - Feasibility Study

Scooter Mode	DMA Tinto	Invacare Auriga	Rascal 338	DMA Shoprider	Road Knight Mini	Kensington Free Rider
Class	2	2	2	2	2	3
Number of Wheels	3	4	4	3	3	4
Length (mm)	1, 020	1, 220	1, 250	1, 040	1, 120	1, 390
Width (mm)	540	610	540	490	540	630
Weight Capacity (kg)	115	N/A	113.4	115	N/A	115
Max Speed (mph)	4	N/A	N/A	4	4	6
Turning Radius (mm)	900	1, 500	N/A	1, 285	N/A	1 600
Max Angle (degree)	12	10	N/A	8	N/A	N/A

N/A - information not available

6.3.22 The classes of trains used in the trials included 442, 450, 444, 159, 170, 458 and 455. The study found that providing a suitable boarding method is used, three-wheel Class 2 mobility scooters that fall within the dimensions of the reference wheelchair can board and alight safely on all SWT trains except Class 442. Class 442 trains proved problematic because of the narrowness of the doorways which did not allow someone to board the train beside the mobility scooter. The study also found that problems were encountered when manoeuvring mobility scooters around the inside of carriages of some classes of rolling stock. This was particular an issue for four-wheeled mobility scooters. Therefore, it was recommended that four-wheel models should not be accepted on SWT services, unless they were a fourwheel mobility scooter with triangular footprint.

6.3.23 Following the first trial, a second trial was undertaken to assess the stability of a mobility scooter on a moving train. As trial 1 found four- wheel mobility scooters to be unsuitable for rail travel two different types of three-wheel mobility scooters were used, both of which fell within the dimensions of the reference wheelchair. These were the Road Knight Mini and the Shoprider (dimension information available in above table). Journeys were made on all types of trains apart from Class 442s. The findings found that both mobility scooters were stable on all trains under normal operating conditions.

6.3.24 In light of the trials, SWT amended its policy from a complete ban to allowing some types of mobility scooter to travel on its network as long as they were:

- three-wheel mobility scooters or those that have a triangular footprint (set of wheels in the centre of the front of the mobility scooter, two at the rear);
- fall within the size dimensions of a reference wheelchair;
- have a maximum speed of 4mph;
- do not exceed 230kg when carrying the user; and

- have a free-wheeling facility for use in case of power-failure.

6.3.25 As most of the above information, maximum weight, speed and dimensions would not be immediately apparent to frontline employees, it was therefore recommended that mobility scooter users supply information in advance and a SWT Scooter Card would be issued (see paragraphs 6.3.31 to 6.3.32 for more information).

Phase Two Trial

6.3.26 In response to changes in four-wheel mobility scooter design and the fact that the some newer models are smaller than the reference wheelchair, and have a turning circle that is either the same as or less than a turning circle of some three-wheel mobility scooters, SWT undertook a further trial in December 2005 specifically evaluating fourwheel mobility scooters that:

- were smaller than dimensions of a reference wheelchair; and
- had a turning circle no greater than the three-wheeled mobility scooters that SWT currently accommodate.

6.3.27 The trial focused on the boarding and alighting of mobility scooters on a variety of trains. This was considered the most suitable way to evaluate the justification for deciding whether to carry four-wheel mobility scooters. Two mobility scooters were used for the trials and their specifications are outlined below.

Table 6.2: Specification of the two mobility scooters used in four-wheel trials

Specification	Pride Go Go	Shoprider Cameo
Class	2	2
Number of Wheels	4	4
Length (mm)	990	1,120
Width (mm)	482	560
Weight Capacity (kg)	113	114
Max Speed (mph)	4	4
Turning Radius (mm)	1,090	900

6.3.28 Following the findings of the initial trial all trains suitable for three-wheeled scooters that are no larger than the dimensions of a reference wheelchair were used in the trial.

6.3.29 Both mobility scooters could manoeuvre onto most train types (Class 170, 444, 450, 455 and 458) without difficulties. However, neither mobility scooter could satisfactorily manoeuvre into the designated wheelchair area on Class 159 trains. This was because the presence of a luggage rack adjacent to the wheelchair space obstructed the space for a large enough turning circle. Nevertheless, both types of mobility scooter could access and exit the area of flexible space known by employees as the "Disco area" of the units where the ramp is stored.

6.3.30 As a result of the trial it was recommended that the scooter card scheme be extended to include four-wheeled mobility scooters with a turning circle diameter no greater than 1,090mm and a maximum width of 560mm and length 1,120mm. In addition mobility scooters should be conveyed in the 'Disco' area (location where ramps are stored) of Class 159 vehicles and not in the wheelchair space.

SWT's Scooter Card

6.3.31 SWT's brochure 'Our Services for Passengers with Impairments', states that due to the number of different shapes and sizes of mobility devices many are unsuitable for rail travel. It explains that, to ensure mobility scooters can travel safely on their trains, mobility scooter-using passengers must own a vehicle that meets SWT's standards. This is achieved by the requirement to obtain a permit.

6.3.32 By obtaining a Scooter Card, SWT know that the mobility scooter is safe for use on their network and that the user has received information making them aware of the travel restrictions, safe boarding/alighting methods and SWT's Assisted Travel Service. Mobility scooter users are asked to send details and a picture of their mobility scooter so that a decision can be made about whether a Scooter Card should be issued permitting travel. The Card only allows travel to and from South West Trains' operated stations on South West Trains services.

Hull Trains

6.3.33 Hull Trains' Disabled People's Protection Policy (DPPP) states that they offer as comprehensive service as possible to disabled customers. In relation to mobility scooters, the following arrangements currently apply:

- customers with electric mobility scooters are encouraged to book reservations and assistance, preferably giving at least 24 hours notice;
- three and four wheeled mobility scooters may be carried on Hull Trains services providing the mobility scooters do not exceed the following dimensions:
 - - maximum width: 610mm
 - - maximum length: 1,320mm

6.3.34 Hull Trains (HT) now have new rolling stock and have in the interim undertaken a Risk Assessment (RA) to identify whether the dimensions need modifying.

6.3.35 The findings of the RA indicated that there was a need for a practical risk assessment looking at different classes of mobility scooters and a variety of users with varying ability in order to firmly evaluate the accessibility of HT's services⁴⁴. It recommended that the following areas be assessed:

- boarding the train;
- access/ manoeuvring inside the train;
- alighting the train; and
- evacuation and egress.

6.3.36 The specifications detailed in the RA include:

- encourage the use of mobility scooters which have three wheels or articulated wheels to assist manoeuvring into tighter spaces;
- the mobility scooter must fall within the size dimensions of the reference wheelchair;
- the weight of the mobility scooter and its user must not exceed the maximum weight of 300kgs (or 660lbs) which our on-board ramps carry;

⁴⁴ At the time of this research, Hull Trains was awaiting the findings of research by DfT on the carriage of mobility scooters before proceeding with further practical risk assessments.

- they cannot be a petrol driven mobility scooter. They must also have a free-wheeling facility for use in case of power failure and be fitted with a parking brake that is in full working order and preferably have batteries that are sealed; and
- whilst on the railway infrastructure the mobility scooter must have maximum speed of 4 mph whilst boarding, on board and alighting our services.

6.4 Light Rail

6.4.1 A study (Rebus, 1997) was conducted on light rail vehicle access devices for persons with reduced mobility. The light rail transit systems of the cities of Edmonton and Calgary with assistance from the government of Alberta undertook the demonstration project. The project involved the design, engineering and manufacture of fully automatic on-board access devices that would provide a smooth transition between the light rail vehicle floor and the rail transit station platform. The access device facilitated the movement of wheelchairs and mobility scooters both on and off the light rail vehicle. The device has been demonstrated on both the Edmonton and Calgary transit systems, and is now accepted by both transit departments for expanded uses. However, there has not been a follow up report outlining whether the system has been successful and widely implemented in the cities.

6.5 Summary

6.5.1 The research identified that very few studies had been undertaken on heavy and light rail. The most useful information obtained came from the mobility scooter trials of UK TOCs. The majority of TOCs will permit the carriage of mobility scooters as long as they are within the dimensions of the reference wheelchair. It does not appear that stability or securement is a central concern. However, manoeuvrability of four-wheeled models in particular can pose some problems as can boarding and alighting using a ramp where there is an excessive gradient.

6.5.2 There was little evidence identified for trams and light rail. Experiences in the UK would indicate that mobility scooters are currently being carried on tram systems without major incidents. The only issue seems to be stability under emergency braking conditions and concern by some operators of the amount of room larger models occupy.

7 Coach and Bus

7.1 Introduction

7.1.1 A significant amount of research has been undertaken on buses and coaches regarding the transport of mobility scooters. The majority of standards are related to the securement of mobility devices on transit buses in North America. Although some studies only undertook tests on transit buses, similar conclusions were drawn on the carriage of mobility scooters on coaches. There have also been a few studies on lifts and ramps for coaches and buses.

7.2 Securement

Background to Securement in North America

7.2.1 The introduction of low floor buses and the increasing cost and demand of paratransit services spawned renewed interest in North America in making conventional buses more acceptable to disabled people. The boarding and securement of mobility devices are two of the most important considerations in achieving the goal of accessibility. For small buses in Canada and all buses in the USA, stringent standards exist that require securement of passengers with mobility aids⁴⁵. These standards are in stark contrast with studies and experience in Europe where no active securement system is required for passengers in wheelchairs or other mobility devices such as mobility scooters on transit buses, where passengers face the rear of the vehicle.

7.2.2 There are two main approaches to securement for mobility aids on low floor buses. One is the forward facing wheelchair/occupant protection system and the other, the rear facing protected position system commonly used in Europe. Both systems have limits with regard to the level of safety provided, the degree of independence for the wheelchair/mobility scooter passenger, and the effects on bus operator efforts and responsibility.

7.2.3 The forward facing belt systems, predominantly used in the US, provide a high level of safety, but also require that the operator must deploy hooks and belts for securement of the wheelchair/mobility scooter and additional belts for the occupant. The wheelchair/mobility scooter passenger must face forward and is mandated by law to accept the securement system. The passenger depends completely on the operator's assistance if unable to deploy belts themselves. Boarding and securement is a time consuming, awkward and sometimes viewed as a degrading experience.

7.2.4 Canadian systems in some cases have adopted versions of the US systems that are less onerous, but do not accommodate all mobility aids and still require operator assistance. The rear facing system that originated in Europe and is in use in many European countries has now been adopted by many Canadian transit operators. It provides the same level of safety afforded to all other seated bus passengers, allows for complete independence of the wheelchair/mobility scooter passenger to ride without the use of hooks or belts, adapts to most wheelchairs/mobility scooters sizes and types, and does not require assistance of the operator, but the passenger must face to the rear. The rear facing position is not an issue in Europe, because transit buses have always had other rear facing seats. In

⁴⁵ In Canada (Canadian Urban Transit Association, 1995) there are no regulations or standards for mobility aid securement systems in large buses, however there are standards for their securement to be used in motor vehicles less than 6,500kg GVW. In the US, the ADA requires buses with GVW over 30,000lbs to provide a 4- point wheelchair/mobility device securement system as well as a passengers lap and shoulder belt restrain system to withstand 2,000lbs per securement leg or a minimum of 4,000lbs per mobility aid. Vehicles under 30,000lbs must restrain forces of up to 2,500lbs per leg of minimum of 5,000lbs per mobility aid. This is equivalent of withstanding deceleration force of 20g. An amendment to the ADA now also indicates that the passenger must be secured in the forward facing position only.

North America, rear facing is not common in transit buses. It is nevertheless accepted in trains, and subways.

7.2.5 Research completed in Germany and France (Rutenberg, 2000) also proved that unsecured wheelchair passengers when facing the rear with their back and head against a load bearing panel, provide a safe way of transportation on transit buses. In the UK, the DfT undertook a study with the aim to assess the safety of wheelchair users when being transported in all types of road passenger vehicles when compared with travellers seated in conventional seats (fitted with head restraints)⁴⁶. The study addressed the safety of adult wheelchair users in M1, M2 and M3 vehicles, i.e. private vehicles, taxis, minibuses, coaches and urban buses. In addition, the security of carriage of a wheelchair user in an urban bus under normal operating conditions was also investigated.

Types of Securement

7.2.6 All newly purchased buses in the US after 1991 must be equipped with a securement system and an occupant restraint system according to ADA. The most common system prevailing in use is the tie-down/belt system (most common being the Q-strait system). It consists typically of two rear belts, (either retractable and fastened to the seat/floor, or portable and stowed in a box), and two front belts, (retractable and portable to floor)⁴⁷. The occupant system consists of a lap and shoulder harness. In recent years there is a trend where wheelchair users have challenged operators and transit systems over the requirement to be secured at all, as per "rights" issue. Rutenberg (2000) notes that whatever the reason, if securement is not being systematically enforced, the theoretical level of safety offered by forward facing systems is severely compromised, diminishing its main advantage (of near total restricted mobility) over rear facing systems. Oregon State University

Securement System

7.2.7 One of the pioneering securement systems included the Oregon State University Securement System⁴⁸. The design concept involved an interface unit that is attached to the mobility aid and a securement system that is mounted on the vehicle. The personal restraint system involved a lap belt and harness system was also provided.

7.2.8 The system was designed to secure a mobility aid in the forward-facing position and was made up of two major parts: a capture mechanism which is mounted to the floor of the transit vehicle and an interface unit (trailer hitch) attached to the back of the mobility aid. The user backs the mobility aid into the securement station which is automatically latched. Verification of securement is provided to both the user and the vehicle operator by an indicator light. To leave the securement station, the user pushes a low force switch to release the latches (or, if unable to do so, asks the vehicle operator to use a duplicate switch) and wheels out.

7.2.9 The system was adopted by a number of transit operators in Oregon. A study (Hunter-zaworski, 1995) which evaluated the systems value concluded that the major problem with this technology is the interface to mobility aids. Since there are no universal mobility aid designs there are no universal interface designs. Therefore many mobility aids lacked the structural integrity to support the securement system.

⁴⁶ The findings of the study can be viewed at the following link:
http://www.dft.gov.uk/stellent/groups/dft_mobility/documents/page/dft_mobility_038498-01.hcsp#P23_1785

⁴⁷ Active systems generally involve the user occupying the mobility device and being secured with additional straps.

⁴⁸ Hunter-zaworski, K.M., A Universal securement/restraint system for wheeled mobility aids on public transportation vehicles. Transportation Research Institute, Oregon State University, April 1992 (Updated February 2003).

7.2.10 As of February 2003, the OSU securement system was no longer being manufactured. However, the product is still being used by the Anchorage, Alaska transit system.

Tie-down/Belt System and Wheel Lock System

7.2.11 The two most commonly used securement systems used in the US include the tie-down/belt system and the wheel lock system. The tiedown/ belt system is self explanatory and involves the use of various belts and straps that immobilise the wheelchair/mobility scooter. The wheel lock system involves the mobility devices front or rear wheels being immobilised by a locking system.

7.2.12 A survey by National Centre for Transit Research (Hardin, Foreman & Calelejas, 2002) which included a total of 270 transport agencies in the US reported that nearly all of the responding agencies (94 per cent) use tie-down/belt systems. In addition, 42 per cent indicated that their agency also relies on wheel-lock devices. The tie-down/belt system appears to be the most common securement equipment in use, with 77 per cent of respondents indicating that their agency uses this type of equipment most often. Other systems, however only rarely used, include the docking/interface system and the t-bar system⁴⁹.

7.2.13 The main advantage of the tie-down system indicated in the survey includes its flexibility of securement or the ability to secure a wide variety of mobility devices. Passenger feelings of security and safety were another advantage associated with tie-down systems. Other advantages of both systems include uniformity of securement and ease for drivers, customer preference, reduced damage to mobility devices, reliability, durability and compliance with ADA requirements. Disadvantages included the time to secure devices with both methods and inadequate securement of mobility devices such as mobility scooters. Other disadvantages for both systems included potential damage to mobility devices, maintenance problems, the need for additional training and the concern of some passengers that their personal space is invaded⁵⁰.

Cleveland Clinic Foundation (CCF) Securement Prototype

7.2.14 Several Transit and specialised transportation providers are participating in a pilot of the new CCF system. The design incorporates motorised tensioning of tie-down straps, which eliminates a common failing of manual systems to be properly tightened. Passengers can activate a nearby electrical switch which tightens and releases the straps. This also gives passengers greater freedom to un-secure themselves, where tensions of straps is not a factor.

Rear-Facing Position

7.2.15 The rear-facing position, was initially deployed in Germany and the UK in the early 1990s, and has now been widely utilised across Europe, in several transit systems in Canada, and most recently in Australia. The rear-facing position concept involves the passenger backing his/her mobility aid into an area provided with a fixed back and head supporting panel, a horizontal handrail on the bus wall, and an arm or stanchion on the aisle side to prevent the mobility aid from moving into the aisle. It allows for complete independence of the wheelchair/mobility scooter passenger to ride without the use of hooks or belts, is suitable for most wheelchair/mobility scooter sizes and types, does not require the assistance of the operator and provides a level of safety equivalent to that afforded to other bus passengers.

⁴⁹ The Cleveland Securement System (Reger, 1994) is another prototype system consisting of a docking latch on the bus interfaced with a securement bracket, attached permanently or temporarily to the mobility aid (see page 75).

⁵⁰ Table 30 (page 56) in the report 'Synthesis of Securement Device Options and Strategies' (Hardin, Foreman & Callejas, 2002) provides detailed information on the various tie-down and belt securement equipment available.

7.2.16 This approach uses the vehicle's mass and operating dynamics to protect passengers who use wheelchairs/mobility scooters in cases of severe braking or collisions. Within the last decade, the rear-facing approach to accommodating wheelchairs on large transit buses has progressed from its use in a few leader transit systems to widespread adoption by an ever-growing number of transit systems around the world, including Germany, the United Kingdom, France, Poland, Austria, Spain, the Czech Republic, Sweden, Belgium, Canada, and Australia. Although the position has been largely been accepted for wheelchairs, Canada is the only country that has utilised the position for mobility scooters.

7.2.17 In the United States, the rear facing position for wheelchairs had not until recently been deployed in any transit bus, as a result of the historical development in bus designs and past interpretations of the ADA. The ADA does allow a rear-facing position for wheelchairs on buses under certain conditions [see Title 49 of the Code of Federal Regulation (CFR), Part 38.23, "Mobility and Accessibility"], although this is not current practice on buses, nor widely recognised. However, given the use of the rear-facing position in Europe and Canada, the Federal Transit Administration (Rutenberg & Hemily, 2003) commissioned a report to ascertain its possible use in the US.

7.2.18 The research examined current practice with respect to the use of the rear-facing position for wheelchairs and mobility scooters on transit buses and identified relevant issues related to its transferability to the U.S. context, in particular with respect to the ADA and to its use in Bus Rapid Transit systems. The research included a survey of the Canadian transit systems that have adopted the rear-facing system, case studies, and interviews with experts in several countries.

7.2.19 It noted that there had been relatively few incidents involving mobility scooters. Only two incidents were reported where there had been minor accidents. In one incident, the mobility scooter user turned the power back on the mobility scooter (while bus was in motion), thus releasing the brakes, and resulting in the mobility scooter rolling and tipping onto another passenger when the bus turned left. The other incident involved the mobility scooter and passenger tipping over when the bus cornered. This was as a result of the bus not having an aisle stanchion. The majority of safety incidents involving wheelchairs and mobility scooters found to be associated with loading or offloading, outside the bus, etc., and were unrelated to the rear-facing position design.

7.2.20 The report raises the issue that prevention of the mobility aids (in particular three-wheeled mobility scooters) from tipping remains a challenge. It notes that experiments were carried out by one transit system to use a pivoting armrest that would be attached to the vertical support of the back panel's aisle side. Although it seemed to prevent tipping with the armrest down parallel to the mobility scooter's armrest, it presented a problem primarily for the passengers who had difficulty in reaching behind to move the armrest from its vertical stored position into the horizontal protecting position and vice versa. In addition, the transit system staff felt that this component could be misused or could create a hazard for other passengers.

7.2.21 The report, at the time of research, concluded there did not appear to be a solution in use that would both prevent tipping and not involve assistance by the bus operator or by an attendant or companion for some passengers. However, it reiterated that, notwithstanding this concern, no serious safety incidents directly linked to rear-facing systems had been reported in Canada or in Europe. Therefore, although it was not conclusive that the position may prevent tipping of three-wheel mobility scooters under severe braking, sharp turns, and curb hopping; the rear-facing design generally offers greater flexibility to accommodate non-common wheelchairs.

The US Experience with Securement of Mobility Devices

7.2.22 The ADA standard was developed and based on experience with smaller vehicles (e.g., van conversions) and school buses and has resulted in a complex system typically involving four separate securement straps plus occupant restraint belts. Although secure in design when properly used, this system has raised a number of practical challenges for transit systems, as well as for wheelchair users on board transit buses. The issues identified in a report by the US Transport Research Board (Ruttenberg, Hemily, 2003) include:

- assistance is required to secure the wheelchair/mobility aid and, if requested, to fasten the occupant restraint. The wheelchair/mobility aid passenger is the only passenger who may be wearing a seat or shoulder belt;
- operator-passenger physical contact is also a sensitive issue, which can result in discomfort for both parties and that is sometimes perceived as a degrading experience by wheelchair/mobility aid passengers;
- the system is not readily adaptable to the wide range of wheelchair/mobility aid in use, in particular mobility scooters. Extra straps are required, thus increasing the complexity of the securement process, and a growing number of wheelchair/mobility aid cannot be accommodated at all because of the lack of designated attachment points and/or risk of damage to the mobility aid;
- the straps are difficult to keep clean and properly store; they can soil clothes and, in some cases, cannot be found for use, thus decreasing the integrity of the system. Because they hang loose, the straps can also be a hazard to other passengers;
- securing a wheelchair/mobility aid is time consuming, disrupting schedules and sometimes causing embarrassment to the wheelchair/mobility aid passenger because the other passengers must wait;
- securement is often physically demanding for the bus operator and can involve the risk of employee injury; and
- in conventional transit systems, the infrequent use of strap systems and the wide range of wheelchair/mobility aid designs may result in incorrect securement practices. Safety could be compromised if the securement system is not actually, or is improperly, used.

7.2.23 To address some of these challenges, a number of initiatives have been undertaken over the last decade to develop universal securement systems. These designs, however, sometimes introduce new concerns.

The Canadian Experience with Securement of Mobility Devices

7.2.24 In Canada if a person wishes to remain in their wheelchair/mobility device for a bus trip, they must notify the company 24 hours in advance so that an accessible bus can be put on the route. The person will be lifted onto the bus in a chair using a mechanised lift or ramp, and secured in a passive or active securement system. There is no requirement in Canada for any one type of securement system. Each carrier can purchase their own, as long as it meets safety standards.

7.2.25 With the introduction of low floor buses, various approaches were experimented with, and different transit systems developed and adopted a variety of approaches to wheelchair securement. In the early 1990s, all of these approaches were based on a forward-facing position and involved physical securement similar to the US. However, transit systems recognised that the dynamic forces occurring on large transit buses, with their larger mass, were substantially lower than those on vans or even small buses. As a result, most approaches adopted simpler designs in the hope of reducing the burden caused by the securement system on the wheelchair passenger, the bus operator, and the transit system⁵¹.

⁵¹ A report in 1992 by the Ontario Ministry of Transportation (Guthrie, Lewis, 1992) indicated that accident rate for all mobility devices is about 3 accidents per 100,000 trips in Ontario. Mobility scooters and electric devices were the most accident prone, with 8-10 accidents per 100,000 trips. However, virtually no accidents occurred while the bus was in motion and most involved the use of lifts and almost all were caused by user error.

7.2.26 In the design of these systems a number of studies were undertaken. These predominantly included assessing the forces and displacements that would occur when a typical mobility scooter and tie-down system is subjected to severe driving conditions. Other studies addressed the operational and safety issues in transporting mobility devices⁵².

7.2.27 The Canadian Urban Transit Association (CUTA) conducted a study (Rutenberg, 1995) which examined the various approaches being adopted by the Canadian transit systems deploying accessible lowfloor buses. Three main types of forward facing securement systems were identified:

- four straps (angled securement): two for the front, two for the rear;
- wheel rim lock combined with one rear retractable strap; and
- two rear straps with angled wheel stop for manual and power chairs, with one additional front strap for mobility scooters.

7.2.28 All three systems immobilised the mobility aid with belts and hooks which are attached to the rear of the frame. This prevents the mobility device from becoming loose under regular driving conditions, including severe braking and cornering. However, a number of problems were identified for these securement systems for mobility scooters and are presented in Table 7.1.

7.2.29 The study found that operations such as use of lift, manoeuvring into securement position, deployment of belts, detachment of belts, and the requirement of other people for assistance was very time consuming. The report also indicated that three-wheeled mobility scooters have a stability problem along their longitudinal axis and can tip sideways on a traverse inclined surface. Moreover, mobility scooters, especially when, used by heavy persons can tip backwards on steep inclines due to a persons' high centre of gravity.

Table 7.1 Two Common Types of Securement in Canada

Angled Securement		Wheel-Rim Lock	
Tie-down	Passenger restraint	Tie-down	Passenger restraint

⁵² Mercer, W. Billing, J.R., Assessment of a transportable mobility aid in severe driving conditions: an exploratory test. The Canadian Standards Association, 1990.

<p>No designated attachment points on mobility scooter; passenger cannot reach to attach rear or front belt; and</p> <p>passenger must make certain to clear floor anchors for front belt;</p> <p>assistance required</p>	<p>Some passengers can reach down to get belts, others require assistance</p>	<p>Small rear wheels do not reach rim lock;</p> <p>rear of mobility scooter housing comes in direct contact with metal seat structure;</p> <p>no designated points on mobility scooter to attach rear belts;</p> <p>passenger cannot reach rear or front belts;</p> <p>passenger must make certain to clear floor anchors for front belts;</p> <p>assistance required</p>	<p>Some passengers can reach belts and buckle up, others require assistance</p>
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7.2.30 The report recommended that standards should make securement adaptable to all types of mobility aids; investigate the use of the centre door for access, reduce the need for hooks and belts, reduce driver involvement and explore the rear-facing position, also known as the Protected Position Securement System (PPSS).

7.2.31 As a result Transit systems, such as those in Montreal, Hamilton, and Ottawa, and BC Transit took advantage of the opportunity to explore the potential adoption of the rear-facing position.

Embracing the Rear-Facing Protected Position Securement System

7.2.32 An initial study by Transport Canada (McCarthy, 1997) confirmed that a non-interlocking securement system is feasible for use on large transit vehicles. Test data on compartment type securement systems verified that an unrestrained, rearward facing mobility aid placed in a properly designed protective compartment can safely manage the forces associated with normal driving and accident avoidance maneuvers. However, the study did note that mobility scooter design does not include side frames and cross braces which would aid in the protection of the occupant and a greater potential to tip over with the application of external forces⁵³.

7.2.33 A further study by Transport Canada (Rutenberg, Rhodes & Szlepetis, 1997) measured G forces during acceleration and deceleration to and from 110 km/h and concluded that passengers, who were transported in a rear-facing protected position in an intercity coach, were safe, secure, and comfortable during the test journeys.

7.2.34 Additional research (Rutenberg, Rhodes and Smith, 1998) of the system involving a hybrid II test dummy and three types of mobility aids (including three and four wheeled mobility scooters) were used to evaluate the effectiveness of a head and back support panel and stanchion for securing an

⁵³ The results of the mobility scooter simulations indicated maximum stresses will be localised in the attachment point between the main frame and the seat post and failure may occur below a 5 g impact in all securement scenarios.

intercity bus passenger in the protected rearfacing orientation during adverse manoeuvring conditions⁵⁴.

7.2.35 Overall, the mobility scooter (weighing 81.8kg) did not appear to move, sway or lift during acceleration or deceleration, although the upper part of the dummy showed signs of swinging because the (1) the mobility scooter's seat was mounted on a singular central tube, and (2) the vertical movements of the bus at the rear were quite significant. Since the restraining arm was not operational, the mobility scooter was secured with an aisle-side belt to prevent it from moving towards the aisle. The study concluded that during g-force tests were consistent with human safety limitations. The following recommendations were proposed:

- the back/head panel structure fasteners which connect the frame to the floor tracks must be of quick deployment/release type; there should be no need for tools;
- the aisle arm must be stronger to resist lateral forces;
- the padded area on the bus wall side is required to provide soft contact and prevent tipping;
- a horizontal fixed armrest on the bus wall side must be provided;
- a passenger restraint system must be an integral part of the back/head panel structure; and
- a shaped headrest with side supports is required to allow the passenger to rest his/her head.

7.2.36 Securement systems similar to the US are still common, however, based on the findings of the research several major transit systems have adopted, or are adopting, the rear-facing system. The main reasons being (1) it provides the passenger with independent and dignified access and (2) it provides the transit system with reduced dwell times and minimal involvement of the bus operator.

7.2.37 Rear-facing systems are now implemented in 18m (60ft) articulated low-floor buses, 12m (40ft) low-floor buses, 12m (40ft) double-decker low-floor buses, and 10.6m (35ft) and 9-m (30ft) low-floor buses, involving front or middle door access, depending on the bus model and transit system. In addition, under the auspices of the Canadian Standards Association (CSA), the principal standards development organisation in Canada, representatives of transit systems, of the wheelchair user community, and of bus and component suppliers, have been involved in the development of the new Standard for Accessible Transit Buses (D435-02), which was published in August 2002. The development of this standard is intended to provide guidance to the industry and encourage greater transit accessibility. The D435 standard specifically recognises the rear-facing position as acceptable practice⁵⁵.

Common Problems with Securement Systems Specific to Mobility Scooters

7.2.38 A number of problems have been identified with securement systems that involve the tie-down/belt and wheel lock systems. Operators have found the systems to be "too time consuming", "hard to work" and results in "being too close to the passenger".

7.2.39 A survey by the National Center for Transit Research (Hardin, Foreman, & Callejas, 2002) identified that the most common complaint from passengers and drivers alike is related to passengers who do not want their mobility device to be secured. In addition, both vehicle operators and passengers who use mobility devices commonly complain about malfunctioning securement equipment. This finding is particularly significant as respondents also indicate that a majority of securement-related passenger injuries have resulted from either malfunctioning securement equipment or improper securement. Since physical securement systems are based on belts and hooks, storage and

⁵⁴ The tests involved rapid acceleration, deceleration and changing lanes at 110km/h.

⁵⁵ Danadian Standards Association, Accessible Transit Buses, Standard D435-02, 1st ed., Mississauga, Ontario, Canada, Aug. 2002.

handling of belts also posed problems. Moreover, for the general public, belts that don't completely retract can create a hazard when hanging loose or laying on the floor.

7.2.40 A number of studies indicated concerns regarding the carriage of three-wheeled mobility scooters. After receiving complaints from a number of transit operators, the Federal Transit Administration (FTA) responding to these concerns commissioned a study (Spiller, 1995) which undertook an assessment of securement and restraint issues related to the transport of tri-wheeled mobility scooters and their occupants on buses and vans used in public transit service.

7.2.41 The study identified that the vast majority of mobility aid-related accidents/incidents did not involve impact collisions and the great majority resulted from excessive braking or sharp cornering or involved lift operations. Over 70 per cent of the accident/incidents researched did not have any injury consequences for other passengers on board the bus or the van.

7.2.42 Based on test reports and the 'expert opinion' of the technical community, the following securement and restraint related issues were identified as actual or potential problems:

Non-crash Issues

- inaccessible attachment points;
- inadequate structural strength of attachment points; and
- proliferation of mobility scooter models that are incompatible with securement systems.

Crash-related Issues

- inability to restrain the battery in a crash impact⁵⁶;
- shearing or fracturing of the seat pedestal; and
- large bending moments that exceed the restraining force of seat designs.

7.2.43 Two additional issues included the rollover or tipping instability inherent in the three-wheeled mobility scooter design and the spillage of battery fluid, unless the mobility scooter is of the dry or gel-type.

7.2.44 The National Center for Transit Research (Hardin, Foreman, & Callejas, 2002) undertook a research survey with 270 transit operators in the US⁵⁷. The research canvassed opinions and experiences of carrying mobility scooters. The main concerns raised included: mobility scooters are extremely difficult to secure using ADA-compliant securement equipment;

- a number of incidents and/or accidents result from improper securement or malfunctioning of securement equipment;
- the difficulty in identifying securement systems that effectively
- secure a wide variety of mobility devices in a reasonable amount of time. Moreover, the problems associated with securing mobility scooters that do not fit within the dimensions of the 'common' wheelchair;

⁵⁶ The report recommended that batteries should be located as low as possible, consistent with ground clearance. The top of the battery should be below seat level; those scooters with batteries or other components projecting above the level of the seat, and which are not securely connected to the scooter platform base were considered unsuitable for transporting by motor vehicle.

⁵⁷ The survey conducted in June 2001 was distributed to 49 Community Transportation Coordinators (CTCs), 12 paratransit providers under contract to Florida's CTCs. In addition, 70 non-Florida transit properties also received the surveys. A total of 270 agencies were surveyed and 95 responses were received (54 from Florida and 41 from Non-Florida).

- the difficulty to secure mobility scooters because of the few areas to secure straps;
- stability of three-wheeled mobility scooters when boarding and alighting and when used by occupants as seats on transit vehicles⁵⁸; and
- frustration with having little-to-no guidance from manufacturers on the securement of three and four-wheel mobility scooters.

7.3 Use of Lifts and Ramps on Transit Buses

7.3.1 The ADA provides specifications for lifts and ramps for transit buses for the carriage of wheelchairs and mobility devices. An article in Metro Magazine (Staricic, 2001) identified ADA specifications for wheelchair lifts on buses were not suitable for many wheelchairs and a number of mobility scooters. As a result transit operations are turning to using ramps in low-floor buses rather than lifts. However, advances in lift design continue to be made.

7.3.2 ADA minimum standards require wheelchair lifts have a platform width of 30 inches (762mm) and a length of 48 inches (1,220mm). However, to cater for customers' preference for wider wheelchairs, the San Francisco MUNI specified for a wider lift platform. The ADA requires a minimum design load of 600lbs (272kg). Kansas Transit Authority has increased this to 700lbs (348kg) and the Ohio Transit Authority has increased this to 1,000lbs (450kg) to withstand the weight of motorised wheelchairs and mobility scooters. However, these are more frequently low floor buses incorporating motorised ramps.

7.3.3 A study (Rutenberg, 2000) noted that people using manual and electric chairs used ramps front first when boarding. However, many people using mobility scooters preferred to back in over the ramp. This allowed them to back right into the wheelchair position without any additional manoeuvring. Side guards on the ramp should be high enough to prevent the mobility scooters from slipping off.

7.4 Summary

7.4.1 A significant amount of research was obtained regarding the carriage of mobility scooters on buses and coaches. It is clear from evidence in the US and Canada that securement is the most significant issue. Without clear guidance from the transit industry, securement manufacturers and mobility aid manufacturers, it has been difficult to adapt or develop a system that is suitable for a variety of mobility aids. Moreover, physical restraint systems can be time consuming and cumbersome with the number of straps and belts required. Passengers can also be reluctant to use this system.

7.4.2 The rear-facing protected position system adapted in Canada which offers more flexibility may be more appropriate to the UK. However, although there are few reports of incidents, there still remain concerns over the stability of mobility scooters on buses and coaches. There was not enough evidence on the use of lifts and ramps to draw any significant conclusions.

⁵⁸ The majority of manufacturers do not recommended using secured scooters as seats on a moving vehicle.

8 Taxis

8.1 Introduction

8.1.1 A number of studies have been undertaken in Australia regarding the use of mobility scooters in taxis. The majority relate to the securement of the mobility device. No other relevant studies that discussed the carriage of mobility scooters on taxis were identified.

8.2 Australian Standards

8.2.1 A report for the Australian Capital Territory (ACT) Government (Brownsdon & Marcar, 2002) developed a set of recommendations to government on the legislative and insurance issues relating to motorised scooter use in the ACT. These included:

- maximise safety for users of electric wheelchairs and motorised mobility scooters in the ACT by 2010;
- develop a training program and manual for use with mobility scooter users;
- increase public awareness of mobility scooters and scooter safety; and
- identify the stakeholders, their roles and responsibilities.

8.2.2 The report concluded that the lack of an Australian Standard for mobility scooters contributes to the difficulty of ensuring that wheelchair accessible taxis, and buses can adequately transport mobility scooters.

8.2.3 The Australian Government improved this situation by specifying in the Disability Standards that 1,410mm in accessible taxis is the minimum internal headroom and 1,400mm as the minimum vertical opening. It is anticipated that manufacturers will develop vehicles suitable for taxis with headroom of at least 1,500mm by 1 January 2013.

8.2.4 The implementation of these two national standards is welcomed in a report titled the Updated Action Plan for Accessible Public Transport in the ACT 2004-2007 (Urban Services, 2004). However, the report stated concern that there was still no Australian Standard for motorised mobility scooters that would define safety features (eg: securing points for taxis), size or operational parameters (such as manoeuvrability or turning circle). Although certain elements have been addressed with the Accessible Transport Standards Guidelines, there are still no specifications on securement for mobility scooters in taxis. The report also states that there is a need for drivers of accessible taxis to be trained accordingly to assist appropriately with mobility scooters.

8.3 Securement

8.3.1 Guidance given on the ACT government website⁵⁹ issued by the Road Transport Authority to assist users of Wheelchair Accessible Taxis (WAT) states that all passengers and their mobility device must be restrained while travelling in a WAT (unless exempt). This is to ensure the comfort and safety of all passengers and the driver. It states that some mobility devices, particularly mobility scooters, cannot be fitted or safely secured in WATs due to their dimensions or construction. It notes that in some circumstances, drivers will be able to secure mobility scooters, but the passenger must relocate and occupy a passenger seating position (effective 1 March 2003). Drivers may refuse to carry a passenger whose device cannot be safely restrained while travelling in a WAT.

⁵⁹ <http://www.transport.act.gov.au/publictransportpolicy/taxi/wheelchair>

8.3.2 A scooters drivers guide⁶⁰ (a booklet which is a component of The Scooter Safe Training Resource funded by the ACT Road Safety Trust, conducted jointly by the Council on the Ageing ACT (COTA) and Able Access) strongly advises that passengers transfer off the mobility scooter when travelling in a vehicle. It states that the occupant and the mobility scooter cannot be effectively restrained in the event of an accident. It is recommended that restraints that resist a force of 25 times the weight of the mobility scooter, in a forward direction, must be installed to tie down the mobility scooter.

8.3.3 The report noted the view of the 'Council on the Ageing' that some regulation of the use of mobility scooters warrants consideration, such as training and registration. While this issue needs more research and probably national consideration as to strategic directions, the report considered that better information for users and potential users of mobility scooters was required.

8.4 Summary

8.4.1 There was little experience or studies to draw on for this research other than from Australia. The research indicated that mobility devices, particularly mobility scooters, cannot be fitted or safely secured in most taxis due to their dimensions or construction. It is recommended that passengers relocate and occupy a passenger seating position, and the mobility device is secured.

⁶⁰ The Guide can be viewed at the following link: http://www.cota-act.org.au/Download_Documents/PDFS/Scooter_Drivers_Guide.pdf

9 Conclusions and Recommendations

9.1 Introduction

9.1.1 This chapter highlights the key findings identified in the research. However, a finding in itself is that little information was identified throughout. This could infer two points. Firstly, that the scope of research is new and there have been few studies undertaken. This is most likely the case for Europe but not North America where mobility scooters have been carried on public transport for the last 15 years. Secondly, that certain issues of interest such as the carriage of scooters as luggage, weight issues, safety of power systems have not provoked significant concern to warrant numerous research studies, in particular for mobility scooters. Although it would be inappropriate to draw conclusions on this lack of evidence, some weight should be given to this finding.

9.1.2 The study found that outside the USA, Canada and Australia there has been very little research undertaken on the carriage of mobility scooters on public transport. Experience in Europe suggests that mobility scooters are not commonly used within transport systems although they are often unintentionally covered by regulations for electric wheelchairs. The majority of the studies undertaken (especially in the USA and Canada) have covered securement on transit buses.

9.1.3 UK experience shows that mobility scooters have been conveyed on heavy and light rail without serious incidents resulting in injury. This research only identified one example of a mobility scooter being carried on a low-floor bus and there is no evidence to suggest that mobility scooters have been transported by taxis or coaches (except where they are folded for carriage as luggage). However, this is not to say that there are many examples where mobility scooters are being conveyed on these forms of public transport; nevertheless for the purpose of this research no evidence was found. The research identified that there is a degree of confusion from operators regarding the carriage of mobility scooters. The main confusion concerns what size and model of mobility scooter is suitable for transport, especially given manoeuvrability and stability considerations. The following sections outline the key findings of the research for each transport mode.

9.2 Heavy and Light Rail

9.2.1 The research indicated that the rail industry in the UK has undertaken a number of trials with various mobility scooters and class of trains. In addition, the Association for Train Operating Companies have established a national policy. As a result, more than half the operators will carry mobility scooters that are within the specifications of the reference wheelchair. All operators will also allow the carriage of folding scooters as luggage. The findings of the research indicate that stability and securement is not a significant concern.

9.2.2 Manoeuvrability of most three-wheel models (within the specifications of the reference wheelchair) was considered satisfactory when navigating within the rail vehicle. However, evidence suggests that larger Class 3 four-wheeled models posed significant problems during the trials. This was not the case though for most Class 2 four-wheeled models. Trials by Virgin Trains and South West Trains of the smaller four-wheeled models (within the dimensions of the reference wheelchair) indicated that these models could board, alight and maneuver with relative ease. Additionally, mobility scooters with articulated wheels proved to be more manoeuvrable.

9.2.3 The majority of mobility scooters have a safe climbing gradient on average of 8 degrees which is approximately the safe angle recommended by DfT. However, there are stations where this angle could be exceeded on ramps by up to as much as 19 degrees.

9.2.4 Another issue highlighted was the use of mobility scooters on rail infrastructure and in particular at level crossings. This concern is not directly relevant to the carriage of mobility scooters on public transport, but could be raised by DfT to the Health and Safety Executive and Network Rail.

9.2.5 There was little evidence identified regarding the carriage of mobility scooters on trams, underground rail and light rail. Experience in the UK would suggest that mobility scooters are currently being carried on several tram systems (especially those which offer level access) without major incidents involving injury to the mobility scooter user or the travelling public. The only issue identified relates to the stability of the mobility scooter under emergency braking and the concern by some operators of the amount of room larger models can occupy. The issue of emergency braking is more relevant for light rail because trams operate within the pedestrian environment and there is a higher likelihood of the emergency brakes being applied and resulting in movement of a mobility scooter. However, other than operators within the UK expressing these concerns there was no international evidence indicating that that the issue has caused widespread problems.

9.3 Bus and Coach

9.3.1 The research identified a substantial amount of information relating to the securement of mobility scooters and mobility aids during carriage on a bus and coach. The majority came from North America where research had been undertaken on passive and active securement restraint systems. The US has adopted active restraint systems, whereas Canada has embraced both active and passive measures. Evidence from Canada would suggest that the rear-facing protected position (passive approach) is a suitable securement measure for mobility scooters. Very few incidents involving injury using this position have been reported. However, stability (particularly three-wheeled models) remains a concern of operators in North America.

9.4 Taxis

9.4.1 There was little evidence to draw from for the research other than minor references to a study in Australia. The research indicated that mobility devices, particularly mobility scooters, cannot be fitted or safely secured in most taxis due to their dimensions or construction. It is recommended passengers relocate and occupy a passenger seating position for greater safety.

9.5 Recommendation for Mobility Scooter Use on UK Public Transport Services

9.5.1 There is sufficient evidence from the research undertaken to make sound recommendations on certain aspects concerning the carriage of mobility scooters on different modes of public transport. However, there are also clear gaps where further research is required before firm recommendations can be made. It is the intention, where possible, to make general recommendations that will be relevant to all modes of public transport. In addition, the following section will identify mode-specific issues and suggest where further research is required due to the unavailability of sufficient evidence.

Class and Specification of Mobility Scooter for Carriage on Public Transport

9.5.2 Mobility scooters and other mobility devices that are carried on public transport in the US have to be within the specifications of the 'common wheelchair'. Evidence from the research suggests that the specifications have not caused significant issues for carriage on any mode of transport. In addition, it is clear from the trials undertaken by rail operators in the UK that mobility scooters that are within the envelope of the reference wheelchair can be accommodated by most classes of rolling stock. Based on this evidence and the common mobility scooters on the market identified in the typology it is proposed that mobility scooters that are within the following threshold be considered for travel on public transport services in the UK⁶¹.

- Height - 1,350mm

⁶¹ It is recognised that non-compliant RVAR rolling stock may not be able to accommodate these specifications. However, by no later than 1 January 2020, all rolling stock and passenger service vehicles will be required to have a compliant wheelchair space or seek an exemption.

- Length - 1,200mm
- Width - 700mm
- Weight⁶² - 300kg

9.5.3 In addition, the mobility scooter should have a maximum turning circle radius of 1,500mm (it may be possible to increase this to 1,700mm at some point). With regard to the Class of mobility scooter it is recommended that only Class 2 mobility scooters (articulated wheels which create a triangular footprint and three- or four-wheeled models) and Class 3 mobility scooters with three wheels (or articulated wheeled) that fall within the above threshold be accommodated on public transport. The notable omission is four-wheeled Class 3 models. Evidence suggests that these models are too large to transport and lack the necessary manoeuvrability. However, if such models become smaller and have greater manoeuvrability, this policy should be revised.

9.5.4 Only mobility scooters with dry cell or batteries should be transported on all forms of public transport.

9.6 Possible issues for further consideration and research

9.6.1 The following table identifies possible issues associated with the carriage of a mobility scooter (based on the above recommended specifications) on public transport in the UK. The table, where possible, identifies where issues could arise for each public transport mode and are discussed in more detail below.

Level access without boarding aid

9.6.2 Where level access is available (some light rail and buses), no problem was identified. Moreover, it would seem improbable that a mobility scooter would in fact be required to board or alight most trains or taxis in the UK without a boarding aid.

Boarding and alighting using ramps

9.6.3 Existing ramps for wheelchairs used for public transport should on most occasions safely accommodate the recommended mobility scooter for carriage on bus, coach and rail. However, most mobility scooters have a safe climbing angle of 8 degrees, where this angle is exceeded (most likely on rail platforms), a staff member should be present to assist. There is insufficient evidence to recommend either way their safe use entering or exiting taxis.

Table 9.1 **Issues** with Transport Modes

⁶² The weight of the mobility scooter includes the occupant.

	Mode of Transport			
	Heavy Rail	Light Rail (including tram and underground)	Bus/Coach	Taxi
Level access without boarding aid	NP	✓/NP	✓/ NP	NP
Boarding and alighting using ramps	✓/?	✓/?	✓	I/E
Dimensions, weight and manoeuvrability	✓	✓	?	?
Stability, securement and restraint systems	✓	?	?	?
Compatibility with transport infrastructure	✓	✓	✓	✓
Safety of power systems	✓	✓	✓	✓
Access to facilities on vehicle	?	N/A	?	N/A
Carriage of folding mobility scooters as luggage	✓	✓	?	✓

NP – Not possible

✓ – Will not cause a problem

? – May cause a problem

I/E – Insufficient evidence to make a judgment

N/A – Not applicable

Dimensions, weight and manoeuvrability

9.6.4 Based on experience from operators in the UK, the dimensions weight and manoeuvrability of the recommended mobility scooter should not pose significant problems for heavy and light rail for regulated stock. However, there is inconclusive evidence regarding bus, coach, and taxi. The main issue is manoeuvrability and testing may be required to identify any limitations of the recommended mobility scooter within the wheelchair space.

Stability, securement and restraint systems

9.6.5 The difficulty when considering stability of mobility scooters lies with the fact that larger four-wheeled modes are more stable but less manoeuvrable, while the opposite is true for three-wheeled models. Experience from North American operators suggests there are concerns over the stability of three-wheel models on buses and coaches. All instances identified where tipping occurred involved three-wheeled models. There is a need for more research on the risks associated with tipping on bus and coaches and the implications for securement. It is likely that the rear facing securement position is suitable for the mobility scooter in the UK, but a single strap for securement may be required for additional restraint. In addition, it may be more appropriate for the passenger to transfer to a seat. There is, therefore, a need for further testing before sound recommendations are made.

9.6.6 There is also a need for possible testing to understand the relationship between stability and securement under emergency braking for light rail. Depending on the results of trials, a similar strap to secure the mobility scooter may be appropriate for light rail operators. There do not appear to be any issues associated with stability for heavy rail, although it is appreciated that any securement might help in the event of an accident.

9.6.7 The research did not yield sufficient evidence to recommend that stability should prevent mobility scooters carriage in taxis. It is recommended that the passenger transfers from the mobility scooter into a passenger seat and the device can be secured or stowed. There is a clear case for trials to investigate whether the securement in place for wheelchairs is suitable for the recommended mobility scooter.

Compatibility with transport infrastructure

9.6.8 There was no evidence from the literature review or from discussions with transport operators to indicate that mobility scooter users would experience difficulty manoeuvring in or around public transport infrastructure.

Safety of power systems

9.6.9 The mobility scooters permitted for carriage on public transport should only utilise a dry cell or gel battery.

Access to facilities on public transport vehicles

9.6.10 There is insufficient evidence from the research to conclude whether a mobility scooter would have difficulty accessing facilities on vehicles (such as toilets or a buffet car). These issues could be explored in any future trials.

Carriage of scooters as luggage

9.6.11 Most modes of public transport will accommodate the carriage of fold-up mobility scooters as luggage. However, problems may occur identifying a suitable area for stowage on buses. In terms of nonfolding mobility scooters that fall within the recommended specification there was little evidence indicating suitable locations or associated issues outside of storing them in the identified wheelchair space.

9.7 Further research required (Stage 2)

9.7.1 Although there is evidence from UK operators and examples of research from other countries there are clear gaps identified in the research. These need to be understood before sound policy decisions can be drafted. There is a need, therefore, for the DfT to undertake a second stage of research in the form of practical trials of the recommended mobility scooters on different forms of public transport. It is recommended that, as a minimum, the following issues should be covered:

- entering and exiting taxis in order to ascertain the usability of a ramp and whether securement measures are satisfactory;
- manoeuvrability of the mobility scooter within bus, coach and taxis in accessing the wheelchair space and (including rail but not taxi) accessing on-board facilities; and
- assess the risks associated with tipping on buses and coaches. Determine whether the rear facing securement position is suitable or whether (alternatively or in combination) an active restraint securement system is required; and identify the stability risk under emergency braking conditions for light rail and whether securement measures are required.

9.8 Complementary Research

9.8.1 If the DfT is to proceed with practical trials as recommended above it would also be useful to conduct complementary research with the transport industry and members of the public who potentially would use mobility scooters on public transport. It is suggested that in-depth interviews are undertaken with representatives from a number of public transport operators. By gauging different operators' experiences it should provide a clearer picture of any issues identified in dealing with mobility scooters, as well as obtaining an understanding of the existing demand by mobility scooter users.

9.8.2 In addition, involving mobility scooter users in a series of focus groups could provide a picture of mobility scooter users' preferences and priorities when travelling on different forms of public transport. Furthermore, it could inform policy decisions such as identifying what issues would be involved if passengers were required to transfer to a seat or if there was conflict between a mobility scooter user and a wheelchair user.

9.9 Revisiting the Research Objectives and Final Recommendations

9.9.1 Subject to the results of any future trials, it is recommended that:

- DfT amends the RVAR and PSVAR to widen the definition of the reference wheelchair to include 'mobility aids' such as mobility scooters;
- DfT to issue a guidance document outlining which mobility scooters are suitable for carriage on public transport vehicles to assist transport operators; and
- transport operators should be required to transport the recommended mobility scooters.

References

- Brownsdon, A. Marcar, C.** Use of Electric Scooters and Wheelchairs in the ACT: Policy Implications & Recommendations. Council on the Ageing (ACT) (Australia), 2002.
- Cambel, J.** 2005 Paratransit Survey. Metro Magazine (USA), August 2005.
- Council on the Ageing (ACT) (Australia)**, A scooter driver's Guide, August 2002.
- Cross, D.** Securing Wheelchairs: Recent Developments, Future Challenges. Proceedings of 2003 Bus and Paratransit Conference sponsored by American Public Transportation Association, 2nd to 4th May 2003.
- Department for Transport.** Review of Class 2 and Class 3 Powered Wheelchairs and Powered Scooters (Invalid Carriages). Transport and Travel Research Ltd, April 2005.
- Department of Health - Medicines and Healthcare products Regulatory Agency.** Guidance on the Safe Transportation of Wheelchairs, March, 2004.
- Department for Transport.** Wheels Within Wheels - A guide to using a wheelchair on public transport. Ricability, 2005.
- Foreman, C. Hardin, J.** The Challenges of Wheelchair Securement: Searching for Solutions. The Center for Urban Transportation Research (USA) for APTA Bus and Paratransit Conference, 2001.
- Guthrie, B.M. Lewsi, D.L. Smith, D.G. Sorbara, B.J.** The operation and safety of mobility devices in public transport services. Hickling Corporation/Ontario Ministry of Transport for Mobility and transport for elderly and disabled people, 1st May 1992.
- Hardin, J. Foreman, C. Callejas, L.** Synthesis of Securement Device Options and Strategies. National Center For Transit Research (NCTR) for Office of Research and Special Programs (USA), 2002.
- Hardin, J. Foreman, C. Callejas, L.** Synthesis of Wheelchair Securement Devices, Final Report. National Center for Transport Research CUTR for Florida Department of Transportation (USA), March 2002.
- Hunter, R.** Occupied Wheelchairs and Scooters: Percentiles, percentage inclusion, representatives and most-compact spaces. Hunarch Consulting (Australia), 2003.
- Hunter, R.** Wheelchairs, scooters and Victorian railway infrastructure. Hunarch Consulting (Australia), 2003.
- Hunter-zaworski, K.M.** Auto engaging mobility and securement systems and low floor buses. Oregon State University for the 8th International Conference on Transport and Mobility, 1st September 1998.
- Hunter-zaworski, K.M.** A Universal securement/restraint system for wheeled mobility aids on public transportation vehicles. Transportation Research Institute, Oregon State University, April 1992 (Updated February 2003).
- Hunter-zaworski, K.M. Zarowski, J.** Preparation of the OSU securement system for a demonstration project. Transport Research Institute, Oregon State University for US Department of Transportation, 1995.
- Kaye, H S. Kang, T. Laplante, M P.** Mobility device use in the United States: disability statistics report. University of California, San Francisco for National Institute on Disability and Rehabilitation, June 2000.

- Layton, R. Hunter, K. Safford, R.** Study of human factors in public transportation safety. Oregon State University, Transportation Research Institute, 1989.
- Mercer, W. Billing, JR.** Assessment of a transportable mobility aid in severe driving conditions: an exploratory test. The Canadian Standards Association, 1990.
- Modern Railways.** New Disability Regulations Highlight Question. September, 2005
- McCarthy, M. Watson, S.** Automated mobility aid securement. TES Limited for Transportation Development Centre (Canada), 1997.
- National Council on Disability,** The current state of transportation for people with disabilities in the United States, June 13th 2005.
- Rebus, B.** Light rail vehicle access device for persons with reduced mobility. Edmonton Transit on behalf of Alberta Transportation and Utilities, 1997.
- Reger, S. I. Adams, T. C. Sahgal, V.** Evaluation of securement systems during severe driving manoeuvres. Cleveland Clinic Foundation, USA for the 9th annual conference of the association advancement of automotive medicine, 1st September 1994.
- Roosmalen, L.V. Bertocci, G.E. Hobson, D.A. Karg, P.** Preliminary evaluation of wheelchair occupant restraint system usage in motor vehicles. Journal of Rehabilitation Research and Development Vol. 39 No. 1, January/February 2002, Pages 83-93.
- Rutenberg, U.** Accommodating mobility aids on Canadian low-floor buses using the rear facing position design: experience, issues, and requirements. Rutenberg Design Inc for Canadian Urban Transit Association (2000).
- Rutenberg, U. Hemily, P B.** Use of Rear-Facing Position for Common Wheelchairs on Transit Buses. Transit Cooperative Research Program for Transport Research Board, 2003.
- Rutenberg, U.** Urban transit bus accessibility considerations. Rutenberg Design Inc for Canadian Urban Transit Association, 1995.
- Rutenberg, U. Rhodes, W. Smith, B A.** Protected position securement for travellers in mobility aids on intercity buses. Rutenberg Design Inc/Rhodes & Assocs Inc. Transportation Development Centre, Canada for the 8th International Conference on Transport and Mobility, 1st September 1998.
- Rutenberg, U. Rhodes, W. Szlapetis, I.** Evaluation of the protected position mobility aid securement system for intercity buses. Rhodes and Associates for Transportation Development Centre, Safety and Security, Transport Canada, April 1997.
- Spiller, D.** Tri-wheeled scooters transported on buses and vans: assessment of securement and restraint issues. Transportation Systems Center, Federal Transit Administration, October 1995.
- Stait, R. Stone, J. & Savill, T (TRL).** A Survey of Occupies Wheelchairs to Determine Their Overall Dimensions and Weight: 1999 Survey. Mobility and Inclusion Unit, DETR, 1999.
- Starcic, J.** Keys to Proper Spec'ing of Wheel Chair Lifts. Metro Magazine (USA), August 2001.
- Steinfeld, E. Maisel, J. Feathers, D.** Standards and Anthropometry for Wheeled Mobility. Inclusive Design and Environmental Access (IDEA) for US Access Board, 2005.
- Updated Action Plan for Accessible Public Transport in the ACT 2004-2007.** Road Transport, Urban Services in conjunction with Transport Reform Advisory Group, July 2004.
- Uras, H & Aktan, H.** Development of Wheelchair-Lift Prototype for Transit Buses. Journal of Transportation Engineering, Vol. 121, No. 2, March/April 1995, pp. 214-220.

Appendix A - Public Transport Operators contacted regarding policy on the carriage of mobility scooters

Public Transport Operator Contacted¹
Light Rail/Tram
Nottingham Express Transit
Croydon Tram Link
Sheffield Super Tram
Manchester Metro Link
Midland Metro
Tyne and Wear Metro
Light Rail Transit Association
Docklands Light Rail
Underground Rail
London Underground Limited
Bus
Arriva Bus
Stagecoach
Go-Ahead (London Central)
Brighton and Hove Bus Company
Solent Blue Line
Travel West Midlands
Coach
National Express
Oxford Tube
The Kings Ferry Coach Kent
Mega Bus
Taxis
Licensed Taxi Drivers Association
National Taxi Association
The London Cab Drivers' Club
Other Relevant Groups

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Public Carriage Office

ECMT Group on Access and Inclusion

¹ Individual train operating companies were not contacted as details of their policies on the carriage of mobility scooters were provided by the Association of Train Operating Companies.

Appendix B - List of Primary Research Databases and Organisation Used throughout the research process

Name	Description	Web Address
ATRI: Australian Transport index	Database on published and unpublished Australian material on transport	http://www-prod.nla.gov.au/pathways/jnls/newsite/view/1229.html
International Transportation Research Documentation	Database reflecting the transport research literature of 23 countries	http://www.itrd.org
Canadian Surface Transportation Research	Database on published and unpublished Canadian material on surface transport	http://www.tac-atc.ca/rdqbe.htm
TRIS (Transportation Research Information Services) Online	Database of 512,510 records of published transportation research	http://trisonline.bts.gov/search.cfm
National Transportation Library	This collection provides access to over 9,272 full-text documents relating to transportation. Resources are primarily technical, research and policy documents provided by U.S. federal, state, local, tribal and other government agencies. Links are to government and other significant web sites and documents.	http://ntl.bts.gov/digital_collection.cfm
Transportation Research Board	A compendium of technical papers taken from the annual meeting of the Transportation Research Board	http://www.dcddata.com/trb/trb.htm
TRANweb: Transportation archive file	TRANweb is a web-based database of magazine article and conference paper citations held in Northwestern University's Transportation Library	http://tran.library.northwestern.edu/

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Transguide	The Library and Information Centre (BIC) of VIT develops and maintains Transguide on behalf of VINNOVA, the Swediah Agency for Innovation Systems. VIT Library abd Information Centre (BIC) collects, organises, stores and disseminates information in the field of transport and communication research	http://www.transguide.org/
CORDIS (Library) Community Research & Development Information Service	This service is the central entry point for all documents and publications on European research and innovation activities available in the RTD-Document Library and the RTD-Publications databases	http://cordis.europa.eu/library/
ELTIS European Local Transport Information Services	Database detailing knowledge and experience in the field of urban and regional transport in Europe	http://www.eltis.org
POLIS Parliamentary Online Indexing Service	POLIS provides an index to the proceedings and publications of both Houses of Parliament and includes the full text of early day motions since May 1997	http://www.polis.parliament.uk
Nottingham University Online Planning Resources	Database of bibliographies covering a very wide range of current planning topics; including transport	http://www.nottingham.ac.uk/sbe/planbiblios/
Transport Policy Institute, TDM Encyclopaedia	The online TDM encyclopaedia a comprehensive source of information about innovative management solutions to transport problems	http://www.vtpi.org/tdm
Zetoc	Zetoc provides access to the British Library's electronic table of contents of around 20,000 current journals and around 16,000 conference proceedings published per year	http://zetoc.mimas.ac.uk/
US Transportation Research Board	The Transportation Research Information Services (TRIS) database is the world's largest and most comprehensive bibliographic resource on transportation information	http://trisonline.bts.gov/search.cfm

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Federal Highway Administration	<p>Electronic reading room allows access to:</p> <ul style="list-style-type: none"> ■ Intelligent transportation system electronic document library ■ Legislation and regulations ■ National transportation library ■ TRIS online ■ Publications and statistics 	http://www.fhwa.dot.gov/
Elsevier	A world leading, multiple-media publisher of scientific, technical and health information products and services	http://www.elsevier.com/
Copac	It provides access to the merged online catalogues of 24 major university research libraries in the UK and Ireland plus the British Library, the National Library of Scotland, and the National Library of Wales/Llyfrgell Genedlaethol Cymru	http://www.copac.ac.uk/
SIGLE (System for Information on Grey Literature in Europe)	A bibliographic database covering European non-conventional (so-called grey) literature in the fields of pure and applied natural sciences and technology, economics, social sciences and humanities	http://opac.brookes.ac.uk/www-bin/ejnis?CN=011538
Centre for Transport Policy, Robert Gordon University	The Centre for Transport Policy aims to remain at the forefront of knowledge on addressing transport issues and to be in the position to advise decision-makers locally, nationally and internationally	http://www.sd-research.org.uk/sdrguide/institution.php?instid=147
The Economic and Social Research Council (ESRC)	The UK's leading research funding and training agency addressing economic and social concerns	http://www.esrc.ac.uk
Institute of Public Policy Research	A think tank undertaking analysis policy and produces reports and publications for government, academia and the corporate and voluntary sectors	http://www.ippr.org.uk/

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International Union of Public Transport	The worldwide network of public transport professionals; represents over 2700 urban, local, regional and national mobility actors from more than 80 countries on all continents	http://www.uitp.com/
Commission for Integrated Transport	The Commission for Integrated Transport (CfIT) is an independent body advising the government on integrated transport policy	http://www.cfit.gov.uk
Department for Disabled People (France)	Central administration dealing with disabled people	http://www.handicap.gouv.fr/
CERTU	Technical body in France dealing with transport - provides local and central authorities with recommendations and good practices	http://www.certu.fr/
DSCR - Direction de la sécurité et de la circulation Routières	Technical body dealing with road safety - sets optimal traffic conditions to ensure road users' safety	http://www.securiteroutiere.gouv.fr
COLIAC - Comite de liaison pour l'accessibilité du cadre de vie	Consultation body in France dealing with accessibility - provides advice and resources for the Department for Transport	http://www.coliac.cnt.fr
FNAUT - Fédération Nationale des Usagers des Transports	National public transport users association in France	http://www.fnaut.asso.fr/

Appendix C - Train Operating Companies' policies for the carriage of mobility scooters

Taking powered scooters on trains

The train companies welcome disabled passengers and accommodate mobility scooters powered by sealed batteries where possible. Unfortunately, not every scooter can be taken on every train and because the dimensions of the train interiors differ, no simple solution is offered for every train company. The term "scooter" refers to a vehicle with a steering column; if your vehicle has a joystick and small front wheels that swivel 360 degrees, this is a powered wheelchair and not a scooter. Scooters which have three wheels, or those four wheeled scooters which have the front two wheels very close together can manoeuvre into tighter spaces than those which have four wheels like a car (pavement vehicles). The table below shows information which will help you decide whether you will be able to take your scooter on the trains.

Most trains can accommodate manual and powered wheelchairs up to a maximum width of 670mm and 1,200mm long (including footplates). However if you have a larger wheelchair, you should check with the relevant train company whether you will be able to access the trains.

The loaded weight of a scooter should not be more than 230kg/36.2stone. This is the weight that the ramps can safely take. As in any environment in which people can come and go as they please, for everyone's safety, we ask you to follow these rules:

- Lower the speed of your scooter to a brisk walking pace.
- Make sure you stay clear of the platform edge until the train has come to a complete stand at the station.
- Unload any bags/shopping etc. from the scooter, as this can cause the scooter to tip when going up/down ramps.
- If you have a folding scooter, ensure that you are able to carry it without staff assistance when boarding and alighting from trains. Staff may not be available to help at many locations.
- Many stations have limited level access. Please make enquiries with the relevant train company before travelling.
- Before making any journey for the first time, contact the relevant train company to check what is possible on your chosen route.
- Follow staff instructions at all times.

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Train Company	Number of different types of trains used	General guidance for going on all trains which the train company uses	Notes
	8	ARRIVA Trains Wales operate a permit scheme which applies to ARRIVA Trains Wales only. Please contact ARRIVA Trains Wales for more information. Please check whether stations you wish to use are accessible to you.	
	1	Scooters which are no more than 1,200mm long and 700mm wide are accommodated. Please check whether stations you wish to use are accessible to you.	
	7	To go on all of these trains, your scooter needs to measure no more than 1,000mm long and 700mm wide. Please check whether stations you wish to use are accessible to you.	
	2	Scooters which are no more than 1,200mm long and 700mm wide are accommodated. Please check whether stations you wish to use are accessible to you.	
	3	Folding scooters are taken when carried on and stored as luggage. Please check whether stations you wish to use are accessible to you.	

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	4	<p>Scooters which are no more than 1,200mm long and 700mm wide are accommodated. Please check whether stations you wish to use are accessible to you.</p>	
	9	<p>Folding scooters are taken when carried on as luggage. Please check whether stations you wish to use are accessible to you.</p>	
	2	<p>Scooters which are no more than 1,200mm long and 700mm wide are accommodated. Please check whether stations you wish to use are accessible to you.</p>	
	3	<p>Scooters which are no more than 1,200mm long and 700mm wide are accommodated. Please check whether stations you wish to use are accessible to you.</p>	
	1	<p>Scooters which are no more than 1,320mm long and 610mm wide are accommodated. Please check whether stations you wish to use are accessible to you.</p>	
	1	<p>Scooters which are no more than 1,200mm long and 700mm wide are accommodated. Please check whether stations you wish to use are accessible to you.</p>	

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	2	<p>Scooters which are no more than 1,200mm long and 700mm wide are accommodated. Please check whether stations you wish to use are accessible to you.</p>	
	2	<p>Folding Scooters are taken when carried on as luggage. Please check whether stations you wish to use are accessible to you.</p>	<p>Some trains may take scooters unfolded. Please contact the train company for further information.</p>
	9	<p>Folding scooters are taken on as luggage. Please check whether stations you wish to use are accessible to you.</p>	
	10	<p>To go on all of these trains, your scooter needs to measure no more than 1,200mm long and 700mm wide are accommodated. Please check whether stations you wish to use are accessible to you.</p>	<p>Some trains may take slightly larger scooters. Please contact the train company for further information.</p>
	4	<p>Scooters which are no more than 1,200mm long and 700mm wide are accommodated. Please check whether stations you wish to use are accessible to you.</p>	
	5	<p>Scooters which are no more than 1,200mm long and 700mm wide are accommodated. Please check whether stations you wish to use are accessible to you.</p>	

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	6	To go on all of these trains, folding scooters are taken when carried on as luggage. Please check whether stations you wish to use are accessible to you.	Mainline trains can take scooters up to 1200mm long and 700mm wide. On Metro services, trains can only take scooters up to 1000mm long and 700mm wide. Please contact the train company for further information.
	7	South West trains operate a permit scheme which applies to South West Trains only. Please contact South West Trains for more information. Please check whether stations you wish to use are accessible to you.	
	1	May not take powered scooters but folding scooters are taken when carried on as luggage. Please check whether stations you wish to use are accessible to you.	Thameslink will consider taking non folding scooters upon application to the Customer Relations Manager.
	2	Folding Scooters are taken when carried on as luggage. Please check whether stations you wish to use are accessible to you.	
	3	Scooters which are no more than 1,200mm long and 700mm wide are accommodated. Please check whether stations you wish to use are accessible to you.	Train company will only accommodate scooters which have three wheels or that have two front wheels very close together and therefore present a triangular 'footprint'.

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	3	<p>Scooters which are no more than 1,200mm long and 700mm wide are accommodated. Please check whether stations you wish to use are accessible to you.</p>	
	3	<p>Folding scooters are taken when carried on as luggage. Please check whether stations you wish to use are accessible to you.</p>	

Train company policies may change as more risk assessments are carried out. As the prime concern is safety, changes can occur without prior notice.

For the latest version of these policies, please refer to the National Rail website at the following address: http://www.nationalrail.co.uk/passenger_services/disabled_passengers/scooters.htm.