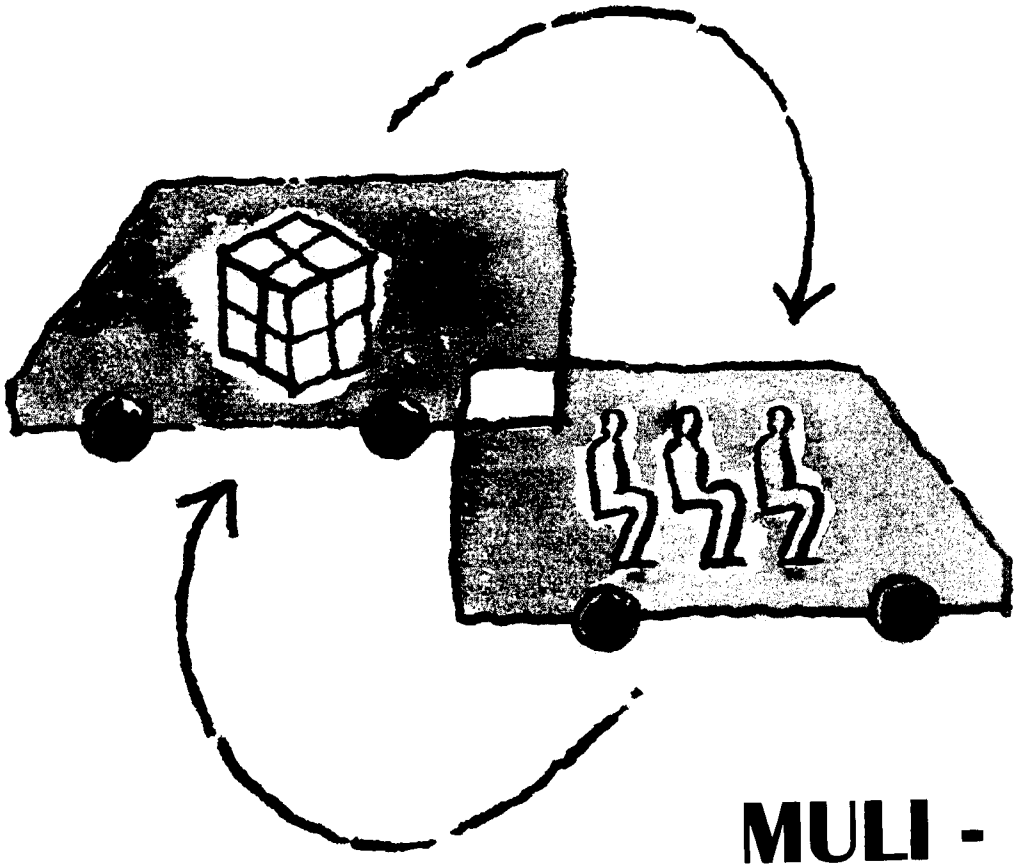
KFB

THERMIE Demonstration

Report From the Swedish Part of the MULI-Project



MULI - *Buslorry*

passenger and goods transport in a multiple buslorry

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I det s.k. MULI-projektet, som stöds av EU inom ramen för THERMIE-programmet och KFB, har ett medelstort fordon (längd/bredd ca 680/213 cm) anpassat för både resenärer och gods tagits fram i samarbete med en kvalificerad tillverkare. Fordonet, som kan sägas vara en busslastbil (MULI-Buslorry), har lågt golv (23 cm över mark, 17 cm när fordonet är nedsänkt), breda dörrar och ett omsorgsfullt planerat resenärsutrymme med plats för 13 sittande. Längst bak finns ett särskilt godsutrymme anpassat för såväl sjukvårdsgods som bussgods. Den valda inredningslösningen baserar sig på en särskild Mock-up studie där olika inredningar testats och utvärderats. Ett liknande fordon har hittills inte funnits tillgängligt. I den svenska delen av projektet (även Tyskland/Berlin deltar) testas och utvärderas två fordon anpassade för biogasdrift i två intressanta och innovativa trafiklösningar, dels på en servicelinje mellan de två sjukhusen i Trestad, NÄL-sjukhuset (Trollhättan/Vänerborg) och Uddevalla sjukhus, och dels på en s.k. Flexlinje (efterfrågestyrd servicelinjetrafik) i Vänersborg. Slutrapport från projektet kommer att presenteras under våren 1999.

ABSTRACT (Aim, Method, Results)

In the MULI-project – supported by the European Union within the THERMIE-programme, and the Swedish Transport and Communications Research Board/KFB – a new type of medium-sized vehicle (length/width approx. 680/213 cm) suitable for both passenger and goods transportation has been developed in co-operation with a qualified vehicle supplier. The vehicle, the MULI-Buslorry, has a low floor (23cm above the ground, 17cm when kneeling), wide doors, a carefully planned passenger compartment with 13 seats based on the results of a special interior layout study, and a goods compartment specially adapted to transport goods from the health care administration and also busgoods. Such a vehicle has not previously been available on the market. In the Swedish test-site two MULI-Buslorries, adapted to biogas fuel and equipped with a CNG engine, will be demonstrated and evaluated in two interesting and innovative transport solutions – on a Service/Hospital Route between NÄL (Trollhättan/Vänersborg) hospital and Uddevalla hospital and on a Flexroute (a demand responsive service route) in Vänersborg. A final report will be presented during the spring 1999.

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STATUS REPORT - SWEDISH PART OF THE MULI PROJECT

1. Background – What is MULI?

The MULI-concept has a dual approach that targets

- offering a new transport organisation concept for passenger and goods transport based on a vehicle suitable for this transport
- reducing environmental impact by using an environmentally friendly and energy effective vehicle

The MULI-concept is being demonstrated in Berlin, Germany, and Älvsborg County (Trestad), Sweden. In each of the chosen test-sites two vehicles ("MULI-Buslorries") are in operation. The demonstration of the MULI-concept is being carried out within the framework of the MULI-Buslorry project, which is supported by the European Union and integrated in the THERMIE-programme (DG XVII, Energy). The project began in April 1996 and will be completed at the end of March 1999. The Swedish Transport and Communications Research Board (KFB) supports the Swedish part of the project.

The MULI-consortium consists of the public transport operators BVG (Berliner Verkehrsbetriebe, Berlin/Germany) and Älvsborgstrafiken (Vänersborg/Sweden) and, as sub-contractors, IVU (Gesellschaft fur Informatik, Verkehrs- und Umveltplanung mbh Berlin) and the Lund Technical University, which are experts in traffic planning, vehicle technology as well as energy and environmental matters.

Älvsborgstrafiken is responsible for public transport in the County of Älvsborg and has considerable experience in service routes (a friendly traffic with a high standard, adapted for disabled and elderly persons) and special transports to/from hospitals (eg, by so called "Jumbolans-transports"), biogas buses (environmentally friendly and energy effective traffic) and goods transportation by bus (so called Busgoods Älvsborg). These experiences will be used in the Swedish part of the MULI-project.

2. The Objective of the MULI-Project

The MULI-Buslorry is a new type of vehicle - a medium sized vehicle for multiple use. The MULI-Buslorry can be used either for passenger transport or goods transport – ***"Switched mode"***- or combined passenger and goods transport – ***"Shared mode"***- and will be the optimum vehicle for many transport situations. It will fulfil the requirements of an attractive bus for different modes of public transport and also fulfil quality requirements for the transport of (smaller) goods. The overall aims of the MULI-project are the

- improvement of the public transport service
- diversification of energy sources
- reduction of both fuel consumption and emissions
- reduction of climate relevant pollution
- reduction of investment cost

The Swedish test-site is a demonstration of the MULI-Buslorry in shared mode by using two CNG vehicles (biogas) operating in a rural area ("Service/Hospital Route" between two hospitals) and a medium-sized Swedish town ("Flexroute" in Vänersborg).

Within the framework of the overall aims there is an ambition in the Swedish part of the project to

- develop the service route concept further
- develop a solution for the distribution of busgoods across short distances in urban areas

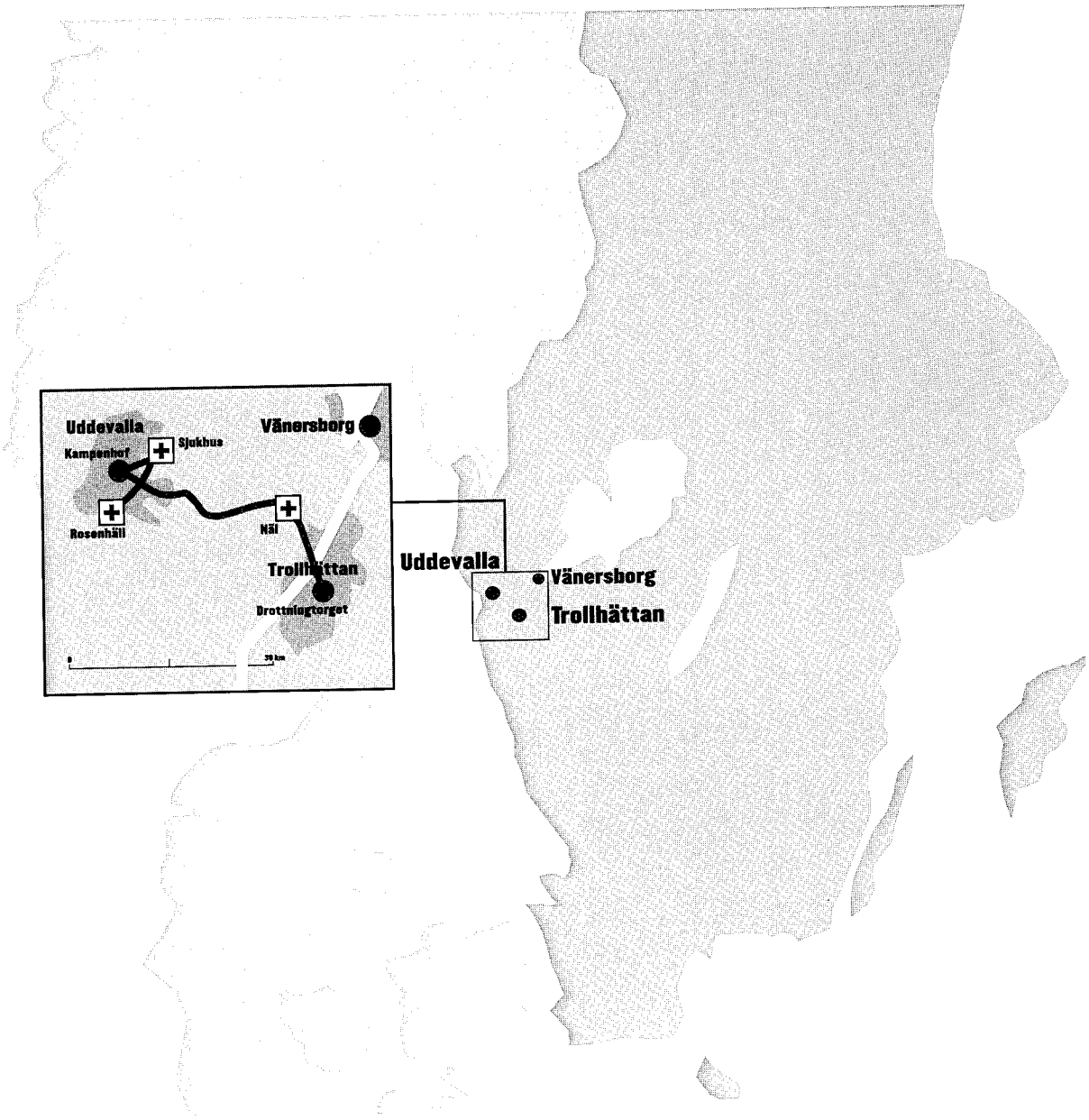
In the German test-site (Berlin) the MULI-Buslorry is being demonstrated in switched mode. In the morning and/or during the day the MULI-Buslorry is used for the transport of goods, whereas in the evening or during the night the vehicle is used for passenger transport. The "German MULI-Buslorry" is the same size as the Swedish one (has the same chassis) but uses another interior layout.

3. Operation Plan for the Swedish Test-Site

3.1 Some Facts about the Test Area

The Swedish part of the MULI-project has chosen ***Trestad as the test area.***

Trestad ("Three towns area") consists of three small cities Trollhättan, Uddevalla and Vänersborg which lie 10 km to 25 km apart. Trestad, which co-operates in a number of matters (communication issues, health and medical care etc), is situated at the south end of Lake Vänern and has about 135,000 inhabitants in total. There are two regional hospitals in Trestad – one in Trollhättan/ Vänersborg (NÄL) and one in Uddevalla. The two hospitals (NÄL/"Norra Älvsborgs Läns" hospital and Uddevalla hospital) are administrated by "NU-sjukvården" (= "Health and medical care administration"). In Trestad it is possible to demonstrate the MULI-Buslorry concept in both a rural and an urban area and there are also feasible transport tasks for testing the vehicle.



Trestad – the Swedish test area.

3.2 Selected Transport Tasks for the Demonstration of the MULI-Buslorry

The public transport system in Sweden comprises both passenger and goods (known as Busgoods) transportation and includes local and regional scheduled services and demand responsive transport (Special Transport Service/"Färdtjänst" and medical journeys/ "Sjukresor"). In each county the responsibility is shared by local municipalities, regional authorities and the county transport authority. An increasing co-operation between the responsible authorities and different forms/ modes of transport is necessary as well as development of these forms, vehicles, technical solutions etc.

There is a great need for a small or medium-sized vehicle – a buslorry – for combined passenger and goods transport both in urban and rural regions. During the initial phase of the project the Swedish Working Group discussed several transport tasks *(feeder bus traffic to main routes in the public transport system, school bus traffic, transportation of elderly and/or disabled persons on service routes, local distribution of Busgoods, transportation of patients and medical items etc)*, where such a vehicle – a MULI-Buslorry – could be demonstrated and tested.

In Älvsborg County a great number of small buses, which are adapted to the needs of disabled and elderly persons are operating more than 20 lines carrying about one million passengers a year. This service route concept has been very successful and extends today all over Sweden. The result shows that a public transport designed for a selected group of passengers is not only attractive for these passengers but also offers a better service for other public transport users. It can however also be stated that the vehicles used on the service routes could be even more suited for their tasks and there is a need for better vehicles than those which are currently available.

Public transport in Sweden is also used for goods transport (Busgoods), eg, distribution of spare parts for small industry from town to rural areas, and medical items and pharmaceutical products from a central storage to various health and medical institutions. During the last few years Älvsborgstrafiken has transported medical goods (in combination with passenger transport) from a central regional hospital to local medical centres. There is a need for further developed concepts and measures – eg, new types of vehicles – in order to achieve greater co-ordination in transport of both passengers and goods between institutions dealing with health and medical care in Älvsborg county.

The combined passenger and goods transport is mostly operated by ordinary standard or Midibuses, which are not adapted for this particular purpose. Small and medium-sized vehicles suitable for both passenger and goods transport are not available on the market. Therefore the MULI-project supports the design and construction of an appropriate vehicle for both the shared (Sweden/Trestad) and switched (Germany/Berlin) mode.

The Swedish Working Group stated at an early stage that Älvsborgstrafiken's experience in, and great knowledge of, service routes and goods transport by the public bus system would be used when testing the MULI-Buslorry in suitable traffic tasks in the Swedish test-site.

When the MULI-project began a new organisation for health and medical care in the Trestad area was decided. It had been decided that the two hospitals in Trestad, Trollhättan/Vänersborg

hospital and Uddevalla hospital, would work together and be administrated by a new administration called NU-sjukvården.

There are 2,700 and 2,500 persons working at the hospitals in Trollhättan/Vänersborg (NÄL-hospital) and Uddevalla respectively. The hospitals intend to work closely together and some clinics will concentrate their activities at one of the two hospitals. This will result in more travelling and a changed pattern of travelling between the hospitals – both for patients and for staff. There will also be an increasing amount of goods transported between the hospitals. The distance between the hospitals is 25 km.

The transport needs consist of

- working journeys for the staff (home – hospitals)
- transport of patients (medical journeys)
- official journeys for the staff between the hospitals
- goods transport – medical items, internal post and journals, medical tests etc.

During the first few years it will be a challenge for NU-sjukvården to establish a pattern for the transports between the hospitals based on public transportation facilities. NU-sjukvården has the following ambition.

- No official journeys between the hospitals in private cars – public transport facilities must be used
- Transportation of patients and goods will be as far as possible co-ordinated and use public transport facilities

The Swedish Working Group decided to demonstrate the MULI-Buslorry on a new service route between the two hospitals in Trestad, and to plan this new route in close co-operation with NU-sjukvården and Bohustrafiken, which is responsible for public transport in Uddevalla.

Älvsborgstrafiken has during the past years run a service route in Vänersborg with a fixed timetable and fixed bus stops. The number of passengers has not been satisfactory and has been lower than on other service routes in the county (eg, in the cities of Borås and Trollhättan). Älvsborgstrafiken has, therefore, had discussions with the municipality – primarily the section responsible for Special Transport Service/STS – on changing the traffic on the service route in some way.

When this discussion was going on, trials with a new type of service route traffic called "Flexroute" started in Gothenburg – in two districts of the city called Biskopsgården and Högsbo. This Flexroute traffic functions as an intermediate form between STS and an ordinary service route. The Flexroute is demand responsive, has no fixed bus stops but a great amount of so called "meeting points" between the stops at the end-points of the route, where the passengers can be picked up and dropped off. The meeting points are closer together than ordinary bus stops, which for most people means a walking distance of less than 150 metres. In Biskopsgården the two minibuses, which are serving the Flexroute, depart each hour on the hour from the respective end-points and must reach the other end-point within 55 minutes. The route (every trip) between the end-points is completely flexible and stopping is only according to demand. After a rather slow start the Flexroute traffic in Gothenburg has been successful and is being used of a growing number of satisfied passengers. The Flexroute in Gothenburg started in March 1996,

and the trials were initially to continue for a year. The Flexroute service was later extended at least through 1998.

The Swedish Working Group decided to demonstrate the MULI-Buslorry on a similar Flexroute solution in Vänersborg adapted to the particular circumstances in Vänersborg.

Research has shown that there are several Busgoods clients in Vänersborg who want a service which fetches and delivers the goods at the door. Until recently clients have themselves fetched and delivered the goods at the Busgoods terminal located at the railway station. This time could be better spent. To use the MULI-Buslorry for such a distribution of goods from the Busgoods terminal to the clients and vice versa was considered a good solution.

The Swedish Working Group therefore decided to test the MULI-Buslorry for distribution of Busgoods in the central parts of Vänersborg within the framework of the Flexroute concept and consequently the MULI-Buslorry on the Flexroute will be used for combined transport of passengers and goods.

Summary

There is an ambition within the public transport system to
- co-ordinate different forms of transport paid for by society
- develop and test new transport solutions for new clients, eg, combination of passenger and goods transport

For such transport tasks there is a need for a new type of vehicle, a vehicle for multiple use. It must be a safe and comfortable vehicle adapted for disabled persons and elderly passengers and a vehicle that also can be used for goods transportation.

The dual approach of the MULI-concept is to
- offer a new transport organisation concept for passenger and goods transport based on a vehicle suitable for this transport
- reduce the environmental impact by using an environmentally friendly and energy effective vehicle

The vehicle developed for the operation demonstrations within the MULI-project, the MULI-Buslorry, is a medium-sized vehicle for multiple use. It can be used for transportation of passengers and goods either simultaneously (shared mode) or alternatively (switched mode) and is an appropriate vehicle for different transport situations.

Älvsborgstrafiken has great experience in service routes, special hospital routes (so called Jumbolans traffic – a special transport solution for patients visiting the hospitals), biogas buses and goods transportation by bus (so called Busgoods). These experiences will be used in the Swedish test-site.

In the Swedish test-site the MULI-Buslorry (*some facts about the "Swedish MULI-Buslorry": length/ width approx. 680/213cm, low floor – 23cm above the ground and when kneeling the height is only 17cm – wide doors, a carefully planned passenger compartment with 13 seats, or 11 seats and room for a wheelchair, a goods compartment adapted for transport of goods and equipped with a CNG engine*

adapted to biogas fuel) is being demonstrated for combined transportation of passengers and goods (shared mode) in two different transport solutions

A. On a Service Route between the two hospitals in the Trestad area, Trollhättan/ Vänersborg hospital (NÄL hospital), and Uddevalla hospital; transportation of passengers and goods between the hospitals
B. On a Flexroute in Vänersborg; service route traffic in combination with the local distribution of Busgoods in the centre of Vänersborg

The Flexroute is a new form of paratransit, a demand responsive service route which can be described as an intermediate form of transport between shared taxi and a more traditional service route for disabled and elderly persons.

In the German test-site (Berlin) the MULI-Buslorry is being demonstrated in switched mode. In the morning and/or during the day the MULI-Buslorry is used for transportation of goods, whereas in the evening or during the night the vehicle is used for passenger transportation. The "German MULI-Buslorry" is the same size as the Swedish one (is based on the same chassis) but uses another interior layout.

3.3 Demonstration of the MULI-Concept in Two Different Transport Solutions

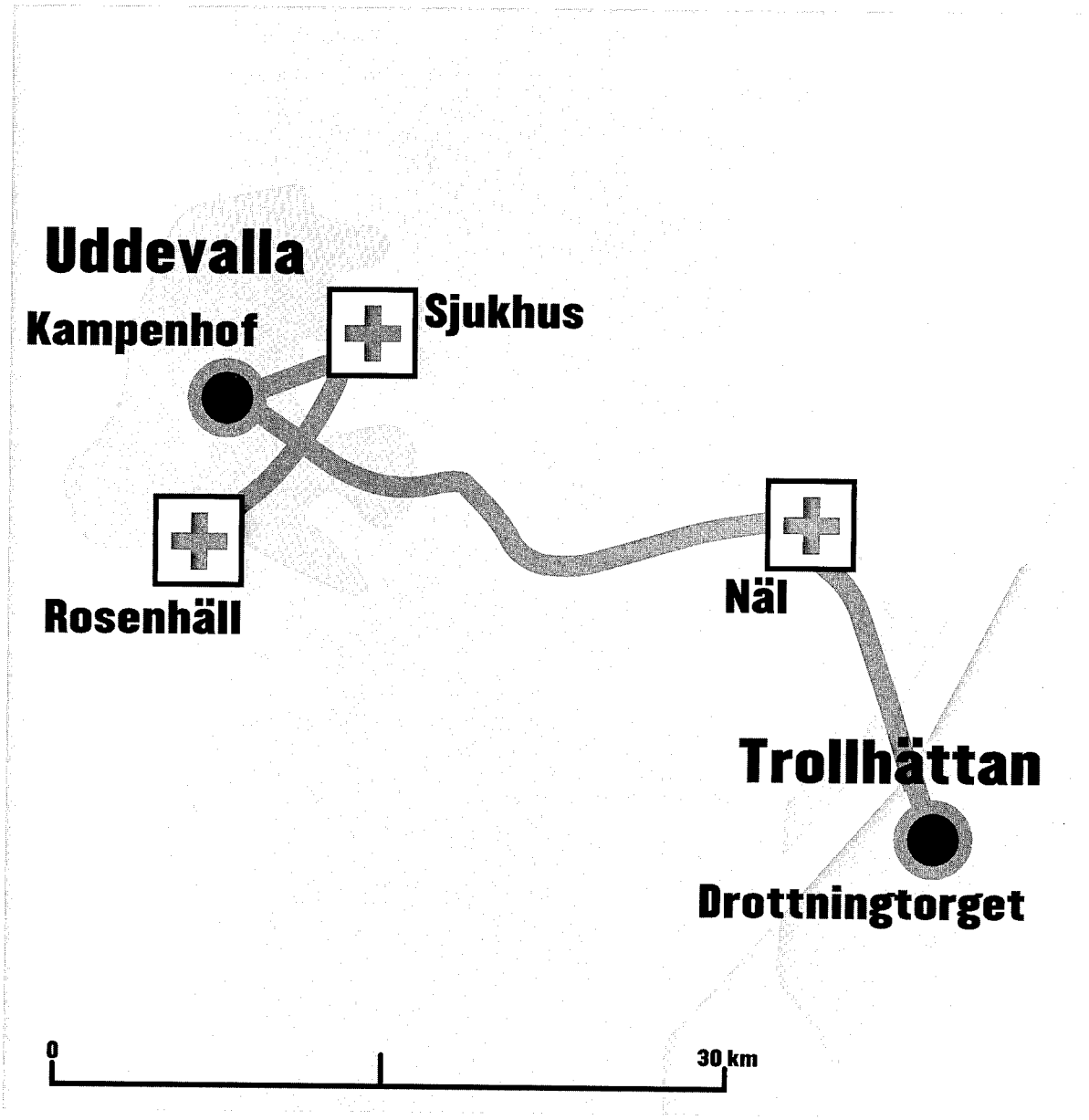
A. Service/Hospital Route between NÄL Hospital and Uddevalla Hospital

Service Principles

The Service/Hospital Route (route 873) is a traditional service route with fixed bus stops and a fixed timetable. The Service/Hospital Route is a transport service primarily for passengers and goods between the two regional hospitals in the Trestad area, Trollhättan/Vänersborg hospital (NÄL hospital) and Uddevalla hospital.

The route starts in the centre of Trollhättan (at the bus terminal on Drottningtorget) and ends (since August 1998) at Rosenhäll, a medical clinic and nursing-home for elderly patients. The route also passes through the centre of Uddevalla (the bus terminal, Kampenhof). There are ten single trips a day (five in each direction) Monday to Friday and all the trips pass the hospitals. The bus stops for passengers at the two hospitals are located at the main hospital entrances. There are special stops at each hospital for goods.

At the next page there is a figure of the Service/Hospital Route.



The Service/Hospital Route – starts in Trollhättan and ends in Uddevalla (Rosenhäll, a nursing home) and passes the two hospitals in Trestad.

One MULI-Buslorry is demonstrated on the Service/Hospital Route. The MULI-Buslorry traffic on the route started March 16, 1998. The traffic was planned to start in November 1997 but due to a delay in the construction of the MULI-Buslorry vehicle and some problems with the gas installation, the start of the Service/Hospital Route was postponed to March 1998. The route will run to at least June 1999 (the timetable extends to June 13, 1999) and the evaluation of the MULI-project will consist of a demonstration period of 12 months between March 1998 and February 1999. The results of this evaluation will determine whether the Service/Hospital Route will continue after June 1999.

The Service/Hospital Route can be used for all kinds of passengers to/from or between the hospitals – medical journeys, working journeys for the staff at the hospitals, official journeys for the staff between the hospitals etc. As the MULI-Buslorry has a low floor (when the bus is in a kneeling position the height above the ground is only 17 cm), space for a wheelchair etc, the route is especially intended for elderly and disabled persons, visiting a doctor or travelling as a patient. Prostrate patients can not travel by the MULI-Buslorry but can use the special transportation facility run by Älvsborgstrafiken called "Jumbolansen".

At NÄL hospital there is a hostess helping disabled and elderly passengers who use the MULI-Buslorry on the Service/Hospital Route. The hostess fetches or leaves those passengers at the bus stop located at the main entrance and helps them to and from the doctor. This appreciated and well-functioning service may be introduced also at the Uddevalla hospital during the autumn 1998.

Bus stop at NÄL hospital (main entrance). The hostess at the hospital helps a passenger to board the MULI-Buslorry. The MULI-Buslorry is in a kneeling position and the height above the ground is only 17 cm. A special ramp is used for the wheelchair.

Passengers visiting a doctor or travelling as patients ("sjukresor") must book a place in advance (at least one hour before the departure of a journey) in the MULI-Buslorry via a booking central located at NÄL hospital. Other passengers do not need to book places in advance (since June 98) but can make such a reservation if they wish to.

The booking central at NÄL hospital. The booking central makes a list of reservations and sends the list by fax to the MULI-Buslorry.

The communication system between the MULI-Buslorry and the booking central consists of fax and mobile telephone. The bookings made at the booking central are listed by the personnel and sent to the MULI-Buslorry by fax. If any passenger has special problems and needs special service or assistance (eg, using a wheelchair) this is noted on the list. If the driver has any questions to the booking central, he/she can use the mobile telephone.

The driver's section in the MULI-Buslorry with the communication facilities – fax and mobile telephone.

Goods transportation with the MULI-Buslorry on the Service/Hospital Route consists of medical items, medical tests, journals etc. The goods must not be too large or too heavy; the driver of the MULI-Buslorry must be able to lift and handle the goods with his hands. The driver fetches or leaves the goods at certain places/bus stops at the two hospitals, where the goods have been left from different parts of the hospitals. Consequently, the personnel at the hospitals do not need to wait for the MULI-Buslorry. The medical items, tests, medicine etc must be packed according to specific regulations and are placed in special boxes or containers – belonging to the loading system of NU-sjukvården – which easily can be handled by the drivers. Fragile and/or dangerous goods are locked up in a special storage room to which the driver has a key.

Medical items etc are loaded at the special bus stop for goods at NÄL. The special container (with wheels) belonging to NÄL's loading system is used. The MULI-Buslorry has a goods compartment at the rear of the vehicle.

The Service/Hospital Route (873) is one part of an increased public transportation system to/from or between the hospitals in Trestad. The service route is co-ordinated both with the so called Four-town-commuter (consists of the routes 870 and 880), which is running Trollhättan/Vänersborg – NÄL hospital – Uddevalla hospital – Uddevalla centre – Lysekil and the special transportation facility called "Jumbolansen" (route 137). The Jumbolans traffic, which also belongs to the public transport system run by Älvsborgstrafiken, is primarily intended for prostrate patients to and from the hospitals but can also be used by other passengers. The combination of these transport facilities makes it possible to go from Trollhättan, Vänersborg and Uddevalla to the two hospitals in Trestad every half an hour almost all day, Monday to Friday.

Promotion and Marketing

On March 12, 1998, a few days before the start of the Service/Hospital Route (March 16, 1998), a press conference was held at NÄL hospital. Information material was distributed to the participants and the MULI-Buslorry was exhibited and demonstrated.

Some articles have been written in both local newspapers and professional journals.

NU-sjukvården has spread information about the new transport facility – the MULI-Buslorry – to the staff within the whole organisation. The booking central encourages doctors and nurses to use the MULI-Buslorry on the Service/Hospital Route, instead of eg, taxi when they are booking transports to/from or between the hospitals for patients, medical items and tests etc. Posters describing the advantages of the Service/Hospital Route can be seen at the different hospital clinics.

There is a special brochure (timetable) showing all the available transport facilities between Trollhättan and Uddevalla via the two hospitals. In this brochure there are facts about fares and information about how to book a journey with the MULI-Buslorry on the Service/Hospital Route.

Payment and Financing (Fares)

The different methods of payment and the fares for travelling with the Service/Hospital Route (and other means of transport to/from or between the hospitals) are as follows.

- Single tickets. The cost for a journey between the hospitals is SEK48 (adults).
- Value Pass/"värdekort". A smart card which can be loaded with different amounts between SEK100 and SEK900. A journey between the hospitals with a value pass costs SEK34.20 (adults); for official journeys, staff can use such a value pass free of charge.
- Travel Pass/"periodkort" (eg, "lilla Fyrstadskortet"). Lasts 30 days and is the cheapest way for anyone using public transport to commute to and from the hospitals every day.

There are special rules and fares for medical journeys. The booking central gives information about fares for the passenger when a medical journey is booked. It should however be stated that society (the county council) will reduce the cost if the Service/Hospital Route is used for medical journeys instead of a taxi or other special transport facility.

In the final MULI report (March/April 1999) a more detailed description of the economic result for the Service/Hospital Route traffic will be presented.

Some Experiences so far

Statistics are still being collected according to the evaluation plan (see chapter 5). Detailed interviews with passengers, drivers, mechanics, personnel at the booking central etc will be carried out during October 1998. In the following only a few facts can be mentioned – what is so far good and what is not so good with the MULI-Buslorry traffic on the Service/Hospital Route.

Good:

- It seems most passengers are satisfied with
  - the vehicle/the MULI-Buslorry: it is easy to board and alight, and comfortable to ride
  - the drivers and the service and assistance they offer the passengers
  - the personnel at the booking central and the service they give the passengers.
- The drivers are satisfied with the MULI-Buslorry – it is comfortable and easy to drive.
- The MULI-Buslorry has been reliable and there has been only a few smaller repairs.
- The amount of goods transportation with the MULI-Buslorry between the hospitals is of a rather great extent.

Not so good:

- The number of passengers using the Service/Hospital Route is too low – on average one passenger per trip. (Experiences from the introduction of other service routes shows that it takes a rather long time before the target groups in question begin to use such a new transportation facility, because they are used to other means of transportation such as taxi or private car).
- There have been some technical problems with the communication between the booking central and the MULI-Buslorry.
- There has been a delay with the gas installation mainly because of different rules in the European Union and Sweden; therefore the MULI-Buslorry has been driven on gasoline up to now (see chapter 4).
- Goods have been forgotten a few times at the special busgoods stops at the hospitals – the logistic system in the hospitals must be improved.
- The drivers are a little concerned about the packaging of dangerous and fragile goods – it is essential that such goods are packed correctly.

Summary

- There is one MULI-Buslorry running the Service/Hospital Route, route 873, between the two hospitals in Trestad. The route has fixed bus stops and a fixed timetable.
- The MULI-Buslorry is being demonstrated for combined transport of passengers and goods (shared mode); all kinds of passengers are allowed to go by the MULI-Buslorry, but the target group is elderly and/or disabled persons who are visiting a doctor or who are travelling as patients. The goods are medical items, medical tests etc which can be handled by the driver in an easy and safe way.
- The demonstration of the MULI-Buslorry on the Service/Hospital Route comprises a test period of 12 months, March 98 – February 99.
- There are 10 single trips on the Service/Hospital Route. These trips are co-ordinated with other traffic (route 870, ordinary bus traffic run by ordinary buses and route 137, run by a special vehicle called "Jumbolansen") to/from or between the hospitals.
- The bus stops at the hospitals are located in front of the main entrances.
- There are special places/bus stops at the hospitals, where the goods are loaded. A special logistic and loading system has been developed for the handling of the goods.
- Passengers visiting a doctor or travelling as a patient between the hospitals (medical journeys/"sjukresor") must book a place (one hour in advance) via the booking central at NÄL.

- The communication system between the booking central and the MULI-Buslorry consists of fax and mobile telephone.
- There is a hostess at the NÄL hospital assisting disabled and elderly persons to and from the hospital bus stops (of the Service/Hospital Route).
- Experiences so far: the passengers appreciate the low floor in the MULI-Buslorry and they are satisfied with the service and assistance the drivers and the booking central offer; the amount of passengers is too low but the level of goods transport is satisfactory.

B. Flexroute in Vänersborg

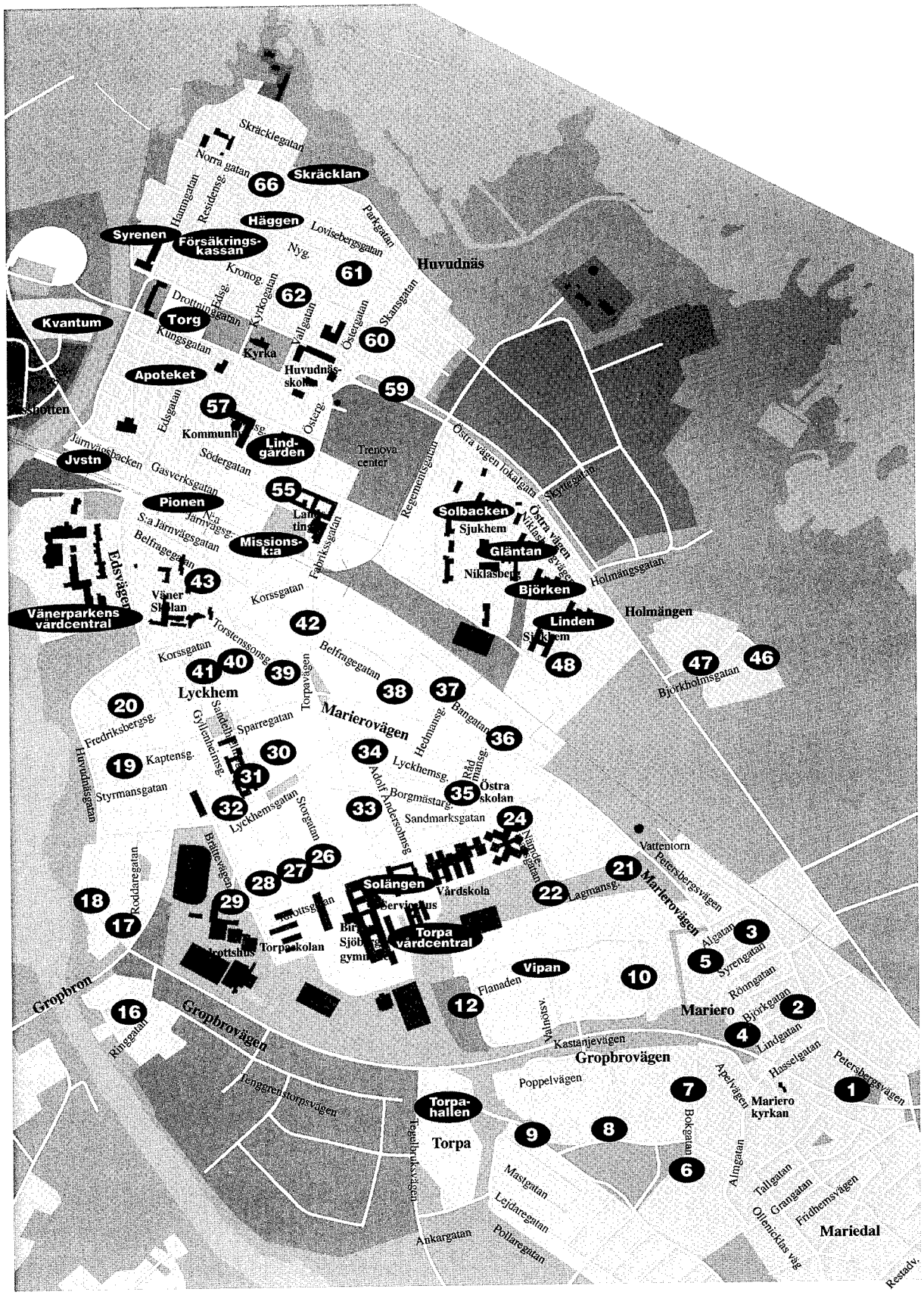
Service Principles

The Flexroute introduced in Vänersborg replaces the previous service route with a fixed timetable and fixed bus stops. The Flexroute traffic is demand responsive and is suited to the desires of the passengers to go from one point to another within a fixed area. Thus each trip in this area is different and only approaches the places ("meeting points") where there are passengers waiting to be fetched or left. There is no ordinary timetable and only the start time towards downtown and departure time from downtown are fixed.

The Flexroute area in Vänersborg covers the city centre including downtown and the district of the city called Mariedal (see figure below). The Flexroute area is the most densely populated area of the city, and the number of inhabitants in the Flexroute area can be estimated to around 10,000. There are also more elderly persons – and persons with an STS permit ("Färdtjänsttillstånd") – in this area than in other parts of the city.

There is one MULI-Buslorry on the Flexroute running between Mariedal and downtown once an hour in each direction from 9.15am to 3.45pm, Monday to Friday. It means there are seven trips to and seven trips from downtown. There are 70 meeting points in the Flexroute area where passengers can be picked up or dropped off. The meeting points are closer together than ordinary bus stops in Vänersborg. The walking distance to a meeting point (eg, from one's home) never exceeds 150 metres but is often much shorter, which means that passengers usually get a door-to-door service. The MULI-Buslorry on the Flexroute only approaches a meeting point if someone has booked a ride to or from this point. It is possible to go between any meeting points. One cannot board the MULI-Buslorry on its way from one point to another if a ride has not been booked in advance.

On the next page there is a figure showing the Flexroute area.



The Flexroute area in Vänersborg with its meeting points.

Traffic with the MULI-Buslorry on the Flexroute started on March 23, 1998. Traffic was planned to start in November 1997 but due to a delay in the construction of the MULI-Buslorry vehicle and some problems with the gas installation the start of the Flexroute was postponed. The route will run until at least June 1999 (the timetable extends to June 13, 1999) and the evaluation of the MULI-project will consist of a demonstration period of 12 months between March 1998 and February 1999. The results of this evaluation will determine whether the Flexroute will continue after June 1999.

The MULI-Buslorry on the Flexroute will be demonstrated for combined transport of passengers and goods but until the end of August 98 it has been used only for passenger transport. From August 26, 1998, the MULI-Buslorry has also been used for goods transport.

The MULI-Buslorry at a meeting point on the Flexroute in Vänersborg. The vehicle is kneeling and the height above the ground is only 17 cm.

The interior of the MULI-Buslorry. The passenger compartment has 13 seats – or 11 seats and room for a wheelchair – low floor (23 cm above the ground), several hand grips etc.

No one is prohibited from using the Flexroute but the route is particularly intended for disabled and elderly (+65) persons. It is expected that persons with the STS (Special Transportation Service) permit will use the Flexroute instead of choosing STS facilities.

All passengers who want to use the Flexroute have to book places at NÄL booking central at least 30 minutes in advance (if a passenger wants to travel at 9.20am from a certain meeting point he/she must call the booking central before 8.50am). On the basis of the bookings made by the passengers, the booking central plans the trip to or from downtown to offer the most suitable times for fetching and leaving passengers.

The communication system between the MULI-Buslorry and the booking central consists of fax and mobile telephone. The bookings made at the booking central are planned and listed by the personnel at the central and then sent to the MULI-Buslorry by fax. If any passenger has special problems and needs special service or assistance (eg, using a wheelchair) this is noted on the list. If the driver has any questions to the booking central, he/she can use the mobile telephone.

Within the framework of the Flexroute concept, a new solution for the distribution of busgoods in the urban areas of Vänersborg will be tested. A survey has shown that there are several busgoods clients in Vänersborg who want a service that fetches and delivers the goods at the door. A first part of this goods distribution test started at the end of August. A busgoods client located within the Flexroute area will get his goods transported from the Busgoods terminal at the railway station (where all the busgoods to and from Vänersborg are stored and where there is also a Flexroute meeting point). The Busgoods terminal calls the MULI-Buslorry when a parcel for the client has arrived at the Busgoods terminal. The driver will then include the goods-client's stop along with the passenger stops.

Busgoods are loaded at the busgoods terminal (at the railway station) in Vänersborg. The MULI-Buslorry has a goods compartment in the rear part of the vehicle.

After the first test period – with only one client and one direction for the busgoods from the Busgoods terminal to the client – the test will be developed to include transportation of goods from the client to the Busgoods terminal. In a further step additional busgoods clients within the Flexroute area will be included in the test.

The Flexroute is co-ordinated with the other public transport in Vänersborg in such a way that the Flexroute arrival and departure times to/from downtown are co-ordinated with the timetable for the other public transport.

Promotion and marketing

On March 12, 1998, a few days before the start of the Service/Hospital Route (March 16, 1998), a press conference was held at NÄL Hospital. Information material was distributed to the participants and the MULI-Buslorry was exhibited and demonstrated.

The Flexroute was inaugurated (with a simple ceremony and special offers to the first passengers) at the start of the Flexroute traffic in Vänersborg March 23, 1998. Before the Flexroute service began operating, a special brochure was produced which described when and where the Flexroute would run and how to use it. This was distributed to people older than 65 (+65) and people with an STS permit.

Advertisements have been placed in local papers and some articles have been written in both local newspapers and professional journals.

Information about the Flexroute has also been given at meetings of associations for elderly people (+65).

In the coming months more personal and direct information will be given to persons belonging to the target groups (+65 and those with an STS permit) in order to increase the number of passengers.

Payment and financing (Fares)

The different methods of payment and fares when travelling with the Flexroute are as follows for a journey in one direction to or from downtown.

- Single tickets (without discount): SEK12.
- Value Pass ("värdekort"). A smart card which can be loaded with a value from between SEK100 and SEK900: SEK7.80 before 2.30pm and SEK9 after 2.30pm.
- Travel pass ("periodkort"). Lasting 30 days: SEK170 if travelling between 9.00am and 2.30pm, SEK250 to use the Flexroute at all times.

Passes and tickets can be purchased on the MULI-Buslorry but also at the information centre of Älvsborgstrafiken called "TidPunkten".

For people using an STS permit the minimum fare when using an STS facility is SEK20. The fare for a Flexroute trip is only half of the STS fare or even cheaper.

In the final MULI report (March/April 1999) a more detailed description of the economic results for the Flexroute traffic will be presented.

Experiences so far

Statistics are being collected according to the evaluation plan (see chapter 5). In-depth interviews with passengers, drivers, mechanics, and personnel at the booking central etc will be carried out during October 98. The following presents a few of the findings so far – the success and the shortcomings of the MULI-Buslorry traffic on the Flexroute.

Good:

- It seems as if most passengers are (very) satisfied with
  - the vehicle/the MULI-Buslorry: it is easy to board and alight, it is comfortable to ride
  - the drivers and the service and assistance they offer the passengers
  - the personnel at the booking central and the service they give the passengers.
- The drivers are satisfied with the MULI-Buslorry – it is comfortable and easy to drive.
- The MULI-Buslorry has been reliable and there have been only a few smaller repairs.
- The goods test is functioning well.

Not so good:

- The number of passengers using the Flexroute is too low – on average only two passengers pertrip. (Experience from the introduction of other service routes shows that it takes a long time before the target groups in question begin to use such a new transport facility, because they are used to other means of transport such as taxis, an STS facility or a private car).
- There have been some technical problems with the communication between the booking central and the MULI-Buslorry.
- There has been a delay with the gas installation mainly because of different rules in the European Union and Sweden; therefore the MULI-Buslorry has been driven on gasoline up to now (see chapter 4).

Summary

- There is one MULI-Buslorry running the Flexroute in the centre of Vänersborg.
- The Flexroute is demand responsive and the passenger must book a place at least 30 minutes in advance at NÄL booking central and every trip is planned to fit each passenger's desire for his/her ride within the Flexroute area. There are 70 meeting points within the Flexroute area – closer to each other than ordinary bus stops – where the passengers can be picked up or dropped off. The Flexroute offers a door-to-door transport.
- Between 9.15am and 3.45pm the passenger can choose between seven trips to and seven trips from downtown; the trips arrive and depart downtown at fixed times co-ordinated with the public transport system in Vänersborg.
- The Flexroute can be used by all kinds of passengers, but the target group is elderly (+65) and/or disabled persons. Especially persons with an STS permit are encouraged to use the Flexroute.
- Until the end of August 98 the MULI-Buslorry on the Flexroute transported only passengers. From the end of August the MULI-Buslorry has been used for the combined transport

of passengers and goods. In the framework of the Flexroute concept, a new solution for local distribution of busgoods in the central parts of Vänersborg is being tested. The demonstration of the MULI-Buslorry on the Flexroute will consist of a test period of 12 months, March 98 – February 99.

- Experiences so far: the passengers appreciate the low floor in the MULI-Buslorry and they are satisfied with the service and assistance the drivers and the booking central offer. The number of passengers is growing but is still too low; the first step of the goods test is running well.

4. The Vehicle - MULI-Buslorry

4.1 User Needs and Technical Requirements

The MULI-Buslorry project ("Buslorry with multiple use") intends to demonstrate an environmentally friendly small to medium-sized vehicle/bus that is suitable for passenger and goods transportation alternatively (=switched mode, Germany/Berlin) or simultaneously (=shared mode, Sweden/Trestad).

A medium-sized vehicle, which could be used for combined passenger and goods transportation is not available on the market. Therefore, the MULI-Buslorry has been developed in co-operation with a qualified vehicle supplier.

As a cost-efficient solution, it was decided that the MULI-Buslorry should be based on a standard vehicle (bus or goods vehicle) and modified to the specific requirements of each project partner (license, regulations etc). The final specifications for the interior of the vehicle used in the Swedish demonstration are a result of the mock-up study and discussions with the manufacturer during the construction phase.

Engine Technologies

In order to evaluate the environmental impact of different engine technologies, CNG and conventionally driven vehicles are being demonstrated in the MULI project. In Trestad two vehicles are used which are adapted to biogas fuel and must therefore be equipped with a CNG engine.

Basic Vehicle Requirements

The concept of the MULI-project is an attractive vehicle that can accommodate all kinds of passengers – including elderly and disabled persons – and is a suitable lorry for transport of different kinds of goods (small to medium-sized goods). The vehicle must fulfil Swedish regulations on accessibility for buses in public transport. It must also fulfil requirements for good ergonomic conditions for the personnel when handling goods.

The MULI-Buslorry must be of a high standard to attract different categories of passengers including school children, commuters etc as well as elderly and disabled people and it must also be a vehicle that attracts bus operators. The vehicle must have a low floor, wide doors, a carefully planned passenger compartment, soft suspension system etc. It must be a vehicle suitable for many different kinds of transportation but especially for service route traffic in combination with goods transport/distribution.

As a basis for the call for tender, basic requirements were set up for the following areas.

Vehicle size, vehicle floor (including floor height), passenger compartment, door openings to the passenger compartment, goods compartment, door opening for loading and unloading goods, interior standing height, suspension, and destination signs.

4.2 Call for Tender

The call for tender information material was sent to 19 vehicle suppliers in November 1996. The selected group of suppliers was based on contacts taken with potential suppliers who had indicated their interest in participating and on a market analysis. It was essential that the suppliers had sufficient experience and could fulfil the necessary quality requirements.

It was pointed out in the call for tender that functional studies would be carried out for the Swedish MULI-Buslorry in order to specify the requirements for the interior of the vehicle.

4.3 Selection of the Vehicle to be Used as the MULI-Buslorry

Of the 19 contacted vehicle suppliers four submitted offers. The small number of responses indicates that the vehicle requirements for the MULI-Buslorry exceed the standard of ordinary vehicle production. Of these four suppliers, three were pre-selected. The requirements for floor height (must not exceed 23cm with no entrance step) were the crucial point for the selection of the basic vehicle.

After detailed discussions with the suppliers about the need for specific technical modifications of the vehicles in question, the final decision on the co-operative partner was made in April 1997. The selected partner was Kutsenits International Bus Constructions in Hornstein, Austria and the selected vehicle was VW-Kutsenits-City III (vehicle length/width approx. 680/213cm). The vehicle is based on a chassis from Volkswagen with a body from Kutsenits. This vehicle has been modified and used as the MULI-Buslorry.

4.4 Mock-up Study

The mock-up study started in June 1997 and was finished in August 1997. The construction of the mock-up, including drawings and supervision during the construction work, was carried out by BW Konsult AB, which also is responsible for the tests, evaluations and the report from the mock-up study. The mock-up study was based on the dimensions of the vehicle chosen as the MULI-Buslorry in the call for tender, Kutsenits City III. Thus the framework and dimensions of the vehicle could not be changed, nor could the design of doors, the height of the floor above ground etc.

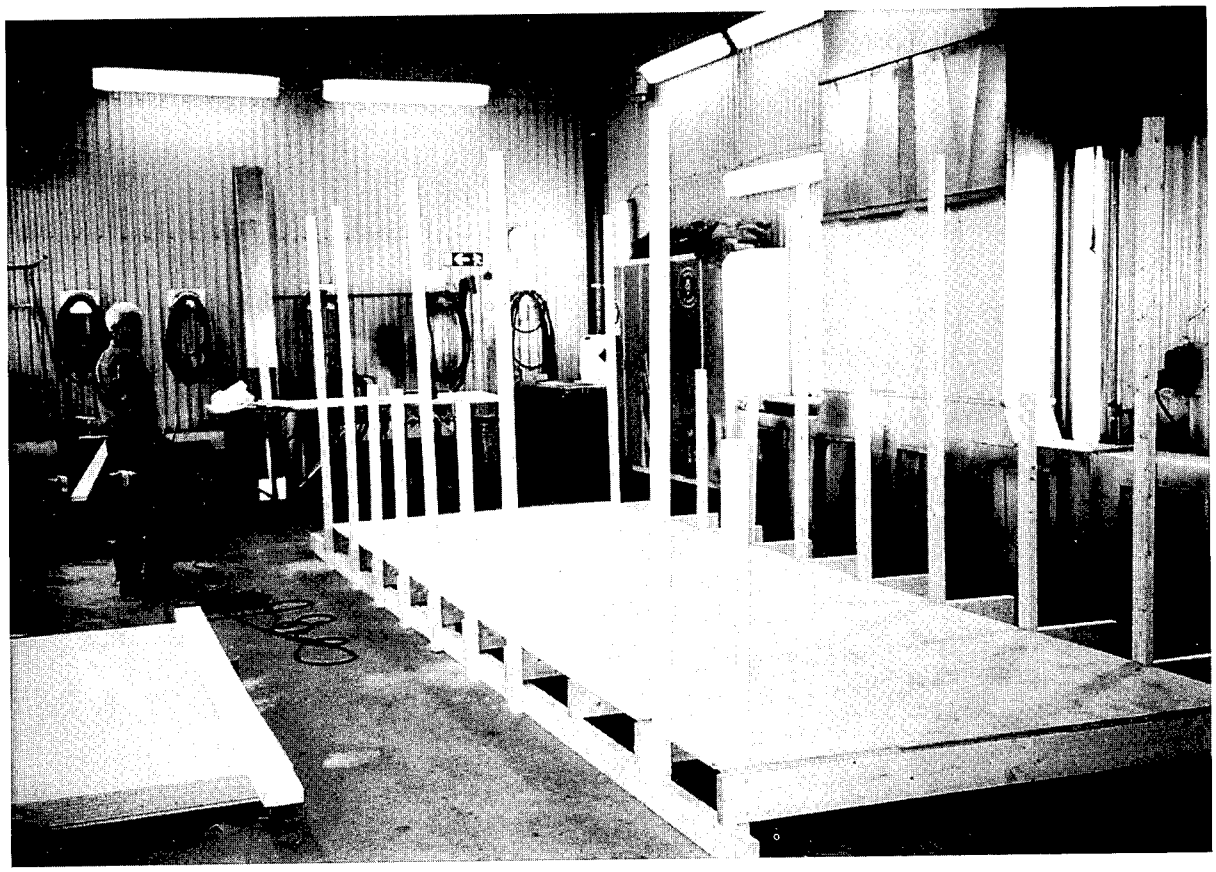
Objective

The objective of the study was to test and evaluate different modes of the interior layout of the vehicle including choice of seats, types and location of interior fittings (handgrips, handrails etc).

The Mock-up

The mock-up was built in the workshop of Linjebuss in Trollhättan in June 1997 and was made by personnel from Linjebuss. The mock-up is entirely made of wood and fibreboard and fixed

together with screws, which made a reconstruction possible during the tests and its disassembly after the completion of the study.



The construction of the mock-up has started.

The MULI-Buslorry will be used for transportation of both persons and goods (shared mode). The mock-up therefore consists of two main parts, one for passengers and one for goods, separated from each other by a wall, which is detachable.

Test Subjects

In total 17 disabled persons – from seriously ambulant disabled to slightly disabled – have tested the mock-up. Furthermore, 6 experts on handling and transportation of disabled people have given their opinions. Each subject was engaged 1-2 hours with the tests.

Evaluation of the tests

According to Swedish regulations it is preferable with 13 seats or more in the vehicle. The tests were carried out with the prerequisite that the passenger space enables 10 fixed seats of high standard and with 3 foldable seats.

The step height, 23 cm above the ground, is considered too high by a few subjects (not wheelchair users) with problems to walk and move. A detachable extra step could be used, handled by

the bus driver, if the bus stop is not elevated. When the MULI-Buslorry is kneeling the step height is only 17 cm, and most "walking" passengers are able to manage this height.

For those using wheelchairs, the angle of the ramp is considered too steep (16 degrees if the bus stop is not elevated), especially when an electric powered wheelchair is boarding. Under these circumstances the test ramp also was too narrow (80 cm) – the clearance was only about 2-4 cm on each side of the wheels.

Tests with disabled persons. The ramp used in the tests was 80 cm, which was considered too narrow for persons using wheelchairs. If the first step above the ground is 23 cm, some people with walking difficulties consider this height too great. If the MULI-Buslorry is kneeling, the step height is only 17 cm, and most "walking" passengers are able to manage this height.

The entrance door in the front of the vehicle has a free width of 125 cm, which is more than necessary. The ramp should be located as far back in the doorway as possible to make it easier to manoeuvre an electric wheelchair within the vehicle and to meet the ramp when disembarking the vehicle.

The free space for a wheelchair in the front of the bus, where the place for the wheelchair is located, is enough for manoeuvring an electric wheelchair if none of the three folding seats is used. The restraint system uses straps fixed to the floor.

Each seat, excluding the three folding seats, will be equipped with two-point safety roller belts. These seats will also be equipped with handgrips as well as folding armrests. All subjects considered the seats to be of a high standard, though a few of them had some objections about the height of the seats above the floor – which can be made higher with an extra cushion – and the angle of the backs, which cannot be raised. As an extra option the backs could be supplemented with adjustable cushions behind the head of a passenger if asked for.

Every step, handgrip, handrail etc will be marked in a contrasting colour, such as yellow.

The goods compartment in the rear of the vehicle has an interior dimension of about 85 cm by 198 cm. Two experts on the handling and transportation of goods in buses in the region have given their opinions on the goods compartment. The goods compartment is large enough for the storage of one of the containers used by the regional hospitals in Trestad (NU-sjukvården) and a number of other goods. No interior fittings were desired. The surface of the floor should be rough. It must be possible to lock the rear door of the vehicle (for the goods compartment) from the outside with a key or something similar, ie, not only from the driver's cab.

The mock-up study is presented in a report (in Swedish) dated September 1, 1997.

4.5 Construction of the MULI-Buslorry

The MULI-Buslorry vehicle has been constructed in a factory in Slovenia. The installation of the gas tanks was carried out in Berlin.

Linjebuss Ltd has carried out the completion of the interior of the MULI-Buslorry vehicle. It is made in Sweden (Trollhättan) and based on the results of the mock-up study. Linjebuss is also responsible for the registration of the vehicle.

There has been a delay with the gas installation. This is mainly a result of different rules in the European Union and Sweden; therefore, the MULI-Buslorry has been driven on gasoline up to now in the Swedish trial.

It has not been possible to test the MULI-Buslorry as gas propelled, due to the fact that Swedish officials have not given the gas installation safety approval. When the vehicle was delivered to Sweden in November 1997, it had the same design as the vehicles in the Berlin project. There are no mutual EU agreements for gas propelled vehicles. Safety inspection was therefore carried out according to Swedish requirements. These showed that the gas system had not been tested at minus 40°C, as required in Sweden, but only at minus 25°C and that the safety ventilators were not approved for use in Sweden. Volkswagen's general agent received an exemption from the

Swedish National Road Administration allowing the use of the vehicle at temperatures over minus 25°C.

New ventilators were procured and re-built to fit the MULI-Buslorry. At re-inspection the ventilators were approved but it was necessary to place one ventilator at each gas tank, ie, 2 ventilators per vehicle, because the tanks "were not situated as one unit". Due to the fact that the ventilators are custom-made and other gas propelled vehicles in Sweden have only one ventilator, an exemption from the Swedish National Road Administration was applied for in March 98. The exemption decision was delayed until September 98 and then denied.

This rigid and time-consuming handling by Swedish officials has resulted in considerable interruption in the operation at the Swedish test-site and significant expenditure for the collaborators of the project. It is very doubtful whether the comparative trial of vehicles in Sweden and Germany will be possible to be made in the way the project initially intended.

5. Evaluation

Evaluation Plan

The start of the demonstration of the MULI-Buslorry is scheduled for February 1998. The demonstration will be carried out for one year. During the demonstration the vehicle will be evaluated on its environmental, energy and operational efficiency.

The MULI-Buslorry concept will be compared to ordinary traffic. The following figures will be needed for such a comparison.

- Operation figures
- Pollution measurement
- Cost and commercial figures
- Passenger opinions

The evaluation will be carried out in such a way that the aims of the project can be followed up. It must also be possible to compare the results from the Swedish evaluation with the evaluation of the Berlin demostration.

The project intends to evaluate

- **personal travel** through interviews and questionnaires to passengers, patients, personnel at the booking central and other personnel at the health care administration (=NU-sjukvården) and drivers and through collection of ticket and revenue statistics; *the effects of the MULI-traffic and traffic reorganisation for travellers in general, what customers think of the MULI-service, the level of service in the booking central etc.*

- **freight transport** through interviews and questionnaires to companies, NU Freight organisation and drivers and trough statistics; *what do customers think of the freight service, the amount of goods transport managed by Älvsborgstrafiken within the MULI-concept etc.*

- **vehicles (the MULI-Buslorries)** through interviews with passengers, drivers and mechanics; *how is the level of accessibility and comfort, how does the vehicle function etc*

- **technology** through interviews with drivers and mechanics and the collection of environmental data and maintenance statistics; *how does the new technology actually work in practice, environmental effects of vehicles etc*

- **economics** through collection of economic data and statistics; *can investment costs be reduced, can maintenance costs be reduced etc*

The final evaluation plan for the Swedish test-site has been developed in co-operation with IVU (Gesellschaft fur Informatik, Verkehrs- und Umveltplanung mbh Berlin). An overview of objectives, evaluation methods and indicators is to be found in the appendix.

In the final MULI-report (spring 1999) a close description of the results of the evaluation will be presented.

Svensk sammanfattning

MULI-projektet har en tvåfaldig målsättning.

1. Utveckla och erbjuda nya transportlösningar/organisationsconcept för resenärer och gods baserade på ett lämpligt fordon.
2. Reducera miljöpåverkan genom att utveckla och använda ett miljövänligt och energieffektivt fordon – en "busslastbil" för flerfaldig användning benämnd MULI-Buslorry (MULI=MUltIple Use).

MULI-conceptet demonstreras och testas i Berlin, Tyskland och i Trestadsområdet (Trollhättan, Vänersborg, Uddevalla) i Älvsborgs län, Sverige. På varje testplats (Berlin och Trestad) testas två fordon (MULI-Buslorries) i olika trafikuppgifter. MULI-projektet stöds av EU inom det s.k. THERMIE-programmet (tillhör DG 17, Energi, inom EU-kommissionen). Projektet, som vad avser den svenska delen också stöds av KFB (Kommunikationsforsknings-beredningen), startade 1 april 1996 och pågår till 31 mars 1999. EU har dessutom i dagarna (september 1998) beslutat om att en fortsatt utveckling av MULI-konceptet skall ske i ett uppföljarprojekt i vilket ytterligare testplatser kommer att ingå.

MULI-konsortiet består av de två kollektivtrafikoperatörerna BVG (Berliner Verkehrsbetriebe, Berlin) och Älvsborgstrafiken (Vänersborg) samt, som "sub-contractors", IVU (Gesellschaft fur Informatik, Verkehrs- und Umveltplanung mbh Berlin) och Trafikteknik/Lunds tekniska högskola. Älvsborgstrafiken är ansvarig för den svenska delen av projektet och det fortlöpande arbetet utförs av en arbetsgrupp med representanter från Älvsborgstrafiken, Linjebuss, Trafikteknik/Lunds tekniska högskola och LW Trafikplanering. NU-sjukvården är adjungerad till arbetsgruppen. På de två sista sidorna i denna delrapport finns organisationsschema, tidplan och var och hur ytterligare information om projektet kan fås.

MULI-Buslorry är en ny typ av mindre/medelstort fordon användbart i ett flertal olika transportsituationer. MULI-Buslorry skall kunna användas både för kombinerad tranport av resenärer och gods (**"shared mode"**, provas i Sverige/Trestad) och för transport av antingen resenärer eller gods (**"switched mode"**, provas i Tyskland/Berlin).

Älvsborgstrafiken har varit föregångare i Sverige vad avser utveckling av bl.a. servicelinjetrafik, biogasdrift och transporter av både sjukresenärer (Jumbolansen mm) och sjukvårdsgods. Dessa erfarenheter används och utvecklas i den svenska delen av MULI-projektet tillsammans med en utveckling av bussgodskonceptet. De två svenska MULI-fordonen, som båda i första hand skall köras på biogas (vald motorlösningen möjliggör också bensindrift), skall prövas i "shared mode" dels på en Service/Sjukhuslinje mellan de två sjukhusen i Trestad, Trollhättan/Vänersborgs sjukhus (oftast kallat NÄL) och Uddevalla sjukhus och dels på en s.k. Flexlinje – en utveckling av servicelinjekonceptet där trafiken är efterfrågestyrd och erbjuder i stort sett en dörr-till-dörr resa/transport inom ett visst område – i Vänersborg.

I den tyska projektdelen provas MULI-Buslorry i "switched mode"; på morgonen och/eller under dagtid används MULI-Buslorry för enbart godstransporter och under kvällstid eller nattetid för enbart resenärer. De svenska och tyska fordonen/MULI-Buslorries är baserade på samma chassi (ett Volkswagenchassi) men har olika inredning av överbyggnaden.

Inredningen i den svenska MULI-Buslorry är baserad på en särskild "Mock-up" studie där dels personer med olika rörelsehinder varit med som testpersoner och gett sina synpunkter på inredningen och dels experter på godshantering gett sina synpunkter. Svenska MULI-Buslorry är ca 680x213 cm, har lågt golv – 23 cm över marken men då fordonen "niger" är instegs-höjden enbart 17 cm – breda dörrar (extra bred framdörr), en omsorgsfullt inrett resenärs-utrymme med plats för 13 sittplatser eller 11 sittplatser och plats för en rullstol, ett särskilt godsutrymme längst bak i fordonet anpassat för både sjukvårdgods (och hanteringen av detta gods i rullcontainrar) och bussgods.

Projektet kommer att utvärderas enligt en särskild utvärderingsplan för en 12 månaders testperiod mellan mars 1998 och februari 1999. Statistik insamlas fortlöpande och under oktober kommer intervjuer av resenärer, förare, mekaniker, sjukhuspersonal mfl kategorier att genomföras. I slutrapporten (våren 1999) kommer projektutvärderingen att presenteras mer detaljerat. Erfarenheterna så här långt avseende den svenska projektdelen kan sammanfattas enligt följande.

Service/Sjukhuslinjen mellan NÄL och Uddevalla sjukhus.

Resenärerna uppskattar den låga instegshöjden och är nöjda med den service som förare och personal vid beställningscentralen ger (NÄL's beställningscentral används och sjukresor måste beställas senast 60 min. före resa; övriga resenärer behöver ej beställa i förväg). Antalet resenärer på de tio sigelturerna mellan sjukhusen (fem i vardera riktningen) är ännu inte tillfredsställande (i dagsläget/september 98 ca en resenär/tur). Däremot är mängden godstransporter mellan sjukhusen med MULI-Buslorry av tillfredsställande omfattning.

Flexlinjen i Vänersborg.

Flexlinjens målgrupper är personer över 65 år och färdtjänstberättigade (Flexlinjen är dock öppen för alla). Dessa resenärer uppskattar den låga instegshöjden och är i övrigt nöjda med den service som förare och personal vid beställningscentralen ger (NÄL's beställningscentral, resa beställs senast 30 min. i förväg). Antalet resenärer är stadigt växande med ännu ej av tillfredsställande omfattning (i dagsläget ca två resenärer/tur på de sju+sju turerna som går till resp. från centrum, måndag-fredag). Inom ramen för Flexlinjen har godsdistribution mellan Bussgodsterminalen vid järnvägsstationen och bussgodskund börjat provas och fungerar så här långt bra. Ytterligare kunder skall tas in successivt i detta godsprov.

Appendix

Evaluation Plan

Overview of Objectives, Evaluation Methods and Indicators

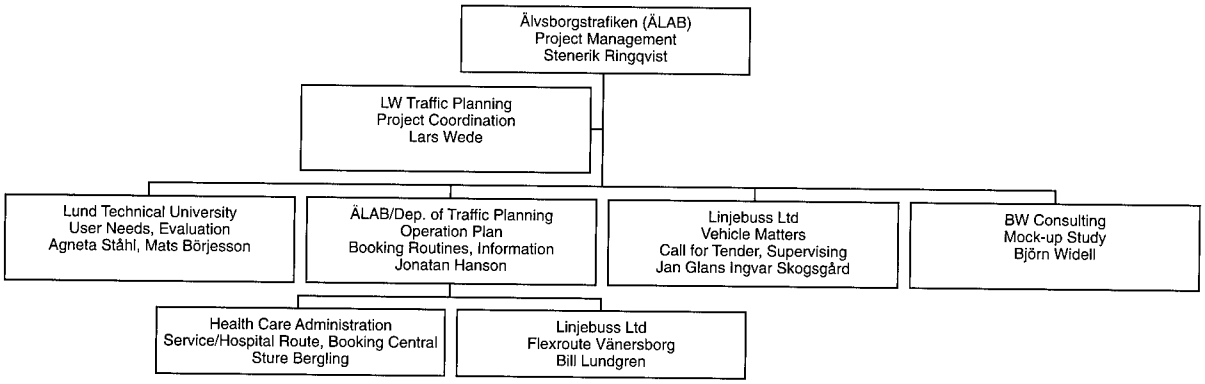
Assessment objective	Main interest group	Relevant user The project is intended to evaluate	Validation method	Unit / indicators to be considered	When	Respon-sible
		A Personal travel				
Is the transport service accessible to a greater group of customer? Has the public transport service improved?	ÄLAB	Passengers	On board passenger interviews: Effects of MULI and traffic for traveller in general. What do customer s think of MULI service? Questions concerning service in booking office and quality of service during travel.	Opinion about service, distance to bus stop, frequency, punctuality, travel time	After	LTH
	ÄLAB	Drivers experience	Interviews with drivers concerning their service to passengers	Opinion about possibilities to give service	After	LTH
	ÄLAB	Statistics	Travel statistics. Passengers per day	Number of passengers/ day	Before-After	ÄLAB
Have the passenger trips between NÄL and Uddevalla hospital been improved?	NU	NU Patients	On Board passenger interviews: Questions concerning service in booking office and quality of service during travel.	Opinion about service	After	LTH
	NU	Statistics	Travel statistics.	Number of passenger trips	Before-After	NU - sjukvården
	NU	NU Personnel	Questionnaire to NU personnel concerning what personnel think of Mulibus service for work trips and for journey on official business.	Opinion about service	After	LTH
		B Freight				
Have the freight transports been improved between NÄL and Uddevalla hospital? Have the costs been reduced?	ÄLAB	Company	Questionnaire to customers: What do customer think of freight service?	Opinion about service	After	LTH
	ÄLAB	Statistics	The amount of gods transport managed by ÄLAB within the MULI-concept.	Number of parcels per day Revenue per day	Before-After	NU - sjukvården ÄLAB
	NU	NU Transport - organisation	Interview with personnel concerning freight transport service.	Opinion about service	After	LTH
		C Vehicle				
Is the transport service accessible to a greater group of customers?	ÄLAB	Passenger	On board passenger interviews concerning the accessibility and the comfort of the vehicles	Opinion about accessibility, boarding and alighting, riding comfort, noise	After	LTH
What are the experiences from the test with the new vehicle?	ÄLAB	Drivers	Interviews concerning how the new vehicle and the new technique work in practice?	Opinion about vehicle and working situation in vehicle	After	LTH

Assessment objective	Main interest group	Relevant user The project is intended to evaluate	Validation method	Unit / indicators to be considered	When	Respon-sible
	ÄLAB	Mechanics	Interviews concerning how the new vehicle and the new technique work in practice?	Opinion about possibility to perform service and maintenance of vehicle	After	ÄLAB Linjebuss
		D Technology				
What are the experiences from gas operation? Have the emissions been reduced and has the environment been improved? Has the fuel consumption been reduced?	ÄLAB	Personal	Interviews with drivers and mechanics concerning how the new technique work in practice?	Opinion about service and maintenance of vehicle	After	ÄLAB Linjebuss
	ÄLAB	Vehicle data	Compile vehicle data concerning emissions	Emissions /km CO2 mg/km NOx mg/km VOC mg/km SO2 mg/km	After	ÄLAB Linjebuss
	ÄLAB	Statistics	Service and maintenance statistics	Fuel / km Hour service and maintenance	Conti-nuous	ÄLAB Linjebuss
		E Economics				
Have the costs been reduced?	ÄLAB	Statistics	Collection of operation and economic statistics. Calculation of the cost effectiveness of the traffic.	Service hours and km. Investment cost Personnel cost Fuel cost Maintenance cost Operation and capital cost/km/h	Before-After	ÄLAB
	NU	NU Economic Statistics	Collection of economic statistics for passenger trips for NU health service. Can the cost for personal travel be reduced?	ECU / patient	Conti-nuous	NU-sjukvården

Time Schedule Swedish Test-Site

Start of the MULI-Project	**April 1, 1996**
Call for Tender	**November 96 – April 97**
Incl.	
• pre-selection of 3 possible vehicle suppliers	
• discussions about technical modifications	
• final decision on vehicle supplier (Kutsenits)	
Mock-Up Study (interior layout studies)	**June 97 – August 97**
Construction of Vehicle	**May 97 – February 98**
Incl.	
• construction of vehicle body (Kutsenits)	
• installation of gas tanks	
• completion of the interior of the vehicle (Linjebuss)	
Fixed Operation Plan	**October 97**
Incl.	
• Service/Hospital Route between NÄL (Trollhättan/ Vänersborg) and Uddevalla hospital	
• Flexroute Vänersborg	
Fixed Evaluation Plan	**February 98**
Traffic Start	
• Service/Hospital Route	**March 98**
• Flexroute Vänersborg	**March 98**
Test Period	**March 98 - February 99**
End of Project	**March 31, 1999**

Organisation Swedish Test-site



Further Information about the MULI-Project

...can be found in the following papers

1. **Reports from the MULI-Consortium**
   - **Information Paper** — **June 96**
   - **Report I: 01.04.96 – 30.09.96** — **October 11, 1996**
     (including user needs)
   - **Report II: 01.09.96 – 31.03.97** — **May 26, 1997**
     (including call for tender information material)
   - **Information Paper** — **October 97**

2. **Reports from the Swedish Working Group**
   - **Mock-Up Study** (in Swedish) — **September 1, 1997**
   - **Report Swedish Test-Site** — **December 97**
   - **Evaluation Plan** (final version in Swedish) — **September 98**

...and can be given by the Swedish working group

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In the MULI-project – supported by the European Union within the THERMIE-programme, and the Swedish Transport and Communications Research Board/KFB – a new type of medium-sized vehicle (length/width approx. 680/213 cm) suitable for both passenger and goods transportation has been developed in co-operation with a qualified vehicle supplier. The vehicle, the MULI-Buslorry, has a low floor (23 cm above the ground, 17 cm when kneeling), wide doors, a carefully planned passenger compartment with 13 seats based on the results of a special interior layout study, and a goods compartment specially adapted to transport goods from the health care administration and also busgoods. Such a vehicle has not previously been available on the market. In the Swedish test-site two MULI-Buslorries, adapted to biogas fuel and equipped with a CNG engine, will be demonstrated and evaluated in two interesting and innovative transport solutions – on a Service/Hospital Route between NÄL (Trollhättan/ Vänersborg) hospital and Uddevalla hospital and on a Flexroute (a demand responsive service route) in Vänersborg. A final report will be presented during the spring 1999.

KFB
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