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D2.1.1.4 Feasibility of New RoRo / RoPax Services between Ireland and Continental Europe

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This report is based on a study carried out by Nautical Enterprise for the International Maritime Organisation (IMO). It has since been updated and condensed for use in SKEMA.

Contents

Executive Summary

This study, on the feasibility of new direct RoRo services between Ireland and Continental Europe, is carried out against a backdrop of thriving ferry and trucking services via the British Land Bridge.

Approximately 90% of RoRo cargo movements with Continental Europe use the British Land Bridge network, which serves Ireland well by providing a very competitive and wide choice of services with over 30 sailings per day in either direction across the Irish Sea and considerably more across the English Channel.

There are, however, forces at play that are putting the dominance of Land Bridge services under considerable pressure. The unit costs of Land Bridge deliveries to / from Continental Europe are relatively high, which reduces the competitiveness and geographical range of Irish exports and imports. Also, the effectiveness of long haul road freight is being progressively reduced by ever-increasing road congestion, safety regulations, weekend driving restrictions and restrictions on driving hours.

The most powerful influence on Land Bridge services is the European transport policy, which is focused on curtailing long-haul road freight for reasons that are generally accepted:

- Road freight is growing rapidly and is contributing excessively to road congestion;
- Environmental damage from exhaust emissions has to be reduced;
- Road freight makes minimal contributions to infrastructures, unlike maritime freight that pays full commercial prices for its infrastructures;
- Road freight that transits intermediary states is generally viewed as an intolerable nuisance.

The question naturally arises – would direct RoRo / RoPax services be competitive with British Land Bridge services? The basic competitiveness issue is addressed in Chapter 4. The answer, of course, is conditional; it depends on the route, the ship and the technologies deployed. The “ship” and operational technologies are examined at some length in Chapter 3.

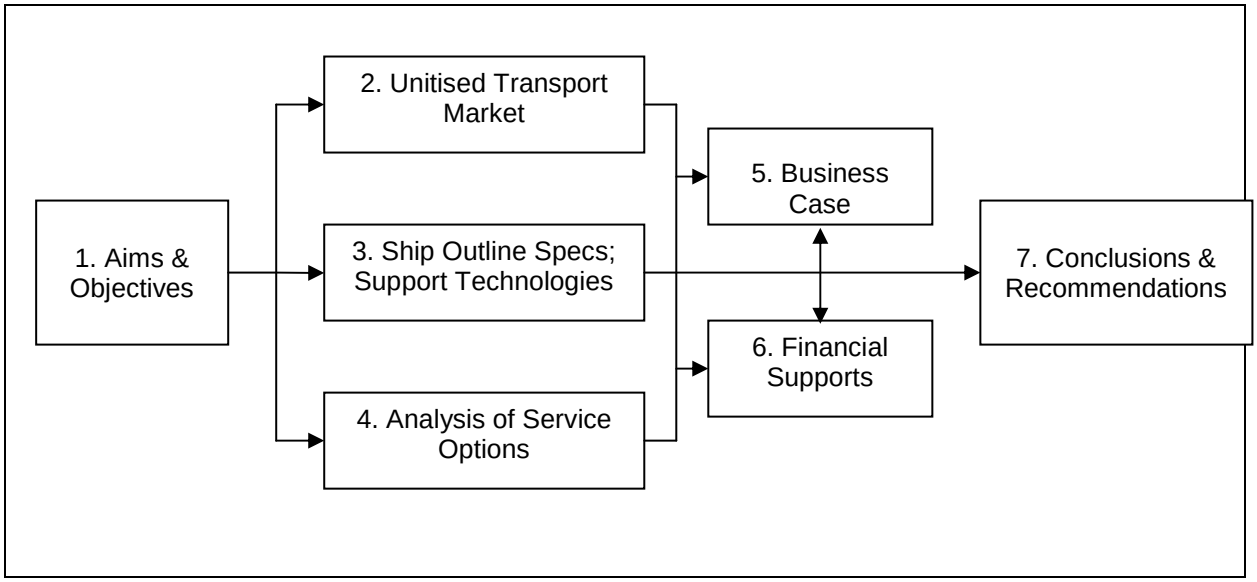
Given the most appropriate ship and “best in class” technologies, would a new direct RoRo service be competitive? This question is addressed by examining a specific case in some depth in Chapter 5.

The study is concluded with Conclusions and Recommendations in Chapter 7, which indicate that a new direct RoRo service would be a major undertaking with some outstanding potential benefits and would be fraught with risk.

Introduction

The primary objective of the study is to examine the feasibility of establishing new RoRo / RoPax services between Ireland and Continental Europe, which could be replicated when examining other RoRo / RoPax routes.

An overview of the study is given in the following schematic diagram:



The brief description of the work carried out in the course of the study is as follows:

Chapter 2: The passenger, car and freight markets between Ireland and Continental Europe were assessed..

Chapter 3: Outline specifications for a suitable RoRo vessel are determined from the logistical demands on the vessel. The technologies that are deemed necessary for the successful operation of a modern RoRo vessel are outlined.

Chapter 4: Five likely routes, for a new RoRo service, between Ireland and Continental Europe are analysed.

Chapter 5: A business case for a specified direct RoRo service is presented in order to assess its operational and commercial feasibility.

Chapter 6: The financial supports that may be available for a new direct RoRo service are examined.

Chapter 7: The Conclusions provide an overview of the whole study, while the Recommendations address two issues that could hamper the introduction of new direct RoRo services between Ireland and Continental Europe.

Glossary

Beam	This refers to the width of a ship at its widest point.
Chart Datum	Chart datum is the depth of water at approximately the lowest astronomical tide.
Cruise Ferry	This is a marketing term used to describe a RoPax ship with a good range of facilities for passengers.
D2D	This is shorthand for “Door to Door” deliveries and encompasses the movement of goods from the point of production/collection to the point of delivery.
Draught or Draft	This refers to the depth of the ship below the water, i.e. the amount of water the vessel is drawing.
Fast craft	This refers to vessels capable of a speed of 30 – 40 knots.
Land Bridge	This refers to the transport of freight by road or rail between ports on either side of a landmass.
Lane Metres	The capacity of ships is often described in terms of lane metres. It is assumed that each lane is sufficiently wide to accommodate a truck i.e. at least 2.4 m
LBP or Lpp	The distance between the intersection of the ship’s load water line and its stem and a vertical line through the centre of its rudder stock. Ships are designed using LBP and operated using LOA.
LOA	‘Length Over All’ (LOA) i.e. the total length of a ship from stem to stern.
LoLo	Lift-on Lift-off. This refers to traffic moved in containers (boxes) and on and off ships by crane. Containers come in various sizes. The width is generally 8ft or 2.4 m. The height is generally 8ft 6ins (2.59 m) but can be 9ft 6ins (2.9 m). The standard lengths are 20ft (6.1m), 40ft (12.2m) and 45ft (13.7m)

RoPax Ship	This term is used to describe ships that can accommodate a wide range of vehicles (cars, coaches, accompanied and unaccompanied freight) as well as passengers.
RoRo Freight	This refers to freight traffic which is driven on and off ships. There are two types of RoRo traffic: accompanied where the cab unit accompanies the trailer and unaccompanied where the trailer is towed on and off a ship by a terminal tractor referred to as 'tugmaster'.
RoRo Ship	This refers to a ship dedicated to the carriage of freight vehicles. As the passenger capacity is usually very limited – generally no more than 12 – these ships are generally geared to the carriage of unaccompanied freight vehicles.
SITC	Standard International Trade Classification of commodities.
TEU	Twenty-foot equivalent unit (TEU). To take account of the various sizes of container, they are sometimes converted to the standard unit of a TEU.
Time Charter	This covers the chartering of a ship for a specific time with crew. The chartering of a ship without crew is described as a "bareboat" charter.
Unitised Cargo	This encompasses both RoRo and LoLo freight that is carried in a unit such as a truck or a container.

Chapter 1. Study Objectives

The primary aims of the study are to:

- Examine the feasibility of establishing new RoPax / RoRo services between Ireland and Continental Europe;
- Establish the associated risks and benefits to the various stakeholders.
- Prepare a case for developing and operating such a service and similar services.

The operational objectives of the study are to:

1. Review relevant literature relating to door-to-door (D2D) unitised services and associated technologies.
2. Estimate:
    - Unitised cargo flows between Irish regions and regions in Continental Europe, specifically France, Spain, Portugal, Benelux States, Germany and Italy; also the Rest of Europe and the Rest of the World;
    - Maritime passenger movements;
    - The segmentation of interregional unitised trades into Ro-Ro and Lo-Lo as far as is practicable.
4. Analyse a number of promising routes and services for freight and passengers between Ireland and Mainland Europe.
5. Identify the possibilities for implementing new services or expanding existing services and the potential for increased cargo flows on the routes.
6. Evaluate the factors that would influence stakeholders[1] in intermodal transport to choose or participate in such services, and the possible benefits associated with their participation.
7. Examine the possibility of such services being eligible for financial assistance under special European programmes.
8. Develop a case for establishing RoRo services between Ireland and Continental Europe.
9. Prepare a Final Report.

[1] Stakeholders in this instance include people / organisations that would have an interest in a new service. They include exporters / importers, freight forwarders, ports, ship operators and hauliers.

Chapter 2: Freight & Passenger Markets.

2.1 Introduction

Almost all of Ireland's trade, by volume, passes through the island's ports. Table 2.1 presents the breakdown of trade by mode (in tonnes) through the Republic of Ireland (RoI) ports for the years 2000-2005 with 1996 as a base year. It highlights:

- The growth in port traffic overall in the last decade in response to the growth in the Irish economy.
- The increasing importance of the unitised modes. In 1996 they accounted for 29% of the overall market. By 2005 this had increased to 38%.
- The buoyancy of the unitised modes, especially RoRo which accounted for 22% of the market in 2005 compared with 16% in 1996. Over the same period, the LoLo share grew from 12% to 15%. Between 1996 and 2005, Ro-Ro tonnage more than doubled while LoLo grew by nearly 80%.

Table 2.1. Tonnage through RoI Ports by Mode, 2000-2005

RoI Ports	1996	2000	2001	2002	2003	2004	2005	Av Growth per yr '00-'05	Av Growth per yr '96-'05
Ro-Ro	5,857	8,947	9,253	9,449	9,857	10,570	11,816	6%	8%
Lo-Lo	4,404	6,262	5,731	5,919	6,574	7,022	7,803	4%	7%
Liquid Bulk	9,828	14,008	14,247	13,154	12,966	13,315	14,759	1%	5%
Dry Bulk	13,538	14,463	14,832	14,775	15,024	14,828	15,589	2%	2%
Break Bulk & Other	1,389	1,593	1,732	1,622	1,743	1,984	2,179	6%	5%
Total RoI	**35,016**	**45,273**	**45,795**	**44,919**	**46,164**	**47,719**	**52,146**	**3%**	**5%**

Source: CSO Statistics of Port Traffic

2.2 Profile of the Irish Sea Ferry Market

There are17 ferry routes linking the island of Ireland to Great Britain as well as three connecting Ireland to France. Most of these are multi-purpose services which carry passengers and their vehicles in addition to RoRo freight, both accompanied and unaccompanied. A map of the ferry network is shown in Figure 2.1.

Figure 2.1. The Ferry Network Linking Ireland to the UK and France

When describing the patterns of traffic the Irish Sea RoRo market is usually segmented by corridor:

- *The Northern / Diagonal Corridor* which comprises the short-sea and long-sea routes out of Larne, Belfast and Warrenpoint.
- *The Central Corridor* which includes all routes out of Dublin Port and Dun Laoghaire
- *The Southern Corridor* which includes the routes from Rosslare and Cork to Great Britain and to France

A breakdown of RoRo freight traffic by port and corridor is shown in Table 2.3. Below. This illustrates clearly:

- The continuing prominence of the Northern/Diagonal Corridor which handles about 50% of the RoRo traffic moving to/from the island of Ireland.
- The leading position of Dublin Port which handles almost 40% of the total RoRo traffic
- The growth in traffic through Rosslare. (The relative lack of congestion on the access routes to Rosslare may be attracting traffic to that port at the expense of Dublin)
- The static pattern of freight volumes through Dun Laoghaire, which primarily serves the travel market.

Table 2.3 RoRo Freight Traffic by Port & Corridor, 1996-2005

	1996	2001	2002	2003	2004	2005
Northern/Diagonal						
Larne	284	347.8	384.2	378.3	388.5	404.9
Belfast	314	332.7	306.8	321.1	331.7	340.0
Warrenpoint	20	48	52.3	55.2	58	71.3
TOTAL	**618**	**728.5**	**743.3**	**754.6**	**778.2**	**816.2**
Central						
Dublin	341	531	554.4	571.2	608	629.8
Dun Laoghaire	24	35.8	30.3	34.7	29.7	31
TOTAL	**365**	**566.8**	**584.7**	**605.9**	**637.7**	**660.8**
Southern						
Rosslare	73	106	104.7	112	126.9	138
Cork	8	3.7	3.7	4.5	5.7	8.2
TOTAL	**81**	**109.7**	**108.4**	**116.5**	**132.6**	**146.2**
TOTAL ALL PORTS	**1064**	**1405**	**1436.4**	**1477**	**1548.5**	**1623.2**

Sources: CSO, Ireland and the Dept of Enterprise, Trade & Investment, Northern Ireland.

2.3 Serving the Travel Market

To an island like Ireland, with a small population and heavily dependent on foreign visitors to support its significant tourism industry, the availability of good access transport services is vital. Throughout the 1970s and 1980s a few dedicated RoRo vessels were operated in parallel to the multi-purpose ferry services. By the late '90s the distinction between the two segments blurred as new tonnage was introduced. These new, larger and faster ships, known as RoPax ferries, carried significantly more than 12 drivers and offered more comfortable accommodation than the previous generation of ship. For the Irish Sea ferry sector, the last decade has been one of significant development:

- The conventional fleet has been upgraded and capacity increased.
- Fast craft, both small and large, have been fully integrated into the ferry fleet.
- Port facilities have been improved.
- New routes have been established.

2.4 Competitive Pressures on Passenger Movements by Sea

As mentioned above, the ferry industry, in the second half of the 1990s, began investing in new ships and terminals to cater for strong growth in both the travel and freight markets. The freight market justified that investment by continuing to grow, while growth in passenger movements by sea continued only to 2000.

By the 1990s the ferry operators were no longer relying on the traditional foot passenger. That market segment had already begun to decrease in the 1980s as the accompanied car market grew and the foot passenger market it provided was very vulnerable to growing competition from the low cost airlines (LCAs) in the 1990s. To compensate for the loss of that income stream, they sought to improve ticket revenue and yield. But this was impossible to achieve in the face of strong competition from the LCAs who were offering low fares to a wide range of new, interesting destinations.

Any changes in the marketing stance or pricing policy, introduced by the ferry industry in response to the loss of business to the LCAs, have had little impact; passenger and car volumes continue to decline. With improvements in volume or yield being difficult to achieve in the face of competition from the LCAs, the ferry industry has sought to reduce its cost base instead, focusing on two of the most significant items of expenditure – crew costs and fuel.

2.5 RoRo Freight Market

2.5.1 Introduction

In the review of the ferry market in the preceding sections the essential importance of RoRo freight to the overall ferry business can be clearly seen. As RoRo volumes have grown in tandem with Ireland's economy, the passenger and car markets have, at the same time declined as a result of intense competition from the LCAs. Freight is vital to the continuation of year-round multi-purpose ferry services. Because it moves every day with little seasonal fluctuation, it provides a steady cash flow which helps sustain services that might otherwise operate only seasonally.

Within the RoRo market there are two discrete segments – accompanied and unaccompanied traffic. In the past, unaccompanied trailers were seen, by definition, to be less urgent and often less valuable. Today that distinction has faded as better logistics management and more cost-effective deployment of drivers have enhanced the role of the unaccompanied trailer.

The direct ferry services between Ireland and Continental Europe carry only a small portion of the RoRo traffic which moves between the two areas. The lack of capacity on the direct services means that most RoRo traffic with Continental Europe uses the Land Bridge services through the UK.

For freight operators the wide choice of Land Bridge routes and services (see Fig 3.1. above) gives them flexibility and reliability. The Land Bridge itinerary is also faster than the direct services to France. This transit through the UK makes a statistical assessment of the actual volume of RoRo units moving between Ireland and Continental Europe difficult, as the ultimate origins / destinations are unclear. It is therefore necessary to approach this issue somewhat indirectly.

2.5.2 Quantifying the Ireland – Continent RoRo Market

Two primary data sources were used for analysing RoRo cargos transported between Ireland and Continental Europe. They were:

- Unitised trade statistics through Irish ports from the Central Statistics Office (CSO). CSO data provide unitised RoRo and LoLo imports and exports though the different ports; countries of origin and destination are not given.
- Standard International Trade Classification (SITC) data relating to trade between Ireland and other states world wide are also produced by the CSO. SITC data provide value and net mass of imports and exports for Ireland's trading partners; no unitisation data are given.

RoRo Imports and Exports through Irish ports:

Table 2.5: RoRo Freight Vehicles / Trailers Received and Forwarded through Irish Ports

	RoRo Trailers Received			RoRo Trailers Forwarded		
Year	**Laden**	**Empty**	**Total**	**Laden**	**Empty**	**Total**
2000	322,712	12,122	334,834	231,025	67,780	298,805
2001	346,433	13,874	360,307	236,972	76,418	313,390
2002	347,285	14,468	361,753	248,355	83,153	331,508
2003	362,673	15,774	378,447	254,992	88,634	343,626
2004	384,285	19,186	403,471	269,407	97,899	367,306
2005	401,023	19,511	420,534	283,346	103,272	386,618
Average Increase / yr	4.4%	10.0%	4.7%	4.2%	8.8%	5.3%

Source: CSO, Statistics of Port Traffic for Ireland

Some of the notable features that emerge from the data in Table 2.5 are:

- The average annual growth in RoRo cargo movements has been about 4% over the last few years (4.4% in laden cargoes received, 4.2% in laden cargoes forwarded).
- The number of Laden RoRo trailers received (imports) exceeded the number of Laden RoRo trailers forwarded (exports) by approximately 42% per year.
- Associated with the imbalance in the numbers of RoRo imports over RoRo exports, the ratio of Empty to Laden imports was 4 %, whereas for exports and imports, the ratio was 33% on average.

Estimated RoRo cargoes between Ireland and Continental Europe:

The key functions in the derivation of unitised cargo flows between Ireland and its trading partners are the application of expert knowledge to:

a. Estimate the percentages of SITC cargo that is unitised,
b. Estimate the percentages of unitised cargo that is RoRo and LoLo for different origins / destinations,
c. Adjusting individual estimates so that the whole system balances.

The result provides estimated unitised RoRo and LoLo imports and exports that can be verified against the CSO unitised primary data sources. The process of managing and deriving the macro-economic cargo unitisation is facilitated using a software program developed by Nautical Enterprise. Applying this software to the SITC data from the CSO resulted in Table 2.7 below. The study "Inter-European Trade Corridors" [2] that was commissioned by the Irish Maritime Development Office provides a summary of the Central Statistics Office Road Freight Survey of 2002. This provides a good indication of RoRo freight leaving Ireland and the destinations of the cargo in Europe.

Table 2.7.

Estimated RoRo cargoes between Ireland and Continental Europe (2005)

Origin / Destination	RoRo Trailers			
	Laden Imports	Est. Empties Imports (4%)	Laden Exports	Est. Empties Exports (4%)
UK	162,785	6,511	118,289	4,732
France	12,935	517	13,336	533
USA	1,085	43	1,406	56
Spain	9,865	395	6,073	243
Portugal	1,707	68	848	34
Germany	27,672	1,107	16,445	658
Italy	5,392	216	5,698	228
Sweden	4,360	174	3,070	123
Greece	478	19	703	28
Netherlands	19,018	761	10,883	435
Denmark	1,341	54	1,855	74
Finland	2,145	86	684	27
Luxembourg	404	16	351	14
Belgium	14,306	572	13,507	540
Austria	1,205	48	1,028	41
Canada	105	4	0	0
Rest of Europe	44,106	1,764	14,690	588
Rest of the World	19,836	793	5,456	218
Total for Continental Europe	144,934	5,797	89,170	3,567

[2] "Inter European Trade Corridors" IMDO Ireland 2004

Adding up the rows (excluding UK, USA, Canada & Rest of World) in Table 2.7, it is estimated that the total number of trailers, laden and empty, that travelled between Ireland and Continental Europe in 2005 was 243,468. To put this in context, one dedicated RoRo vessel trading between Ireland and Continental Europe (as specified in Chapter 3) would have a capability of carrying approximately 20,000 trailers per year. There is, therefore, significant potential for a RoRo service between Ireland and Continental Europe.

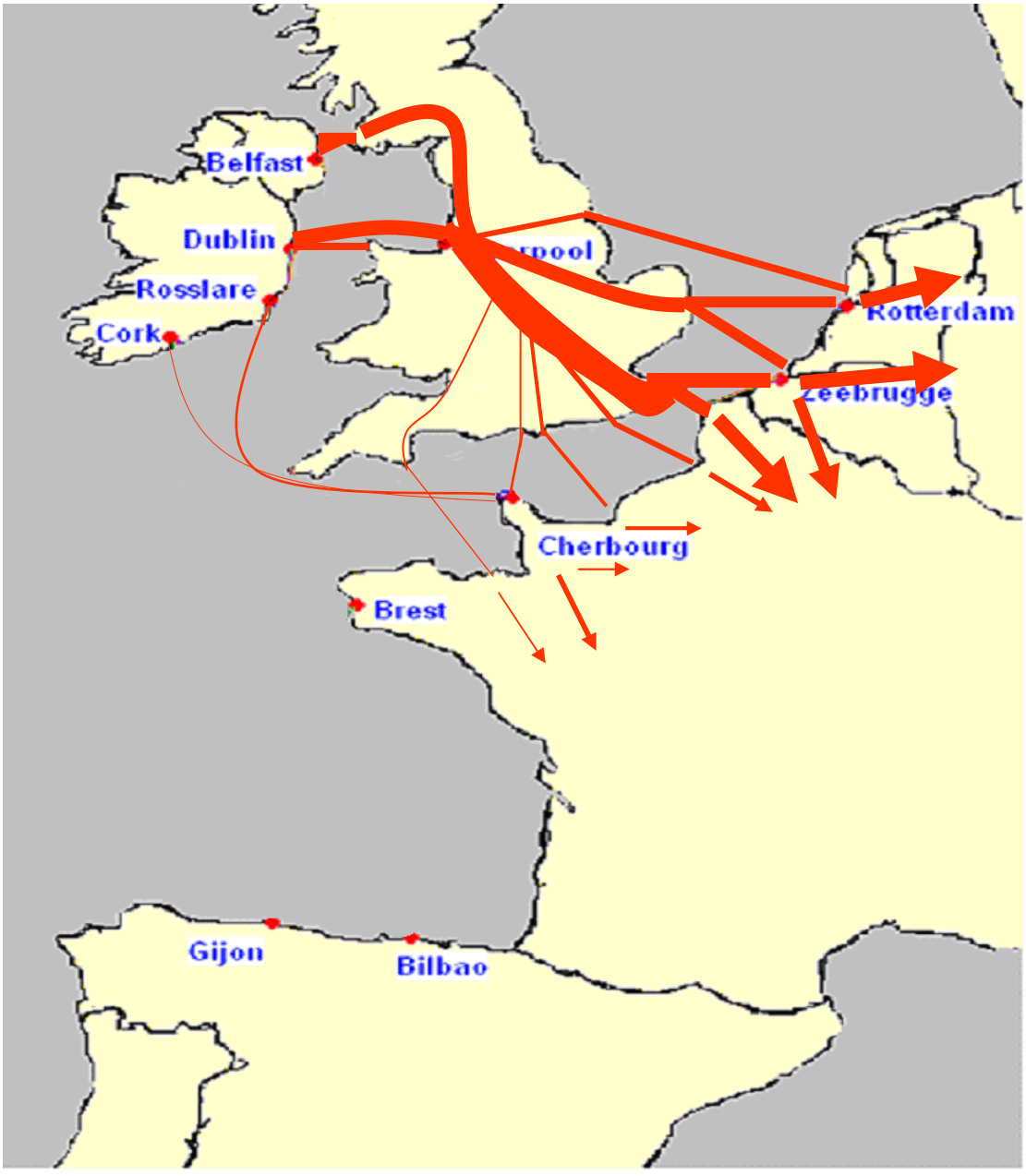


Figure 2.2: Indicative trade Routes for RoRo Cargo between Ireland and Continental European

Figure 2.2 suggests that, due to the amount of RoRo cargo moved, routes between the maritime gateways of Ireland and those of the southern North Sea may be the most attractive for a possible

direct RoRo service between Ireland and the Continent. This could be augmented by direct services from Ireland to western France and the Iberian Peninsula.

2.6 Conclusions to Chapter 2

C2 – 1 There is a large range of RoRo services across the Irish Sea. The ferry sector has proved very responsive to changes in market demand and to innovations in transport services.

C2 – 2 Since 2000 and 2002 the ferry operators have experienced a decline in demand from the passenger and car sectors respectively.

C2 – 3 In contrast with the travel market, laden RoRo freight vehicles / trailers have grown at a credible rate of over 4% per year since 2000. This follows the double-digit growth during the halcyon years of '94 – '99.

C2 – 4 Approximately 90% of the trade flows of RoRo cargoes from and to Ireland use the British Land Bridge and approximately 10% of the direct RoRo services from Ireland.

C2 – 5 Unitised cargo movements between Ireland and Continental Europe have progressively grown in volume. While trade between the two regions has grown significantly there has been no parallel development in the provision of direct ferry services.

C2 – 6 Land Bridge freight services with Continental Europe are an extension of the excellent ferry services across the Irish Sea and across the English Channel. They have a formidable array of positive features that can be repeated like a mantra by anybody engaged in the industry. However due to high unit costs for intermediate and long distances, and also ever increasing road congestion, the landbridge hegemony is under threat.

In Chapter 3 we examine RoRo / RoPax vessels and the technologies that may be deployed to ensure their efficient operation.

3. RoRo / RoPax Vessels in Intermodal Transport

3.0 Introduction

Chapter 2 investigated and discussed existing services for both passengers and freight between Ireland and the European Continent using the British Land-Bridge or direct RoRo / RoPax services. This chapter reviews the vessels which might appropriately be used on such a service. It begins by reviewing current RoRo and RoPax vessels and their operating environment and then considers the technologies that could be employed to improve the competitiveness of RoRo / RoPax vessels including systems that exploit the synergy of ship and terminal. The chapter concludes with the presentation of an outline specifications for a suitable vessel for this service.

3.1 Modern RoRo and RoPax Vessels

Roll-On / Roll-Off (RoRo) vessels have constantly evolved from the first purpose-built ferries that came into service in the late sixties[3]. Passengers, cars and freight vehicles make their individual demands on ship access and space and thus on the architecture of vessels, leading to compromises in terms of design. Where the bias lies – passengers, cars or freight vehicles – depends on the market the vessel is serving and the route it is plying. In essence, three RoRo concepts have evolved:

- The cruise ferry
- RoPax ferries
- Freight RoRo

3.2 RoPax / RoRo, Distances, Operating Speeds and Prevailing Sea States

The availability of low cost air travel in conjunction with low-cost car rental affects the already seasonal demand for passenger car space on RoPax ferries and raises the question of where the development of these vessels will go[4].

On short distances, transited in a couple of hours, aircraft style seating for passengers prevails and cabin accommodation for passengers is generally limited. Depending on the route, sailing times vary between one hour (Dover Straits) to about six hours (Western Channel and Southern North Sea). Based on Distance Tables contained in Brown's Nautical Almanac[5], distances range between: 20 and 90 nautical miles in the English Channel, 40 and 120 in the Irish Sea, and 50 to 120 nautical miles in the Southern Baltic[6]. A typical operating speed of about 20 knots yields crossing times from one to six hours. With the exception of the Southern Baltic, the ships travel in unprotected waters and are often

[3] Kanerva, M. et al. 'Concepts and Configurations for Ferries in Northern Europe, 2004.

[4] Galloway County Council, Stena Line, and P&O, North Channel Interest Group, 2002.

[5] Brown Son & Ferguson Ltd, Glasgow, Brown's Nautical Almanac, 2004.

[6] Mueller-Kraus, Handbuch fuer die Schiffsfuehrung, Vol 1, Springer Verlag, Berlin, 1961.

subject to severe weather and rough sea conditions. Figure 3.1 below shows a typical example of a RoPax ferry for short distances.

Figure 3.1: Pride of Burgundy (P&O Ferries), off Calais, France

Source: http://en.wikipedia.org

On medium distances, where travel time exceeds 6 hours and a night crossing may be involved, the provision of cabin accommodation for passengers becomes a necessity. Examples of routes are given in Table 3.1 below:

***Table 3.1: Examples of medium distance RoRo / RoPax routes**:*

Sea Area	Origin	Destination	Distance (nm)
Irish Sea	Belfast	Liverpool	135
Southern North Sea	Humber Ports	Rotterdam & Ostend	209 & 201
North Sea	Cuxhaven / Bremerhaven	Harwich	300
Western Approaches	Cork / Rosslare	Roscoff, St Malo, Cherbourg, or le Harve	280 -420
Baltic	Lübeck	Oslo & Stockholm	405 & 480
Mediterranean	Genoa	Barcelona	352

Figure 3.3 below depicts a freight RoRo vessel generally travelling over medium distances.

Figure 3.3: STO/RO Paper and Trailer Vessel "MV MISTRAL"

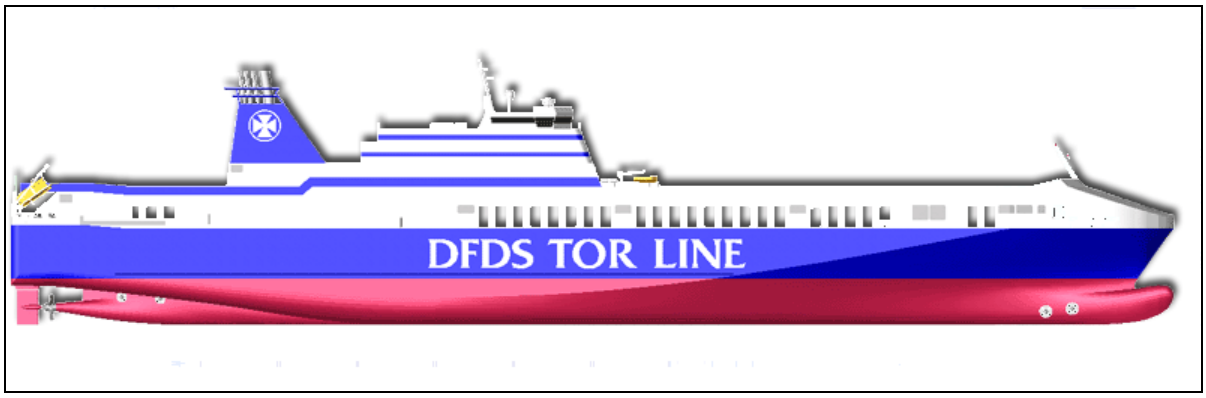
Length 153.45 m, Beam 20.60 m, Draught 7.00 m; 1,624 lane-metres; Cabins for 12 Drivers; Operating Speed 21 knots; Propulsive Power 12,600 KW.

On long distances the length of the vessel may exceed 180 m. The availability of cheap airfares has changed passengers' travel preferences over long routes to 'flying rather than sailing'. For this reason the passenger accommodation of these ships may be curtailed in favour of freight vehicles, generally unaccompanied trailers, stowed on at least two trailer decks. Due to a favourable length-to-beam ratio, the service speed can be greater than that applicable to smaller vessels. Examples of routes are shown in Table 3.2 and an example of a large RoRo vessel is given in Figure 3.4 below:

Table 3.2: Examples of long distance RoRo routes:

Sea Area	Origin	Destination	Distance (nm)
Baltic	Lübeck	St Petersburg	780
North Sea	Gothenburg	Zeebrugge	670
Western Approaches / Bay of Biscay	Plymouth	Bilbao	453
Mediterranean	Citavecchia	Barcelona	440

Figure 3.4: Outline of a large freight RoRo vessel Source: http://www.fsg-ship.de



Principal Dimensions		**Speed & F.O Consumption**	
Length (Overall)	199.80 m	Service Speed	22.5 Knots
Length (Between perpendiculars)	190.29 m	Consumption	73.70 t/day
Breadth	26.50 m	**Main Engine**	
Depth (to upper deck)	16.95 m	One 2-Stroke Cross Head Diesel Engine 9L60MC-C -- 20,070 KW @ 123 rpm	
Draught (design)	6.95 m	**Trailer Decks**	
Deadweight (design)	8,420 t	4 Decks, Total Lane-metres = 3,831	

3.3 Technologies to improve Competitiveness of RoRo and RoPax Vessels

- Quantification of the target market
- Design of a superior Door-to-Door service solution
- Implementation of an e-booking system
- Installation of an information management system
- Automatic preparation of ship pre-loading plans
- Integrated management of trailers on terminals
- Technologies to facilitate rapid ship turnaround in Port

3.4 Logistical Factors influencing Competitiveness

3.4.1 RoRo vs. RoPax ; RoRo vs. LoLo.

RoPax vessels are eminently suitable for ferry-type services between two ports, where the distances are not particularly long and a combination of driver-accompanied freight, passenger buses and cars,

trade cars and foot-passengers has to be facilitated. Irish Sea crossings, where ferries equipped with aircraft style seating operate, can be taken as an example. For intermediate distance (400 nm) the cost of truck drivers and tractor units on board ship and the extra costs associated with the provision of extensive cabin accommodation for passengers carried on these vessels compared to RoRo ships can make RoPax vessels uncompetitive. In these circumstances freight RoRo, offering accommodation for up to 12 drivers, comes into its own. For distances above 660 nautical miles, LoLo operations using modern feeder / liner vessels become the preferred solution.

TRAPIST[7] makes a case for the use of hatchless LoLo vessels for intermediate trading distances of 280 – 660 nautical miles. The following is a summary of its conclusions:

- For short distances, up to approximately 280 nautical miles, RoRo and RoPax have no maritime competitor.
- For intermediate distances of between 280 and 660 nautical miles, RoRo would be challenged by hatchless LoLo, if hatchless LoLo ships were available. Conventional LoLo for these distances is not in the running.
- For distances greater than approximately 660 nautical miles and less than 1,200 nautical miles, conventional LoLo is the winner.

3.4.2 Ship Capacity and Utilisations

Freight capacity of a ship is determined by the number of cargo units that it is expected to carry. This, in turn, is dependent on the amount of unitised cargo available and the relative attractiveness of the proposed service compared to other transport options. Whilst economics of size play an important part, it needs to be borne in mind that these can only be realised if the prerequisite amounts of cargo can be secured. This is not always possible and results in a greater risk of ship under-utilisation with increased ship size.

There is a further issue to be considered: that of maximum and average ship utilisation.

The practical maximum utilisation is deemed to be somewhere between 80% and 90% of the nominal RoRo capacity. The average utilisation depends on the level of randomness in cargo availability. In the scenarios that are examined in Chapters 4 & 5, three ports in three different states are used in each case; that is, four ports of call per round trip. Such an “un-ferry” like itinerary is used in order to increase the options for achieving high average ship utilisations by availing of the singular feature of RoRo vessels – their rapid port turn-around times. For cargo availabilities that are random, the average ship utilisation should be about 65%, and this is the figure used in subsequent analyses.

[7] TRAPIST (2004): “Tools and Routines to Assist Ports and Improve Shipping” A project funded by the European Community under the Competitive and Sustainable Growth Programme.

3.4.3 Market Availability of the "ideal" Vessel

The general market requirements of a vessel under consideration are determined by the combination of the transport characteristics of the potential cargoes and the vagaries of the volumes that can be attracted to the new service. In addition the following factors also need to be noted:

- Possible draught restrictions en route to and in the ports of call,
- The manoeuvring requirements in comparison with the manoeuvring capability of the vessel,
- Matching the configuration of shore based ramps with the dimensions and positions of the axial openings of the vessel,
- The optimum operating speed of the vessel to meet the reliability requirements of the service.

All of that has to be achieved at commercially acceptable fuel consumptions. Considering the complexity of these combined requirements, selecting the correct vessel from the charter market, or commissioning a new ship once the service has been established and proven itself, is a rather difficult task and will always involve compromises.

3.4.4 Service Speed to meet the Schedule

The service speed of the ship is the speed required to complete a round trip in the scheduled time with a targeted average ship utilisation of 65%. For two round trips per week, the scheduled time on passage is 84 hours. The detailed schedule must be adjusted to accommodate berth availabilities at the different ports. It is desirable to be able to reduce average ship speeds in order to save fuel, and, hence, turnaround times in ports are shorter than expected.

3.4.5 Ship Speeds and Fuel Consumption

Estimates of fuel consumption at different operating speeds can be based on the convenient assumption that the resistance of the ship is mainly frictional. It can therefore be related to the ship's length 'L^2', its displacement '$\Delta^{2/3}$', and its operational speed 'V^3'. This yields an expression for the vessel's propulsive power:

$$\text{Power (MW)} = AC \times \Delta^{2/3} \times V^3$$

Where AC is referred to as the Admiralty Coefficient

As fuel consumption is proportional to power, the same expression can be used to estimate the daily fuel consumption of the vessel at a given speed and displacement, yielding:

$$\text{Fuel Consumption (t / day)} = FC \times \Delta^{2/3} \times V^3$$

Where FC is referred to as the Fuel Coefficient

Even though the method shows results and its application yields a convenient approximation, it is subject to the following caveats:

- Variation of both the Admiralty Coefficient and the Fuel Coefficient with displacement and speed for the same vessel affect the estimates of power and fuel consumption.

- The assumption that the resistance of a ship is mainly frictional is correct at slow speeds of 10 – 15 knots and is approximate at speeds at which RoRo and RoPax vessels sail. At these speeds, residual or wave making resistance is important.
- The Resistance-to-Speed graph is undulating. Changes in speed required to maintain the ship's schedule, assuming the vessel's machinery is capable of producing the required power, may lead to large variations in fuel consumption. Estimating these is beyond the capability of the above expression.

3.6 Conclusions to Chapter 3

C 3 – 1 The modern RoPax and RoRo vessels have rapidly developed in response to increased prosperity in Europe and keen competition between ship operators, as described in Chapter 2.

C3 – 2 The benefits to the stakeholders associated with a comprehensive RoRo service, as given in the case study in Chapter 5, amount to approximately half a billion euro over five years, starting from scratch. This does not take into account the principal economic benefit.

C3 – 3 There is an association between market preferences for different maritime transport modes and maritime distances. For short distances (up 280 n.m) RoRo and RoPax have competitive advantage over LoLo. Both RoPax and RoRo have their loyal advocates for short-to-medium distances (~ 280 – 400 n.m.). For medium-to-long distances (400 – 660 n.m) LoLo has the competitive advantage.

In Chapter 4, five likely routes are selected and Door-to-Door (D2D) delivery costs and times are computed per unit of cargo for direct RoRo / RoPax services and compared to those of equivalent Land Bridge services. The operational benefits of the RoRo / RoPax services are determined, as are the operational risks for such services.

4. Analysis of New RoRo Services

4.0 Introduction to Chapter 4

Five possible direct RoRo / RoPax routes between Ireland and Continental Europe were selected and analysed for the purpose of checking the feasibility of possible new RoRo services. This, of course, is not the totality of all possible direct RoRo / RoPax services, but it provides a basis for drawing some general conclusions on the feasibility of direct services vis-à-vis Land Bridge services.

4.1 Description of Routes and of the Analysis Process

The bases for selecting the five routes were:

- The routes serve Ireland's major potential markets, which correspond to the East / West corridor between Ireland and Northwest Europe, and the North / South corridor between Ireland, Western France and the Iberian Peninsula.
- Each route links three states, including Ireland. This makes good use of the most important feature of RoRo vessels – their rapid turnaround times in port. It also increases the probability of having viable cargo volumes.
- Two of the routes involve calls to Dublin Port, two involve calls to Rosslare Europort and one involves a call to Cork. The case study in Chapter 5 also includes a call to Cork, thus restoring the balance of two calls to each of Ireland's three prime RoRo ports
- None of the selected services would be in conflict with an existing direct RoRo service.

The five routes selected were:

- Dublin – Cherbourg – Zeebrugge – Cherbourg – Dublin;
- Liverpool – Rosslare – Bilbao – Rosslare – Liverpool;
- Cork – Western France – Northern Spain – Western France – Cork;
- Belfast – Dublin – Zeebrugge – Dublin – Belfast;
- Rosslare – Cherbourg – Rotterdam – Cherbourg – Rosslare;

The analysis assumed that:

- Ship berths were available in the ports that were selected;
- An average ship utilisation of 65% was used to facilitate comparison between routes;
- Average ship speeds and fuel consumptions were variables and depended on distances between ports and the need to complete two round trips per week.

The RoRo vessel that was derived in Chapter 3 was used throughout. It has a capacity of 155 trailers and Time Charter Rate[8] (TCR) of € 20,000 per day, while the RoPax vessel had a similar capacity and a TCR of € 27,000 per day;

The analyses of routes were carried out using Nautical Enterprise's TransPlan-IT software, which facilitates computation of the multiple calculations involved in route analysis. It enables an input-output approach to be used in the analysis process. The principal input variables are the route, and the annualised inter-port cargo flows or average ship utilisation. The principal outputs are the ship's average service speed, the ship's schedule and D2D unit costs and delivery times. Trucking via the British Land Bridge was used as a comparative reference throughout.

A Modular Flow of the TransPlan-IT system is presented in Diagram 4.2. The TransPlan-IT system is, itself, based on the calculation of the individual elements of intermodal transport services, such as –

- Indicative ship Time Charter Rates (TCR),
- Average cargo units loaded in ports, based on annualised inter-port cargo flows,
- Truck calculations, based on an approximation of € 1 per km.

These elements are combined together systematically to provide logistical characteristics, such as –

- Ship capacity, speed and schedule,
- D2D unit costs and delivery times,
- Truck and Ferry D2D unit costs and delivery times.

The system may be used to assess operational risks associated with variations in –

- Ship TCRs,
- Fuel prices,
- Port delays,
- Ship utilisations,
- Possible imposition of a road levy.

The system may also be used to assess the benefits to different stakeholders, to –

- Ship operators,
- Participating ports,
- Haulage companies,
- Consignors and consignees.

[8] Time Charter Rates were derived from Bare Boat Charter Rates that were supplied by a European Ship Broker.

Figure 4.1: Routes selected for analysis

4.2 Overview of the Outputs from the Analysis

Table 4.1 RoRo & RoPax vs. Landbridge

Scenario	Weighted average D2D Cost per cargo unit (€/trailer)			Wt. Av. D2D reduction on Land Bridge per Round-Trip (€ / trailer)		Reduced Cost for total Cargo per Round-Trip (€)		Weighted average difference in D2D delivery times (hrs)	Weighted Av. Difference per ship per year (€ M / yr)	
Scenario	**RoRo**	**RoPax**	**Land Bridge**	**RoRo**	**RoPax**	**RoRo**	**RoPax**	**RoRo/RoPax vs. Land Bridge**	**RoRo**	**RoPax**
*	1,391	1,491	2,159	768	668	192,768	167,668	5	20	17.4
*	1,366	1,458	1,904	538	446	150,640	124,880	7	15.7	13
*	1,344	1,444	2,154	810	710	206,550	181,050	6	21.5	18.8
*	1,567	1,667	2,129	562	462	145,558	119,658	-11	15.1	12.4
*	1,331	1,427	2,596	1,265	1,169	332,695	307,447	-5	34.6	32
Average				**789**	**691**	**205,642**	**180,141**	**7**	**21.4**	**18.7**

* In the above table the scenarios have been scrambled and their identities hidden. This is because the emphasis throughout is on the feasibility of the concept rather than on the merits of individual routes.

Table 4.1 above has the following distinguishing features:

1. For each of the five routes chosen, a direct RoRo service would be significantly less costly than Land Bridge, with an average cost differential of approximately € 789 per trailer. The cost differential would amount to approximately € 21.4 Million per year under similar operating conditions to those in the case studies.
2. RoPax presents a special case. On average, the D2D cost of RoPax would be approximately € 98 per trailer greater than RoRo. This, however, does not take into account the cost of a driver and tractor unit lying idle on relatively long sea journeys. Allowing € 40 per hour for driver and tractor unit and charging for 10 hours on relatively long sea passages, then the RoPax vessel would be approximately € 500 per trailer more costly than RoRo. In effect, this means that, on average, RoPax would have no cost advantage over Land Bridge for intermediate length voyages.
3. Differences in D2D delivery times are shown to be relatively small. However, there are significant differences in individual cases and the figures do not take into account the lack of frequency in RoRo sailings when compared to the multiple Land Bridge options.

Table 4.2 Summary of ship speed and fuel consumption for each scenario

Scenario	Speed RoRo/RoPax (knots)	Fuel Cons RoRo/RoPax (t / day)
*	20.5	60
*	24.1	98
*	20.5	60
*	25.6	118
*	21.4	69

4.3 Operational Risks Associated with a New RoRo Service

Commencing a new RoRo service is a risky venture, as evidenced by the number of failures that occur. The various operational risks can be grouped into five categories:

1. Delays in ports.
2. A significant increase in fuel prices.
3. The imposition of a road levy on trucks.
4. Ship Time Charter Rate higher than expected.
5. Ship utilisation lower than expected.

4.3.1 Risk associated with Delays in Ports

Delays in ports have to be compensated for by higher ship speeds, resulting in increased fuel consumption and increased voyage costs. A port delay of 5 hours per round trip was assumed and the consequential increase in D2D cost per trailer was computed. This is shown in the following table:

Table 4.3 Port Delay per Voyage (5 Hours)

Scenario	Increased av. ship speed to compensate for delay (kts)	Increased D2D cost per cargo unit (€/trailer)	Average No. of Trailers moved per voyage	Increased cost for total cargo per voyage(€)	Increased cost per year (€ M/yr)
*	1.95	37	255	9,435	0.98
*	2.35	68	259	17,612	1.83
*	2.4	55	280	15,400	1.6
*	1.9	38	263	9,994	1.04
*	1.9	36	251	9,036	0.94
Average	**2.1**	**46.8**	**262**	**12,295**	**1.28**

The ship would be expected to run to a tight schedule and would have to increase speed to compensate for delays. The resulting cost would be approximately € 12,295 per round trip, which corresponds to € 1.28M per year if such delays should be chronic.

4.3.2 Risk associated with a Fuel Price Increase

Fuel price variations are to be expected and it is important to see how they would affect a RoRo service compared to Land Bridge.

Table 4.4 Fuel Price Increase

Scenario	Increased D2D Cost per unit (€/trailer)		Increased D2D Cost for total cargo per round-trip (€)		Increased D2D Cost per year (€ M/yr)	
	RoRo Service	Land Bridge	RoRo Service	Land Bridge	RoRo Service	Land Bridge
*	120	80	33,600	22,400	3.5	2.3
*	101	160	26,563	42,080	2.8	4.4
*	98	118	24,990	30,090	2.6	3.1
*	153	109	39,627	28,231	4.1	2.9
*	102	118	25,602	29,618	2.7	3.1
Average	**115**	**117**	**30,076**	**30,484**	**3.1**	**3.2**

If fuel prices should increase by 30%, then the increased D2D cost would be approximately €115 per trailer for a RoRo service and €117 for a Land Bridge service. The average D2D cost of a RoRo

service would increase by €3.1 Million per year. Of this figure €2.4 Million is accounted for by the ship and €0.7 Million by tractor units delivering and collecting trailers at the ports.

4.3.3 Risk associated with a Road Levy on Trucks

Table 4.5 Levy on Road Transport (0.15/km)

Scenario	Increased D2D Cost per unit (€/trailer)		Increased D2D Cost for total cargo per voyage(€)		Increased D2D Cost per year (€ M/yr)	
	RoRo Service	Landbridge	RoRo Service	Landbridge	RoRo Service	Landbridge
*	71	231	18,673	60,753	1.94	6.32
*	74	172	18,870	43,860	1.96	4.56
*	78	173	19,578	43,423	2.04	4.52
*	68	141	19,040	39,480	1.98	4.11
*	80	192	20,720	49,728	2.15	5.17
Average	**74**	**182**	**19,376**	**47,449**	**2.02**	**4.93**

A road levy of € 0.15 per km would be comparable to a substantial increase in fuel price. It would adversely affect both Land Bridge and RoRo short sea freight services, albeit the latter to a lesser extent. Its overall effect would be a disincentive to trade. For the average of the five scenarios chosen, a blanket application of a road levy would be a relatively crude instrument with which to try and achieve a modal shift from road transport to short sea shipping. It would adversely affect the trucking element in D2D short sea shipping services, but would not directly affect the ship's operation. The negative impact on Land Bridge would be more pronounced.

4.3.4 Risk of the Ship Time Charter Rate being higher than expected.

It is unlikely that a ship would be purchased or chartered on a long-term basis for a new service. The probability is that a suitable ship would be chartered on a short-term basis or diverted from another route in order to inaugurate the service. Time charter rates, especially for short periods, are known to be volatile; it is therefore appropriate to calculate the impact of higher a higher TCR. A TCR of €20,000 per day is used for the vessel engaged on the different routes. Table 4.6 below calculates the impact of a TCR that is 10% higher than expected.

Table 4.6 Ship TCR 10% Higher than Expected

Scenario	Increased D2D Cost per cargo unit for T.C.R. 10% greater than expected (€/trailer)	Average number of Trailers per round trip	Cost increase for total cargo per round Trip(€)	Cost increase per Year(€ M)
*	27	259	6,993	0.73
*	28	255	7,140	0.74
*	27	263	7,101	0.74
*	25	280	7,000	0.73
*	28	251	7,028	0.73
Av. Cost increase /year				0.73

4.3.5 Risk of the Average Ship Utilization being lower than expected.

Table 4.7 Reduced Ship Utilization (65% - 48.75%)

Scenario	Reduced ship speed to allow for Reduced Ship Utilization (kts)	D2D RoRo cost with 48.75% ship utilization (€)	Increased D2D cost per cargo unit (€/trailer)	Average No. of Trailers moved per voyage	Increased cost for total cargo per voyage(€)	Increased cost per year (€ M/yr)
*	1	1,520	129	189	49,665	5.17
*	1	1,479	135	190	54,861	5.71
*	1.3	1,471	140	192	84,386	8.78
*	1.4	1,516	150	205	51,820	5.39
*	1.2	1,729	162	195	49,282	5.13
Average	**1.18**	**1,543**	**143**	**194**	**58,003**	**6.03**

A ship utilisation that is less than expected is a major threat overhanging a RoRo operation, especially a new service faced with a raft of uncertainties. A lower than expected ship utilisation may arise for a number of reasons:

a. Reduced economic growth and a corresponding reduction in trade;
b. A poorly designed service – an inappropriate schedule, an unsuitable vessel, an excessive dependence on scale economies;
c. Strong, entrenched competition;

d. Poor marketing – inadequate differentiation from alternative transport options, lack of knowledge of market niches with their specific transport requirements, weak promotional effort.

In the examples shown in the table above a drop in average ship utilisation of 16% is analysed for the five selected routes. This represents a reduction from a credible 65% average ship utilisation to a reasonable 48.8%. The effect is an increase in unit cost of € 143 per trailer, € 58k per voyage – which translates to € 6.03 M per year. This is all the more chilling as it does not necessarily affect the Land Bridge option or indeed other competitors.

4.3.6 Quantification of the Risks

Table 4.8 Summary of Risks

Risk Description	Increased D2D Cost per Trailer (€ / Trailer)	Increased D2D Cost per Round-Trip (€)	Est. Cost per year (M €/yr)
5 hrs Port Delay per Round-Trip	46.8	12,295	1.28
Ship TCR 10% higher than expected.	27	7,052	0.73
€ 0.15 / km road levy on trucks	74	19,376	2.02
30% increase in fuel prices.	115	30,076	3.13
Ship utilization 16% lower than expected.	143	58,003	6.03

The costs associated with different risks cannot be directly compared without assigning a probability of occurrence to each risk. Probabilities were assigned on the basis of the likelihood of their occurring within one year of commencing a new service, as this would be the period of highest risk for a new service. The probabilities that are assigned in the following table are based on the judgement of the authors.

Table 4.9 Probability of Risks Occurring in First Year

Reference	Description	Est. Cost per Year (€M/yr)	Probability of Occurrence	Risk Quantification (€/yr)	Expected Time Frame (S,M,L)
1	Road Levy	-	0.1	-	S
2	Fuel Price Incr.	3.13	0.06	0.19	S
3	Higher TCR	0.73	0.3	0.22	S
4	Port Delay	1.28	0.4	0.51	S
5	Lower Ship Utilisation	6.03	0.6	3.62	S
Average Total				**4.54**	

In the above table the risks have been ranked in terms of their impact. Risks 3, 4 and 5 can become active in the short term (in Year 1), whereas risks 1 & 2 are more likely to occur in the medium term.

For the sake of comparison and to assess the potential impact on a new service, all risks are abridged to the short term with a corresponding reduction in the probabilities for risks 1 & 2.

From the quantification of operational risks in the short term, the following emerges:

a. The major risk is “ship utilisation lower than expected”, which accounts for over 80% of the total operational risk in the above table.
b. The cumulative operational risk in the first year for a new service would be approximately €4.54 M, but could be greater, depending on the average ship utilisation that is achieved.

4.4 Minimum Ship Utilisation & Potential Profit Premium

4.4.1 Minimum Ship Utilisation

A new RoRo service would have to offer a significant price discount on Land Bridge D2D prices, if it is to overcome decision inertia and secure adequate market share. The size of the minimum discount is open to debate, but 20% is considered to be about right by people who are acquainted with the market. The task then is to determine the minimum ship utilisation that would cover all costs, provide a cost-plus profit margin for the ship operator and enable a discount of 20% to be given on D2D delivery prices. The minimum ship utilisations for the five scenarios are given in the second column in table 4.10.

Table 4.10: Minimum Ship Utilisations to Maintain 20% Price Differential on Land Bridge

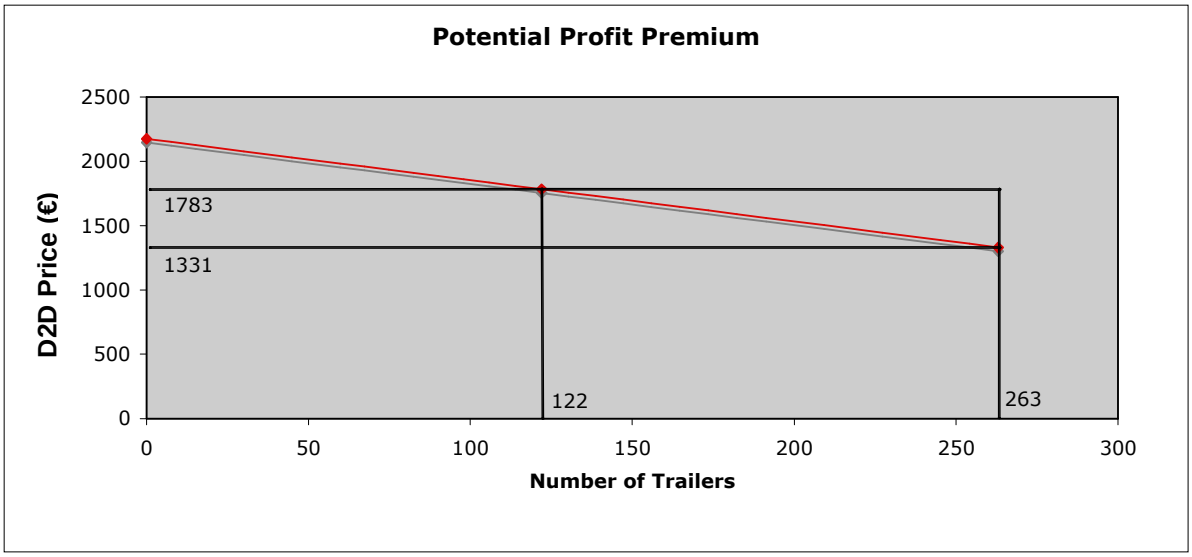
Data Corresponding to 80% of Land Bridge Price				**Potential Profit Premium, maintaining 20% Price Diff. up to 65% Util.**	
Scenario	**Min. Ship Utilisation**	**Av. D2D price at Min. Ship Utilisation**	**Av. D2D price at 65% Ship Utilisation**	**Extra Premium per Round-Trip (€)**	**Potential Profit Premium (M€ / yr)**
A	64%	1,371	1,366	1,400	0.15
B	63%	1,405	1,391	3,514	0.37
C	54%	1,416	1,344	18,360	1.91
D	50%	1,712	1,567	37,555	3.91
E	30%	1,783	1,331	118,876	12.36
Averages	**52%**	**1,537**	**1,400**	**35,941**	**3.74**

4.4.2 Potential Profit Premium

In the above table the scenarios are assigned letters for identification purposes. The Potential Profit Premium to the ship operator is the extra profit achieved at 65% average ship utilisation after giving a 20% discount on the comparable Land Bridge option. It is additional to the cost-plus time charter profit.

Scenario (E) in the above table can be taken as an example to illustrate the Profit Premium. This is elaborated further in Diagram 4.3 (below). At the minimum ship utilisation for Scenario (E) the average number of trailers per voyage would be 122 and the corresponding average D2D unit price would be €1,783. If the utilisation should increase to 65%, then the unit price could fall to €1,331 per trailer to cover all costs and a cost+ profit margin, and still provide a 20% discount on Land Bridge. The gross revenue would be €1,331 x 263 per voyage.
If, however, the price of €1,783 per trailer were held firm up to a ship utilisation level of 65%, then the gross revenue would be € 1,783 x 263, of which the Potential Profit Premium would be (1,783-1,331) x 263, which is € 118,876 per voyage, or € 12.36 Million per year.

Diagram 4.3: Potential Profit Premium



In practice the ship operator would accelerate the increase in average ship utilisation by distributing some of the Profit Premium to exporters / importers in the form of reduced differential prices. Otherwise, competition would force down prices over time. Nevertheless, Scenario (e) can withstand a reduction in ship utilisation down to 30% and still offer a discount of 20% on average Land Bridge prices. It also has a potential Profit Premium of € 12.36 Million / year which compensates for the substantial risks associated with commencing a new direct RoRo service.

Operational risk, therefore, can be offset to a great extent where there is a large price differential between D2D RoRo prices and Land Bridge prices at an average ship utilisation of approximately 65%. This enables a low average ship utilisation to be endured while still maintaining a price

differential of 20% on Land Bridge. If the same D2D price differential were maintained right up to 65% average utilisation there would be a substantially increased profit margin accruing to the ship operator that could be used in a number of possible ways: as a hedge against operational risk, to provide further discounts to shippers / consignees in order to accelerate increased ship utilisation and as a reward for undertaking a risky venture in the first place. The allocations would be a matter of judgement. This extra margin is the Profit Premium.

4.4.3 Operational Criteria for Assessment of Services

The analysis of the five scenarios has identified three operational criteria that can be used in the assessment of possible direct RoRo services. These are shown in Table 4.10 below:

Table 4.11: Operational Criteria for the assessment of possible services

Operational Criteria	Comment
Ship's average service speed	The average service speed is instantly recognisable as a major operational factor because of the relationship between service speed and fuel consumption, which is approximately a cubed relationship, as well as the difficulty of maintaining high average speeds in rough weather.
Minimum Ship Utilisation at which a 20% discount can be offered on Long-Haul trucking.	This provides a simple assessment of the major risk to the ship operation, which is the under-utilisation of the ship resource.
The Potential Profit Premium (at 65% average ship utilisation)	This is related to the Minimum Ship Utilisation, except that it provides a measure of the potential rewards if the enterprise should be successful.

Table 4.12 Summary of operational criteria for the assessment of the five scenarios

Scenario	Av. Service Speed (knots)	Minimum Ship Utilisation (%)	Potential Profit Premium (€ M / yr)
A	24.1	64%	0.15
B	20.5	63%	0.37
C	20.5	54%	1.91
D	25.6	50%	3.91
E	21.4	30%	12.36

By inspection, it is evident that scenarios A & B are not viable because of their high Minimum Ship Utilisations and low values for Potential Profit Premium. Scenario A also has a very high average service speed.

Scenarios C & D are marginal, although D has an unacceptably high average service speed.

Scenario E looks promising on the basis of the operational criteria.

4.5 Operational Benefits to Stakeholders

The stakeholders that would benefit directly from a new RoRo service between Ireland and Continental Europe would be –

- Ship operators,
- Truck operators,
- Ports,
- Exporters and Importers.

Benefits to operators can be assessed in terms of the revenues accruing to each under the five scenarios. Benefits to importers / exporters can be determined in terms of savings over current Land Bridge options. In addition, regional communities would benefit from the dividends associated with improved trade between the different regions.

4.5.1 Operational Revenues to Ship Operators

The revenues to ship operators can be assessed in terms of –

a. The cost-plus time charter revenue per trailer,
b. The profit premium per trailer; that is, the extra revenues per trailer achieved at 65% average ship utilisation after giving a 20% discount on the comparable Land Bridge option,
c. The revenue per trailer necessary to cover the cost of fuel.

Table 4.13: Operational Revenues to Ship Operators

Weighted Average Ship Revenues @ 65% Average Ship Utilisation				
Scenario	**Time Charter revenue per Trailer (€ / Trailer)**	**Profit Premium to Operator (€ / Trailer)**	**Fuel Cost per Trailer (€ / Trailer)**	**Total Ship Revenues per year (M € / Year)**
*	275	379	191	22.4
*	280	337	195	21.1
*	270	136	359	20.7
*	266	746	206	33.3
*	252	158	274	19.9
Averages	269	351	245	23.5

The average potential revenue per ship per year is € 23.5 Million / year. Of this, the Time Charter revenue accounts for 31%, the Profit Premium for 41% and Fuel Costs for 28%.

4.5.2 Operational Revenues to Truck Operators

The estimated operational revenues to truck operators for one RoRo vessel are shown in Table 4.14 below.

Table 4.14: Operational Revenues to Truck Operators

Weighted Average Truck Revenues			
Scenario	**Truck Revenues (€ / Trailer)**	**Truck Revenues per Ship-load (€ / Voyage)**	**Total Truck Revenues per Year (M € / Yr)**
*	619	157,949	16.4
*	656	164,355	17.1
*	678	175,815	18.3
*	599	157,763	16.4
*	580	162,203	16.9
Averages	626	163,617	17.0

Initially, trucking revenues associated with a new RoRo service would be displacement revenues from Land Bridge. Eventually, there would be contributions from new trades and increased market reach – arising from reduced cost of D2D transport.

4.5.3 Operational Revenues to Ports

The estimated revenues to the ports in each of the six scenarios are outlined in Table 4.15.

Table 4.15: Operational Revenues to Ports

Weighted Average Port Revenues		
Scenario	**Port Revenues per Ship per Voyage (€)**	**Port Revenues per Year (M € / Yr)**
*	66,396	6.9
*	65,142	6.8
*	67,469	7
*	68,432	7.1
*	72,721	7.6
Averages	68,032	7.1

Port costs are mainly fixed. Extra revenues arising from a new RoRo service would be particularly valuable for the associated ports.

4.5.4 Operational Benefits to Exporters / Importers

The operational benefits to exporters / importers are based on a 20% discount per trailer on the comparable Land Bridge computed prices. The cumulative benefits per shipload and per year are shown in the table below.

Table 4.16: Operational Benefits to Exporters / Importers

Exporters / Importers Weighted Average Benefits vis-à-vis Land-Bridge @ 65% Average Ship Utilisation			
Scenario	**Benefits per Trailer per Voyage (€)**	**Benefits per Ship Load (€)**	**Benefits per Year (M €)**
*	519	136,670	14.2
*	431	110,025	11.4
*	432	108,192	11.3
*	381	106,531	11.1
*	426	110,496	11.5
Averages	438	114,383	11.9

4.5.5 Summary of Benefits to Stakeholders

The benefits to all stakeholders are summarized in Table 4.17 below.

Tables 4.17: Summary of Benefits to all Stakeholders

Benefits per year @ 65% Average Ship Utilisation				
Scenario	Port operators (M €/year)	Truck Operators (M €/year)	Ship Operators (M €/year)	Exporters/ Importers (M €/year)
*	6.9	16.4	22.4	11.4
*	6.8	17.1	21.1	11.3
*	7	18.3	20.7	11.5
*	7.1	16.4	33.3	14.2
*	7.6	16.9	19.9	11.1
Average (M €/year) :	**7.1**	17.0	23.5	**11.9**

4.6 Conclusions to Chapter 4

C4 – 1 From the analysis of the five selected routes it is evident that direct RoRo services can have a significant unit cost advantage over Land Bridge services.

C4 – 2 It is unlikely that there would be any unit cost advantage for RoPax vessels over Land Bridge for the intermediate distances (~ 600 nautical miles) that were used in the scenarios.

C4 – 3 Differences in average delivery times between RoRo and Land Bridge can vary quite considerably, depending on the particular route. The average time difference for the five scenarios is 7 hours, with Land Bridge taking less time than direct RoRo.

C4 – 4 Land Bridge has an overwhelming advantage in frequency of services over feasible RoRo routes. This means that a new RoRo service, with possibly just one ship initially, could only serve specific segments of the current Land Bridge market.

C4 – 5 Reliability of deliveries is a *sine qua non* for a new direct RoRo service to Continental Europe. Feedback from participants at the workshop in Dublin Port[9] and from subsequent discussions with people in the industry indicated that this is the aspect of a direct RoRo service that would be of greatest concern to road hauliers, freight forwarders and to exporters / importers. For them the negative impact of unreliable deliveries would simply be intolerable.

C4 – 6 There would be significant operational benefits to stakeholders participating in a successful RoRo service between Ireland and Continental Europe.

C4 – 7 A new direct RoRo service would be exposed to a wide range of operational risks in its first year of service. Potentially the most threatening of these risks would be under-utilisation of the ship resource.

C4 – 8 The operational risks to which a new RoRo service would be exposed would be carried primarily by the ship operator. The service, therefore, would have to have associated with it a large Potential Profit Premium to cover the cumulative risk and make it attractive for the operator to commence the service. The Profit Premium depends on a combination of factors, with geography probably being the most relevant.

In Chapter 5 a Business Case is prepared for a specific route and service, which is a direct RoRo service linking the ports of Cork, Portsmouth and Zeebrugge.

[9] Workshop in Dublin Port: refer to Appendix 4.

5. Business Case for a Selected RoRo Service

5.0 Introduction

In order to test the feasibility of a direct RoRo service to the Continent, a business case based on a specific route was developed. The business case brings together elements explored in Chapters 2, 3 and 4.

The Business Case follows a classic pattern.

- An overview is obtained of the market targeted by the proposed service;
- The proposed service is analysed vis-à-vis competing alternatives;
- The operational risks to which the new service would be exposed are assessed;
- The potential benefits to the stakeholders in the new services are determined;
- A competitive strategy for the new service is outlined;
- A growth strategy for the new service is proposed;
- Finally, general conclusions from the whole process are presented.

5.1 The Business Opportunity and Associated Route

The Business Case focuses on a route that currently has no direct RoRo service between Ireland and Continental Europe. The process of assessing its feasibility provides an example that could be applied in similar situations and on other routes.

The Business Opportunity is driven by a number of factors:

a. It is evident from the analysis in Chapter 4 that direct RoRo for medium distances to Continental Europe is generally less costly than Land Bridge.

b. Land Bridge sets high standards in reliability, security and delivery times and there is considerable doubt in the market – bordering on disbelief – about the ability of a direct RoRo service to match them.

c. The south coast of Ireland has a geographical advantage over the east coast regarding a direct RoRo service to Continental Europe (refer to Section 4.6). For this reason Cork is used as the reference port in Ireland for the Business Case.

d. Probably the most notable operational advantage of RoRo vessels is their rapid turnaround time in ports, which is augmented by their ability to segregate cargo by decks and lanes, all of which makes it feasible to call to more than one port on voyages that are of intermediate distance i.e. voyages of about 500 nautical miles. A second port of call is therefore desirable both to increase the ship utilisation and reduce risks associated with changes and fluctuations in demand for transport services.

e. There are a number of options regarding a second port of call. Zeebrugge is chosen for the business case because of its favourable location. It is nearer to Paris than Cherbourg. The greater Paris region accounts for approximately 40% of the French freight market and Paris provides good access to the remainder of France. Belgium / Luxemburg and the Netherlands lie within the hinterland of Zeebrugge and it also has good access to the densely populated and highly productive regions of western Germany.

The selected route for demonstration purposes is therefore Cork – Portsmouth – Zeebrugge – Portsmouth – Cork. See Diagram 5.1 below.
Reference cities are used as “centres of gravity” for the hinterlands of the different ports.

Table 5.1: Route from Cork – Portsmouth – Zeebrugge – Portsmouth – Cork

Route (Ports):	Cork	Portsmouth	Zeebrugge	Portsmouth	Cork
Reference Hinterland	Limerick	London	Dortmund	London	Limerick

Diagram 5.1: Cork – Portsmouth – Zeebrugge – Portsmouth – Cork

5.2 Overview of the Market

The market for the proposed service was estimated using the methodology outlined in Section 2.5.2. This involved obtaining estimates of total unitised cargo flows between Ireland and Great Britain, France, Belgium / Luxemburg, the Netherlands, Germany, the Rest of Europe and the Rest of the World. (See Table 5.3).

The Port of Cork's hinterland was estimated to encompass an area which generates 41% of national unitised imports and 46% of unitised exports. It should be noted that a port's potential hinterland is not exclusive, but overlaps the targeted hinterlands of competitor ports.

The Port of Cork's potential forelands, associated with the ports of Portsmouth and Zeebrugge are shown in Table 5.2 below. These forelands are effectively the hinterlands of the ports with which Port of Cork would be trading. The estimates are based on population distributions in the different states and their relative proximities to the ports in these states.

Table 5.2: Port of Cork's Potential Forelands

	Britain	Belgium	Nether-lands	France	Germany	Rest of Europe	Rest of World
Cork's Potential Forelands (% of market totals)	45	100	100	50	50	30	40

Port of Cork's realisable forelands in the first year of service were conservatively estimated to be 12% of the potential forelands. These figures were then used as a basis for determining cargoes that could be won in the first year for an efficient RoRo service linking Cork, Portsmouth and Zeebrugge.

5.2.1 The Nature of Unitised Cargoes between Britain and Ireland

Virtually all unitised cargoes traded between Britain and Ireland are transported by truck and ferry across the Irish Sea. The totals are estimated to be 412,936 TEU imported into Ireland in 2004, and 420,322 TEU exported from Ireland to Britain. The virtues of truck & ferry (via British Land Bridge) are numerous and there is a general assumption that such a high quality service is necessary for the Ireland / Britain trade.

Table 5.3: Port of Cork's Hinterland and Potential & Realisable Forelands (2004)

Country	Great Britain		Belgium		Netherlands		France		Germany		Rest Of Europe		Rest Of World	
	Imports (TEU)	Exports (TEU)	Imports (TEU)	Exports (TEU)	Imports (TEU)	Exports (TEU)	Imports (TEU)	Exports (TEU)	Imports (TEU)	Exports (TEU)	Imports (TEU)	Exports (TEU)	Imports (TEU)	Exports (TEU)
Est. Total Unitised Cargoes to/from Ireland	412,936	420,322	53,100	27,932	74,428	48,411	65,561	53,043	119,862	79,854	133,137	34,660	202,688	100,453
Port of Cork's est Hinterland	169,304	193,348	21,771	12,849	30,515	22,269	26,880	24,400	49,143	36,733	54,586	15,944	83,102	46,208
Port of Cork's Potential Foreland	76,187	87,007	21,771	12,849	30,515	22,269	13,440	12,200	24,572	18,366	16,376	4,783	33,241	18,483
Port of Cork's Realisable Foreland in Short Term	9,142	10,441	2,613	1,542	3,662	2,672	1,613	1,464	2,949	2,204	1,965	574	3,989	2,218

5.2.2 The Nature of Unitised Cargoes between Continental Europe and Ireland

Unitised cargo movements between Ireland and Continental Europe are different from cargo movements between Ireland and Britain in at least three important respects:

i. There are two major competing transport modes between Ireland and Continental Europe –
   a. Truck-and-ferry via the British Land Bridge,
   b. Direct LoLo between Irish ports and Northwest Europe.

   A new direct RoRo service would have to carve out a niche for itself between these two well-established modes.

ii. The distributions of cargoes to the Rest of Europe and feeder services to the Rest of the World constitute 42% of the total unitised cargoes between Ireland and Continental Europe (refer Table 5.3).

5.3 Analysis of the Proposed RoRo Service

5.3.1 Assumptions regarding the Proposed Service

A new RoRo service would require close cooperation between key stakeholders in the transport / distribution network. The stakeholders include the participating ports, ship operator(s), hauliers, freight forwarders, exporters and importers. Accordingly, the business model incorporates provision for the establishment of informal structures that will achieve efficient management of the cargo in the transport network. That means that

- There is an understanding and acceptance amongst key players in the network as to what their various roles and commitments are;

- Business arrangements are entered into between haulage companies, ship operator(s) and freight forwarders that will ensure that cargoes are collected and delivered on time and that they are cared for in transit and in the different ports and states;

- Operational standards are proposed, accepted by key stakeholders and mechanisms are agreed whereby adherence to standards can be monitored.

It is also assumed that a modern, efficient e-booking system and an associated information management system have been installed. They will;

- Help give the proposed RoRo service access to the unitised freight markets in the different states;

- Reduce operating costs by eliminating the need for layers of intermediaries within the network;

- Facilitate cohesion within the network by providing participants with information that is necessary for them to function effectively;

- Achieve transparency in prices, discounts and D2D delivery times that will enable exporters and importers to incorporate the transport function into their primary businesses and help them achieve fully integrated supply chain management;

- Help prepare ship pre-load plans and achieve an efficient loading configuration on the ship and efficient management of cargo on the terminals. These technological supports will help increase ship loading efficiency and reduce ship turnaround times in ports.

It is further assumed that a ship as outlined in Chapter 3 will be used on the service, with the following outline specifications:

Table 5.8: Ship Outline Specifications

Ref.	Input / Output Characteristics	Ship Characteristics	
1	Input	Type of Ship:	RoRo
2	Input	Average Ship Utilization per Round-Trip:	65%
3	Input	Time Reserve at Sea:	8%
4	Input – from analysis of Cargo Flows and logistical considerations	Ship capacity (trailers):	155
5	Input – from # 4 & bare-boat charter rates	Time Charter Rate (€ / day):	20,000
6	Output – from Analysis of RoRo Service	Average Operational Speed (knots):	18.2
7	Output – from Analysis of RoRo Service & parametric relationships between ship variables	Fuel Consumption at Sea (t / d):	42

5.3.2 Competitiveness of proposed RoRo Service vis-à-vis Land Bridge

Operationally the average service speed of the RoRo vessel would be 18.2 knots with an estimated fuel consumption of 42 t / day.

Door-to-Door (D2D) prices and delivery times are calculated for the direct RoRo service (Refer to Chapter 4). These are compared to calculated prices and delivery times for Land Bridge services. Weighted average D2D prices and delivery times are also used to provide a simple comparison between direct RoRo and Land Bridge for a total round trip.

Table 5.9: Comparison between Land Bridge and Direct RoRo Service for each Section of a Round Trip:

From	To	Est. D2D Prices (€ / Trailer)		Est. D2D Delivery Times (hrs)	
		Land Bridge	Direct RoRo	Land Bridge	Direct RoRo
Limerick	London	1,339	900	20	36
Limerick	Dortmund	2,215	1,401	47	55
London	Dortmund	1,116	1,131	16	28
London	Limerick	1,339	846	20	36
Dortmund	Limerick	2,215	1,265	47	55
Dortmund	London	1,116	1,048	16	28

Table 5.10: Weighted Average D2D Prices and Delivery Times per Round Trip

Description	Land Bridge	Direct RoRo
Weighted Av. D2D Price (€ / trailer)	1,872	1,146
Weighted Av. D2D Delivery Times (hrs)	36	47

Points arising from the Comparative Analysis with Land Bridge:

Limerick to London:

The potential difference in unit price between Land Bridge and Direct RoRo is over € 400 per trailer, which is quite significant. Direct RoRo would take 16 hours longer than Land Bridge for D2D deliveries. As the majority of unitised cargoes between Britain and Ireland are medium-to-low value durable goods (refer to Section 5.2.1), a substantial cost saving would be the distinctive marketable feature of Direct RoRo.

The potential Direct RoRo price between London and Limerick is shown to be less than the Direct RoRo price between Limerick and London. This is because more cargo is moved between Britain and Ireland than between Ireland and Britain – resulting in reduced unit cost in westbound cargoes when compared to eastbound ones. When the demand for ship slots is taken into account, the unit price charged from Britain to Ireland would be greater.

Limerick to Dortmund:

The potential price difference between Land Bridge and Direct RoRo is up to € 800 per trailer, and the time difference is only 8 hours. Direct RoRo, therefore, would offer strong competition to Land Bridge between Ireland and Continental Europe, taking due regard of the caveats listed in Section 5.2.2.

London to Dortmund:

The unit price differential between Land Bridge and Direct RoRo is negligible and Direct RoRo delivery times are substantially longer than Land Bridge. Direct RoRo between London and Dortmund is therefore not competitive.

Direct RoRo would be competitive for cargoes originating in or destined for towns / cities in the vicinity of Portsmouth, such as Southampton, Reading, Guildford and Basingstoke. Nevertheless, it is assumed that no cargoes are loaded / discharged between Portsmouth and Zeebrugge, which reduces the ship utilisation and increases unit costs on the other legs of the voyage.

Weighted Average D2D delivery price:

The difference between the weighted average D2D Land Bridge and Direct RoRo is € 726 per trailer. This equates to € 188 k per voyage, or € 19.6 Million per year. This means that the direct RoRo service would be able to offer attractive discounts to exporters / importers compared to Land Bridge.

Weighted Average D2D delivery time:

The D2D delivery time is of immense importance for certain goods. Land Bridge is, on average, 11 hours quicker than direct RoRo, which means that if the Value of Time[10] should be €57 per hour or greater, then Land Bridge would be more attractive than direct RoRo. The Value of Time is a concept beloved by theoreticians as it provides a link between difference in delivery price and difference in delivery time, although it is abhorrent to both business and scientific principles as it mixes “apples and oranges”. Nevertheless, it highlights the fact that for certain goods rapid delivery times are essential.

5.3.3 Competitiveness of proposed RoRo Service vis-à-vis LoLo

LoLo vessels have a number of admirable features:

- They are efficient carriers of containers, with up to 2/3 of their cargo carried on deck.

[10] Value of Time: This is the value or cost that an exporter or importer attaches to each hour extra that a trailer takes to be delivered – over and above the reference delivery time, which in this case, is that for Land Bridge.

- Their capital costs are approximately half those of RoRo vessels of equivalent carrying capacity.

- They have available a well established network of terminals, large and small, around Europe and around the world.

- Large, deep-sea container vessels have no competitors for intercontinental unitised services. This gives a decided boost to LoLo feeder vessels that service the intercontinental hub ports.

A big disadvantage of small-to-medium size LoLo vessels is their slow turnaround times in port. This makes them uncompetitive against RoPax / RoRo vessels over relatively short distances and against RoRo vessels over intermediate distances[11].

The network of LoLo services between Ireland and Continental Europe is centered on the hub ports of Rotterdam and Antwerp, but for comparison purposes Zeebrugge is used in this instance. In a comparison between the proposed direct RoRo service and LoLo via the ports of Cork and Zeebrugge the following were the calculated results (see table 5.11):

Table 5.11: Comparison between Direct RoRo and LoLo via the ports of Cork and Zeebrugge

From	To	Est. D2D Prices (€ / Trailer)		Est. D2D Delivery Times (hrs)	
		LoLo	Direct RoRo	LoLo	Direct RoRo
Limerick	Dortmund	1,236	1,401	88	55
Dortmund	Limerick	1,169	1,265	93	55

In general, LoLo has a price advantage over direct RoRo, which on average amounts to about € 116 per trailer equivalent. RoRo deliveries would be approximately 1.5 days faster than LoLo.

There is no conclusive winner in this comparison as both transport modes are targeting medium-to-low value durable goods that are price-sensitive to the choice of transport mode. A competitive advantage of RoRo could be in its technological supports, such as its e-booking system linked to an efficient information management capability that would provide ease of access to potential clients, as well as transparency in pricing.

[11] Refer to TRAPIST (Tools and Routines to Assist Ports and Improve Shipping) 2004

5.4 Operational Risks and their Costs

A summary of risks and their costs for the proposed RoRo services are shown in Table 5.12 below. The relationships between the risk factors and their associated costs are linear, so that the consequences of greater or less changes in the risk factors can readily be determined.

The probabilities shown of the risks occurring in Year 1 are conjectures. It should be borne in mind that a direct RoRo service, as proposed, would be a totally new venture and the risk exposure would be high in its first year of service. The “Probabilities of Occurring” are therefore pitched relatively high and could be higher in some cases rather than lower.

It was pointed out in Section 4.3 and it is evident from Table 5.12 that the principal risk is “Reduced Ship Utilisation”. Reducing this risk and the severity of its impact will therefore be a central feature of the Competitive Strategy of the new operation. After the first year of service, it is reckoned that the operational risk would be somewhat similar to the first year, with greater competition in the market.

Table 5.12: Summary of Risks and their Costs

Risk	Increased D2D Cost per unit (€/trailer)	Increased D2D Cost for total cargo per round-trip (€)	Increased D2D Cost per year (€ M/yr)	Probability of Occurring (Year 1)	Risk Quantification Year 1 (M€/yr)
Port delay per voyage (5 hours)	25	6,250	0.65	0.4	0.26
Fuel price increase (+30%)	69	17,250	1.79	0.1	0.18
Levy on Road transport (€ 0.15 / km)	51	12,750	1.33	0.05	-
Increase in time charter rate (+10%)	28	7,000	0.73	0.3	0.22
Reduced ship utilisation (65 - 48.8%)	121	22,627	2.35	0.6	1.41
Total Estimated Risk (Year 1)					**1.89**

5.5 Potential Profit Premium and Benefits to Stakeholders

5.5.1 Potential Profit Premium[12]

The minimum average ship utilisation that the new RoRo service could withstand, while giving a 20% discount on Land Bridge prices, would be 33% at an average unit price of € 1,494 per trailer.
The unit price at 65% average ship utilisation with a 20% discount on Land Bridge could be reduced to € 1,146 per trailer. If, however, the unit price is maintained at € 1,494 per trailer at 65% ship utilisation, the Potential Profit Premium would be € 87,000 per voyage i.e. (€ 1,494 - € 1,146) x (Av. Number of Trailers / voyage), which amounts to € 9.0 Million per year.

Table 5.14: Potential Profit Premium

Data Corresponding to 80% of Land Bridge Price			**Potential Profit Premium, due to maintaining 20% Price differential out to 65% Utilisation**	
Min. Ship Utilisation	**Av. D2D price at Min. Ship Util. (€ / trailer)**	**Av. D2D price at 65% Ship Util. (€ / trailer)**	**Extra Premium per Round-Trip (€ / voyage)**	**Potential Profit Premium (M€ / yr)**
33%	1,494	1,146	87,000	9.0

The operational assessment criteria for the proposed services would, therefore, be as follows:

Table 5.15: Operational Assessment Criteria for the Proposed Service

Operational Criteria	**Comment**
Ship's average service speed: 18.1(knots) with a fuel consumption of 42 t/ day	The average service speed is quite modest. A vessel with a Time Charter Rate less than that used in the calculations may be available for the service
Minimum Average Ship Utilisation: 33%	This is low and sharply reduces the risk of under-utilisation of the ship resource.
The Potential Profit Premium (at 65% average ship utilisation) € 9 M / yr	This means that the proposed service is inherently profitable and that extra discounts can be selectively assigned in order to increase ship utilisation.

[12] Refer to Section 4.4 for a discussion on "Minimum Ship Utilisation" and "Potential Profit Premium".

5.5.2 Operational Benefits to Stakeholders

The total operational benefits for all stakeholders amount to € 48.5 M / year. The benefits to the discrete groups of stakeholders are shown in Table 5.15 to 5.18 below.

Table 5.15: Port Operators' Revenues @ 65% Average Ship Utilisation

Stakeholders	Revenues (€ / Trailer)	Revenues per Ship-load (€ / Voyage)	Total Revenues per year (M € / Year)
Port operators	260	64,900	6.7

Table 5.16: Truck Operators' Revenues @ 65% Average Ship Utilisation

Stakeholders	Revenues (€ / Trailer)	Revenues per Ship-load (€ / Voyage)	Total Revenues per year (M € / Year)
Truck operators	469	117,172	12.2

Table 5.17: Exporters' / Importers' Savings on Land Bridge @ 65% Average Ship Utilisation

Stakeholders	Benefits (€ / Trailer)	Benefits per Ship-load (€ / Voyage)	Total Benefits per year (M € / Year)
Exporters / Importers	374	93,467	9.7

Table 5.18: Ship Operator's Revenues @ 65% Average Ship Utilisation

Time Charter Revenue per Trailer (€ / Trailer)	Potential Profit Premium to Operator (€ / Trailer)	Fuel Cost per Trailer (€ / Trailer)	Total Ship Revenues per year (M € / Year)
280	352	137	19.9
36%	46%	18%	100%

5.6 Competitive Strategy

5.6.1 Benefits of the proposed Direct RoRo Service

The benefit of the proposed direct RoRo service is that it could provide a good service to significant segments of the large unitised market:

- It would have competitive advantage on price vis-à-vis –
    a. Truck and Ferry to / from Southern Britain,

b. Land Bridge to / from Continental Europe;

- In competition with LoLo to / from Continental Europe, it would be –
  a. Moderately less competitive on price,
  b. Considerable better on delivery times.

5.6.2 Challenges facing a direct RoRo Service

The establishment of a new RoRo service linking Ireland and the Continent is a challenging venture.

- Operationally, a new direct RoRo service would have to achieve similar standards in reliability and security of deliveries to those set by Land Bridge.
- A direct RoRo service would have to coordinate the actions of a number of operational stakeholders, primarily ship operator(s), port operators, truck operators (hauliers) and freight forwarders.
- Sufficient cargo for the first vessel would have to be secured in order to offset the principal risk of under utilisation of the ship resource.

5.6.3 Meeting the Challenges to the Direct RoRo Service

Standards in Reliability of Deliveries:

Operational standards would have to be agreed by the stakeholders and monitored by means of status reports that would relate to the ship, port and truck operations. Table 5.19 below lists the operational features that could be monitored to ensure that standards are maintained.

Table 5.19: Overview of Operational Status Reports

Status Reports	Operations Involved in Reports		
	Ship Operations	Port Operations	Truck Operations
Ship arrival time in port	X	X	
Ship departure time from port	X	X	
Units discharged	X	X	
Units loaded	X	X	
Weather experienced on sea passage	X		
Truck collection time at consignor			X
Truck delivery time at departure port		X	X
Truck collection time at discharge port		X	X
Truck delivery time to consignee		X	X
Traffic experienced on route			X

The RoRo vessel would also need to have sufficient reserve speed to compensate for delays, primarily caused by bad weather. An 8% time reserve is built into each sea passage to compensate for adverse weather.
The ship would require adequate cargo capacity to accommodate surges in demand and to avoid having to refuse priority cargoes because of lack of space. For this reason an average ship utilisation of 65% is used as a practical limit.

Information Management:
An Information Management System would be necessary to coordinate the actions of the operational players within the intermodal network and to keep clients (exporters, importers and freight forwarders) informed of the status of their cargo.

E-Booking System:
An e-booking system would be a vital facility for the proposed direct RoRo service. It would automatically supply responses to internet queries, such as ship schedules, D2D prices with discounts clearly specified and estimates of delivery times. It would also accept bookings, which would be linked through ship pre-stow plans to the management of trailers / containers on terminals.

Pricing:
The major competitive advantage of direct RoRo service over British Land Bridge is D2D unit price. It is reckoned that the least price differential should be about a 20% discount on Land Bridge prices and this can be achieved at a minimum ship utilisation of approximately 33%. For ship utilisations greater than 33% and up to an effective "full" utilisation of approximately 65% (average) there is considerable room for discounts for volume bookings, early bookings and low priority bookings – while retaining some of the Profit Premium to offset the risks inherent in a new service. The discounts would not be exclusive and would be representative of the different market segments being targeted, i.e.

High volume discounts →	Freight forwarders, a key market segment,
Early booking discounts →	Regular consignors / consignees,
Low priority discounts →	Price sensitive consignors / consignees for whom delivery times are not particularly important.

An important marketing feature is that the prices and discounts are transparent to everybody and that bookings can be secured on the internet.

Promotion of the Direct RoRo Service:
Promotion of the direct RoRo service would be a multi-dimensional continuous programme. It would include the following activities:

- Identification of the firms that deal in the Top-20 exports / imports in the different states. They would be briefed on the services available with D2D prices and delivery times, the schedule of discounts available, and the quality of the services i.e. the reliability, security and safety of deliveries, the web address would provide unambiguous information on service details and where bookings can be made. Ultimately, what would be promoted would be the web address and the services available.
- Ensuring that operational stakeholders are fully briefed and trained using simulated representations of actual operations.
- Publicising widely the pre-launch notifications in the different regions and states.
- Personal briefings by marketing managers to client stakeholders, such as freight forwarders, agents and representative organisations.
- Widely publicised launch, emphasising regional and national trade opportunities and benefits.
- Continuous promotion of the service and the web address in trade, research and state publications.
- Frequent bulletins regarding distinctive features of the new direct RoRo service.

5.7 Growth Strategy

Assuming survival or even moderate success in the first year, the maturing service could target Port of Cork's potential foreland, which is approximately 450,000 TEU / yr. This is equivalent to the capacity of nine RoRo ships per annum. A realistic level of operation would be three RoRo vessels that would provide six sailings per week. This would be "Motorway of the Sea" standard in terms of the frequency of service. A realistic growth schedule with associated benefits to stakeholders is shown in Table 5.20.

Table 5.20: Growth Schedule and Expected Benefits to Stakeholders

Benefits to Stakeholders @ 65% Average Ship Utilisation						
Year	**No. Of Ships**		Port operators (M €/year)	Truck Operators (M €/year)	Ship Operators (M €/year)	Exporters / Importers (M €/year)
1	1	Benefits for year 1	6.7	12.2	19.9	9.7
2	1	Benefits for year 2	6.7	12.2	19.9	9.7
3	2	Benefits for year 3	13.4	24.4	39.8	19.4
4	3	Benefits for year 4	20.1	36.6	59.7	29.1
5	3	Benefits for year 5	20.1	36.6	59.7	29.1
Totals (Million €) :			**67**	**122**	**199**	**97**
Grand Total (Million €)			**485**			

The cumulative operational benefits to the stakeholders for a three ship service built up over five years would, therefore, amount to approximately half a billion euro. In addition, economic benefits would accrue to the regional communities associated with the facilitation of interregional trade, which over time would probably be considerably greater than the direct benefits to the operational stakeholders.

On the basis of its market potential, its operational / competitive attributes and its operational risks, the proposed service appears to be a promising business opportunity. Increasing the freight volumes would be dependent on making a success of the first ship on the route.

5.9 Conclusions to Chapter 5

C5 – 1 The Business Case investigates a possible business opportunity associated with a direct RoRo service linking the ports of Cork, Portsmouth and Zeebrugge

C5 – 2 The three ports have access to substantial markets in unitised goods in their individual hinterlands. .

C5 – 3 It is reckoned that the new direct RoRo service would need to match Land Bridge standards in the quality of its services, principally in reliability of deliveries

C5 – 4 Direct RoRo would have a significant price advantage over Land Bridge in D2D deliveries, although its delivery times would be somewhat longer. It would be marginally more costly than LoLo to Continental Europe and its delivery times would be considerably shorter.

C5 – 5 The direct RoRo service under review performs strongly in three important operational criteria:

a. The average ship service speed is relatively low at 18.1 knots;
b. The minimum level of ship utilisation at which it can continue to offer a 20% discount on the service of its nearest competitor and still make a profit is also low (33%), which reduces the principal operational risk;
c. The potential Profit Premium if the service were to achieve an average ship utilisation of 65% is high (€ 9 M per ship per year), which indicates that there would be an attractive premium if the service should be successful.

Chapter 6 examines the possibility of obtaining financial support for a new direct RoRo service under the Marco Polo II programme, as well as financial supports for associated port infrastructural developments under the Ten-T programme.

Chapter 6: Financial Supports for a direct RoRo service

6.1 Introduction

Chapter 6 examines possible financial supports for a new direct RoRo service.

Three possible funding sources are investigated:

a. The Marco Polo programme, which provides assistance for shipping services that meet certain criteria;
b. The TEN-T programme that provides financial supports for infrastructural developments that improve Motorways of the Sea gateways (ports);
c. Public Service Obligations funding.

6.2 Marco Polo I

In its White Paper, "European Transport Policy for 2010: time to decide" the Commission proposed to take measures that would shift the balance between transport modes by promoting maritime, rail and inland waterways as a substitute for long-haul road freight. One such measure was the Marco Polo programme (MP I), which was adopted on 22nd July 2003. The objectives of MP I was:

- To reduce road congestion,
- To improve the environmental performance of the freight transport system within the Community,
- To enhance intermodality, thereby contributing to an efficient and sustainable transport system.

6.3 Marco Polo II

Marco Polo II was introduced in January 2007. It has a substantially higher budget of € 400 M than its predecessor Marco Polo I (€ 100 M). It also has a larger scope and will give financial support to five types of action:

- **Catalyst Actions** to overcome significant structural barriers in the European Freight Transport market through highly innovative concepts.
- **Motorways of the Sea (MOS) Actions** to shift freight directly from road to short sea shipping or a combination of short sea shipping with other modes of transport in which road journeys are as short as possible. MOS actions will support large-volume, high frequency intermodal maritime transport services.
- **Modal Shift Actions** to shift freight from road to short sea shipping, rail and inland waterways, either through new services or significantly enhanced existing services.

- **Traffic Avoidance Actions** to integrate transport into production logistics to avoid a large percentage of freight transport by road without adversely affecting production output or workforce.
- **Common Learning Actions** to improve cooperation for structurally optimising working methods and procedures in the freight transport chain, taking into account the requirements of logistics.

6.3 The TEN-T Programme

The TEN -T Programme, which encompasses 'Motorways of the Sea' as outlined in the EC Guidelines for TEN-T projects and possible financial support under this EU programme, are directly linked to Marco Polo II.

6.3.1 TEN-T Guidlines

The Decision of the European Parliament and Council entitled "Community Guidelines for the Development of the trans-European Transport Network" forms the basis for the provision of possible financial support by the Community for the development of Motorways of the Sea. Support for the development of Motorways of the Sea under the TEN-T Guidelines is complementary to Community aid for the development of short sea shipping operations under the Marco Polo 11 Programme. The granting of Community financial assistance under both of the two instruments is not allowed. In order to make information regarding the Guidelines readily accessible to the public, the Commission has prepared a *Vademecum* that explains the funding available for the development of Motorways of the Sea. The material that follows is largely based on this *Vademecum*.

6.3.2 Aim of Motorways of the Sea

The aim of the trans-European network of Motorways of the Sea is to concentrate flows of freight on logistical routes in such a way as to improve existing maritime links or to establish new viable, regular and frequent maritime links for the transport of goods between Member States – so as to reduce road congestion and/or improve access to peripheral and island regions and States.

6.3.3 Composition of Motorways of the Sea

The trans-European network of Motorways of the Sea shall consist of facilities and infrastructure concerning at least two ports in two different Member States. These facilities and infrastructure shall include elements such as port facilities, electronic logistics management systems, safety and security and administrative and customs procedures, as well as infrastructure for direct land and sea access, including ways of ensuring year-round navigability, in particular the availability of facilities for dredging and icebreakers for winter access.

6.3.4 Funding under the TEN-T Programme

The financial reference amount for the implementation of the Motorways of the Sea programme for the period 2007 - 2013 is € 20.69 Billion. Of this amount, € 20.35 Billion is earmarked for transport and €340 Million is allocated to energy.

6.3.5 Acceptable Projects for Grant Aid

Projects of common interest within the trans-European network of Motorways of the Sea shall be proposed by at least two Member States and be geared to actual needs. The projects proposed should follow a public call for tenders organised jointly by the Member States concerned before aid granted from the national budgets can be supplemented, if necessary, by aid from the Community.

Projects must be part of a Motorway of the Sea corridor. This network is intended to concentrate flows of freight on sea routes. Its ultimate goal is to reduce road congestion and/or improve access to peripheral and island regions and States. The network shall consist of facilities and infrastructure concerning at least two ports in two different Member States. Motorways of the Sea should not exclude the combined transport of persons and goods, provided that freight transport is dominant.

The four Motorways of the Sea corridors defined in the TEN-T Guidelines are:

- **Motorway of the Baltic**
- **Motorway of the Sea of Western Europe**
- **Motorway of the Sea of South-East Europe**
- **Motorway of the Sea of South-West Europe**

6.3.6 Beneficiaries and Eligible Costs

The beneficiaries of funding under the TEN - T Regulation are Member States which designate the entity in charge of implementing the project. These entities can be authorities, or public or private companies. Eligible Costs are as follows:

a. **Investment aid in Infrastructure and Facilities:**
   Infrastructures: port infrastructures, infrastructures for direct land and sea access, waterway and canal infrastructures.
   Facilities: electronic logistics management systems, safety, security, administrative and customs facilities, facilities for ice-breaking and dredging operations.
b. **Start-up Aid related to Capital Costs:**
   The start-up support under TEN-T Guidelines is limited to two years. For example, if a ship costing € 50 Million is depreciated over 20 years, TEN-T Guidelines funding could be requested amounting to 20% (maximum funding rate according to the TEN-T Regulation) of €

2.5 Million (depreciation per year) per year, over a period of two years. The total allowable subsidy under TEN-T would thus be € 1Million.

c. Studies related to Motorways of the Sea Projects

The aim of the studies would be, *inter alia*, to identify potential transport routes, existing and forecast cargo flows attracted by the planned service, the development needs, the share of this service in the market, impact assessment, implementation and financing. These studies could also identify sub-projects and propose a plan for the implementation of the Motorways of the Sea project. Such studies may be financed by up to 50% according to the TEN - T Regulation, irrespective of whether they relate to priority or non-priority projects.

6.4 State Aid Funding and Public Service Obligations (PSO)

The European Commission in a Decision of November 28th 2005 determined that: "For certain services of general economic interest to operate on the basis of principles and under conditions that enable them to fulfil their missions, financial support from the State intended to cover some or all of the specific costs resulting from the public service obligations may prove necessary. In accordance with Article 295 of the Treaty, as interpreted by the case-law of the Court of Justice and Court of First Instance of the European Communities, it is irrelevant, from the viewpoint of Community law, whether such services of general economic interest are operated by public or private undertakings"[13]. Such services have to be operated at a high

The national, regional and local authorities of each Member State are, in principle, free to define what they consider to be a service of general interest. This freedom to define also includes the freedom to impose obligations on the providers of such services, provided that these obligations are in conformity with Community rules. In the absence of specific Community legislation, it is therefore the responsibility of the Member States to define, in principle, requirements such as universal service obligations, territorial coverage requirements, quality and safety standards, user and consumer rights, and environmental requirements.

6.5 Conclusions to Chapter 6

C5 – 1 The most important influence on the intermodal transport market in Europe at present is the Motorways of the Sea (MoS) programme that is managed by the European Commission. Within the MoS programme there are two support actions that are relevant to the implementation of a new direct RoRo service. They are:

- Marco Polo II, which can provide financial support for a new or improved service that displaces a significant quantity of long-haul road freight with maritime transport;

[13] COMMISSION DECISION of 28 November 2005 on the application of Article 86(2) of the EC Treaty to State aid in the form of public service compensation granted to certain undertakings entrusted with the operation of services of general economic interest *(notified under document number C(2005) 2673)*(2005/842/EC).

- o TEN-T, which can provide financial support for port infrastructural developments that are part of a MoS.

In addition to possible EU financial supports, a MoS designation is becoming a *de facto* quality standard in intermodal transport.

C5 – 3 Provision is available in the European Union for individual states to provide financial assistance for projects of general public interest. Such assistance can be additional to financial supports under the EU programmes.

Chapter 7: Study Conclusions

7.1 Conclusions

C7.1 – 1 Background & Market Potential

The study examines the feasibility of establishing direct RoPax / RoRo services between Ireland and Continental Europe.

Since 2000 and 2002 the ferry operators have experienced a decline in demand from the passenger and car sectors respectively. The cessation of duty free sales in 1999 undermined the attractions of ferry travel and deprived the ferry operators of a reliable revenue stream. This was compounded by strong competition from the low cost airlines (LCAs) who offered low fares to interesting destinations not accessible by ferry.

While the travel market declined, the orientation of ferry operators shifted to meeting the needs of the RoRo market which has enjoyed continuous growth since the mid-1990s. To cater for that growth ferry operators have increased their capacity by deploying large modern ships and port operators have upgraded berths, ramps and terminals

Land Bridge services for freight to Continental Europe are an extension of the excellent ferry services across the Irish Sea. They have an impressive array of positive features that make them formidable competitors for any new direct RoRo service. Nevertheless, there are forces at play which indicate that the Land Bridge dominance is under considerable threat.

C7.1 – 2 RoRo Ships & Intermodal Transport Technologies

There is a relationship between the competitiveness of different maritime transport modes and maritime distances. Freight RoRo vessels have emerged as serious contenders to long-haul trucking. In general, these vessels are large, fast, weather resistant and capable of keeping to tight schedules. They require different technologies and cooperative structures to traditional shipping if they are to be successful, and they have to be accommodated in all weathers and at all stages of the tide in correspondingly large RoRo terminals.

The technological supports that are deemed to be necessary for their success include:

- Quantification and monitoring of targeted markets,
- Design and adoption of superior D2D service solutions,
- Implementation of an efficient e-booking system,

- Installation of an information management system for the total network,
- Automatic preparation of ship pre-loading plans,
- Integrated management of trailers in terminals,
- Rapid ship turnarounds in port.

The cooperative and business structures that are necessary for the success of direct RoRo services include:

- Close cooperation between key stakeholders in the transport / distribution network. The stakeholders include the participating ports, ship operator(s), hauliers, freight forwarders, exporters and importers;
- An understanding and acceptance amongst key players in the network as to what their various roles and commitments are;
- Business arrangements between haulage companies, ship operator(s) and freight forwarders that will ensure that cargoes are collected and delivered on time and that they are cared for in transit and in the different ports and states;
- Operational standards are proposed, accepted by key stakeholders and mechanisms are agreed whereby adherence to standards can be monitored.

C7.1 – 3 Analysis of Selected RoRo Routes

Five RoRo routes were selected and analysed with the following outcomes:

- Direct RoRo services can have a significant unit cost advantage over Land Bridge services. It is unlikely that there would be any unit cost advantage for RoPax vessels over Land Bridge for the intermediate distances (~ 600 nautical miles) that were used in the scenarios.

- Differences in average D2D delivery times between RoRo and Land Bridge can vary quite considerably, depending on the particular route. Time differences, therefore, have to be determined on a case-by-case basis with Land Bridge generally setting a standard that is hard to beat.

- Land Bridge has an overwhelming advantage in frequency of services over direct RoRo services. This means that a new RoRo service, with probably just one ship initially, could only serve specific segments of the current Land Bridge market.

- Reliability of deliveries is a *sine qua non* for a new direct RoRo service to Continental Europe. Feedback from the industry indicates that this is the aspect of a direct RoRo service that would be of greatest concern to potential clients and to operational stakeholders

- There would be significant operational benefits to stakeholders participating in a successful RoRo service between Ireland and Continental Europe. For the most part the benefits can be assessed in terms of operational revenues, except for exporters / importers where they can be assessed, more directly, in terms of potential savings over Land Bridge.

- A new direct RoRo service would be exposed to a wide range of operational risks in its first year of service. Potentially the most threatening of these risks would be under-utilisation of the ship resource. The mitigation of this risk is a major challenge facing any new direct RoRo service.

- It is reckoned that a new direct RoRo service would have to offer at least a 20% discount on Land Bridge prices to secure market share. The minimum ship utilisation at which it can make an operating profit and offer a 20% discount on Land Bridge becomes a significant operational criterion. For the five scenarios the minimum ship utilisation varied from 64% to 30%. Associated with the minimum ship utilisation is the Potential Profit Premium. This is the extra profit that would be made if the ship utilisation were increased from its minimum to an average of 65% while keeping unit prices constant at minimum ship utilisation levels.

  Three operational criteria, therefore, emerge from the analysis of the five scenarios. These are:

  a. The ship's average service speed, the lower the better,
  b. The Minimum Ship Utilisation, again the lower the better,
  c. The Potential Profit Premium at 65% average ship utilisation, the higher the better.

C7.1 – 4 Business Case for a Selected RoRo Service

The Business Case investigates a possible business opportunity associated with a direct RoRo service linking the ports of Cork, Portsmouth and Zeebrugge. Cork is selected in Ireland because of the geographical advantage that the South Coast has over the East Coast for a direct service to Continental Europe. Portsmouth is selected to provide an entrée to the large market in Southern Britain. Zeebrugge is strategically positioned to offer easy access to the important French, Benelux and German markets and provides good connections to the rest of Europe and to intercontinental ports.

Success for the new service presupposes that the series of technological and business measures that are outlined in Section 7.2 are put in place before the service commences. These measures are not normally associated with short sea shipping, but are necessary for the service to be a competitive force in the market.

In summary the direct RoRo service would have a significant price advantage over Land Bridge in D2D deliveries, although its delivery times would be somewhat longer. It would be marginally more costly than LoLo to Continental Europe and its delivery times would be considerably shorter.

C7.1 – 5 Possibility of Support Funding for a Direct RoRo Service

The Motorways of the Sea (MoS) programme that is managed by the European Commission has become an important influence on the intermodal transport market in Europe. It has taken a number of years for the MoS concept to be developed since it was first proposed in the transport policy document “European Transport Policy for 2010: time to decide” (September 2001). Within the MoS programme there are two support actions that are relevant to the implementation of a direct RoRo service between Ireland and Continental Europe. They are:

- Marco Polo II, which can provide financial support for a new or improved service that substitutes a significant amount of long-haul road freight with maritime transport;
- TEN-T, which can provide financial support for port infrastructural developments that are part of a Motorway of the Sea.

Provision is made in the European Union for individual states to provide financial assistance for projects of general public interest. Such assistance can be additional to financial supports under the EU programmes.