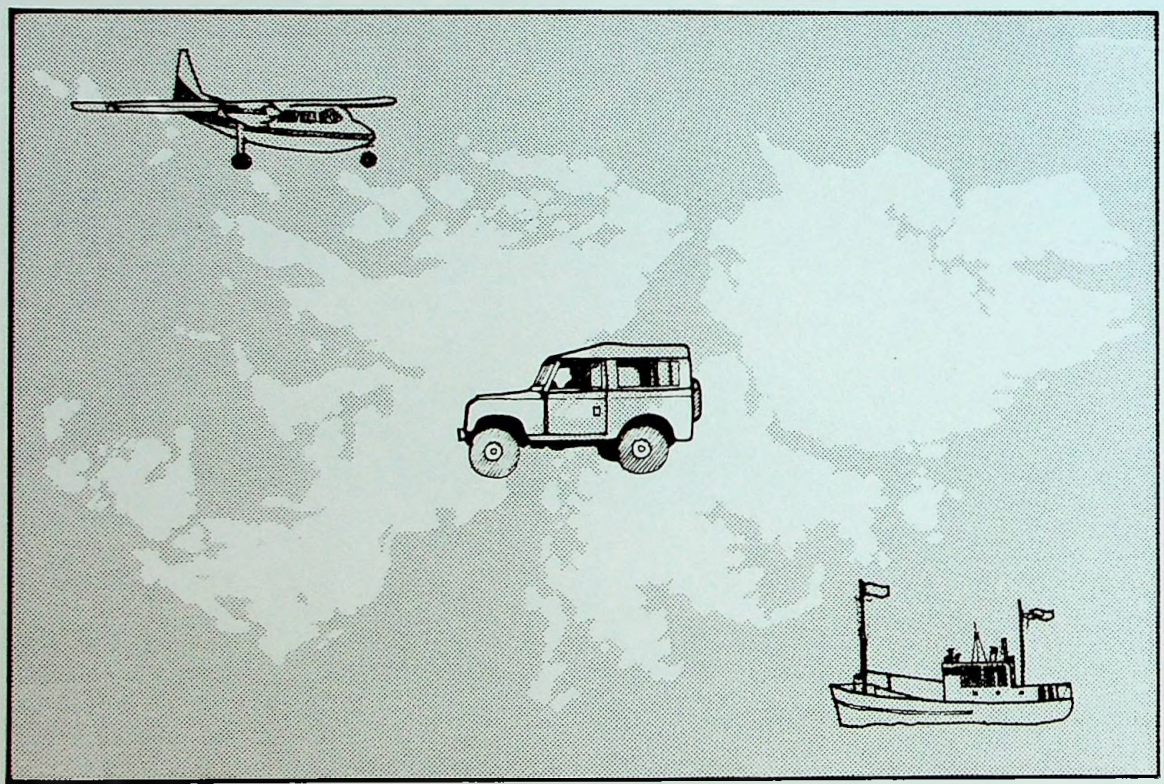
Falkland Islands Development Corporation

FALKLAND ISLANDS



INTERNAL TRANSPORT STUDY

Halcrow Fox and Associates

Falkland Islands Development Corporation

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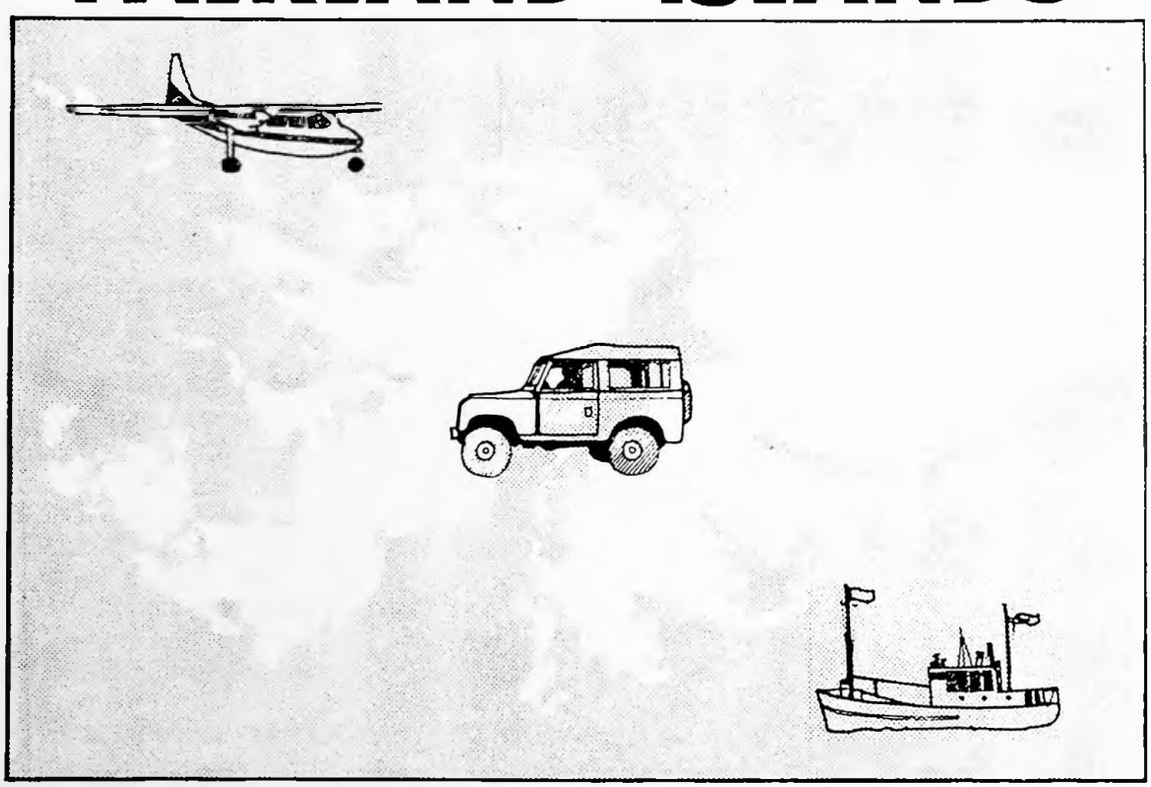

INTERNAL TRANSPORT STUDY

Halcrow Fox and Associates

January 1986

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CONSULTANTS IN PLANNING, TRANSPORTATION AND ECONOMICS

January 1986

The Chairman
Falkland Islands Development Corporation
The Secretariat
Stanley
Falkland Islands

Dear Sir

Falkland Islands : Internal Transport Study

It is with very great pleasure that I submit herewith my Report on the Internal Transport System of the Falkland Islands.

The future development of this system is the subject of considerable debate in the Islands at this time, and it is my hope that the findings of this Study will make a major contribution to that debate.

While it is difficult, if not impossible, to quantify in monetary terms the full benefits of investment in basic infrastructure, I am convinced that the type of programme outlined in this Report will have an important impact on the development of the Islands, and I have no hesitation in recommending it, in spite of the very high capital cost.

You have also asked me to undertake a review of the shipping services operating between the UK and the Falkland Islands. This will be incorporated in an additional volume to be submitted at a later date.

Yours faithfully

P J PRYNN

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1. Summary

1. SUMMARY

The current internal transport system of the Falkland Islands consists of three elements:

- a coastal shipping service provided basically by the privately owned and operated m.v. Monsunen, with increasing competition from the Government owned m.v. Forrest. This service evacuates wool in bales from the sheep farms to Stanley, supplies them with necessary stores and provisions and, at slack times, moves stock between the farms. The total volume of wool available is about 2,200 tonnes a year and the two vessels together provide considerable overcapacity. Even so, because of the number of locations to be served, each settlement is visited only three or four times a year.

- The Falkland Islands Government Air Service (FIGAS) operates two Islander aircraft (shortly to be three) on a virtual airtaxi basis between Stanley and some 37 airstrips in camp. The rough conditions in camp, together with the fact that virtually all servicing of aircraft is done in flying hours, means that one aircraft is frequently grounded. Nevertheless, FIGAS operates a highly effective service within its limitations and in 1985 carried about 7,000 passengers, together with some 80,000 lbs of light freight.

- a system of informal camp tracks connect all the farms and settlements. Before the 1982 conflict, the only road outside Stanley led to Stanley airport, though another gravel track to Fitzroy and Darwin was under construction. Since 1982, this has been incorporated into a high quality road to Mount Pleasant and a spur to Estancia is under construction. Apart from this, all the tracks on the Islands run directly over the camp, and the passage of even a few vehicles gives rise to boggy sections and bottlenecks, such that speeds are low, wear and tear on vehicles is high and, particularly during the Winter, bogging becomes a hazard and travel is uncertain and can even be somewhat dangerous. It is estimated that some 3,000 vehicle journeys a year of significant length are made over the camp tracks, though this can only be regarded as very approximate.

This system meets the basic demands of the Island's economy, though some expenditure is required by Government to maintain operations. While the Monsunen is operated on a break even basis by Coastal Shipping Limited (CSL), the Forrest (which fulfills an essential back up role) costs Government some £65,000 a year net of earnings. Equally, FIGAS can cover less than half of its costs out of revenue and requires support of some £150,000 - £250,000 a year.

Basic transport demands are not expected to increase dramatically in the future, though some rise in wool production is likely (to about 2,600 tonnes by 1995) and the resumption of tourist visits should generate some 5,000 more passengers a year for FIGAS over the next three years or so.

Nevertheless, there is a strongly held view that the transport system of the Islands should be radically improved by the construction of a road system and the linkage of the two main Islands by a ferry service. This Report has examined the implications of such a development, and particularly the repercussions of such a system on coastal shipping and the air service, which will always be required to meet the needs of those living on the outlying islands and more remote mainland settlements.

Paved roads would be almost certain to be too costly for such a remote and scattered population and were not further considered. Instead, two alternative networks of improved camp tracks of crushed aggregate on a well drained bed were examined and evaluated. It is estimated that such tracks, with a 3 metre carriageway and passing places, could be constructed by expatriate contractors at a capital cost of about £50,000 per km and should require relatively low maintenance expenditure, providing it were done promptly.

Three future systems were considered:

1. Do Minimum - a continuation of the existing system, with a limited expenditure of £2 million over the next ten years, designed to eliminate some of the worst bottlenecks and boggy stretches of existing camp tracks.

2. Road Based - the construction of 550 km of improved camp tracks, based on the suggestions made by O'Reilly in 1963 and designed to link all of the major settlements in East and West Falkland, with a ferry service between Port Howard and Darwin.

3. Shackleton - this was devised from the capital expenditure recommendations of the 1982 Shackleton Report, and involves the construction of 200 km of improved camp tracks on both East and West Falkland and their connection by a ferry service.

The Road Based System, which would cost nearly £28 million was found to give very considerable benefits to the Falkland Islands economy and population, but it would divert so much freight from coastal shipping to the roads that the maintenance of a service to the outlying islands would be difficult and costly. Equally, the costs of maintaining such an extensive road system would be heavy and not commensurate with the benefits to be gained from it.

The more limited objective of the "Shackleton" system, though, was found to give very many of the same benefits as the full system, at substantially reduced capital cost, some £10 1/2 million. The Monsunen would still be able to maintain an economic service to the islands and the more remote mainland settlements. The Forrest could be disposed of, since back up to the Monsunen could be given by a sea going landing craft which could both provide a ferry service across Falkland Sound, shift sheep between farms when required, and do normal cargo work at those farms and settlements whose jetties cannot at present be easily served by the Monsunen. FIGAS patronage would be reduced, but the revenue anticipated from tourists should keep its deficit down to reasonable levels.

While the direct economic benefits of this system in terms of transport costs amount to only £170,000 a year, compared to an additional operating and maintenance cost of £106,000 a year and a total capital expenditure of £10 1/2 million, the indirect social and economic impact was judged to be sufficient to justify it.

The main recommendations of this Report may be summarised as follows:

1. the construction of 200 km of 3 metre wide gravel tracks, linking Mount Pleasant to Darwin and thence to San Carlos and Port San Carlos, and on West Falkland a similar track linking Port Howard to Chartres and Fox Bay, with a spur from Chartres to Hill Cove.

2. that Falkland Islands Government should dispose of the Forrest and replace it with a sea going landing craft of about 23 metres. This should be chartered to CSL (in which FIG should take a share) and operated both as a ferry across Falkland Sound and as part of an integrated service with the Monsunen to meet the needs of the remoter settlements and outlying islands.

3. that FIGAS should be separated from the Civil Aviation Department and a study made of the practicality of putting it under commercial management, with limited Government support.

2. Introduction

2. INTRODUCTION

2.1 Terms of Reference

The Terms of Reference for the current study have been defined by the Board of the Falkland Islands Development Corporation as follows:

> "1. To review all current inter and intra island transport systems throughout the islands.
>
> 2. To prepare a plan for the co-ordinated development of inter and intra island transport over the period 1985-1995, the plan to take account of:
>
> a) the development of a new airport and harbour complex at Mount Pleasant/East Cove;
>
> b) the financial constraints on the Falkland Island Government;
>
> c) FIDC's economic and tourist development plans for the same period."

Mr Prynn, a Director of Halcrow Fox and Associates, visited the Falkland Islands from 1st to 22nd October 1985. During this time he met a wide range of people, including Legislative Councillors, Government officials, local businessmen, representatives of trade associations, farmers, farm employees and the owners, managers, operators and users of the transport system. He also travelled around the camp, including West Falkland and the smaller islands. The purpose of this visit was to gain an understanding of the existing transport system, its role in the economy, the purposes it fulfils, the problems experienced and the opportunities presented for development. Most particularly, though, the purpose of the visit was to learn from the experience of local people, many of whom had thought deeply about the transport system of the Islands and had a wealth of suggestions as to how that system could be improved.

These ideas and experiences were freely shared, such that the major function of this Report has been to analyse those ideas within an integrated and co-ordinated framework, so as to derive a comprehensive plan for transport development which is practicable within the very real financial constraints.

2.2 The Problem

The Falkland Islands have three very obvious facts of geography which militate against the development of an efficient, modern road based transport system:

- o the very sparse population - less than 2,000 people in a land area of 4,700 sq miles
- o the predominant ground conditions, where the top surface of the peat breaks down with the repeated passage of wheeled vehicles and makes the progressive upgrading of informal tracks very difficult
- o the many islands which make up the total inhabited land area.

Thus, the existing transport system is still essentially that which served the islands in the nineteenth century, i.e. coastal shipping, which (together with the availability of workable peat banks) has determined a pattern of settlement which is almost entirely coastal and based on accessible harbours and jetties. In more recent years, the Falkland Islands Government Air Service (FIGAS) has provided a supplementary, if necessarily expensive system, for moving passengers and light freight around the islands. However, an internal, surface based, transport system has been slow to develop. Some roads were built in the 1920's simply by removing the surface layer of peat with hand labour. These so-called "clay tracks" were, however, inadequately drained and soon deteriorated so far as to be practically unusable. Most of the camp tracks now in use take advantage of the surface vegetation covering the peat. Since this breaks down after a few passes of even comparatively light vehicles, these tracks have broadened over the years sometimes to a mile or more in width. Where soft ground occurs or where the track narrows at a bridge, ford or gateway, very muddy and treacherous conditions are experienced (particularly in Winter) making overland travel extremely hazardous at times, with the continual risk of the notorious "bogging".

In 1963 Mr M P O'Reilly of the Road Research Laboratory was commissioned to study the track system and his report recommended a major construction programme. Since that time, though, constraints of money and other resources dictated that only the most tentative start had been made by the 1982 conflict. Following the conflict, a major road was built between Stanley and the Mount Pleasant complex (already in use, though full construction is not yet completed) which, together with the Stanley to Stanley Airport road constitute the only all-weather roads in the Colony.

The issue of whether or not to proceed with a programme of the O'Reilly type dominates thinking on transport development, and public opinion on the Islands is strongly and almost unanimously in favour of such a policy. Equally, it would involve large capital and annual maintenance expenditures, as well as conceivably undermining the fragile economics of the coastal shipping and air services which will continue to be vital to the survival of the Islands' economy as it is at present constituted. This issue lies at the heart of the Report.

2.3 Method of Approach

Apart from its resident population of rather less than 2,000 persons, the Islands have since 1982 been host to a large military garrison, considerably outnumbering the civilian population, as well as a variable number of expatriate construction workers at the Mount Pleasant complex which at their height numbered over 2,300. These groups have their own transport needs and requirements, both for operational and recreational purposes. To a large extent, they have made their own arrangements, although there have been areas of overlap and opportunities for sharing facilities.

In view of the uncertainties about the level and requirements of these non-resident populations, the basic philosophy of this Report is that the civilian transport system should be designed principally to meet the needs of the resident civilian population and financed by the resources available to that population.

This is not to suggest that military or expatriate construction workers should not make use of the civilian transport system and, in so doing, contribute financially to its cost, but such usage and contribution cannot be relied upon in the longer term and the physical and financial design of such a system should not be reliant on anything other than the needs and requirements of the resident civilian population alone.

What then are these needs and requirements, and how have they been taken care of in the Report which follows? First and foremost these are seen as the needs of the sheep farming community of the camp - the backbone of the economy. This means the ability to move wool as cheaply and as flexibly as possible from the farms and settlements to Stanley for onward shipment to market. It also means meeting the demands of these farms and settlements for stores, for fuel and for general farm requirements such as machinery, fencing materials and so on.

Of growing importance, too, is the need to satisfy the demand for personal mobility, if life in the camp is to measure up to the generally accepted standards of the late twentieth century - the ability of parents to visit their children in school at Stanley, the ability of farmers and farm workers to meet and discuss problems of common interest and the ability to pursue a wide and fulfilling social life released from the restrictions of an isolated settlement or farmstead. This applies equally to the residents of Stanley, many of whom have retired from a life time of work in the camp and who are at present very nearly cut off from their former friends and associates.

The second, and possibly in the longer term almost equally important consideration, is the development of new and more diverse economic activities. The Falkland mono-cultural economy has long been seen as very vulnerable to changes in price and fashion and limited by nature in its ability to grow and create new opportunities for enterprise and wealth creation. Strenuous efforts are now being made (spearheaded by the FIDC) to diversify and exploit previously unused resources. Such efforts are all too likely to founder (or be completely confined to Stanley and its environs) unless communications can be improved and the transport infrastructure created to support new ventures.

Given the constraints of geography and terrain alluded to above, it is extremely unlikely that any substantial investment programme will be "economically justified" using the conventional criterion of cost savings normally applied in the appraisal of transport projects. However, the Falkland Islands transport problems are not "conventional" in this sense, and any transport developments should be seen in the light of the economic development of the country as a whole, as it was for example in the two Shackleton Reports of 1976 and 1982.

This Report takes a similarly broad view of "economic viability", though such a view is always tempered by the limited range of viable development options and the necessity not to overburden the economy and its major wealth producer - sheep farming. That said though, there are encouraging signs that the farms wish to take a positive role in assisting with transport development and every opportunity has been taken, in framing proposals, to harness this desire and create co-operation between the private and public sector in the development of a transport system which can take the Falkland Islands into the twenty first century.

2.4 The Report

Following this Introduction, Section 3 briefly examines the geography, economy and human resources of the Islands to set the context for transport development. It also describes the existing transport facilities and gives estimates of the resources currently being devoted to them. Section 4 examines the existing transport demand, in so far as data permits, and presents estimated matrices of passenger and freight movements between the major settlements. Section 5 discusses the factors influencing demand in the future, so as to forecast the traffic volumes which any system should be designed to meet.

Section 6 discusses potential developments in each sector individually and develops cost parameters for use in the subsequent evaluation. In Section 7 these individual modes are combined into a series of viable alternative systems encompassing all modes of transport. Section 8 evaluates the alternative systems both in terms of their cost and of their impact on the economic and social life of the Islands. Finally, Section 9 draws conclusions from this analysis and sets out a recommended investment programme.

2.5 Acknowledgements

In view of the warmth of Falkland hospitality and the wide range of individuals who gave unstintingly of their time to discuss the transport problems of the Islands so knowledgeably, it is invidious to single out particular individuals. However, mention must be made of some.

The then Governor, His Excellency Sir Rex Hunt, Mr David Taylor, the Chief Executive, Mr Simon Armstrong of the Falkland Islands Development Corporation and everyone in the Government Secretariat were extraordinarily cooperative in providing data and background information.

Rodney and Robin Lee at Port Howard were particularly helpful with suggestions about the proposed ferry across Falkland Sound, Brook Hardcastle at Darwin gave major insights into the requirements of the large farming enterprises and Terry Clifton at Sea Lion Island demonstrated the particular problems of the small island farm. Special mention should also be made of Carole Lee, Eilleen Hardcastle and Doreen Clifton who demonstrated graphically why Falklands hospitality is famous the world over.

In Stanley, Terry Spruce of the Falkland Islands Company shared his great knowledge of Coastal Shipping Limited and its operations, Gerald Cheek, the Director of Civil Aviation, did the same for FIGAS and Les Halliday, the Harbour Master was extremely helpful about the Forrest. Bill Hills, the Director of Public Works contributed a great deal of his thinking about camp track development and access to invaluable data about construction costs. Others who made valuable contributions were Robin Pitaluga, Norma Edwards and other members of the Sheep Owners Association, Dave Eynon of the Falkland Islands Traders Association and a wide range of personnel concerned with transport.

In the UK, very useful discussions were held with Alistair Cameron, the Falkland Islands Representative, David Brittan of the Falkland Islands Company and Wyn Kendrick of the LMA Group.

3. The Falkland Islands

3. THE FALKLAND ISLANDS

3.1 Population

The civilian population of the Falkland Islands (excluding contractors personnel on short term contracts) has shown a consistent pattern of decline for the past 50 years, though this has been far more marked in the camp, the Stanley population having appeared to stabilise in the last 20 years. The official Census figures during the present century are given in Table 3.1 below:

Table 3.1 : Population of Falkland Islands, 1901-80

Year	Total	Stanley	Rest of East Falkland	West Falkland
1901	2,003	916	594	451
1911	2,176	885	723	553
1921	2,094	890	801	395
1931	2,392	1,213	702	426
1946	2,239	1,252	579	364
1953	2,230	1,135	642	453
1962	2,172	1,074	597	460
1972	1,957	1,079	498	380
1980	1,813	1,050	441	322

Source: FIG Census

There are indications that since the 1982 conflict, the population of Stanley has increased somewhat, as is evidenced by the current difficulty in obtaining housing accommodation in the town. Equally, though, the population of camp seems to have continued to decline. A recent (July 1985) survey undertaken by the camp school children suggested a total camp population of about 600, distributed between farms and settlements as shown in Table 3.2.

Table 3.2 : Estimated Camp Population, mid 1985

East Falkland		West Falkland	
San Carlos [1]	24	Port Howard	35
Salvador	15	Bold Cove	4
Darwin	10	Hill Cove	43
Walker Creek	15	Fox Bay West	30
Goose Green	74	Fox Bay East	38
North Arm	23	Port Stephens	28
Fitzroy	23	Chartres	20
Long Island	4	Crooked Inlet	4
Horseshoe Bay	2	Boundary Farm	4
Mount Kent	4	Hope Harbour	2
Estancia	4	Pickthorne	3
Murrell Farm	2	Port North	2
Brookfield	2	Dunbar	5
Johnsons Harbour	8	Dunnose Head	16
Bluff Cove	4	Little Chartres	4
Port Louis	6	Manybranch	4
Douglas Station	12	Weddell Island	10
Port San Carlos	23	Saunders Island	9
Teal Inlet	15	Pebble Island	20
Rincon Grande	4	Carcass Island	4
Riverside	2	West Point Island	4
Lively Island	3	Keppel Island	4
Speedwell Island	3	Golding Island	4
Sea Lion Islands	3	Other	5
Other	10		
Total East Falkland	295	Total West Falkland	302

Source: Consultants Estimate

Notes: 1. This relates to the area covered by the former San Carlos and includes Wreck Point, Maryfield, Port Sussex, Waimea, Greenfield and Blue Beach.

This figure is, of course, very much an estimate. However, it compares well with the 1985 Electoral Register, which shows 387 electors in the Camp Electoral Area. If an allowance is made for the 35 per cent or so of the population below voting age, this would bring the total numbers up to some 595 which (even if some further allowance is made for recent immigrants and contract workers) is still reasonably consistent with the survey figures shown in Table 3.2. If the figures given for some of the individual farms are incorrect, this should not matter in the context of a broad planning study, provided the overall totals are of the right order of magnitude.

Thus, a camp population of 600 has been adopted as the base point for this study and has been used to calculate trip generation and as a starting point for future traffic projections.

As for future changes in population, these are particularly difficult to predict as, apart from the normal uncertainties, there is probably a close relationship between changes in population levels and the development of the transport system.

The decline of the camp population has undoubtedly been caused in part by changes in farming methods to a less labour intense method of shepherding, together with the development of itinerant shearing gangs which have reduced peak labour demands on the farms. This has to some extent been counteracted by the sub-division of some of the larger farms into owner operated units. There is also evidence of a labour shortage on some of the larger farms which must, at least in part, be a function of the isolated conditions of life on the settlements, an isolation which is increasingly at odds with the type of life style to which people feel they have a right at the end of the twentieth century.

Equally, attempts to diversify the camp economy away from a total reliance on sheep farming are likely to be severely hampered, if not thwarted entirely, unless communications can be improved to bring producers into closer contact with their markets and to give easier access to the support services required by virtually every economic activity.

It seems, then, that camp population is unlikely to increase significantly without improved transport systems and, without improvement, population levels could fall even further, possibly to an extent which would threaten the continued viability even of the sheep farming industry itself. This topic is reverted to in Section 5 below.

3.2 Economic Activities

The Falkland economy has been dominated for many years by sheep farming which produces virtually all of the colony's export earnings and provides almost its only source of employment other than Government and service activities.

The level of output from the sheep farming industry has remained constant for a long time. Although there were over 800,000 sheep on the Islands at the end of the nineteenth century (compared with a current level of some 650,000) wool yields (and number of stock) have not changed significantly since 1910 when some 2.2 million kg of wool was exported. At various times from the late 19th century attempts have been made to export sheep meat, either frozen, canned, or on the hoof, but these attempts have so far been relatively shortlived and unsuccessful, as the remoteness of the Falkland Islands from the market, combined with quality problems have not offered a worthwhile return to farmers.

The wool, however, is of a special and highly prized quality. There have been wide fluctuations in the prices obtainable for Falkland wool, inducing equally wide fluctuations in the profitability of sheep farming. Taking a long term view, though, the industry has given a fairly reasonable return to the resources invested in it. For a variety of reasons (discussed at some length in the two Shackleton Reports) few of the profits from the industry have been reinvested in the Islands and, as a result, equipment has become antiquated and rundown in some cases and pastures have become less productive.

In the last few years two major developments have occurred in the industry which may have a bearing on their transport requirements. Several of the larger farms such as Green Patch, San Carlos and Roy Cove have been subdivided into single family units. This has created some fracturing of the traditional settlement pattern with each large farm having a central settlement where the bulk of the labour force lived, where the shearing sheds and other major farm buildings were located and where there was a jetty and, more latterly, an airstrip.

Following sub-division the new owner occupying farmers and their families have tended to leave the settlements and, quite naturally, establish themselves on their own land. This has entailed the creation of new, and more numerous, jetties and airstrips. This, in turn, has imposed greater costs on the transport operators who now have to serve more locations and, equally importantly, has placed the burden of maintaining these facilities on a single family, where formerly it was shared between many through the agency of the farming company. As a result some facilities are not being adequately maintained and are deteriorating. Equally, where the common facilities of the old settlement are still being used, the responsibility for maintenance is now diffused and difficulties are sometimes experienced in organising co-operative maintenance for the good of all resident farmers.

The other interesting feature of the past few years has been a vigorous experimentation by farms in enhanced pasture productivity and stocking rates (assisted by the Agricultural Research Centre). Experiments in reseeding and more intensive grazing and pasture management are taking place all over the Islands, and the results are hotly debated amongst the protagonists. Certainly the total number of sheep on the Islands is rising and is likely to continue to rise, though whether this will result in a higher total wool clip, or whether wool yield per sheep will fall correspondingly yet remains to be seen. The basic agricultural statistics of the Islands are summarised in Table 3.3

Table 3.3 : Falkland Islands Agricultural Sector 1979-85

	Total No. of Sheep 000	Total Wool Clip 000 kg	No. of Cattle	No. of Poultry	No. of Pigs
1979/80	663	2,223	8,056	3,280	43
1980/81	650	2,117	8,092	2,192	52
1981/82		NOT AVAILABLE			
1982/83	669	2,282	7,648	4,198	67
1983/84	679	2,188	7,378	3,466	38
1984/85	692	2,252	7,550	3,264	33

Source: Falkland Islands Farming Statistics

In addition to the sheep, Table 3.3 shows that a limited but still significant national herd of cattle exists on the Islands. These are mainly used to condition pastures intended principally for sheep grazing and to produce the beef and dairy products to meet the settlements' own requirements. Although there is generally a surplus of such products available on the farms, there is only limited trading between the farms and Stanley mainly because of the difficult transport conditions.

Other economic activities outside of Stanley itself are virtually confined to Fox Bay East, a Government sponsored village and the only settlement other than Stanley not directly owned by a farm. Fox Bay East contains the Falkland Woollen Mill, as well as acting as the base for the current inshore fisheries project. Both of these activities are still on a relatively limited scale and their development is hampered by transport and communications constraints. This will be discussed at greater length in Section 5.3 below.

3.3 Existing Transport Facilities

3.3.1 Roads and Camp Tracks

The only roads existing on the Falkland Islands at the moment (other than the internal streets of Stanley itself) are those from Stanley to Stanley Airport and from Stanley to Mount Pleasant, the two linked by the Stanley by-pass. In addition, there is a considerable network of camp tracks, some of which are clearly defined, but others of which cover a fairly wide area. Figure 3.1 shows the locations of these roads and of the principal camp tracks. It should be noted that West Falkland and East Falkland have completely independent camp track systems and that no ferry currently links them, so that transporting a vehicle between the two main islands is costly and inconvenient. This point is reverted to in Section 6.3 below.

The road between Stanley and Mount Pleasant is still under construction and is not due for completion until mid 1986. It is already in use though, as the demand for transport between Mount Pleasant and Stanley was so acute, particularly following the opening of the Airport in May 1985 and the subsequent twice weekly flights between Mount Pleasant and Brize Norton. Vehicles currently (October 1985) use the base, or finished surface where this is available, while work on the road continues. When it is finished this road will offer a carriageway 6 metres in width over a distance of some 50 km. The surface will be principally finished in rolled stone, though sections with a steep gradient will have a bitumen top coat.

The Stanley Airport road also has a bitumen top coat though this is breaking down in places, mainly because of the number of heavy military vehicles using the road, particularly those servicing the floating port facility, FIPASS. It is anticipated that when the military facilities are removed to Mount Pleasant in 1987, the maintenance problems will be considerably eased and it would probably be sensible to allow the surface to revert to rolled stone when it can be maintained simply by grading and drain clearance.

PWD are also currently constructing a gravel track from the Mount Pleasant Road to Estancia, over the central range near Mount Kent. This track will be about 14 km in length and is expected to be completed in 1988. This will give access to the whole area north of the central range and obviate the use of the track between Moody Brook and the Murrell where ground conditions are particularly bad.

Existing Roads

Principal Camp Tracks

SEDGE ISLAND

CARCASS ISLAND

KEPPEL ISLAND

PEBBLE ISLAND

GOLDING ISLAND

SAUNDERS ISLAND

WEST POINT ISLAND

DUNBAR

HILL COVE

ROY COVE

PORT HOWARD

WEST FALKLAND

CHARTRES

DUNNOSE HEAD

NEW ISLAND

BEAVER ISLAND

WEDDELL ISLAND

FOX BAY WEST

FOX BAY EAST

PORT STEPHENS

FALKLAND SOUND

SWAN ISLANDS

GREAT ISLAND

LAFONIA

NORTH ARM

SPEEDWELL ISLAND

GEORGE ISLAND

SEA LION ISLANDS

BLEAKER ISLAND

SALVADOR

DOUGLAS STATION

PORT SAN CARLOS

NORTH FALKLAND

SAN CARLOS

TEAL INLET

RINCON GRANDE

JOHNSON HARBOUR

PORT LOUIS

GREEN PATCH

BERKELEY SOUND

ESTANCIA

STANLEY

FITZROY

MOUNT PLEASANT

MARE HARBOUR

MARWIN

GOOSE GREEN

WALKER CREEK

LIVELY ISLAND

Land over 1500 feet

1000 - 1500

500 - 1000

below 500

N

Scale 1 643,000

Miles 5 0 5 10 15 20 Miles

Existing Roads and Camp Tracks

HFA

Figure 3.1

The rest of the Islands are served only by camp tracks which are very variable in quality and difficult to generalise about. On the Eastern end of East Falkland where the peat is usually thick and overlies a clay sub-soil on the lower ground, driving conditions are difficult, even in the Summer, and frequent use can make them virtually impassable, even to 4 wheel drive vehicles (e.g. the track between Moody Brook and the Murrell River). Even where use is lighter, vehicles have as far as possible to avoid the tracks of earlier users. When this becomes impossible (i.e. bridges, gates, etc) quagmires develop which become extremely difficult and hazardous to pass, and even the most experienced camp drivers can become bogged. In the Winter only the most urgent travel is undertaken by Land Rover, frequently in convoys. Even in the Summer, average speeds rarely exceed 10 km per hour. No certainty of arrival at a specified time can be guaranteed.

On the Westerly part of East Falkland, the whole of Lafonia and large areas of West Falkland, the ground conditions are kinder, the peat layers tend to be thinner and the underlying rock is sandstone or tillite. Here, particularly during Summer, the driving conditions are easier, and with a four wheel drive vehicle, average speeds of about 15 km per hour or more can be achieved. However, everywhere there are difficult patches and bottlenecks on flat boggy patches, on steep slopes and at pinch points, such as bridges. In very few places can guaranteed arrival times be specified, even during Summer.

The resident civilian vehicle fleet (i.e. excluding military vehicles and those owned and operated by the Mount Pleasant contractors and their labour force) amounted to nearly 900 in October 1985, as set out in Table 3.4.

Table 3.4 : Resident Civilian Vehicle Fleet : Stanley & Camp 1985

	Stanley Registered	Camp Registered	Total
Land Rovers	325	86	411
Cars	92	2	94
Motor Cycles	236	78	314
Lorries	23	7	30
Tractors	13	19	32
Plant Vehicles	6	-	6
	695	192	887

Source: Police Department

It is not clear whether all the Stanley Registered vehicles are, in fact, based in the town, but, nevertheless, the total number of 887 is probably well based. This gives a total vehicle ownership of some 490 vehicles per 1,000 population, which may be compared with an equivalent figure of about 400 per 1,000 population in UK, indicating the very high priority placed on personal mobility in the Falkland Islands. Many of these vehicles are old and used for little more than short journeys in and around Stanley. On the farms, however, many Land Rovers are used extensively for work and are often disposed of after three or four years. Thus, it is difficult to generalise about current vehicle operating costs. However, investigations in the Falkland Islands suggest that total vehicle operating costs are not very different in these two cases, at about 40 pence per km. A simple calculation of the two extreme cases is given below:

	Old Land Rover (lightly used)	New Land Rover (hard driven)
Basic Assumptions		
Cost of Vehicle (net of resale value)	£2,000	£7,000
Fuel cost	£1.60 per gallon	
Fuel Consumption (per gallon)	16 km	19 km
Spare Parts (£ per year)	£200	£1,000
Life of Vehicle (km)	30,000	50,000
Vehicle Usage (km per year)	3,000	12,500
Standing Costs (£ per year)		
Insurance	£250	£250
Interest on capital	£280	£700
Other	£50	£50
Total per year	£580	£1,000
Total standing costs (pence/km)	19.3	8.0
Running Costs (pence per km)		
Diesel fuel	10.0	8.4
Lubricants	0.2	0.2
Spare parts	6.7	8.0
Maintenance labour	-	2.0
Depreciation	6.7	10.0
Total running cost	23.6	28.6
Total Operating Cost (pence/km)	42.9	36.6

Source: Consultants Estimate.

For the purpose of calculating the vehicle operating cost savings which can be derived from camp track improvement a figure of 37 pence per km has been used, as representing the typical costs incurred by camp drivers, most of whom are using relatively modern vehicles and making significant use of them.

3.3.2 Shipping

Two small coastal vessels, m.v. Monsunen and m.v. Forrest are based permanently in Stanley, and provide the basic freight service between Stanley and the camp farms and settlements. Occasional shipments of civilian goods are also made by the naval supply vessels St Angus and Icelark and there are also a few small schooners which carry some freight and animals between the outer islands and farms on East or West Falkland.

The Monsunen is owned jointly by the Falkland Islands Company (FIC) and the shipping agents Jeppesen Heaton Limited. She is chartered by Coastal Shipping Limited (a company limited by guarantee, in which all the large farms are represented) and managed on behalf of Coastal Shipping Limited (CSL) by the Falkland Island Company.

The vessel is 131 feet long, has a beam of 21 feet and is of 230 gross tons and 119 net tons. She draws about 9 feet when fully laden. She was built in Denmark in 1957 and has been registered in the Falkland Islands since 1973. She has a crew of 7, whose quarters in the foreward section are limited. There are no facilities for passengers below decks. Her average speed is about 8 knots, at which speed her 4 cylinder, 2 stroke Alpha diesel engine uses between 10 and 14 gallons of fuel per hour.

She has two derricks (maximum lift 2 tons each) at either end of a single hold capable of carrying a maximum of about 400 bales of wool. She can also carry about 4,250 gallons of bulk gas oil, though this is one of her main capacity limitations at the present time and investigations are planned to see where this can be considerably increased (to about 9,000 gallons) at the next survey.

The operational schedule is set by CSL to link with the four annual sailings of the charter vessel m.v. A.E.S. from and to the United Kingdom. The Monsunen makes about 32 voyages a year arranged in four groups, so designed that virtually every port and jetty is visited in each group of voyages. During the first three groups (i.e. November/January, February/April and April/June) wool and skins are collected from the settlements for storage in the F.I.C. warehouse in Stanley. During all voyages, stores and gas oil are delivered to the settlements, but during the fourth group of voyages (August/September) little cargo is carried back to Stanley. Some stock moving is also undertaken, generally during March and September.

The vessel steams some 12,000 miles a year including a biennial trip to Montevideo for survey. The crew are normally resident on the vessel, though about two days are allowed in Stanley between each voyage for the crew to visit their families and there is a break of about two weeks between each group of voyages, while engine repairs and other routine maintenance is undertaken.

Cargo handling is undertaken by a gang of stevedores at the F.I.C. jetty at Stanley, but at the settlements cargo handling is done by the crew assisted by farm workers, who also assemble cargoes on the jetty. At those settlements without a jetty, cargo is delivered and collected by a Rotork sea truck, which is carried on the Monsunen's hatch covers.

In spite of her considerable age, the Monsunen appears to be in excellent condition, experiencing few problems with the engine and with a good thickness of steel still on the hull. While the costs of the biennial surveys may tend to rise in future years, there is every reason to suppose that many more years of useful service could be obtained from this vessel.

The Forrest is owned by the Falkland Islands Government and operated by the Customs and Harbour Department. She is 80 feet long and has a beam of 22 feet, with a gross tonnage of 144 tons and 47 net registered tons. She draws about 9 feet when fully laden. She was built in Wivenhoe, Essex in 1967, specifically for the Falkland Islands Government and registered in the Falklands in the same year. She has a crew of four. Her average speed is about 9 knots, at which speed her 8 cylinder TS8 diesel engine uses about 12 gallons of fuel per hour.

She has a single derrick (maximum lift 4 tons) forward of a single hold capable of carrying about 100 bales of wool. She can also carry about 7,000 gallons of bulk fuel oil.

Before the 1982 conflict, the Forrest was for some years on an annual charter to the Royal Marine detatchment. Since then, a number of charters have been secured, both to the military and, on occasions to CSL, when the capacity of the Monsunen was overstretched, but in general the Forrest is underused. More recently she has started offering general carrier services to the settlements and, although operating at the same cargo tariff as the Monsunen, is effectively competing against CSL.

The Forrest does not appear to be as reliable as the Monsunen and is said to require more frequent repairs. Apart from her bulk fuel capacity, she is not as well suited to the requirements of the Falklands coastal trade, having such limited cargo capacity. In spite of her lesser age, she should probably be the candidate for replacement should it be decided to change or reduce the coastal fleet serving the settlements.

There are four jetties in Stanley Harbour itself: the Government Jetty, the F.I.C. West Jetty, the Public Jetty (all of which are only rarely used for cargo handling) and the F.I.C. East Jetty which is used by the m.v. A.E.S. and the m.v. Monsunen and is currently the major cargo handling facility for the civilian population. In addition there is an oil berth at Navy Point and, at the East end of Stanley Harbour is the floating port facility known as FIPASS. This was constructed very rapidly after the 1982 conflict on top of

6 standard North Sea Barges, has 220 feet of workable quay and can handle containers, either lift on/lift off or from ro-ro vessels. FIPASS is under military control and its main function is to supply the garrison, though some limited volumes of civilian cargo are shipped over it.

At Mare Harbour in East Cove, there is another, temporary port facility formed by the cargo vessel "Merchant Providence", which is moored and connected to the shore by Bailey Bridge. All the supplies for the Mount Pleasant construction project have been shipped over the Merchant Providence (over 1/2 million freight tons so far) and civilian cargoes have occasionally been landed here (and ferried back to Stanley by the Monsunen). Permanent facilities are now under construction at Mare Harbour to service the military complex at Mount Pleasant and the Merchant Providence should have completed its function by about mid 1986. Mare Harbour is intended to be the principal point of supply for the garrison when it moves to Mount Pleasant in 1987 and after this date the future role and function of FIPASS is uncertain.

Each of the settlements and groups of farms has jetty facilities of their own. These vary enormously in quality from the substantial timber jetties of Goose Green and Port Howard where Monsunen can come alongside at all states of the tide, to the famous "Gulch" at Sea Lion Island where cargo is manhandled between the Monsunen's sea truck and a narrow platform of rock which is connected to the rest of the island only via a near vertical ramp some 50 feet high up and down which a cargo is winched on a sledge.

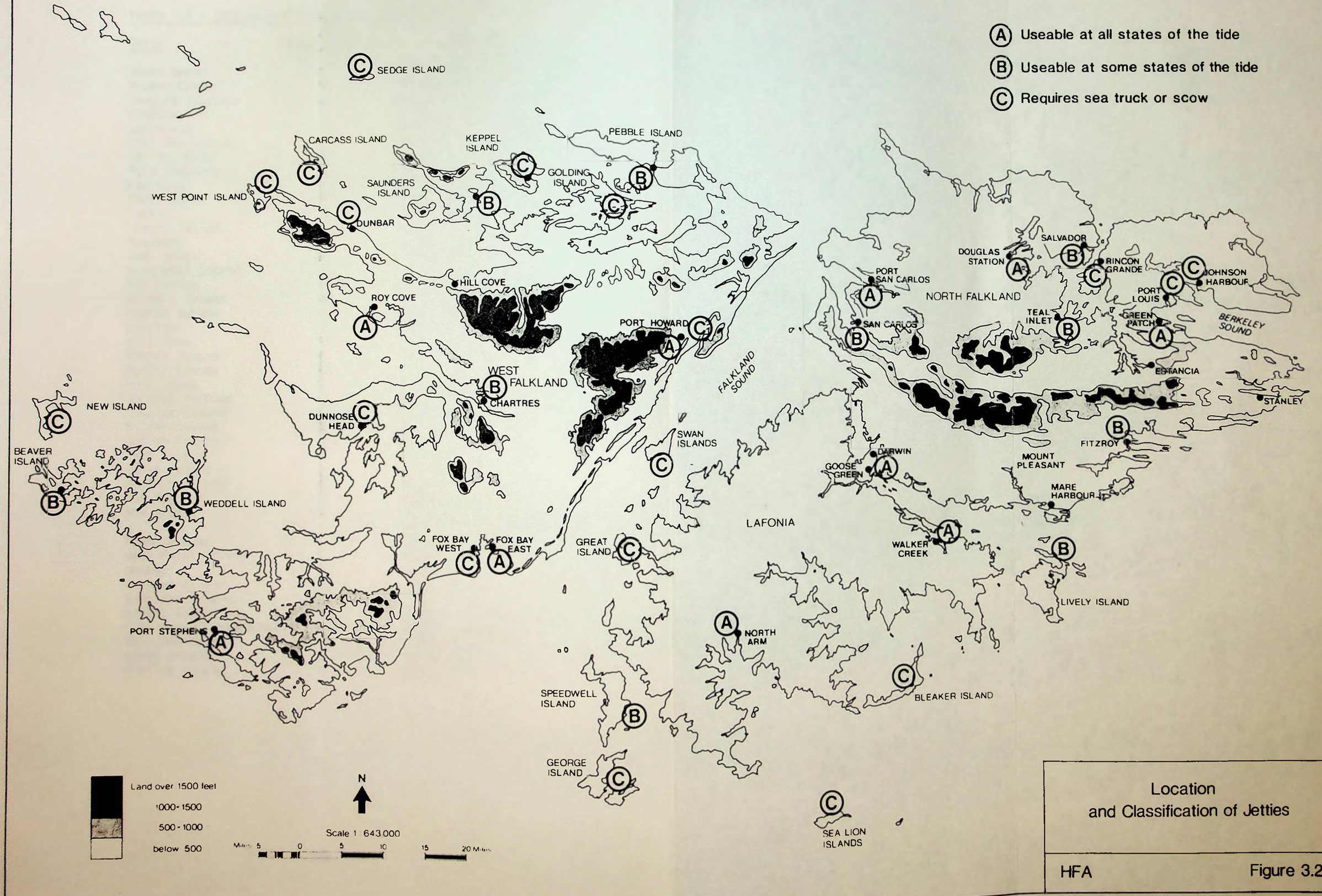
Table 3.5 sets out a list of all the jetties, with brief comments on each, classified by Coastal Shipping Limited into:

Category A : where Monsunen can berth at all states of tide.
Category B : where Monsunen can berth at only some tides.
Category C : where Monsunen can never berth and a seatruck or scow is required.

The locations of these jetties are shown in Figure 3.2

3.3.3 Aircraft

FIGAS have two BN2B-26 Islander Aircraft and a further similar aircraft has been ordered and is expected to come into service early in 1986. These aircraft have twin piston engines running on AVGAS and carry 9 passengers and a limited amount of freight up to a total payload of about 1,800 lbs. The Islander cruises at 135 kts and has a cruise fuel consumption of some 22 gallons per hour. The aircraft has been designed for varied operating conditions and is tolerant of reasonably maintained grass airstrips, which should ideally be some 600 metres in length.



Location
and Classification of Jetties

HFA

Figure 3.2

Table 3.5 : Jetties and Harbours in the Camp

Jetty	Classification	Comments
Goose Green	A	Decking now under repair
Walker Creek	A	Good condition
Douglas Station	A	Good jetty, but no fendering
Green Patch	A	Jetty in poor state of repair
North Arm	A	Good jetty, but poor fendering
Port San Carlos	A	Good jetty, but poor fendering
Fox Bay East	A	Jetty in poor condition
Port Stephens	A	Narrow jetty; fendering poor
Roy Cove	A	Jetty needs repair
Port Howard	A	Good jetty
Fitzroy	B	Good jetty
Lively Island	B	Poor condition
Salvador	B	Cargo work normally by scow
Teal Inlet	B	Good jetty; fendering poor
Speedwell Island	B	Some repairs required
San Carlos	B	Good jetty; fendering poor
Weddell Island	B	Satisfactory
Beaver Island	B	Jetty in poor condition
Chartres	B	Good jetty; fendering poor
Hill Cove	B	Jetty requires repair
Pebble Island	B	Jetty satisfactory; fendering poor
Rincon Grande	C	No fendering
Port Louis	C	No fendering
Johnson Harbour	C	Good jetty; no fendering
Bleaker Island	C	Satisfactory
Barren Island	C	Satisfactory
George Island	C	Satisfactory
Swan Island	C	Satisfactory
Great Island	C	Beach work only
Ruggles Island	C	Beach work only
Fox Bay West	C	Satisfactory
New Island	C	Jetty collapsed; cargo work difficult
Dunnose Head	C	Jetty satisfactory; no fendering
West Point Island	C	Good jetty
Dunbar	C	Beach work only
Carcass Island	C	Jetty satisfactory; no fendering
Saunders Island	C	Beach work only
Keppel Island	C	Beach work at high tide
Port Howard (ex Packes)	C	Jetty very poor
Sea Lion Island	C	Gulch satisfactory
Sedge Island	C	Beach work only
Golding Island	C	Beach work at half tide rising

The Islander Aircraft has been designed to operate most efficiently in just the sort of conditions experienced in the Falkland Islands. It is economical over short sectors and sufficiently robust to resist a considerable amount of punishment when landing on poor surfaces. Although the passenger accommodation is somewhat spartan, it is adequate for the relatively short Falkland journeys. While criticisms can be made of the aircraft, it is very difficult, if not impossible, to find an alternative of this size and cost which could do the job as well, as few competitors are as robust or cheap. Most aircraft designed for commercial passenger operations are larger and could not be justified by the passenger volumes available, nor could they operate on many of the current Falkland strips. There does not seem to be any case for change at the present time.

The aircraft are hangered beside the runway at Stanley Airport (which will continue to operate principally as an RAF station until 1987) and provide a passenger service on five days a week, with some charter work at the weekends, when aircraft are available. Further description of FIGAS operations is given in Section 3.4.2 below.

Apart from the FIGAS Islanders, there are two privately owned light aircraft in the Islands which are kept at the owners' airstrips (Chartres and Salvador) and flown to Stanley Airport for servicing.

Stanley has an aluminium surfaced runway of some 1,250 metres in length, though it is intended that the aluminium surface will be removed in 1987 and the tarmac surface reinstated.

The new International Airport at Mount Pleasant has a main runway of 2,590 metres and a smaller cross strip. Since its opening in May 1985, there have been two international flights per week from Brize Norton and this will shortly increase to three when the RAF Tristars take over from the British Airways Boeing 747's on the route. Passengers normally make their way to and from the 50 km to Stanley by bus or Land Rover, and because of its remoteness from the main settlements, it seems unlikely that Mount Pleasant will play any significant role in the inland transport system of the Islands for non-military residents, once the construction work is completed.

Apart from the new International Airport at Mount Pleasant there are 38 grass airfields in the camp, as illustrated in Figure 3.3. These airstrips vary considerably in quality, the main problems encountered being the surfaces. Some are very soft in Winter such that operations have to be abandoned on occasions and are marginal at all times. On even the driest of surfaces, though, the frequent landings eventually cause rutting in the turf surfaces and unless heavy rolling or lengthy "resting" of the strip is introduced, progressive deterioration can be expected. These airstrips are provided by the farms and settlements concerned, who are also responsible for their maintenance. Appendix A sets out some of the basic data on these airstrips and some brief comments on their condition.

SEDGE ISLAND
CARCASS ISLAND
KEPPEL ISLAND
PEBBLE ISLAND
GOLDING ISLAND
SAUNDERS ISLAND
WEST POINT ISLAND
DUNBAR
HILL COVE
ROY COVE
PORT HOWARD
WEST FALKLAND
FALKLAND SOUND
CHARTRES
NEW ISLAND
DUNNOSE HEAD
BEAVER ISLAND
WEDDELL ISLAND
SWAN ISLANDS
FOX BAY WEST
FOX BAY EAST
GREAT ISLAND
PORT STEPHENS
SPEEDWELL ISLAND
GEORGE ISLAND
LAFONIA
NORTH ARM
SEA LION ISLANDS
DOUGLAS STATION
SALVADOR
FINCON GRANDE
PORT SAN CARLOS
NORTH FALKLAND
JOHNSON HARBOUR
PORT LOUIS
TEAL INLET
GREEN PATCH
BERKELEY SOUND
SAN CARLOS
ESTANCIA
STANLEY
FITZROY
DARWIN
GOOSE GREEN
MOUNT PLEASANT
MARE HARBOUR
WALKER CREEK
LIVELY ISLAND
BLEAKER ISLAND

Land over 1500 feet
1000 - 1500
500 - 1000
below 500

N

Scale 1 643,000

Miles 5 0 5 10 15 20 Miles

Locations of Camp Air Strips

HFA

Figure 3.3

3.4 Institutions

3.4.1 Coastal Shipping Limited

(CSL) is a company limited by guarantee with 14 members (all of whom are sheep farmers). CSL charters the Monsunen on a bare boat basis and operates her in the way described in Section 3.3.2 above with the objective of maintaining a sevice to the farms at a tariff rate designed to break even, taking one year with another. The profit and loss accounts of CSL for the past five years are summarised in Table 3.6 below.

Table 3.6 : Profit and Loss Accounts for Coastal Shipping Limited 1979-1984

Expenditure	1979/80	1980/81	1981/82	1982/83	1983/84
Charter Fees - M.V.Monsunen	11,985	13,545	13,965	12,987	13,840
- M.V.Forrest	-	-	-	-	5,800
Insurances	4,358	3,940	4,181	5,518	4,101
Stores Consumed - Ship	14,629	8,268	12,886	21,413	27,959
- Catering	3,638	5,095	3,832	5,971	5,551
Fuel	9,143	10,177	10,270	16,676	21,518
Crew Wages	31,136	33,231	32,402	37,630	49,044
Other Crew Costs	1,648	2,121	2,055	2,101	2,314
Repairs and Dry Docking	15,870	19,859	18,484	33,821	12,852
Stanley Office Management	2,500	6,250	7,781	7,969	8,600
Stevedores Stanley	13,228	16,726	12,155	16,746	21,836
Crane and Tractor Hire	4,275	3,218	2,991	8,039	9,980
Overseas Port Charges	4,736	3,192	3,289	4,273	-
Rent, Rates & Maintenance - Stanley	1,296	2,781	1,140	969	1,337
Other Overhead Expenditures	2,790	3,907	7,859	5,283	5,435
Total Expenditure	121,232	132,310	133,290	179,396	190,167
Revenue					
Freight & Wharfage - Stanley	129,631	111,900	101,043	170,686	204,113
- Overseas	23,105	7,705	1,990	4,875	-
Bar Profit	20	22	(88)	15	334
Sundry Income	591	350	112	48,858(1)	1,350
	153,347	119,977	103,057	224,434	205,797
Profit (or Loss) for Year	32,115	(12,333)	(30,232)	45,038	15,631

Source: CSL

Notes: (1) Including £47,846 in Settlement of Military Claim

It can be seen from these accounts that in the aftermath of the 1982 conflict, there was a sharp upsurge in work for the Monsunen (caused both by the requirement to restock and re-equip farms and the necessity to shuttle cargo from West Cove to Stanley) which caused an increase in both revenue and operating costs. In 1984/5 (the accounts for which are not yet complete) carryings fell back and it is anticipated that revenue will amount to only about £140,000, against an operating cost of some £160,000, putting CSL into loss. To counteract this, a 20 per cent increase in freight rates has already been introduced from 1st September 1985, and it may prove necessary to introduce further tariff increases if losses are to be avoided.

In spite of the view, frequently expressed, that CSL freight rates are very high, it is clear that this is not because of the high operating expenditure of the vessel. At £160,000 a year, or say £440 per calendar day, these expenses are very low indeed, by international standards. While there could conceivably be some scope for cost cutting on certain items, the general order of costs compares very favourably with similar operations elsewhere. The fact is that this sort of coastal operation, with small volumes of freight being shipped from a large number of outports over short distances, with a high ratio of cargo handling time to steaming time, is inherently expensive and it is extremely rare to find such opertions covering their costs out of revenue.

By comparison, the Orkney Island Shipping Company which serves the North Isles of Orkney with two small freight/passenger vessels and one small passenger ferry had an operating cost in 1980/81 of some £871,000 of which only £315,400 was covered by revenue, necessitating a subsidy of £555,600 in that year. The parallels are not precise for a number of reasons, and should therefore not be pursued too far, but they do serve to demonstrate the order of magnitude of costs encountered elsewhere in operating this kind of service.

The current cost covering tariff is set out in Table 3.7. This schedule has evolved over the years and has a clear logic, even if it seems to be slightly untidily applied at times. As the freight charge includes not only the freight tariff as such, but also handling costs at Stanley as well as the vessel waiting time at the outport, it is to be expected that charges (on a per mile basis) would rise with the difficulty of the jetty concerned, but more importantly as the distance fell. Most of the ships standing cost is incurred in port as only about 60 days in a year are actually spent steaming.

Table 3.7 : Tariffs Currently Charged by CSL (£ per cubic metre)

Port	Classification	Tariff £	Distance from Stanley n.m.	Cost per n.m. £
Fitzroy	B	24.00	28	0.86
Lively Island	B	24.00	45	0.53
Goose Green	A	19.30	59	0.33
Walker Creek	A	19.30	51	0.38
Salvador	B	24.00	51	0.47
Rincon Grande	C	28.50	48	0.59
Teal Inlet	B	23.50	56	0.42
Douglas Station	A	19.30	56	0.34
Green Patch	A	19.30	57	0.34
Port Louis	C	25.30	24	1.05
Johnson Harbour	C	25.30	21	1.20
Bleaker Island	C	35.00	66	0.53
North Arm	A	25.80	85	0.30
Speedwell Island	B	30.30	99	0.31
Barren Island	C	35.00	97	0.36
George Island	C	35.00	97	0.36
Swan Island	C	35.00	109	0.32
San Carlos	B	30.30	94	0.32
Port San Carlos	A	25.80	93	0.28
Port Sussex	C	35.00	100	0.35
Fox Bay West	C	38.60	120	0.32
Fox Bay East	A	32.40	120	0.27
Port Stephens	A	32.40	145	0.22
Weddell Island	B	36.80	168	0.22
Beaver Island	B	36.80	170	0.22
New Island	C	41.30	167	0.25
Dunnose Head	C	41.30	172	0.24
Chartres	B	36.80	166	0.22
Roy Cove	A	32.40	153	0.21
West Point Island	C	41.30	134	0.31
Dunbar	C	41.30	120	0.34
Carcass Island	C	41.30	130	0.32
Hill Cove	B	36.80	128	0.29
Saunders Island	C	41.30	117	0.35
Pebble Island	B	36.80	96	0.38
Keppel Island	C	41.30	114	0.36
Port Howard	A	32.40	106	0.31
Port Howard(Packes)	C	41.30	107	0.39
Sea Lion Island	C	41.30	74	0.56
Sedge Island	C	41.30	130	0.32
Golding Island	C	41.30	105	0.39

3.4.2 Customs and Harbour Department - m.v. Forrest

As has already been explained the role and operating philosophy of the Forrest are not clear at the moment and this is a point which is returned to in Section 6 below. At present the vessel secures whatever charter work is available about the Islands and offers herself as a general freight carrier (when not on charter) using the same freight tariff as CSL.

The operating costs of the vessel are published in the Falkland Islands Government Annual Estimates. These figures, however, can be somewhat difficult to interpret and in any case are not on a comparable basis of CSL's as:

- o no allowance is made for charter fees, depreciation and capital replacement
- o no specific account is taken for management and other shore based administrative overheads
- o survey and overhaul costs are entered in the year in which they occur (whereas CSL accrues annually for a biennial survey).

Nevertheless, with these limitations, the estimated operating costs in 1984/85 were some £128,000, made up as follows:

	£
Charter fee (nominal)	10,000
Insurance	1,600
Stores consumed - ship	1,850
- catering	4,600
Fuel	22,500
Crew Costs	47,500
Repairs & Dry Docking	29,250
Cargo handling	700
Administration (nominal)	5,000
Other overheads	5,000
	128,000
Less	
Charter fees/freight charges	35,000
Net Cost	93,000

These costs may be somewhat unrepresentative, in that the dry docking was the first for several years and there may have been some backlog to catch up. Equally, certain other cost items seem rather high for reasons which are not entirely clear. Nevertheless, it seems that the true annual cost of the Forrest is unlikely to be less than £100,000 and (barring unforeseen new opportunities for charter work) with revenue at around £35,000 a year, the net cost to the Falkland Island Government is likely to be at least £65,000 a year. Clearly, this is a somewhat unsatisfactory situation and it will be further examined in Section 6 below.

3.4.3 Falkland Island Government Air Service

FIGAS is run directly by the Director of Civil Aviation and his clerk and in addition employs four pilots and six hanger staff. The two BN Islanders (three from early 1986) operate a form of "on demand" air taxi service on the five working days of the week, with occasional charter flights at the weekend, when aircraft are available.

This mode of operations is partially a reflection of FIGAS's origins (as literally a Government air service) and partially because of the difficulties of maintaining any kind of schedule to the 37 different airstrips which it currently serves.

Under the legislation which establishes FIGAS it is obliged to organise its schedules under the following five priorities, in order of importance:

- Emergencies and health care
- Mail distribution
- Government officers or official business
- Civilian passengers
- Freight

Thus, while it has come to be regarded by the public very much as a commercial air service, the normal carriage of passengers and freight come low on its list of official priorities and when there is a limitation on aircraft availability (e.g. when an aircraft is grounded for repairs or routine servicing) it has sometimes been necessary to restrict ticket sales to the public.

The schedule for each day's flying is worked out late in the afternoon of the previous day, when the bookings are arranged into a route which minimises flying time (within the constraints imposed by weight restrictions at some of the poorer airstrips). The passenger lists and routings are then announced on the Falkland Islands Broadcasting Service that evening.

Flights normally leave Stanley at 8.15 a.m., although sometimes afternoon schedules are also arranged if warranted by demand. This policy of meeting virtually all demand on the day required (if capacity is available) means that the routes flown are sometimes very indirect and can involve passengers flying considerably greater distances than their "crow fly" travel distance. Thus, even though the aircraft may be full at all times, the "revenue distance" is considerably less than the flying distance, giving very low effective capacity utilisations. As a simplified example let us assume that the schedule on any particular day is Stanley-Port San Carlos-Port Stephens-Fox Bay East-Darwin-Sea Lion Island-Stanley, and that

there are 2 passengers to each of the first four destinations and one to Sea Lion Island, with an exactly similar number of passengers travelling from each settlement back to Stanley. Each of the nine passenger seats will therefore be occupied throughout the 292 nautical miles of the flight. But the fares are based on the flying distance between Stanley and the airstrip concerned - in this hypothetical case, a total of some 1,275 passenger miles. The seat miles flown on this schedule are, however, 9 x 292 = 2,628 nautical miles. Thus, the effective utilisation is only 48 per cent.

Tariffs are not, though, entirely based on distance travelled, but consist of two elements: a boarding fee of £13.00, plus a distance element of 34 pence per mile, which is rebated by non-Government residents to 21 pence per mile. In addition (for non-Government Falkland Islands residents) there is a maximum fare of £28.50. Freight is charged at a rate of 18 pence per pound, with a minimum of 50 pence per item. The tariff is set by Legislative Council on an annual basis and is determined more by reference to equity than to cost recovery.

It may be interesting to compare these fares with those charged by Loganair for their scheduled services from Kirkwall to the North Isles of Orkney, an average flying distance of some 29 miles. The fare here is £15.50 single or £25.00 return (with North Isles residents permitted 2 discount vouchers of £2 per year). On this basis FIGAS fares seem fairly high, yet it must be remembered that the type of service being offered is quite different and it is inevitable that FIGAS's costs will be higher, carrying, as they do, so few passengers to so many destinations. (For comparison, Loganair carry some 18,000 passengers a year to and from six airstrips out of Kirkwall). Thus, it is not surprising that FIGAS requires a considerable subsidy, as the summary accounts set out in Table 3.8 show.

Not too much should be made of the figures from before the 1982 conflict, since the accounting basis, as well as the type of operation was very different at that time. However, more recently it can be seen that in 1983/4, when revenue was high because of good aircraft availability and sales were made to military and expatriate contractors personnel, some 69 per cent of costs were covered by revenue. In 1984/5 this fell to below 50 per cent, in spite of the fact that no expenditure was incurred on Stanley Airport (other than the hanger) as facilities were provided free of charge by the RAF.

Table 3.8 : FIGAS Costs and Revenues 1980-1985

£

	1980/81	1981/2	1982/3	1983/4	1984/5 Estimated
Revenue					
Passenger Revenue)					(170,000
Freight charges)	83,715	72,270	48,415	217,380	(8,500
Mail delivery)					(20,000
Other	5,420	2,570	5,292	14	-
	89,135	74,840	53,707	217,394	198,500
Expenditure					
Variable Costs					
Petrol and Lubricants	93,930	35,785	84,010	93,630	150,000
Materials and Spares	54,554	16,263	12,174	41,984	45,000
Maintenance Fund	40,267	7,580	27,006	296	20,000
	188,751	59,628	123,190	135,910	215,000
Fixed Costs					
Salaries)				(72,389	66,828
Wages)	62,504	81,107	54,617	(13,144	16,900
Other staff costs)				(-	9,825
Insurance	9,662	9,086	9,500	25,713	25,000
Vehicle costs and replacement	4,663	3,642	4,900	10,429	9,000
Aircraft replacement fund	50,000	50,000	50,000	50,000	50,000
Hanger equipment and rent	1,599	160	757	3,037	3,500
Other general overheads	6,169	9,824	11,396	5,390	9,513
Stanley Airport	31,881	23,040	12,200	-	-
Special expenditure	1,296	-	-	686	9,367
	167,774	176,859	143,370	180,788	199,933
	356,525	236,487	266,560	316,698	414,933
Deficit	267,390	176,859	212,853	99,304	216,433
Deficit as proportion of total expenditure	75%	75%	80%	31%	52%

It is difficult to do any very detailed analysis of the operating accounts for FIGAS since data on passenger miles, aircraft flying hours, etc, is not readily available. However, in 1983/4 FIGAS carried some 7,700 passengers and in 1984/5 an estimated 7,300 passengers. On a crude average basis, costs and revenues per passenger carried were as follows:

	1983/4	1984/5
Revenue	£28.20	£27.20
Variable cost	£17.60	£29.43
Total cost	£41.10	£56.80
Government contribution	£12.90	£29.60

These figures could be the result of accounting and statistical anomalies, but if they are an accurate reflection of the true situation, they present a worrying picture. Not only have costs risen substantially over a 12 month period, but, more importantly, the variable costs for 1984/5 exceeded revenue. Whereas on the 1983/4 results, an increase in passenger carryings would have reduced the overall deficit (with any additional revenues amounting to more than the variable costs of providing the additional service) the reverse was true in 1984/5. Thus, without some fairly major rise in fares, the prospect is for an ever increasing financial deficit for FIGAS, if it continues to be operated on the present basis. This point is returned to in Section 6 below.

3.5 Resources

As in any country, the total resources available to the transport sector are limited - limited by total national income, by government income and expenditure and by the extent to which available resources are devoted to transport rather than other sectors.

The Falkland Islands have no readily available figures for National Income, though in 1982 the Shackleton Commission estimated a figure for 1980 of some £4.375 million. Since then, Government revenue has risen some $2^1/2$ times, though it is probable that this has risen far more rapidly than GNP. Current GNP may therefore well be in the range £8-10 million.

It is interesting to compute in very round terms what proportion of this National Income is spent on internal transport, simply to give an "order of magnitude" assessment of the importance of the transport sector to the Falkland economy.

Air Transport	-	£470,000	(Estimate FIGAS 1985/6)
Shipping - CSL	-	£160,000	(1984/5 estimated)
- Forrest	-	£100,000	(see Section 3.4.2 above)
Roads - PWD (roads)	-	£123,000	(1985/6 Estimates)
- Capital expenditure		£135,000	(1985/6 Estimates)
- Private costs	-	£300,000 - £600,000(1)	
		£1.3 - £1.6 million	

Thus, it seems likely that about 15 per cent of total national income is being spent in the transport sector alone.

Looking purely at Government revenues, estimated Ordinary Expenditure for 1985/6 is £5.488 million, out of an estimated revenue of £5.599 million. Of this expenditure some £424,000 or 7.7 per cent is directly transport related:

FIGAS Deficit	£242,000
MV Forrest (net)	£ 59,000
P.W.D. (roads)	£123,000

In addition there is considerable expenditure on the purchase, operation and maintenance of Government vehicles, together with over £70,000 budgetted for Government use of FIGAS services, as follows:

Mail	£20,000
Medical	£18,000
Education	£ 9,520
Fox Bay Village	£ 1,000
Agriculture	£ 5,200
Justice	£ 600
Police	£ 700
Secretariat	£ 3,920
Legislature	£ 2,700
ARC	£ 9,000

(1) Estimated as 900 vehicles x 1000-2000 km per vehicle x 37 pence per vehicle km

Budgetted development expenditure for 1985/6 amounts to some £1.091 million of which some £180,000 or 16 per cent is on the internal transport system, namely:

Jetty, Fox Bay Village	-	£50,000
Workshop, Islander Hanger	-	£15,000
Assistance to Camp Link Roads	-	£30,000
Estancia Road	-	£105,000

This development expenditure is partly financed by the British Government out of the £31 million set aside in 1983 for Falkland Islands development, sometimes known as the "Shackleton money". It is interesting to compare the actual expenditures with those suggested in the 1982 Shackleton Report itself. This suggested that between £31 and £36 million (in 1982 prices) should be spent on development between 1984 and 1988. The figures were broken down as follows:

Expanded Government Services	£3.6 million
Transfer of Farm Ownership	£14-£19 million
Development - FIDC	£2.8 million
Agriculture and Fisheries	£2.8 million
Infrastructure - Roads	£5.0 million
- Deep Water Jetty	£3.0 million

This means that between 22 and 26 per cent were ear-marked for infrastructural development and, of this, well over half was intended for the internal transport system.

4. Existing Traffic Flows

4. EXISTING TRAFFIC FLOWS

4.1 Passengers

Data on the existing pattern of movement around the Falkland Islands is scanty and difficult to interpret. FIGAS have records of ticket sales going back over a considerable period. However, these are largely unanalysed. During the current study some analysis was carried out of FIGAS passenger movements during 1985 and this has been compared with the only previous known work on internal air passenger movements (that done in 1977 by Jones and Orme[1]). These analyses have revealed some interesting features, but not too much significance should be attached to the results as they cover a relatively short period, and passenger carryings by FIGAS are subject to considerable short term fluctuations because of a series of influences such as aircraft availability.

No information of any kind has been found regarding personal movement by vehicle. No traffic counts appear to have been made on camp tracks, and estimates by analogy appear to be the only way of establishing a base pattern of movement by this mode.

4.1.1 Air Passengers

During the 1970's, when the main operational aircraft used by FIGAS were Beaver floatplanes, the average number of passengers carried per year was about 4,000, with a maximum of 5,200 in 1975. Since the resumption of the service after the 1982 conflict when all of the FIGAS aircraft were damaged beyond repair, the total passenger carryings were 4,940 in 1983, 8,834 in 1984 and 4,114 in the first 8 months of 1985. The reason for the fall between 1984 and 1985 seems to have been a combination of the opening of the Mount Pleasant Road in June 1984 and the loss of military passengers at about the same time. This was brought about because of limitations on FIGAS capacity when one of the Islander aircraft went out of service for two months while repairs were effected to a badly damaged undercarriage. This can be quite clearly seen in a monthly passenger analysis where FIGAS carried an average of 840 passengers a month in the first five months of 1984, but only an average of 660 per month in the remaining 7 months. It is estimated that current passenger carryings are at about the same level, i.e. approximately 7,000 per year. This figure may be regarded as representing the use made of the service by the resident civilian population and represents a fairly high rate of growth over the past ten years, of the order of 5 1/2 per cent a year.

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(1) The Development of the Transport System of the Falkland Islands by G S Jones and J R Orme 1977 (Unpublished)

A more detailed analysis of origins and destinations was carried out for a sample period from May to August 1985 inclusive, covering some 2,150 individual trips. The full results of this analysis are set out in Appendix B, but the salient points are as follows:

	No.	Proportion
Stanley/E.Falkland airstrips	721	33.5%
Stanley/W.Falkland airstrips	1,077	50.0%
Other journeys	356	16.5%

This is in marked contrast to the pattern of movement in 1976 (revealed by the Jones and Orme analysis alluded to above) where the relevant distribution of air trips was as follows:

	No.	Proportion
Stanley/E.Falkland airstrips	1,668	49.6%
Stanley/W.Falkland airstrips	1,218	36.2%
Other journeys	478	14.2%

If the 1985 figures are converted to an annual basis and the results compared with the relevant camp populations to give a figure for air journeys per head of camp population, the resulting change in the patterns of internal passenger movements by air becomes even more clear:

	1976	1985
Total airjourneys per head of camp population	4.5	11.7
Stanley/E.F. per head of E.F. camp population	4.0	8.0
Stanley/W.F. per head of W.F. population	3.7	11.6

This shows that whereas the propensity to make air journeys has increased by some 2.6 times over the period, that in East Falkland has doubled, while in West Falkland the increase has been some 3.1 times.

Air fares have in fact increased slightly in real terms over this period (by almost 10% to East Falkland and about 20% to West Falkland) and the enormous rise in patronage demonstrates the great growth in demand for personal mobility which has occurred over the period. When the analysis is extended to the settlement level, the effects of the increased surface accessibility brought about by the opening of the Mount Pleasant Road can be seen quite clearly. While great care must be used in interpreting these results because of the very small populations involved, and other factors such as sub-division also play a part, it can be seen that the settlements on the Southern part of East Falkland generated only 6.3 air journeys per head of population, compared with 10.9 for the more remote communities on the North of East Falkland and an average of 11.6 for West Falkland as a whole.

4.1.2 Vehicle Journeys

As has already been mentioned, there are no available statistics on personal movement by vehicle in the Falklands. Since it is extremely difficult and costly to take a vehicle across the Falkland Sound at present, it can be assumed that virtually all vehicle journeys are confined to the individual Islands concerned. In West Falkland these journeys are likely to be relatively few, since there is no centre of population and contacts between the settlements are, by and large, fairly infrequent.

On East Falkland, however, land communication is possible between the camp settlements and Stanley and it is clear from discussions with residents that these journeys are made from time to time, particularly in Summer when driving conditions are easier. While it is not possible to make anything more than an educated guess as to the volumes involved, it is interesting to look at trip generation in other areas which are in some way comparable with Falkland conditions. In 1981, Halcrow Fox and Associates carried out a study of the transport system serving the North Isles of Orkney. The six outer islands (i.e. Sanday, Stronsay, Eday, Westray, Papa Westray and North Ronaldsay) have a population of about 2,000 in total and in 1981 generated some 30,000 one way journeys between the islands and Kirkwall, the capital of Mainland Orkney. Of these journeys, some 60 per cent were by air (Islander aircraft operated on a scheduled service by Loganair) and the remainder by boat. In other words there was a trip generation of some 15 trips per island resident per year.

While there are many differences between the Falkland Islands and the North Isles of Orkney, the functional, social and economic relationship between Kirkwall and the North Isles is not all that different to that between Stanley and the East Falkland camp, nor are journeys strikingly easier to make nor less costly.

Thus, it seems reasonable to assume that on average there will be at least 15 journeys per head of camp population per year between Stanley and the East Falkland camp communities. (Note: this does not mean that each camp resident makes 15 journeys per year. Many of the journeys will be made by Stanley residents. It is simply an analytical convenience to measure trip generation in this way).

On the basis of the 15 one way journeys per head per year and taking into account the known air trips set out in Section 4.1.1 above, it seems likely that some 3,000 significant overland journeys are made each year of which about 2,500 are on East Falkland, as follows:

	To/From Stanley	Other E. Falkland
Bluff Cove	60	15
Darwin/Goose Green	660	160
Douglas	75	20
Fitzroy	290	60
Green Patch	170	45
Johnson Harbour	45	10
North Arm	130	30
San Carlos/Port San Carlos	120	30
Salvador	110	25
Teal Inlet	70	15
Walker Creek	180	50
Port Louis	55	15
Rincon Grande	55	15

While such a tabulation is unlikely to be accurate in detail, the broad aggregates probably conform reasonably closely to reality. They have been converted to vehicle numbers on the basis of an average of 1.5 persons per vehicle and plotted on a schematic diagram in Figure 4.1. It should be emphasised that these are very much minimum estimates, that they refer only to mid 1985 and include only traffic between the various settlements themselves and between the settlements and Stanley.

4.2 Freight

Internal freight is carried almost exclusively by sea, most by CSL in the m.v. Monsunen, with some carried in the Government vessel m.v. Forrest. Light packages, some perishables and small urgent items are also carried by air in the FIGAS Islanders.

The freight inbound to Stanley consists very largely of wool in bales, although some other cargoes such as furniture and personal effects are also carried. Outgoing freight consists of farm materials, stores, gas oil and occasional vehicles. Live animals are also occasionally carried between farms.

4.2.1 Coastal Shipping

It is difficult, and could be confusing, to express the volumes of cargo moved by coastal shipping in common units (such as weight tons). Records are maintained in terms of number of bales (for wool and skins), shipping tons (for general cargo) i.e. which ever is the greater of a cubic metre or a weight ton, and in numbers of units (for mutton carcasses, beef quarters or live animals).

Table 4.1 summarises the coastal freight movements for the seasons 1983/84 and 1984/85 (a shipping year is from October to the following September). The majority of this cargo was carried by the m.v. Monsunen, though important contributions were made by the m.v. Forrest with occasional shipments by the m.v. St Angus. The totals are necessarily approximate, but represent fairly accurately the orders of magnitude involved.

Table 4.1 : Volumes of Cargo carried by Coastal Vessels 1983 to 1985

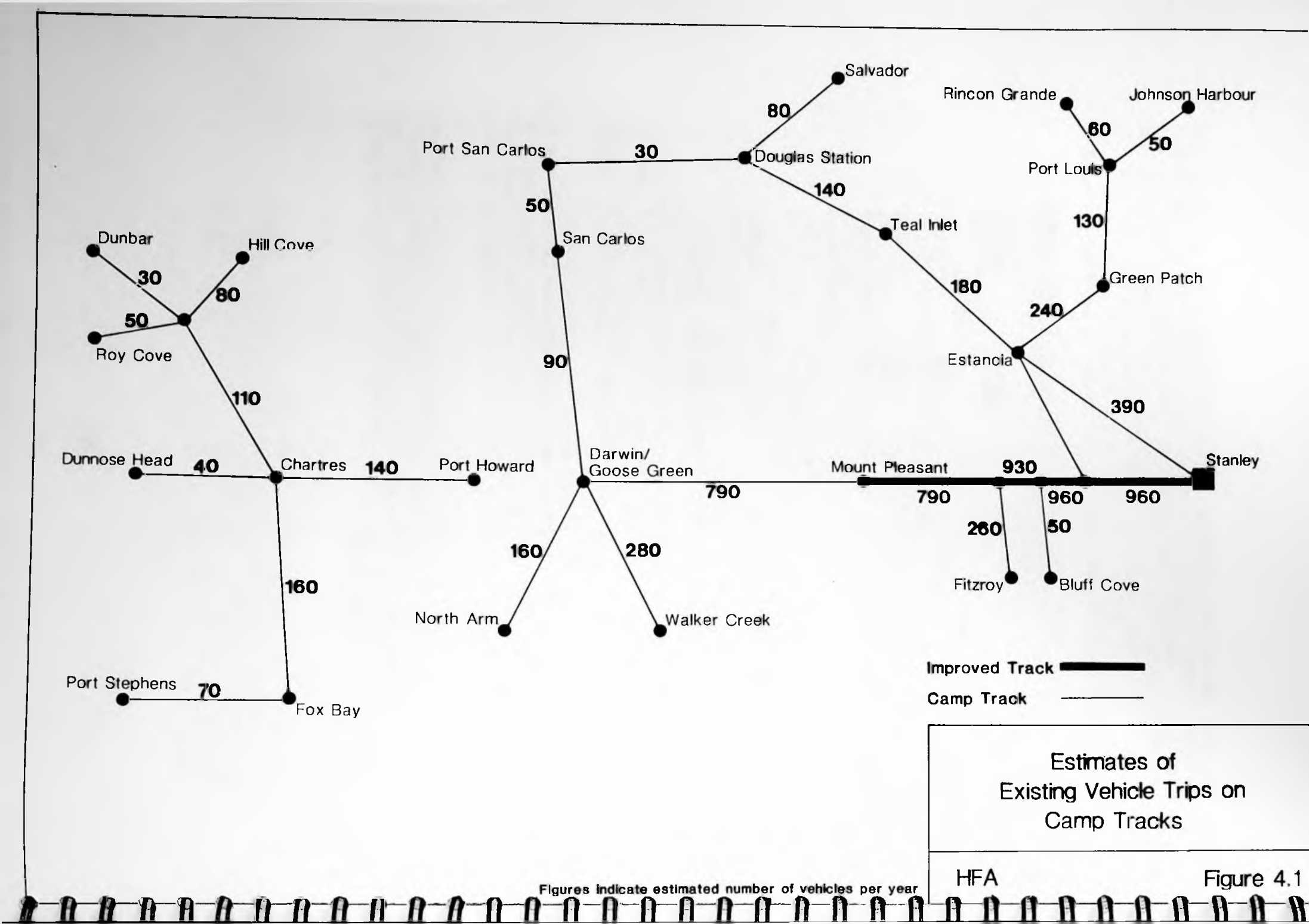
	1983/4	1984/5
From Camp		
Wool (in bales)	8,359	8,135
Sheep skins (in bales)	94	129
General cargo (ship tons)	165	118
Mutton carcasses	320	425
Beef quarters	170	192
To Camp		
General cargo (ship tons)	1,996	1,844
Stock Movement		
No. of animals	10,337	8,854

Sources: Records of CSL and Falkland Islands Customs

As far as the distribution of this cargo between settlements is concerned, that of the wool clip for 1983/84 is given in Table 4.2 below. It is probably a reasonable assumption that the general cargo is distributed according to a roughly equivalent pattern.

It should be noted that the figures given in Table 4.2 are in weight. This will not be strictly equivalent to the number of bales originating on any individual farm since the bales vary considerably in weight, according to the type and size of wool press used.

Since wool represents the largest volume and is the limiting factor as far as freight capacity is concerned, future freight systems have been designed around the requirements set by the wool clip. On this basis, present traffic volumes are about 2,250 tonnes of wool.



Estimates of
Existing Vehicle Trips on
Camp Tracks

Figures indicate estimated number of vehicles per year

HFA

Figure 4.1

Table 4.2 : Distribution of Wool Clip between Farms 1984/85

Harbour		Farm	Total Wool Clip kg000	% of total
San Carlos	-	Wreck Point	13	0.6
San Carlos	-	Waimea	16	0.7
San Carlos	-	Maryfield	12	0.5
San Carlos	-	Blue Beach	25	1.1
San Carlos	-	Greenfield	11	0.5
San Carlos	-	Kingsford Valley	9	0.4
Port Sussex	-	Port Sussex	10	0.4
Salvador	-	Salvador	52	2.3
Goose Green	-	Darwin/Walker Creek	364	16.2
Fitzroy	-	Fitzroy	90	4.0
Green Patch	-	Long Island	10	0.4
Green Patch	-	Horseshoe Bay	22	1.0
Green Patch	-	Mount Kent	9	0.4
Green Patch	-	Brookfield	12	0.5
Johnson Harbour	-	Berkeley Sound	50	2.2
Port Louis	-	Port Louis	34	1.5
Douglas Station	-	Douglas Station	49	2.2
Port San Carlos	-	Port San Carlos	98	4.4
Teal Inlet	-	Teal Inlet	78	3.5
Rincon Grande	-	Rincon Grande	29	1.3
North Arm	-	North Arm	227	10.1
Port Howard	-	Port Howard	141	6.3
Hill Cove	-	Hill Cove	121	5.4
Dunnose Head	-	Shallow Harbour	13	0.6
Dunnose Head	-	Dunnose Head	11	0.5
Dunnose Head	-	Narrow Farm	14	0.6
Port Stephens	-	Port Stephens	125	5.6
Fox Bay West	-	Fox Bay West	95	4.2
Fox Bay East	-	Coast Ridge	20	0.9
Fox Bay East	-	Lakelands	19	0.8
Chartres	-	Little Chartres	18	0.8
Chartres	-	Chartres	98	4.4
Packes Port Howard	-	Bold Cove	11	0.5
Packes Port Howard	-	Manybranch Farm	10	0.4
Roy Cove	-	Crooked Inlet	11	0.5
Roy Cove	-	Boundary Farm	13	0.6
Roy Cove	-	Hope Harbour	11	0.5
Roy Cove	-	Pickthorne	11	0.5
Roy Cove	-	Port North	14	0.6
Dunbar	-	Dunbar	12	0.5
Weddle Island	-	Weddle Island	35	1.6
Saunders Island	-	Saunders Island	31	1.4
Pebble Island	-	Pebble Island	42	1.9
Carcass Island	-	Carcass Island	6	0.3
Sea Lion Island	-	Sea Lion Island	6	0.3
West Point Island	-	West Point Island	9	0.4
Speedwell Island	-	Speedwell Island	23	1.0
George Island	-	George Island	10	0.4

Table 4.2 : Distribution of Wool Clip between Farms 1984/85 (cont...)

Harbour		Farm	Total Wool Clip kg000	% of total
New Island	-	New Island	6	0.3
Sedge Island	-	Sedge Island	2	0.1
Lively Island	-	Lively Island	24	1.1
Bleaker Island	-	Bleaker Island	9	0.4
Keppell Island	-	Keppell Island	11	0.5
Golding Island	-	Golding Island	6	0.3
Great Island	-	Great Island	10	0.4
Box Island	-	Box Island	1	0.1
	-	Estancia (1)	11	0.5
	-	Murrell River (1)	9	0.4
	-	Bluff Cove (1)	9	0.4
	-	Stanley Dairy (1)	-	-
	-	Riverside	1	-
		Total	2,252	100.0

Note: (1) Wool from these farms is moved into Stanley by tractor and trailer overland.

4.2.2 Air Freight

The volume of freight carried in the FIGAS Islanders makes up only a tiny proportion of total internal freight movements in the Falklands (by weight), but is nevertheless providing an significant service to the camp community. The ability to move urgently required spare parts, mail, perishable items, video cassettes, etc, is important when coastal vessels visit a remote settlement only once every three months or so. Freight carryings by FIGAS have shown a marked increase in the last 18 months, as Table 4.3 shows.

Table 4.3 : Freight Carried by FIGAS

Year	Freight Carried lbs
1970	8,486
1975	19,000
1983	38,539
1984	80,105
1985 (1st 4 months)	21,503

4.2.3 Overland

As far as is known very little freight is carried overland between Stanley and East Falkland camp settlements. Recorded volumes of wool carried overland are as follows (in bales):

	1983/4	1984/5
Bluff Cove	79	48
Estancia	37	40
Murrell	112	58
Stanley Butchery	49	118
	277	264

This represents only some 3 per cent of the total wool clip.

5. Future Demand for Transport

5. FUTURE DEMAND FOR TRANSPORT

5.1 General

Conventionally, in national transport studies, the future is seen in terms of a general growth in a base level of transport demand brought about by increasing economic activity and personal incomes. The distribution of this demand is influenced by changing settlement patterns and specific new development projects. There may also be traffic generation caused by new transport infrastructure itself releasing pent up demand.

All these influences are present in the Falkland Islands, and will be dealt with below. However, as far as personal journeys are concerned, the current state of underdevelopment of the transport system and the consequent difficulty and expense of personal mobility has inhibited movement to a level where the present matrix of journeys probably provides a very inadequate base from which to make future projections. Moreover, very little is known about this base matrix (other than air journeys). However, it was not felt worthwhile undertaking surveys to extend this knowledge, since any substantial investment in the transport sector is likely to generate so much traffic that the existing base would provide little guide to the future.

Some tentative estimates of existing personal movements were made in Section 4, but these are very much educated guesses, as also are any forecasts of future traffic, particularly in those cases where major new works are proposed.

In the case of freight movements, knowledge of the existing picture is much more secure. Nor is much traffic likely to be generated by improvements to the transport system, since these movements are largely derived from the economic activities of the islands, where major change and growth are difficult to see, even if the constraints of the present transport system were eased. A more difficult question to answer is whether existing traffic levels will be maintained without improvements to the transport system, since some have argued that, without this, continued population decline in the camp will be experienced and eventually it will be difficult to find the manpower to maintain present production levels.

5.2 Changing Settlement Patterns

The traditional settlement pattern in the camp was relatively centralised within each of the large farms. Although there used to be a number of shepherds living in outlying cottages, the number of these has fallen markedly in the past two or three decades. Most of the farm employees are now concentrated at the central settlement which, besides housing, contains the shearing sheds, mechanical workshops and other

main farm buildings, the settlement store and social club, a jetty and more latterly, an airstrip. The responsibility for providing and maintaining these facilities is that of the farm owner or manager and, by and large, that responsibility has been fulfilled with the labour and funds at his disposal. Because of this centralisation, the transport demands for both freight and passengers was also reasonably concentrated and fairly well adapted to economical servicing by sea and air.

The more recent policy of subdivision of these large farms operated by hired labour, into smaller, family owned and run units, however desirable from a social and economic point of view, has created some problems for the transport planner.

When the farms are subdivided, the new owner occupiers quite naturally no longer wish to live in the old settlement, but on the land which they own and work. They also want their own facilities, such as shearing sheds, jetties and airstrips.

However, the subdivision of large farms requires a lot of capital and the new owner occupier, (who already has to find cash to service the mortgage which enabled him to buy the farm) has other projects competing for his limited funds, such as fencing his new property, the purchase of stock and farm equipment, etc. Thus, very often, he is content, at least for the first few years, to continue to use the old settlement transport facilities of jetty and airstrip. Maintenance, though, has now become difficult. The former direct responsibility for maintenance has become diffused into a number of hands, some of whom live at a distance from the facilities concerned. But it is not simply a question of the difficulties of organising co-operative action and finding the funds in the face of competing requirements. When a settlement employed, say, ten hands, it was easy enough for the owner or manager to detach one or two of these from strictly farming duties during the slack period to do some maintenance work on the jetty. When each of the subdivisions has only one or two family workers, it is difficult to detach anyone from any particular subdivision to attend to the transport facilities of the group, without that one subdivision suffering considerable neglect and disadvantage.

Thus, the former settlement facilities are tending to deteriorate from lack of maintenance, while the more dispersed pattern of housing increases the difficulties of providing camp tracks of an adequate standard to every inhabitant. So far, subdivision has taken place at Green Patch, Roy Cove, Packes and San Carlos. It is not clear at the moment which further farms are to be subdivided, nor how quickly the process will proceed. However, the pressure for subdivision remains, and it seems virtually certain that the number of farm units will increase and the pattern of settlement become increasingly dispersed.

Whether this process will eventually reverse the erosion of population from the camp or increase the physical output of wool remains to be seen. The individual farmsteads cannot, of course, afford the specialised services which some of the settlements have, such as skilled mechanics or small primary schools, and are thus more dependent upon itinerant services based normally in Stanley. The only exception to this is Fox Bay Village, though this is likely to remain an isolated experiment for the time being, due to the expense of setting up and maintaining such a community.

Assuming that the subdivisions are successful, however, it is more likely that they will retain members of the family on the farm. For the purposes of this study, a 10 per cent increase in camp population is assumed by 1995.

Similar considerations apply to the volume of the wool clip. To a large extent this volume is determined by ecological balance. Increased stocking rates on unimproved pastures has tended simply to reduce wool yield per animal, with a more or less unchanged total clip. However, numerous experiments are now taking place with pasture improvement and reseeding, as well as a higher degree of pasture management. The results of these experiments are as yet far from conclusive, but there is considerable evidence of scope for economically increasing yields. Such schemes do not mature rapidly, however, and require considerable inputs of skilled management, patience and capital investment. For this report an increase in the total wool clip of 15 per cent is assumed by the year 1995.

5.3 Changing Social Patterns

Camp society has been and remains a very isolated one. Medical services are provided from Stanley on the basis of periodical doctors visits, radio consultations and the occasional doctors flight for emergency consultations or evacuation to hospital. Education is provided at the secondary level through residential facilities in Stanley and at the primary level through small settlement schools or itinerant camp teachers. Other government services, such as agricultural officers visiting the farms and settlements, are provided by air or overland in Land Rovers. Apart from this, social life is very self-contained and centres around the social club, where one exists, the home video and local social events. The annual trip to the "races" and the occasional "two nighter" form, for many people, the only significant social contacts outside their own settlement.

"True campers" express themselves very satisfied with this way of life and often treasure the solitude and isolation, taking no pleasure in what is seen as the pressure and hurly-burly of life in Stanley. Self-sufficiency and the opportunities for contemplation, conversation and the pleasures of being part of a closely knit, internally self-supporting small community can be very real.

Nevertheless, experience elsewhere has shown that when the opportunities for mobility and greater social interaction are presented to isolated rural communities, these opportunities are normally taken, particularly by the young. Equally, such opportunities, which sometimes demonstrate the advantages of a wider range of choice and contacts to those who were unaware of them before, can have a corrosive effect on communities. The revolution in camp social life brought about by the once scorned "video" demonstrate the potential for change which increased transport opportunities could bring.

It has frequently been argued that by opening up social opportunities to the camp communities, it would be easier to retain population there. This may be true, but is an argument which must be handled with care. In the Orkneys, the more isolated North Isles have been more successful in retaining population than those South Isles which are now linked to Mainland by causeways. It almost seems as though the greater social contact with Mainland offered to these South Isles communities, eroded the very qualities which gave them their special character. Greater accessibility could even have accellerated depopulation.

Nevertheless, the Falkland situation is very different to that of the Orkneys. Certainly at present, when the whole of the Falkland community is characterised by a shortage of labour and difficulty is found in attracting and retaining in camp the skilled labour so essential to farming operations, it is likely that improved communications would assist farm owners and managers in retaining their labour force and increasing its quality.

Equally, if communications were substantially improved it would be possible for farms to make increasing use of specialised services in Stanley as well as, possibly, supplying more of the needs of that community. Undoubtedly a very different pattern of life could emerge in camp with considerably enhanced personal mobility for social reasons and a more efficient economy able to take greater advantage of the specialisation of labour.

5.4 New Economic Activities

As has already been mentioned, there are very few economic activities outside Stanley, other than sheep farming. This is not purely a function of poor communications, but primarily a result of the limited natural resource base. This is the key to any consideration of new economic activities which might be stimulated by an improved transport system. The very remoteness of the Falkland Islands from the main centres of the world economy and the restricted domestic demand, makes it extremely unlikely that any economic activity other than one based on local resources could be successful.

While there has been speculation about, and some investigations into, natural resources such as minerals, crude oil and the naturally occurring kelp, nothing has shown sufficiently encouraging prospects for it to be taken into account in designing a transport development plan for the next ten years. Opportunities for economic development are thus limited to the land, the products of that land, the fisheries, and the natural beauties of the landscape and the wildlife which can form the basis of a tourist industry.

As far as the land is concerned, sheep farming has already been discussed, and it seems reasonable to expect some modest increase in wool production in the years ahead. Any major move into other products seems unlikely, though. The production of sheep meat for export has been tried on a number of occasions, and so far the results have not been encouraging. A very large volume of production is necessary before the economics of transport to market become attractive. Nor do the sheep becoming available for slaughter from current farming practices have much market appeal. This is not to say that any new initiative to export sheep meat would be doomed to the expensive failure of its predecessors, but a recent feasibility study for converting the slaughter house and exporting meat was not very encouraging. Sheep meat will continue to be produced for the Stanley market and for other consumers such as the military and possibly, off-shore fishing fleets, but a major industry with significant internal transport implications does not seem likely at the present time. The same considerations apply to beef.

The domestic processing of wool does, however, appear to have much brighter prospects. The Falkland Woollen Mill at Fox Bay East is already producing an undyed yarn which finds a ready local market for knitting into sweaters. The wool is of a high quality and there seems every likelihood that an economically exportable product can be developed. The high returns necessitated by the transport problems inevitably mean that such products should be at the fashion end of the market which will entail close liaison with marketing and design organisations overseas and the kind of rapid response from the production end which can only be obtained by using airfreight from the Falklands to overseas markets.

The In-Shore Fishery Project is still in the experimental and development stage, though already there are indications that a high quality marketable product may be obtained. This, too, though would require air freight to market and, in view of the volumes involved, would almost certainly have to be based in Stanley if it were to have a chance of commercial success.

The most promising industry, based on local resources, remains tourism. The superb natural wildlife of the Falklands, the scenic beauty and the remote empty landscapes can be expected to attract a limited but significant number of visitors, in spite of the travel costs, once suitable accommodation can be arranged. Some parties will be arriving in 1985/6 and it is expected that this will grow to some 1,000 visitors a year within three years or so. Such tourists will probably be organised into groups of nine and visit up to four locations in the Falklands apart from Stanley itself.

FIDC are already actively assisting in the provision of hotel facilities at Sea Lion Island, Port Howard and Pebble Island and further developments can be expected at such locations as Volunteer Point, Carcass Island, New Island and Port Stephens. The transport of these visitors around the Islands will almost certainly be by air and thus a demand for some additional 5,000 internal air trips can be foreseen by 1988 or 1989. Whether tourist numbers will show much growth thereafter must be open to conjecture. But the high costs of access to the Falkland Islands coupled with limited absorbtive capacity may put considerable constraints on further development thereafter.

5.5 Conclusions

The above discussion suggests that over the next ten years, the volumes of freight moving about the Falkland Islands are unlikely to change significantly, though the critical wool clip will increase to perhaps 2,500 tonnes.

Passenger movements are, however, less easy to predict, and depend to some extent on the state of the transport system itself. If no significant improvements are made to the system of camp tracks, and air services remain much as they do now, then the scope for growth in trip generation by Island residents is probably limited and the only major increases in demand will come from tourists. If, though, at the other extreme, a complete system of all weather surfaced camp tracks were installed, reaching to virtually all settlements on East and West Falkland and connected by a ferry service across the Falkland Sound, then a very considerable increase in personal trips could be expected. For comparison, a recent tabulation of passenger trips between some of the Scottish Western Isles and the Scottish mainland are set out in Table 5.1.

Table 5.1 : Trip Generation in Selected Scottish Islands - 1983

Island/Group	Islay/Jura	Colonsay	Mull	Coll/Tiree
Population	4,330	140	2,720	910
Distance from Mainland - miles	30	32	8	40/52
Total Estimated Passenger trips, excluding tourists:				
Foot passengers on ferries	41,100	5,000	112,300	8,400
Air passengers	8,330	-	-	3,000
Car passengers on ferries	51,500	2,550	58,050	6,750
	100,930	7,550	170,350	18,150
Trips per resident	23	54	63	20

Once again, caution is advised in interpreting these results as each island has its own special circumstances and the journeys in question are made between small offshore islands and the major land mass and economic centre of Scotland. Nevertheless, it is clear that the scope for increased trip making is large, if land communications were to be substantially increased. For future transport planning purposes, it will be assumed that, as a maximum the following trip generation factors would apply:

West Falkland	30 trips per camp resident per year
East Falkland	20 trips per camp resident per year
Islands	15 trips per island resident per year

In addition, there will be the 5,000 tourist trips per year mentioned above.

In Appendix C these factors, together with a consideration of the existing matrix, have been used to derive forecasts of total passenger flows in 1995 over each of the three transport systems derived in Section 7. The results of this exercise are summarised in Table 5.2

Table 5.2 : Passenger Forecasts for 1995

Camp	Camp Tracks	Domestic Air trips	Tourist Air trips	Total Air trips	Total Trips
1985-Estimated	3,080	7,000	-	7,000	10,080
1995-System 1	3,900	7,700	5,000	12,700	16,600
-System 2	16,500	2,700	5,000	7,700	24,200
-System 3	12,250	4,250	5,000	9,250	21,500

6. Potential Developments in Internal Transport

6. POTENTIAL DEVELOPMENTS IN INTERNAL TRANSPORT

6.1 Camp Tracks

Without doubt, the central issue which this Report has to consider is the construction of improved camp tracks. The overwhelming weight of public opinion in the Islands appears to be behind a programme of camp track development and this was expressed by virtually every individual, business or association contacted during the preparation of this Report.

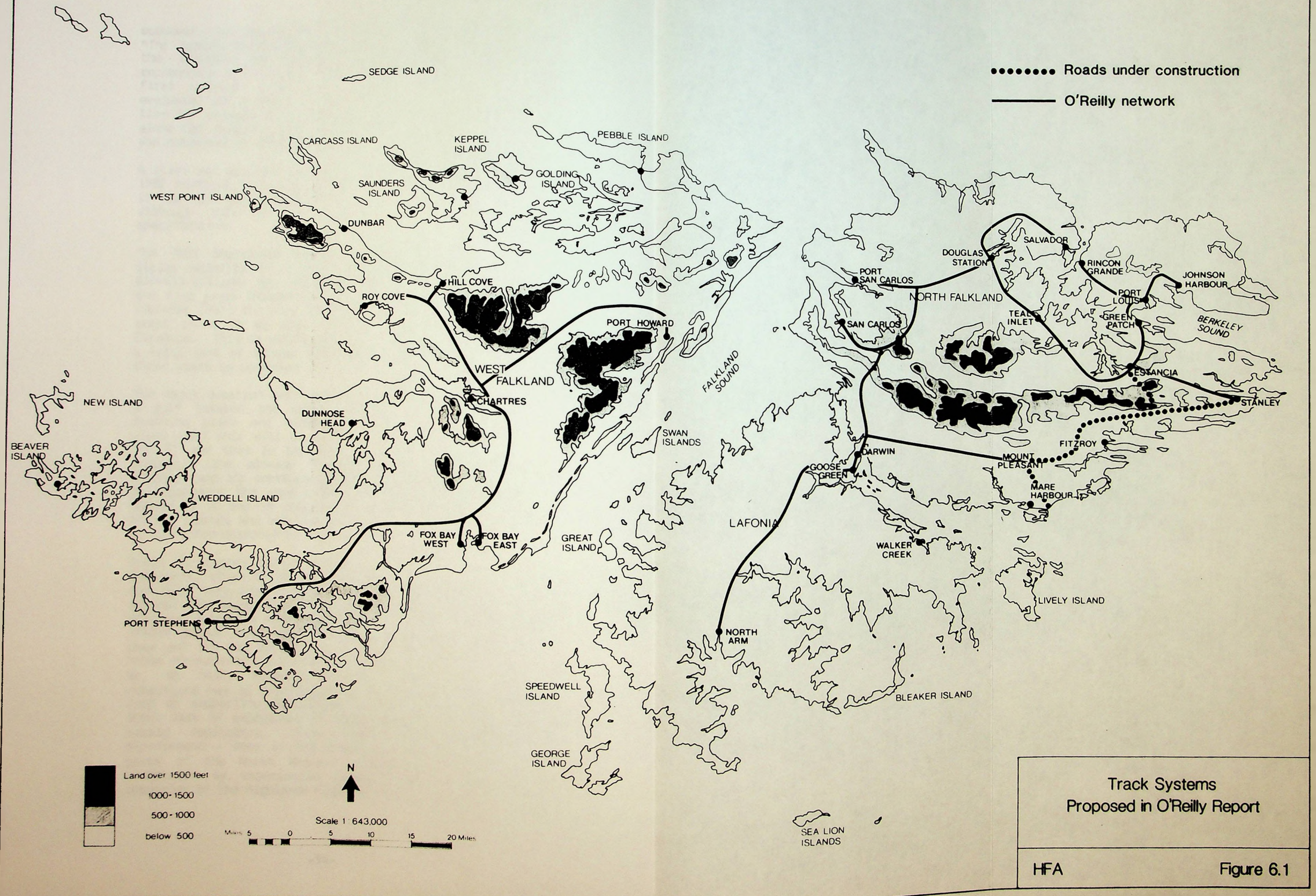
Nor is such a view new. Governor Moody, in his astonishingly acute and modern sounding dispatch to Lord Stanley in 1842 wrote:

> "There appears to be very little difficulty in forming communications from one part of the country to another. There are many passes in the principal chain of hills through which roads could be led without any great ascent, and good materials for constructing them are abundant everywhere."

In spite of his enthusiasm for roads though, Moody was a canny and realistic man, who ended this section of his dispatch, "The readiest mode of communication will, however, be generally by boats and small coasters ....."

And so it remained 121 years later when in 1963 Mr M P O'Reilly of the Road Research Laboratory reported on "The Factors Involved in Providing a Road System in the Rural Areas of the Falkland Islands". O'Reilly suggested a system of some 400 miles of gravel tracks connecting all the main settlements on East Falkland to Stanley in a circular system and on West Falkland a linear system extending from Port Howard to Chartres and from there branching to Hill Cove and Roy Cove in the North and to Fox Bay and Port Stephens in the South, as illustrated in Figure 6.1. These roads were envisaged as being 10 feet wide with passing places at intervals. The estimated total construction costs were £1.6-£2.0 million using an expatriate labour gang of 30-40 men. In addition he suggested a recurrent maintenance cost of between £20,000 and £30,000 a year.

Although the O'Reilly Report was received with enthusiasm, very little was in fact done. Between 1965 and 1972 the government introduced a camp track scheme to provide farms with grants to improve tracks, bridges, culverts and drainage, but only a few thousand pounds had been disbursed by the time the scheme was closed. The 1976 Shackleton Report again addressed the road issue, though, this time, with somewhat greater circumspection. It admitted that the



Track Systems
Proposed in O'Reilly Report

HFA

Figure 6.1

economic case for building roads was a weak one, but added "The justification must therefore be on social grounds, and the argument we believe, is a powerful one". They recommended a road from Stanley to Darwin, via Fitzroy, as a first project, after which the results could be fully evaluated and a decision made on any further work. By that time the estimated capital costs for this 60 miles of road alone had risen to £900,000 and the average maintenance cost was estimated at £25,000 a year.

A start was made on the road in 1979, but by the time of the 1982 conflict, only some 20 km had been completed. Much of it has now been incorporated into the Mount Pleasant Road, although this has been constructed to a much higher specification.

The 1982 Shackleton Report reiterated its belief in the social benefits of a road system (now estimated to cost £10-£15 million) and suggested that £5 million be spent in the five years 1984-88 on a construction programme. To date (October 1985) the only result of this has been a very recent start on a 14 km track from the Mount Pleasant Road to Estancia. This is estimated to cost some £27,600 per km with a total cost of between £350,000 and £400,000. It will take three years to construct.

The major question which must be raised is why there is such a gulf between the meagre achievements and all the far reaching plans and recommendations. One reason is quite clear (and this will be dealt with at length in Sections 7 and 8) and this is the fear that road construction would undermine the already fragile economics of the coastal shipping and air services which will always be required, both to supplement the road system for those lucky enough to be served by it and to continue to provide the essential links to the islands and very remote farms, who can never expect to be connected directly to a road system.

There is another reason, though, and this may be even more important, which is that the costs of road construction are not only very high (in relation to the numbers of people served) but, also, to a large extent unknown. By and large, previous estimates have been based on UK experience (for the simple reason that there was so little local experience to draw on) and yet conditions in the Falklands are so unlike those encountered in the UK that such parallels are likely to be, at best, somewhat suspect. While similar ground conditions may be experienced in the UK, the remoteness, the lack of supporting facilities for the labour force and the sheer lack of experience of those likely to be involved are rarely replicated. Even where such conditions are experienced - some of the Scottish Islands, or the remoter parts of the North Western Highlands - road works are undertaken by experienced gangs, backed up by all the resources of the Highlands Regional Council.

Where road building works have been attempted in the Falklands, these have invariably been within a few miles of Stanley, with the men travelling to the site from Stanley on a daily basis and all plant maintenance and repair carried out in the Stanley depot. This bears very little resemblance to work on West Falkland, for example, where a labour camp would have to be established and supplied and where all plant would have to be shipped and maintained on site. Thus, while the techniques of building simple gravel tracks are well known and (provided there is an accessible source of stone) relatively easy to cost at one level, road construction is also a major logistical exercise in the Falklands and, it is this element of costing which throws up the greatest difficulties.

Construction costs for the Estancia track are, as has already been mentioned, expected to be in the region of £27,000 per km. The site, it should be noted, is in relatively difficult terrain but close to Stanley, close to an existing quarry at Pony's Pass and under the control of the PWD using local labour. If the PWD were charged with building further roads, in more remote localities, their costs would almost certainly rise (even though ground conditions were easier) because of the severe logistical problems mentioned earlier. The PWD also has the problem of attracting labour from the very limited local pool. The wages normally paid by PWD are not geared to the arduous conditions associated with living in a remote construction camp for considerable periods and undoubtedly an inducement would have to be paid, if indeed, local labour could be attracted at all. Furthermore, the PWD is not organised for a major roads construction programme and additional support at the administrative and managerial level would be required if it were called upon to undertake such a task. Thus, even if it could obtain the resources, it is unlikely that it could construct roads on an extensive basis for much less than £40,000 per km.

An alternative would be to use expatriate contractors. The Mount Pleasant complex is being constructed in this way, and a number of UK contractors now have experience of working under Falkland conditions, and with considerable success. Such an operation would undoubtedly be more expensive in the first instance than using the PWD directly, but expatriate contractors have demonstrated a drive and ability to complete substantial contracts on time and within budget, which suggests that a much more rapid and secure development programme could be achieved. It is difficult to estimate the costs of such an operation and there would be wide variations in contract price depending upon location, conditions and the terms of contract. Discussions have taken place both with officials of the PSA who have had considerable experience of contracting work in the Falklands and with a number of individual contracting companies who have worked on the Islands. The consensus view was that it is probably reasonable to expect an average construction cost of some £50,000 per km.

The maintenance costs of such gravel tracks are even harder to assess. Enquiries in UK have produced somewhat conflicting answers. Highland Regional Council, for example, appear very reluctant to build such tracks at all because of the alleged maintenance problems. The Winter pattern of continual freezing, thawing and refreezing is said to loosen the surface dressing which is then quickly washed away by the high rainfall experienced in the area.

The Forestry Commission, on the other hand, operating in very similar circumstances, report considerable success with gravel roads, though they do emphasise the importance of prompt maintenance. This need not be very extensive, but drains must be kept clear, so that the road is dry at all times. Their estimated maintenance expenditure is £300 per km per year. To be conservative, this figure has been increased by 50 per cent for Falkland conditions and a figure of £450 per km per year is estimated. It should be emphasised though that this figure is highly contingent upon maintenance work being undertaken regularly and well in advance of serious problems developing. It should also be noted that such a figure would only apply to tracks on which traffic were relatively light, i.e. used by the vehicles of Island inhabitants only. Regular use of tracks by military or other heavy vehicles could increase maintenance costs three or four fold.

In terms of the network to be considered, the basic structure set out in the O'Reilly Report has been used as a starting point, since this is a logical response to a settlement pattern which has not changed essentially since 1963. Obviously, some modifications have to be introduced because of the construction of the Mount Pleasant Road and of the completion by 1988 of the track to Estancia. In essence the remainder of the network is retained.

This consists of some 550 km of road, but, it should be noted, the most difficult stretches in terms of construction have been, or will be, already completed. Much of the terrain to the West of Mount Pleasant consists of a relatively thin peat blanket overlying a sandstone or tillite subsoil. While problem areas of boggy lowland and some deep peat, particularly on the more mountainous stretches, will be encountered, in general conditions can be expected to be much easier for road construction than in the Eastern parts of East Falkland.

The approach used in this Report has been to consider three possible levels of road building. These are:

- a very limited programme of track improvement, within the budgetary constraint imposed by the £2 million earmarked by Legco from the £31 million Shackleton money for expenditure on camp tracks

- a programme which attempts to deal in ten years with the entire back-log of road construction and is designed to install virtually the complete O'Reilly system by 1995.

- a more ambitious programme, based on the £5 million in 5 years suggested in the 1982 Shackleton Report

In terms of these options, the construction of all 550 km within a ten year period would clearly be a major programme, well outside the scope of the PWD's resources and a series of contracts would be required with expatriate contractors. So that the total cost would amount to some £27½ million, or about £2.75 million a year over the period.

Even the reduced programme of some £10 million over the ten year period would require outside contractors, as it is very difficult to imagine the PWD being able to gear up to a £1 million a year programme using domestic labour resources. In that case, some 200 km of road could be constructed over the period up to 1995. It is suggested that the priorities here should be determined by the number of persons served. On that basis, the suggested routes are:

Mount Pleasant to Darwin
Port Howard to Chartres
Chartres to Fox Bay
Chartres to Hill Cove
Darwin to San Carlos and Port San Carlos

This network is illustrated in Figure 6.2.

With the most restricted option of all, i.e. working within the £2 million constraint, it seems very doubtful whether any expatriate contracts would be justified, as even the Mount Pleasant to Darwin Road would use up virtually all of that sum in a single contract. Equally, the amount which could be achieved by the PWD within such a budget is such that it may be wiser to think in terms of limited improvements covering the whole network of existing tracks, rather than the totally new construction of any individual route.

The existing camp tracks consist of considerable stretches of reasonable ground with frequent bottlenecks and difficult passes of boggy and ill-drained land. Much could be achieved by a concerted programme of improving these difficult stretches. In the case of stream crossings this would amount to the construction of bridges or culverts with, say, 100 metres of approach gravel road on either side to avoid the creation of a "bog hole" on either side of the bridge.

●●●●●●● Roads under construction

——— Tracks to be improved

SEDGE ISLAND

CARCASS ISLAND

KEPPEL ISLAND

PEBBLE ISLAND

GOLDING ISLAND

SAUNDERS ISLAND

WEST POINT ISLAND

DUNBAR

HILL COVE

ROY COVE

PORT HOWARD

WEST FALKLAND

FALKLAND SOUND

CHARTRES

NEW ISLAND

DUNNOSE HEAD

BEAVER ISLAND

WEDDELL ISLAND

SWAN ISLANDS

FOX BAY WEST

FOX BAY EAST

GREAT ISLAND

PORT STEPHENS

LAFONIA

NORTH ARM

SPEEDWELL ISLAND

GEORGE ISLAND

SEA LION ISLANDS

BLEAKER ISLAND

LIVELY ISLAND

WALKER CREEK

DARWIN

GOOSE GREEN

PORT SAN CARLOS

SAN CARLOS

NORTH FALKLAND

DOUGLAS STATION

SALVADOR

RINCON GRANDE

JOHNSON HARBOUR

PORT LOUIS

GREEN PATCH

TEAL INLET

BERKELEY SOUND

ESTANCIA

STANLEY

FITZROY

MOUNT PLEASANT

MARE HARBOUR

Land over 1500 feet

1000 - 1500

500 - 1000

below 500

N

Scale 1 643,000

Miles 5 0 5 10 15 20

Modified System of Improved Tracks

HFA

Figure 6.2

Similarly, the construction of stretches of gravel road across unavoidable peaty or boggy areas would do a great deal to facilitate movement, provided that they were well drained and the drains were maintained.

The effect of such a programme of "bottleneck improvement" would probably be very limited as far as vehicle operating costs were concerned and the 37 pence per km estimated in Section 2.3 would still be valid. The main impact would be to reduce the risk of "bogging" and thus, effectively reduce the average time of journeys and the certainty of arriving at a stated time.

With the more extensive programmes of camp track improvement, however, the effect on vehicle operating costs should be large. Not only would the easier driving conditions generate substantially larger volumes of traffic, thus increasing vehicle usage and reducing standing costs per km travelled, but operating and, particularly maintenance costs, would be substantially reduced. The major maintenance costs at present are caused by failures of suspensions and steering due to the constant strain imposed by the rough ground conditions. This would be very substantially reduced even by gravel roads. Vehicle operating costs have been estimated for both a Land Rover and 7 1/2 tonne truck operating under these conditions.

Land Rover (on improved tracks)

Cost of vehicle	-	£7,000
Fuel cost (£ per gallon)	-	£1.60
Fuel consumption (km/gallon)	-	25
Spare parts (£ per year)	-	£400
Life of vehicle	-	100,000 km
Average usage (per year)	-	20,000 km

Standing Costs		£ per year
Insurance	-	£250
Interest	-	£700
Other	-	£50
		£1,000 = 5 pence/km

Running Costs		pence/km
Diesel fuel	-	6.4
Lubricants	-	0.2
Spare parts	-	2.0
Maintenance	-	1.2
Depreciation	-	5.0
		14.8

Total operating costs 19.8 pence/km.

7.5 tonne Truck (on improved tracks)

Cost of vehicle (less tyres)	-	£12,000
Cost of tyres (1 set)	-	£700
Fuel cost (per gallon)	-	£1.60
Fuel consumption (km/gallon)	-	22
Spare parts (per year)	-	£1,000
Life of vehicle	-	100,000 km
Life of tyres	-	35,000 km
Average usage (per year)	-	25,000 km

Standing Costs		£ per year
Wages	-	£4,000
Rent and Rates	-	£400
Insurance	-	£600
Interest	-	£1,700
Other	-	£100
		£6,800 = 27.2 pence/km

Running Costs	pence/km
Diesel fuel	7.3
Lubricants	0.5
Tyres	2.0
Spare parts	4.0
Maintenance	2.3
Depreciation	12.0
	28.1

Total operating costs - 55.3 pence per vehicle/km.
Assume a 75% load factor (i.e. 5.5 tonnes carried)
Average haulage cost - 10.0 pence per tonne/km

6.2 Coastal Shipping

It has already been noted that the coastal shipping service provided by the Monsunen and the Forrest is cheap and reasonably efficient by international standards. Suggestions have been made that neither vessel is ideally suited to the conditions and the demands made on her and a variety of replacement vessels have been put forward. However, the basic situation is such that it is difficult to see what advantages, other than very marginal ones, could be achieved in this way.

The current freight carried (i.e. 2,000 tons of wool, plus some 2,000 cubic metres of general cargo) is unlikely to increase substantially in the years ahead, and is more likely to fall as track development diverts more cargo overland. This is barely enough cargo to keep even a single vessel busy, though the Falkland Islands should always have two coastal vessels available in order to provide emergency cover, should one vessel suffer a major breakdown or damage. Thus a fleet of two vessels seems to be a minimum requirement, even though this will theoretically result in overcapacity.

The Monsunen, in spite of her age, still seems to be in very good condition. It may be that her biennial surveys will become increasingly expensive as time goes on, but even this is likely to be far cheaper than replacing the Monsunen by a more modern vessel. The current charter fee paid by CSL for the Monsunen is some £14,000 per year. A replacement would cost at least £500,000 to £750,000 and thus involve charter fees of the order of £75,000 to £100,000 a year. While this may eliminate some of the known problems of the Monsunen, it is by no means certain that her known strengths (for example, her reliability) would be reproduced in a replacement. Thus, it is considered that the coastal shipping service should continue to be based on the Monsunen, at least for the time being, and only reconsidered in the event that the vessel should encounter major engine or structural problems.

The Forrest, in spite of her comparative youth, seems to be in less good condition than the Monsunen and to require more frequent repairs with consequently reduced reliability. While she continues to fulfill her current role as essentially a support and emergency standby for the Monsunen, such drawbacks are not too important. However, if other ways can be found to support the Monsunen and provide emergency cover (see Section 6.3 - Ferries) then the Forrest should be disposed of. Her very lack of flexibility makes her an expensive craft to maintain, as she cannot readily be used to provide ancillary services, such as ferrying across the Falkland Sound.

Should the Forrest be retained, however, changes might be considered in the way in which the coastal service operates. While, in general, the competition between rival enterprises for the supply of transport services can be seen as healthy and likely to produce cheap and efficient services, the particular circumstances in the Falkland Islands are unlikely to produce this result. The volume of cargo is limited and moves according to a predictable pattern determined by the shearing season and the sailing dates of external vessels. For Monsunen and Forrest to compete for this trade is only likely to result in increasing inefficiencies with lower utilisation and longer steaming distances to carry the same cargo. A more efficient arrangement would be for the vessels to operate a coordinated service, dividing the demand between them in a rational way, so as to take maximum advantage of the particular characteristics of each vessel in relation to the pattern of demand.

Such coordination could theoretically be achieved by consultation and cooperation between the groups managing the two vessels, but it would be difficult administratively, particularly as CSL is a private company which has to raise sufficient revenue to cover its costs and would thus be understandably reluctant to allow the Forrest to carry anything other than those peaks of demand with which Monsunen could not cope.

It is therefore suggested that the Monsunen and Forrest be placed under a joint operational management. This could be achieved by the FIG becoming a member of CSL, and chartering the Forrest to CSL at a nominal sum. Since the Forrest is currently operating at a considerable financial deficit, FIG would also have to offer a subsidy to CSL which could be at the present budgeted level of £60,000 a year. The details of such an arrangement would have to be worked out in consultations between FIG, CSL and FIC.

It may be objected that, by allowing a subsidy into CSL's operations, the incentive to maximise efficiency would be eroded as FIG would always have to step in to make good any operational deficit incurred. This is a valid point and one which should be carefully addressed during detailed negotiations. It could be avoided, though, if FIG, for example, were to agree to meet some maximum percentage of the total operating costs of the enterprise (rather than a specified sum of money) with the understanding that the balance was contributed out of revenue. Similarly, FIG should have the right to withdraw Forrest from CSL (during any periods that Forrest was not working) at a nominal sum, if other remunerative opportunities arose to employ Forrest and thus permit the FIG to earn some charter fees to set against its subsidy to CSL.

The other question which arises with regard to coastal shipping is the condition of individual jetties, the provision and maintenance of which has always been the responsibility of the farm or community concerned.

It has already been stated that some of these jetties are in a poor condition and certain others are deteriorating and badly in need of remedial maintenance. This situation is likely to get worse, rather than better, if further sub-division of farms take place and as the system of camp tracks is improved. Such unfit jetties can damage the vessels calling at them and ultimately present considerable danger to users. It is suggested that, after suitable warnings have been issued, CSL should surcharge (say by 10 per cent) all cargos passing over those jetties they consider to be unfit and, ultimately, if no repairs are effected, refuse to call until such time as the jetty is put into a reasonable condition.

The current operating accounts of the Monsunen and the Forrest have been given in Section 3.4 above. These are not expected to change basically in the years above, but for the purposes of evaluation of alternative systems, it is important to be able to estimate the variation caused by different levels of utilisation. they have thus been estimated under standing and variable costs as follows:

	Monsunen	Forrest
Standing Costs (£ per year)		
Charter fee	14,000	10,000
Insurance	4,000	2,000
Catering stores	6,000	4,500
Crew Costs	42,000	37,000
Repairs and surveys	16,000	15,000
Management	9,000	5,000
Passages/travel	1,000	1,000
Overheads	4,000	4,500
	96,000	79,000
Variable Costs (per £10,000 of revenue at Sept 1985 tariff rates)		
Ships Stores	1,130	1,100
Fuel	870	4,570
Steaming Bonus	360	-
Repairs	120	1,200
Stevedores	880	880
Equipment Hire Charges	400	400
Other	40	50
	3,800	8,200

The very high level of variable costs estimated for the Forrest in 1985 must result from the low ratio of revenue steaming to total steaming, and this may be expected to improve considerably if usage were significantly increased.

6.3 Ferries

The provision of a ferry service between East and West Falkland has been under discussion for some considerable time and a number of different routes and craft have been suggested. Clearly, the provision of improved camp tracks on West Falkland will have only limited benefit unless this system is linked in some way with the East Falkland system and thence to Stanley.

J L Waldron, the owners of Port Howard, are vigorous proponents of such a view and, indeed, have offered to contribute substantial assistance to such a project if it could be got off the ground. Port Howard makes a logical base for such a service, as the only other possible contender, Fox Bay, is too far distant from the main centres of East Falkland and the likely network of improved camp tracks.

Two possible land falls on East Falkland have been considered - Egg Harbour, which would minimise the crossing distance (to some 17 miles each way) and Brenton Loch, near Darwin (a total distance of about 30 miles in each direction). It has been suggested that a small fast landing craft (such as a Trojan) should be employed which could make the crossing in the evening (when winds usually die down) and be crewed by farm workers in their slack time after their farming duties were complete.

Such an idea has its attractions, but has many practical drawbacks. Small landing craft do exist which can travel at speeds up to 30 knots. However, these are "planing" vessels and such speeds can only be achieved by unloaded vessels in relatively calm waters. With a load of one or two Land Rovers, for example, and in the water conditions more typically encountered in the Falklands, a return crossing even from Port Howard to Egg Harbour would take at least two hours. Even assuming that this could be done before nightfall, it would leave the vehicles and their passengers (unless they happened to be bound for Port Howard) at some distance from their ultimate destination and with night falling. From Egg Harbour there is only a camp track of nearly 20 miles in length even to Goose Green. A crossing to Brenton Loch, on the other hand, would take about 4 hours round trip and thus not be achievable during the limited period of low wind velocity at the end of the day, nor in the marginal time of farm employees.

More importantly, such vessels are expensive both to purchase and to run, and economical operations are achieved only with fairly high utilisation. For example, construction costs for the Trojan have been quoted, as follows:

	Ex-Works	Ex-Lloyds
10m Trojan (1 Land Rover capacity)	£170,000 -	£200,000
13m Trojan (2 Land Rover capacity)	£200,000 -	£250,000
15m Super Trojan (2 Land Rover capacity)	£450,000 -	£700,000
18m Super Trojan (3 Land Rover capacity)	£500,000 -	£750,000

The range of prices are caused by the wide variety of engine installations and configurations. In order to achieve the kind of "planing" performance mentioned above, it would be necessary to have one of the larger Super Trojans, with large engines, whose fuel consumption at this level of performance would be of the order of 50 gallons per hour. Thus, a single crossing in a Super Trojan might use some 75 to 100 gallons of fuel at a cost of £120 to £160. A Land Rover fare which only covered the cost of fuel would thus put travel costs beyond the reach of most potential users.

A much more economical performance could be obtained by using a larger, slower vessel. Landing craft can be obtained of about 23 metres which could carry 10 or 12 Short Wheel Based Land Rovers, as they have a wider beam than the Trojan. While only cruising at speeds of 8-9 knots, they need much smaller engines and thus consume only some 14 to 16 gallons of fuel per hour. This has the disadvantage that a ferry crossing between Port Howard and Brenton Loch at Darwin would take between 3 and 4 hours and thus the vessel could not be readily crewed by farm employees in their slack time. On the other hand, there is the very considerable advantage that such vessels are capable of open sea passages and are thus much more versatile than a Trojan.

A typical vessel of this type is the 23 Metre Twin-Screw Cheverton Loadmaster (details of which are given in Appendix E). The ex-works cost of such a vessel would be of the order of £500,000 and its principal characteristics are as follows:

Length over all	22.86m
Beam	6.10m
Draft (loaded)	1.07m
Deck load capacity	30 tonnes
Bulk liquid cargo capacity	59,130 litres
Speed - light	9 knots
- loaded	8.5 knots

Propulsion machinery - Twin Detroit Diesels GM6V71N, naturally aspirated, fresh water heat exchanger cooled marine diesels; Allison hydraulically operated 2:1 reverse/reduction gearboxes. Each engine continuously rated at 174 shp (129.8 kW) at 1800 rpm.

Such a vessel could not only operate a ferry service between East and West Falkland on, say, two days a week, but could also be seen as a replacement for the Forrest. Its ability to steam in open waters, to work on islands without proper jetty facilities, to be easily loaded with sheep and to carry substantial volumes of liquid fuel, make it an ideal foil to the Monsunen.

The operating costs of such a vessel if operated by CSL (excluding a charter fee) are estimated as follows:

Standing Costs (£ per year)		
Insurance	-	10,000
Crew (3 men)	-	20,000
Catering stores	-	5,000
Repairs and survey	-	10,000
Management	-	5,000
Other overheads	-	5,000
		55,000

Variable Costs (based on 400 ferry crossings per year)		
Fuel	-	17,500
Stores	-	2,500
Repairs and maintenance	-	5,000
		25,000

This would put costs per crossing at about £200 each, or, if half of the working time were devoted to other duties at £130 per crossing. With an average of four vehicles per crossing, this would give a cost per vehicle of about £32.50.

6.4 Aviation

The main concerns which have been expressed about FIGAS relate to the costs of its operations, both in terms of the individual fares charged and in terms of the deficit on its operations which is funded out of general government revenue.

Some suggestions have also been made that other aircraft, and even helicopters, should be considered as alternatives to the Islanders. These suggestions rule themselves out immediately on grounds of cost. The traffic volumes are insufficient to justify any larger aircraft than the Islander and the economics of helicopters are such that they can never be justified for passenger operations when airstrips are available. For example, the commercial charter rate for a Chinook in UK is about £4,000 per hour, compared with about £400 per hour for an Islander.

The question of fares has already been examined. While they may seem high to individuals who have no other available means of travel to Stanley, they do compare reasonably well with similar fares in UK. They are already highly subsidised and, should alternative means of transport become available, should be reviewed with a view to increasing them to more realistic levels.

The overall level of cost of the FIGAS operation, however, is likely to continue to be inherently high, given the type of service which is offered and the type of arrangements which are made for servicing the aircraft.

It is understood that a committee has been appointed under the chairmanship of Tony Blake to look into some of these matters, particularly

- the separation of the posts of Director of Civil Aviation and Manager of FIGAS
- staggered servicing
- the gaining of additional traffic from military and contractors personnel
- the use of FIGAS aircraft for fisheries protection work
- the payment of overtime to ground crew for working unsocial hours
- the improvement of existing landing strips
- the requirements at Stanley Airport once the RAF leave in 1987

Without wishing to pre-judge the findings of this Committee, it is clear that when FIGAS acquire three Islanders in 1986, the likely travel demand from resident Falkland Islanders will be insufficient to keep all aircraft fully occupied.

The alternatives, therefore, would seem to be either to cut staff to the minimum required to keep two aircraft airborne at all times. Servicing and repairs to one aircraft would then be able to take place in an unhurried way, so that operational staff could probably be cut to three pilots and four ground crew. This would reduce operational costs, but represent a relatively inefficient use of the funds invested in three aircraft.

At the other extreme, the airline should seek to operate on more commercial principles with a major drive for new sources of revenue. This would entail both more resources being devoted to management and promotion and equally a more streamlined ground operation, with servicing being done in non-flying hours and the ground crew being appropriately compensated for the unsocial hours involved.

It is appreciated that there are severe difficulties in the way of this latter course under current Government conditions of employment and it raises issues beyond the scope of the current Report. It is suggested that a short study into this problem should be commissioned by Government. An aviation expert, with experience of third-tier operations, should be asked to look into the practicalities and cost of placing FIGAS under a commercial management with a view to maximising revenue and minimising cost. While FIGAS is always likely to require some subsidy because of the widely dispersed nature of the population it is serving, it is considered that there

may be practicable ways of considerably reducing this from current levels, while at the same time maintaining and possibly enhancing the level of service which it offers to its passengers.

In the evaluation which follows, the following estimates of FIGAS annual costs have been used

Standing Costs (£ per year)	2 Aircraft	3 Aircraft
Staff	95,000	95,000
Insurance	25,000	37,500
Vehicles	10,000	10,000
Aircraft replacement fund	50,000	75,000
Hanger equipment (rent)	3,000	4,500
Other overheads	10,000	10,000
	193,000	232,000

Variable Costs (£ per year, based on 7,700 passengers)	
Fuel and lubricants	94,000
Materials and spares	42,000
Maintenance fund	20,000
	156,000

7. Viable Alternative Systems

7. VIABLE ALTERNATIVE SYSTEMS

7.1 General

In the light of the transport demand forecasts set out in Section 5 and the potential developments in each individual mode of transport discussed in Section 6, three different systems have been devised for meeting the 1995 transport demand. Clearly, many more than three feasible systems can be imagined, but the three which are described below and evaluated in Section 8 have been designed in the light of the declared preferences of Island residents and represent radically different orders of capital expenditure. They may be characterised as:

1. Do Minimum
2. Road Based
3. Shackleton

System 1, the "Do Minimum" assumes that the £2 million already ear-marked from the Shackleton money for camp track improvement would be so spent, but that this is the full extent of investment in roads in the period up to 1995. The Monsunen and the Forrest together would continue to provide the coastal shipping service, under a single integrated management and FIGAS would continue to offer an effective "air taxi" service employing three Islander aircraft. In other words, there would be only minimal changes from the transport system currently operating in the Islands.

System 2, the Road Based Solution, involves the total implementation of the O'Reilly network of improved camp tracks by 1995. This would generate a great deal of traffic on the tracks, but also divert substantial volumes from CSL and FIGAS. CSL would be reduced to providing cargo services to the outlying islands only and the Forrest could be disposed of, to be replaced by a landing craft for use as a ferry between East and West Falkland. FIGAS, too, would experience a very substantial reduction in demand, with an elimination of services to East Falkland and a very severe reduction in West Falkland passengers. Island flights would continue and there would be a demand from tourists and for emergency flights.

System 3 - the Shackleton Solution envisages about £5 million being spent on camp track improvements up to 1990 (as the 1982 Shackleton Report recommended) and a similar sum in the further period 1990-95. This would enable a basic network of some 200 km of gravel tracks to be constructed, covering all the more heavily trafficed routes. There would be some diversion of freight traffic from CSL (enough for the Forrest to be sold off) but the Monsunen, backed up where appropriate by the new landing craft ferry vessel would still remain fairly busy. Similarly, FIGAS would still be required to meet a lot of the needs of the outlying settlements on both East and West Falkland, as well as the Islands, and to cater for tourist demand.

The volumes of freight and passengers forecast in Section 5 have been assigned to these three networks, largely on the basis of cost minimising, though in some cases allowance has also been made for convenience and time savings. The results of these assignments are shown in Appendices C and D.

The implications of these traffic flows on the various different modes have then been calculated and the results are presented below. In the calculations which have been made it is assumed that only Island residents and tourists from overseas make use of the internal transport system and the figures of vehicle flows, freight tonnages, etc are all based on journeys of significant length. They are thus very much "minimum" figures and conservatively estimated.

In fact, use of the transport system by military personnel and by expatriate workers who are temporarily in the Falklands could increase usage. However, such demand cannot be relied upon and, as has been stated earlier, the most robust result should be based on the assumption that the Islanders' transport system is capable of meeting their needs and their needs only. Anything else must be seen as a bonus.

Similarly, the estimates of generated traffic must be seen very much as minimal. It is almost impossible to predict such demand with precision, and the analogies with trip generation in the off-shore islands of Scotland, while providing some guidance, cannot be regarded as anything other than educated guesses.

7.2 System 1 - Do Minimum

This system assumes that FIGAS and CSL continue to provide much the same service as at present, except that the Forrest would come under the same operational management as the Monsunen and provide an integrated service. The camp tracks will be improved to the extent of £2 million expenditure over the period to 1995. It is not envisaged that any new tracks

would be built with this money - other than the completion of the Estancia track, whose construction is now under way. Rather, the balance of £1.6 million should be spent on improving critical bottlenecks, stream crossings and particularly difficult stretches of existing camp tracks to upgrade the whole of the existing system and reduce substantially the risks of "bogging". Wherever possible this should be done as a joint venture between the PWD and the farm concerned (an arrangement currently being pioneered at Port Howard and Darwin). Where this is not possible, and the benefits are shared between a significant number of farms, the PWD should undertake the works directly. Under this system it is not envisaged that there should be a ferry service across Falkland Sound as the volumes would be too low and the costs too high to justify it.

The total wool clip is estimated to rise from the 1984/5 level of 2,250 tonnes to some 2,600 tonnes by 1994/5. As at present, a small portion of this will be brought to Stanley overland from a few of the nearby farms, but in total this should not amount to 100 tonnes, leaving 2,500 tonnes or more to be carried by CSL, together with the stores and other general cargo required by the farms. On the basis of existing CSL tariffs, revenues would rise from the current level of £175,000 to some £200,000. However, it is unlikely that current tariff levels could be held in real terms, even in the short term, and assuming a 20% increase by 1995, a total revenue of £240,000 a year could be expected. Total costs of the Monsunen and Forrest together are estimated, on the basis of £175,000 standing costs and £91,000 variable costs, or a total of £266,000 a year and an overall deficit of some £26,000 a year, compared with the current combined losses of £80,000 a year on current tariffs and £45,000 even with a 20% tariff increase.

It is estimated that FIGAS domestic passenger carryings would increase at about the same rate as population increase, i.e. from about 7,000 passengers in 1985 to some 7,700 by 1995. In addition, there would be some 5,000 trips a year by external tourists, bringing total carryings to some 12,700 a year in 1995. This should increase revenue from its current level of about £200,000 a year, to £355,000 by 1995 and allowing for a real fare increase of 10 per cent over the period, actual revenue could be as high as £390,000. In spite of standing costs of £230,000 a year, variable costs should rise to only £250,000, giving a total cost of £480,000 a year and a deficit of £90,000, compared with the 1983/4 level of £132,000. To this should be added the costs of operating Stanley Airport, but since these would be common to all three systems, they have not been taken into account at the current time.

As far as vehicle trips are concerned, it is assumed that the modest overall improvement in the camp track system will generate some additional traffic, but this will be slight and total personal trips on camp tracks would increase only from 3,000 a year to about 3,900. On the basis of a vehicle

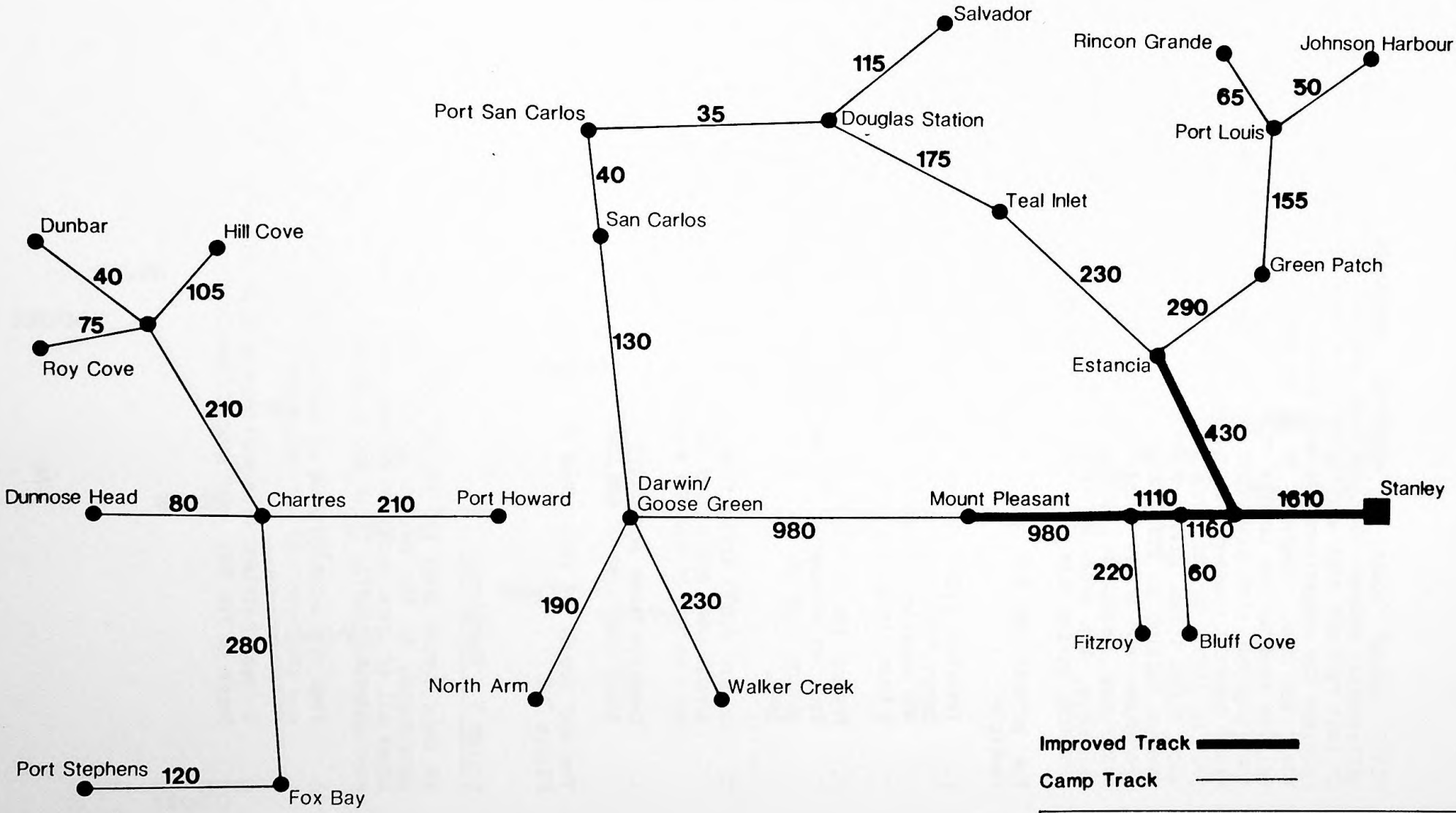
occupancy of 1.5 persons per vehicle, the resulting traffic flows are shown in Figure 7.1. Vehicle operating costs over the camp tracks would probably not decrease significantly as a result of the improvement programme (the benefits should be seen more in terms of increased average vehicle speeds and certainty of arrival). Thus, vehicle operating costs are expected to be some 20 pence per km on the 60 km of improved track in the system and 37 pence per km on the remainder of the camp tracks. Of the 215,000 vehicle/km shown in Figure 7.1, some 62,000 would be on improved tracks and 153,000 on unimproved tracks giving a total vehicle cost of some £69,000. Assuming average speeds of 50 km per hour on the improved tracks and 15 km per hour on unimproved tracks, the total passenger time in vehicles would be some 17,160 hours.

7.3 System 2 - Road Based

The central feature of this system is a network of improved Camp Tracks covering the whole of East and West Falkland, with a ferry linking the two networks. This would bring virtually the whole of the population of the two main islands within easy reach of an all weather road and completely trarsform accessibility and mobility for the people and for economic activities.

Cost comparisons between likely freight charges by CSL (i.e. existing tariffs + 20%) and the use of trucks on the camp tracks (based on a $7\frac{1}{2}$ ton lorry, carrying an average of 5 tonnes of freight, with a ferry crossing charge of £30 per single trip) indicate that all farms on East and West Falkland would find it cheaper to carry their wool to Stanley and freight back to the farm overland. Even the most distant farm, Port Stephens, could then carry its wool to Stanley for £30 per tonne + £7.50 handling costs, compared with the present CSL rate of £32.40, which must be expected to rise to about £39 per tonne shortly. Thus, the role of Coastal Shipping would be reduced to one of serving only the outlying islands and the volume carried would fall by 88 per cent, to some 270 tonnes of wool, plus the equivalent volume of stores.

At this level, there is clearly no requirement for two coastal vessels to be working the Falkland Islands and one could be disposed of. It is suggested that this should be the Forrest. While she is smaller and cheaper than the Monsunen, she is also less reliable and, even with the ferry able to act as back up in emergency, this reliability is an important quality in the Falklands environment. Even so, such a small volume of cargo would ruin the profit and loss account of CSL. It is estimated that even operating at this reduced level, the Monsunen would cost some £105,000 a year and earn only some £25,000 a year in revenue, giving rise to a subsidy requirement of about £80,000 a year. Equally, the new ferry vessel, if operated by CSL, would cost about £92,000 a year and earn £66,000, giving rise to a further subsidy of some £26,000 a year, for a total of £106,000 a year.



No. indicates number of vehicles per year

1995 Estimated Vehicle Traffic - System 1 - Do Minimum

HFA

Figure 7.1

FIGAS demand would be similarly decimated. The cost differential between overland trips and air would be so great in East Falkland that all flying would cease there. For West Falkland the comparisons are much closer and some air journeys would continue. However, it is estimated that these would fall to some 40 per cent of that anticipated in System 1, so that together with passengers to and from the outer Islands, FIGAS domestic passenger carryings would fall to about 2,700 a year by 1995. To this should be added the tourist demand for about 5,000 trips, giving a total of 7,700 in all, with total revenue falling to £235,000 a year. With changed management procedures and a new maintenance routine, such a volume of passengers should be easily coped with by a fleet of 2 Islanders, but even so total costs would amount to about £350,000, giving rise to a deficit of £115,000 a year.

The effects of the improved camp track system would be fourfold:

1. Transfer 2,250 tonnes of wool and equivalent general cargo from ships to trucks. This should generate some 470 vehicle journeys a year at a total cost of £118,000 a year (including cargo handling at Stanley).

2. Reduce the cost of the existing 3,900 overland trips from an average of 32 pence per km to 20 pence per km giving rise to user cost savings of £26,000 a year by 1995.

3. Divert 5,000 trips from air to road by 1995, reducing annual user costs from £158,000 to £104,000, giving rise to a saving of £54,000 a year.

4. Generate some additional 6,200 overland journeys at a total user cost of £50,000.

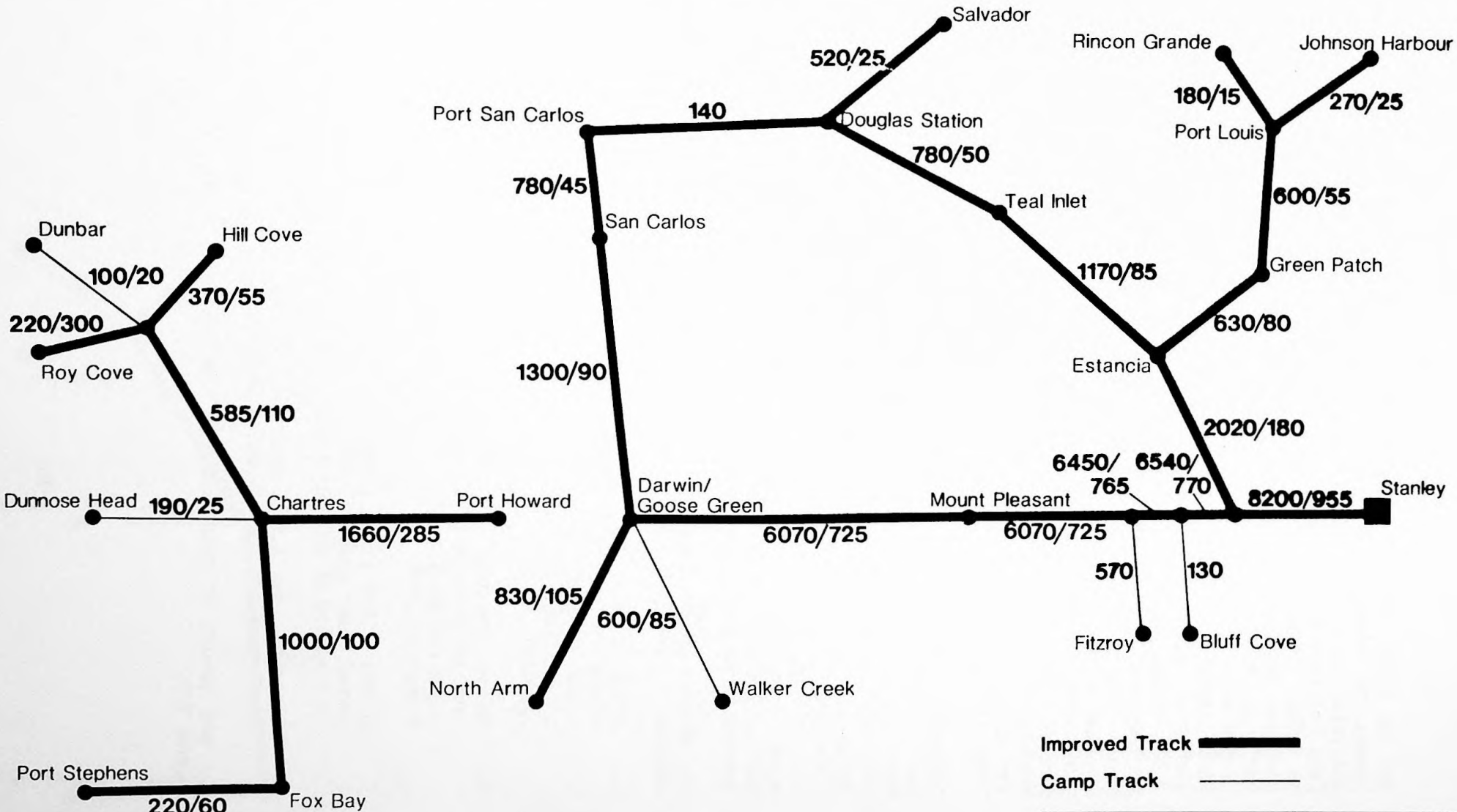
The end result of this would be traffic flows as set out in Figure 7.2

7.4 System 3 - Shackleton

In this system some 200 km of improved camp track would be constructed in the period up to 1995. This network would cover all of those sections of camp track likely to experience even moderate traffic flows and is envisaged as follows:

- from the existing road at Mount Pleasant, West to Darwin and then North to San Carlos and Port San Carlos

- on West Falkland from Port Howard to Chartres and thence South to Fox Bay, with a spur from Chartres to Hill Cove



1995 Estimated Vehicle Traffic - System 2 - Road Based

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Figure 7.2

No. indicates vehicles per year as Passenger Veh./Trucks

The two roads would be connected by a ferry running from Port Howard to Brenton Loch near Darwin. A comparative cost analysis suggests that this would divert about half of the East Falkland wool to land transport, though such settlements as Walker Creek and North Arm in the South and many of the Northern settlements such as Salvador and Teal Inlet would continue to use CSL. On West Falkland only some 36 per cent of the wool would be carried overland and such settlements as Port Stephens and Roy Cove would continue to use CSL. Thus, the total volume of wool being carried by CSL would fall from 2,500 tonnes to about 1,650 tonnes, well within the capacity of the Monsunen, and the Forrest could be disposed of. This would reduce CSL costs to some £154,000 a year and with revenue of about the same amount, the CSL operation should just about break even on coastal operations. The ferry vessel, however, could be expected to cost some £80,000 (excluding capital charges) and earn only £50,000 from ferry crossings, so that a total subsidy of £30,000 a year would be required for CSL.

Similarly, with FIGAS, the number of domestic passengers would fall, though there would still be a significant demand on both East and West Falkland. The estimated domestic carryings in 1995 are 4,250 which together with the 5,000 tourist trips would give a total of 9,250 and an estimated revenue of £285,000. The three Islander aircraft would have a standing cost of some £230,000 and the variable costs associated with 9,250 passengers are £185,000 to give a total of £415,000 a year in 1995. Thus there would be an overall deficit on FIGAS operations of about £130,000 a year.

The effects of the improved camp track networks, though not as dramatic as System 2, may be categorised in a similar manner:

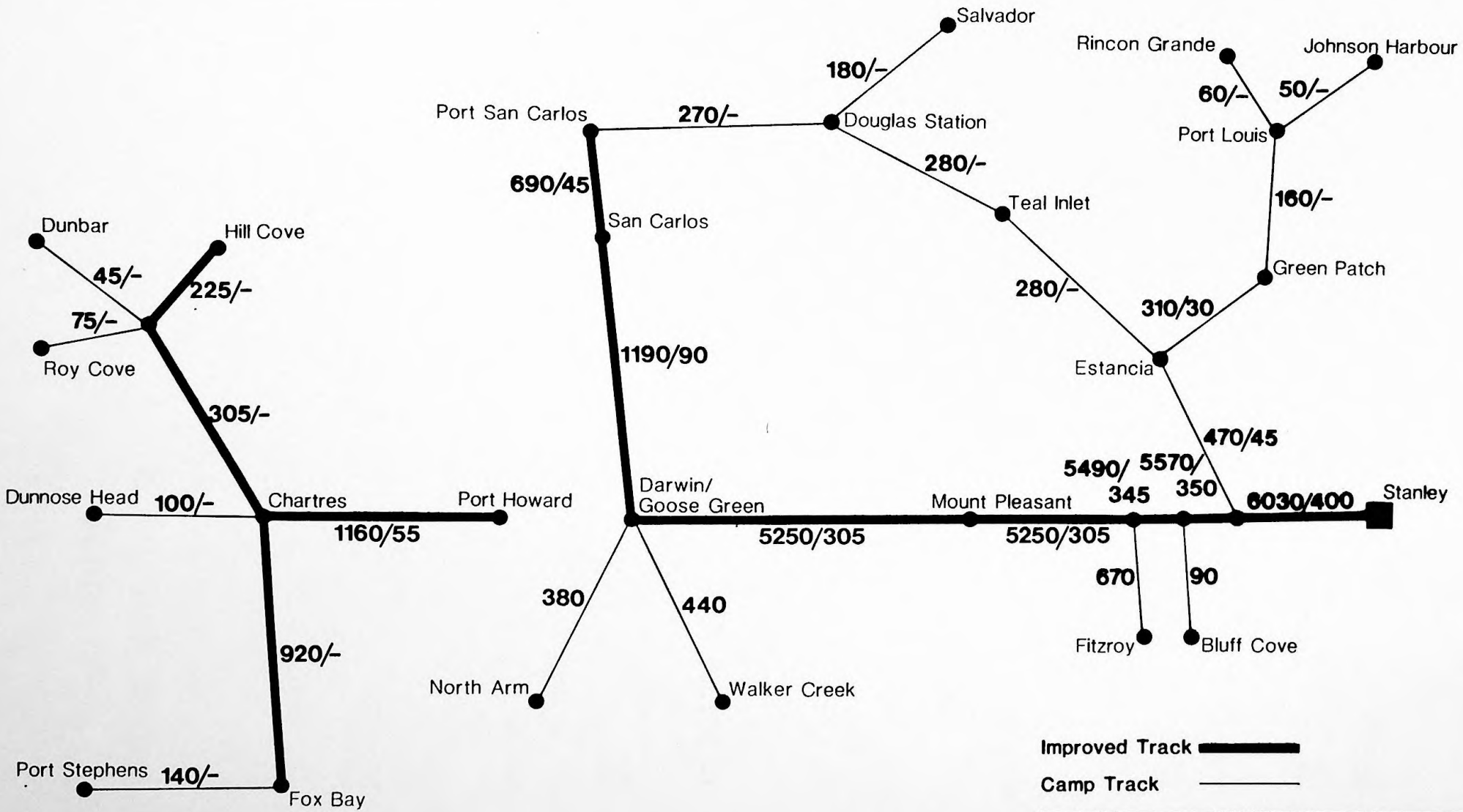
1. Transfer some 900 tonnes of wool and the equivalent volume of general cargo from shipping to trucks. This would generate some 200 vehicle journeys a year at a total cost of £41,600 (including cargo handling at Stanley).

2. Reduce the cost of the existing 3,900 overland trips from an average of 32 pence per km to an average of 22 pence per km giving rise to user cost savings of £24,000 a year by 1995.

3. Divert 3,400 trips from air to road by 1995, reducing annual user costs from £109,000 to £77,000 giving rise to a saving of £32,000 a year.

4. Generate some 4,900 additional overland journeys at a total user cost of £35,000 a year.

The end result of this would be the traffic flows shown in Figure 7.3.



No. indicates vehicles per year as Passenger Veh./Trucks

1995 Estimated Vehicle Traffic - System 3 - Shackleton

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Figure 7.3

7.5 Summary

The net effects of these three systems are shown in Table 7.1, where they are compared with the existing situation.

Table 7.1 : Effects of the Three Transport Systems

	1984	1995		
	Existing	System 1	System 2	System 3
Demand				
Freight				
Tonnes of wool				
- CSL	2,220	2,520	270	1,640
- Overland	40	80	2,330	960
No. of lorry trips	-	16	470	200
Passengers				
FIGAS	7,000	12,700	7,700	9,250
Overland	3,100	3,900	16,500	12,250
Total	10,100	16,600	24,200	21,500
Costs and Revenues (£)				
CSL				
Coastal Shipping				
Cost	255,500	266,000	105,000	154,000
Revenue	175,000	240,000	25,000	155,000
Deficit	80,000	24,000	80,000	-
Ferry Service				
Cost	-	-	92,500	80,000
Revenue	-	-	66,000	50,000
Deficit	-	-	26,500	30,000
FIGAS				
Cost	349,000	480,000	350,000	415,000
Revenue	217,000	390,000	235,000	285,000
Deficit	132,000	90,000	115,000	130,000

8. Evaluation of Alternative Schemes

8. EVALUATION OF ALTERNATIVE SCHEMES

8.1 Capital Costs

The capital cost implications of the three Schemes under evaluation differ very widely and are briefly summarised in Table 8.1 below:

Table 8.1 : Capital Cost of Alternative Schemes (£ million)

	1. Do Minimum	2. Road Based	3. Shackleton
Road Construction	2.0(1)	27.5	10.0
Vessels - Ferry	-	0.6	0.6
less disposal of Forrest(2)	-	(0.2)	(0.2)
Aircraft(2)	-	(0.2)	-
Total	2.0	27.7	10.4

Notes: (1) Including Estancia track, already under construction
(2) Notional figure

Clearly Schemes 2 and 3 involve the expenditures of very large sums of money, in relation both to the total population of the Falkland Islands, total Government expenditure and Gross National Product.

However, it has been a theme of all recent reviews of the Falkland Islands economy that its future is clouded by a failure to invest, stretching back over a number of years. This comment applies as much to the public sector, and infrastructure provision, as to the private sector enterprises operating in the Falklands.

Capital investment on the scale suggested by Systems 2 and 3 can only be regarded in this light, i.e. as an exercise designed to catch up on a history of neglect of infrastructure dating back over a considerable period. If the current situation in the Falklands is compared with that of, for example, the Western Isles of Scotland, the relatively primitive system of tracks proposed under even System 2 can be seen as not particularly lavish had it been built up steadily over the past six or seven decades, rather than being put in place in a single concentrated programme. Nor, indeed, can such expenditure be seen as lavish when compared with the sums being spent on the defence of the Islands and its external communications - Mount Pleasant Airfield, Mare Harbour, etc.

Nevertheless, the key to the viability of such expenditure should be in the recurrent costs of maintaining it and the likely benefits which it would bring to the resident population.

8.2 Recurrent Costs

As has already been noted in Section 3.5, Government estimates that in 1985/6, some £424,000, or 7.7 per cent of its total budget for Ordinary Expenditure will be spent on directly transport related items. In Table 8.2 these sums are compared with the estimated amounts which would be required under the three schemes outlined in Section 7. The tabulation is, however, somewhat misleading in that much of the improvement in deficit payments to the transport operators arises from increases in the tariff rates which are, to a large extent, already overdue and which, if implemented, would automatically have the effect of reducing current Government expenditure on transport. It is also fair to add that the estimates of road maintenance expenditure are particularly speculative. They are based on the experience of the Forestry Commission, particularly in Wales and Scotland. The critical factors are the weight and volume of traffic using the roads and the promptness and frequency with which maintenance works, particularly drain clearance, are carried out. Any stretches of camp track which experienced heavy military traffic, for example, or where a backlog of maintenance work were allowed to build up, could deteriorate rapidly. Under those conditions, maintenance expenditure would be several times higher than the estimate contained in Table 8.2. Equally, the figure shown for road maintenance in the 1985/6 Estimates relates largely to internal Stanley roads. Some expenditures would continue to be required on these items.

Table 8.2 : Estimated Government Recurrent Expenditures Under the Three Transport Development Schemes - 1998

	1985 Estimated	1995 Scheme 1	1995 Scheme 2	1995 Scheme 3
FIGAS Deficit	242,000	90,000	115,000	130,000
MV Forrest	59,000	-	-	-
CSL Deficit	-	24,000	80,000	-
Ferry Service	-	-	26,500	30,000
Track Maintenance	123,000	150,000	370,000	210,000
Total	424,000	264,000	591,500	370,000

It is, thus, probably more reasonable, in making economic evaluations, to consider Scheme 1, the Do Minimum Scheme, as the base point and consider the marginal recurrent costs of the other schemes in comparison to the marginal benefits to be obtained. On that basis, the marginal additional annual recurrent costs to the FIG are as follows:

Scheme 2 - £327,000
Scheme 3 - £106,000

8.3 Economic Benefits

The economic benefits of improving the Falkland Islands transport system have been considered under four headings:

- user cost savings
- time savings
- generated traffic
- economic and social benefits

These groups involve increasing degrees of speculation as far as quantification is concerned and, indeed, the final group can be dealt with only in qualitative terms. Nevertheless, the ability to quantify a benefit is not a necessary indication of its importance and it may well be that the four groups indicated are, in fact, in increasing degrees of importance, as far as the future of the Falklands is concerned.

8.3.1 User Cost Savings

Cost savings can also be considered under two headings. There are the cost savings which arise through reductions in the cost of journeys which would be made in any case but where conditions are improved, i.e. reductions in vehicle operating costs of overland camp driving. There are also savings which arise through the ability to switch from a more expensive mode of transport to a cheaper one.

As far as the first is concerned, it is estimated that in 1995 under the Do Minimum System, there would be some 3,900 overland camp journeys, covering some 215,000 vehicle/km at a total vehicle operating cost of about £69,000. Under Scheme 2, the cost of these journeys would fall to £43,000 a year and under Scheme 3 to £45,000. Thus, in terms of straight user costs, the marginal economic benefit of the two systems are:

System 2 - £26,000 a year
System 3 - £24,000 a year

In terms of freight switching from coastal shipping to overland truck haulage, the costs are estimated as follows:

	1	2	3
CSL Freight Revenues	240,000	25,000	155,000
Overland Freight Costs (inc. handling)	1,000	118,000	41,600
	241,000	143,000	196,600

Thus, marginal economic benefits to users by 1995 may be calculated as:

System 2 - £98,000 a year
System 3 - £44,400 a year

The other modal switch which would realise user cost savings would be passengers travelling overland instead of taking air journeys with FIGAS. The total costs involved in 1995 would be as follows:

	1	2	3
FIGAS Domestic Passenger Revenues	240,000	82,500	131,000
Overland Travel Costs	-	104,000	77,000
	240,000	186,500	208,000

Thus, marginal economic benefit to users by 1995 may be calculated as:

System 2 - £55,000 a year
System 3 - £32,000 a year

In addition to these straight user costs, consideration should be given to the cost saved where maintenance is no longer required for transport facilities, such as airstrips and jetties, which will no longer be needed when all freight and passenger movement to and from a given settlement is by vehicle. It is true that at present very little maintenance effort is expended on either jetties or airstrips, but the effects of this are showing (as has already been noted) and a sharp deterioration in condition has been experienced in some cases. If these facilities are to be retained in a safe and operable condition through to 1995 considerable maintenance expenditures will be required. These will vary very considerably in extent from jetties which will need virtual replacement and airstrips which will require rotavation and reseeding to those where only minor remedial works such as fender replacement and strip rolling will be required.

A notional average maintenance figure for the next decade of £4,000 a year for each jetty and £2,000 a year for each airstrip has been assumed. On this basis System 2 would save these maintenance costs on some 16 jetties and 13 airstrips, for a total saving of £90,000 a year. System 3 would only probably release 5 jetties and 4 air strips, but even here the annual savings would amount to £28,000 a year by 1995.

The total annual user cost savings of the two systems may be summarised as follows:

	System 2	System 3
Existing vehicle journeys	26,000	24,000
Diverted freight	98,000	44,000
Diverted passengers	53,500	32,000
Reduced maintenance	90,000	28,000
	£267,500	£128,000

8.3.2 Time Savings

Anyone who has travelled around the Falkland Islands is aware of how much time is consumed in making even the simplest of journeys (other than between Stanley and Mount Pleasant). It is not simply a question of the elapsed time of the journey either, but the uncertainty of arrival time makes it difficult to plan ahead.

Thus, a journey from Stanley to Darwin by Land Rover may take only $3^{1}/_{2}$ to 4 hours and someone with one hours business in Stanley may be able to make the return journey in a single day. But, particularly in Winter when the risk of bogging is high, he may set out at day break on one day and yet not return until well into the following day. Similarly, if he elected to travel by air, he would not know his time of departure from Darwin until the evening of the previous day. This may be, say, 11.30 am, allowing him to do a morning's work in Darwin. But by the time he had got to Stanley and done his business, it would be too late in all probability to get a flight home, and he would have to say in Stanley overnight and return by the first flight next morning, probably arriving back in Darwin some 24 hours after his departure. All this for a round trip of 170 km and an hours business.

Islanders are, of course, well aware of this, and have adapted their way of life to it, combining purposes for journeys whenever possible and mixing business with social trips. Nevertheless, it introduces a leisureliness into commercial and administrative life which results in a low level of efficiency and a great deal of frustration at times.

Improved speed of travel would enable, for example, skilled craftsmen, professional advisors, or government officers, to accomplish a great deal more in their limited time and, thus, not only reduce the level of cost for these services, but enable them to do a great deal more work at a time of considerable shortage of skilled manpower at almost every level in the Falklands economy.

Quantification of these time savings is extremely difficult, but if it is assumed that existing overland journeys take place at an average speed of 15 km per hour, that a round trip by air takes 24 hours, of which 14 are taken up by business and social activities and that average speeds on an improved camp track would be 50 km per hour, then the following annual time savings may be calculated:

	System 1	System 2	System 3
Total Time Air Journeys (hrs)	38,500	13,500	21,250
Total Time Land Journeys (hrs) (excluding generated)	17,200	27,200	24,150
	55,700	41,700	45,400
Savings over System 1	-	14,000	10,300

The value of marginal time is always difficult to quantify. Some have argued that such savings have no economic value at all and are simply absorbed into the social time of the individual. At the other extreme it has been argued that the loss of productivity involved is measured not only by the wage rate of the individual, but his on-cost as well, in the case of work trips.

No information is available on the split between trip purposes of existing journeys, but in view of their cost and difficulty it is safe to assume that the majority will have at least some work element. On the basis of an average value of time of £2 per hour, the above savings may be quantified as:

System 2 - £28,000 a year
System 3 - £20,600 a year

8.3.3 Generated Trips

Generated trips are brought about by a reduction in their cost to the individual. If the journey costs X then he does not make the trip. If it is reduced to Y then he can see some benefit in making it. It is conventional to quantify the value of these trips by the so called "rule of a half", where it is assumed that, on average, the value of the trip to the individual must be somewhere between X and Y, say $\frac{X + Y}{2}$

Since the cost of making the trip is X, then the net benefit to the individual is $\frac{X + Y}{2} - X = \frac{Y - X}{2}$

In this case, it is estimated that in System 2, the cost of trip making is reduced from 37 pence per vehicle/km to 20 pence per vehicle/km, so that in vehicle operating costs alone, the benefit of generated trips may be seen as

$$\frac{37 - 20}{2} = 8.5 \text{ pence per km.}$$

In System 2, there are estimated to be a total of 960,000 vehicle/km, of which some 215,000 are existing trips and some 355,000 vehicle/km are diverted from air. Thus, generated trips amount to some 390,000 vehicle/km, which valued at 8.5 pence per vehicle/km, gives a benefit of some £33,000 a year.

For System 3, the same figures are a total of 714,000 vehicle/km, of which 215,000 km are existing trips, 253,000 vehicle/km are diverted from air, and 246,000 vehicle/km are generated, to give a total benefit of £20,900 a year.

8.3.4 Economic and Social Impact

The assessment of the economic and social impact of the improvement of the Falkland Islands internal transport system inevitably involves judgement and uncertainty. On the one hand, as has already been noted, the scope for economic development in the Falkland Islands is limited by its remoteness and the narrowness of the resource base. Equally, many camp residents have expressed themselves to be worried by the impact of greater mobility and accessibility, which they often see in terms of incursions by Stanley residents and military personnel on Saturday nights with ensuing drunkenness and disturbance.

At the other extreme, falling margins in the wool industry, combined with expensive transport from the farms to Stanley and the increased difficulty of retaining skilled men in camp locations, have been seen as resulting in the virtual collapse of the Falkland economy, with an increasingly aged Stanley resident community subsisting on limited tourism earnings and port dues from the off-shore fishing fleet.

Neither of these two extreme scenarios is probably right. While it is true that many camp residents are happy with their relatively isolated existence and would not wish to see too many visitors, nor have much desire to travel to visit others, there are undoubtedly many others, probably a majority, who find the seclusion irksome. They would like to be able to enjoy a more varied social life, to have greater access to their children and relatives in Stanley, to have closer contact with medical and educational services, and so on. This is shown up in the declining population of camp and whereas the larger farms find it easy enough to recruit unskilled labour from Britain (particularly with the current high levels of unemployment there) the situation regarding skilled shepherds and other craftsmen is far more difficult. There is a distinct impression of falling levels of skill and experience on the farms, which in the long term could be damaging.

Equally, the present difficulty of transportation means, almost inevitably, that such economic diversification as does take place other than tourism will be located in Stanley. In so far as these diversification activities involve primary economic activity (e.g. inshore fishing) this need not necessarily be a bad thing, but as far as the service sector, broadly defined, is concerned, this is hardly desirable.

Admittedly, far more than improved transport facilities are required before such activities as builders, mechanics, electricians and plumbers can be established in camp. But with the sub-division of the large farms, such services will be increasingly required on the farms and with all such activities based in Stanley the real cost of delivery will continue to be high.

It is something of an act of faith finally to assess the resultant of all these forces, but it is the contention of this Report that without some sort of improvement to internal communications, the social and economic life of the Falklands will at best stagnate and may very well fall into decline. With greater mobility, there is at least an opportunity for diversification and development. Many of the steps required to realise this opportunity are already being taken, but without improved transport systems they may wither on the vine.

As far as the three Systems under consideration are concerned, System 1 represents little change on the existing situation and cannot be regarded as having a significant economic or social impact. The other two could both have a substantial impact, though it is difficult to distinguish much difference between the two. In spite of the far greater capital cost of System 2, it in fact achieves little more in developmental terms than System 3 which already gives surface access to the majority of camp residents and substantially improves accessibility, even to those who are not directly connected.

8.4 Conclusion

Those economic costs and benefits which can be quantified are summarised in Table 8.3.

Table 8.3 : Summary of Costs and Benefits
(£ million)

	1. Do Minimum	2. Road Based	3. Shackleton
F.I.G.			
Capital Cost	2.000	27.700	10.400
Annual Cost	.264	.592	.370
Incremental Annual Cost	-	.327	.106
Benefits over Scheme 1			
User cost savings	-	.267	.128
Time savings	-	.028	.021
Generated traffic	-	.033	.021
Total Incremental Benefit	-	.328	.170
Net Incremental Benefit	-	.001	.064

This shows that in narrow economic terms, the quantifiable benefits of Scheme 2 are approximately equal to the additional annual costs imposed by the system, whereas for System 3, a net benefit of only £64,000 a year remains once additional costs have been taken into account, representing some 0.8 per cent of the additional capital invested.

Clearly then, if anything is worth doing in the transport sector, it should be on a more limited scale than that envisaged in the O'Reilly Report, as embodied in the System 3 which has been discussed.

The more limited proposals set out in System 2 though, which consist essentially of two sections of improved camp track, the one on West Falkland connected to the other by a limited ferry service, can be seen as having substantial social and economic benefits for the Island, which are in excess of the relatively limited annual expenditure needed to support and maintain them.

9. Recommendations

9. RECOMMENDATIONS

9.1 Facilities

Some 200 km of improved camp tracks should be constructed over the following routes:

Mount Pleasant to Darwin
Port Howard to Chartres
Chartres to Fox Bay
Darwin to San Carlos and Port San Carlos
Chartres to Hill Cove

These tracks should be 3 metres in width with crossing places and constructed of crushed aggregate placed on a well drained base. It is suggested that a series of contracts be let to expatriate contractors on a "design and construct" basis, each contract being limited to some 40 or 50 km of track. In order to get competitive, but realistic prices, it may be desirable to restrict invitations to tender to reasonably large contractors who already have experience of working under Falkland conditions. Ideally, invitations to tender should be issued during the Summer months, so that contractors would have the opportunity to inspect the sites under dry conditions and submit tenders during the Winter. An early selection of the successful contractor would enable him to mobilise during the late Winter/early Spring with a view to starting work in, say, October, and accomplishing his contract during the dry Summer conditions when progress should be rapid and costs at a minimum. To assist contractors to keep costs and contingencies to a minimum, it would be helpful to conduct a geological survey of each route in advance, so that contractors would have knowledge both of the soil conditions and peat depths along the route, as well as the availability, location and type of suitable quarry sites in the vicinity.

Equally, it would probably pay Government to acquire the necessary plant in advance and lease this to the successful contractor, both to reduce the cost of plant disposal at the end of the contract and to ensure that time were not lost in mobilisation. Suitable plant should be available at the termination of the LMA contract at Mount Pleasant and Government may wish to bid for suitable items for their retention in the Islands for track improvement work.

Contracts for work on West Falkland should not be initiated until the recommended ferry vessel has been acquired and commissioned. This will greatly assist with the delivery of suitable plant and necessary stores to site on West Falkland and could significantly reduce the price of the tenders.

PWD staff will need to be strengthened, both in order to supervise the construction contracts while they are under way and to organise and carry out the necessary road maintenance works, without which much of the improved track construction will rapidly deteriorate.

A landing craft with sea going capability, such as the Cheverton 23 metre twin screw Loadmaster (illustrated in Appendix E) should be acquired as soon as possible. This would operate a scheduled ferry service between Port Howard and Brenton Loch on two or three days a week, and be available for other appropriate work at other times. It is suggested that the vessel be acquired in the first instance by FIG and leased to CSL who would operate it in conjunction with the Monsunen. The Forrest should be disposed of as soon as the new ferry is established and operational.

9.2 Phasing

It is recommended that the first step in the implementation should be to acquire the new ferry vessel. This would be seen as very encouraging to the inhabitants of West Falkland, who are sometimes suspicious that undue consideration is given to the needs of East Falklanders, and would provide considerable assistance at a later stage to contractors.

Road contracts could then be let on an annual basis from say 1987 to 1991 at an approximate cost of some £2 million each. This would give rise to the following approximate cash flow profile.

	1985/6	1986/7	1987/8	1988/9 to 1991/2
Estancia Road	.100	.150	.150	-
Purchase of Ferry	-	.600	-	-
Track improvement contracts	-	-	2.000	2.000

9.3 Institutions

The Falkland Islands Government is at present very much involved in the provision of transport services. The PWD builds and maintains roads, FIGAS is a direct arm of Government and the Forrest is owned by Government and operated by the Customs and Harbour Department. While there is nothing intrinsically wrong with this, the conditions of Government service and the traditions and objectives of that service do not always coincide with the requirements of operating an efficient and demand responsive transport system.

It is suggested that while Government continue to take the ultimate responsibility for the planning and provision of a transport system, the day to day operations should more and more be entrusted to private or independent bodies who would have more freedom to design the services to meet customers requirements and to employ appropriate staff on the basis of the needs of that system.

Thus, it is suggested that the post of Director of Civil Aviation should be separated from that of the Manager of FIGAS. Apart from the obvious conflicts of interest which such a joint responsibility could entail, the demands of operating even such a small air service efficiently are likely to absorb the total commitment of a single individual. While not wishing to pre-empt the conclusions of the committee chaired by Mr A Blake, it is recommended that a study be commissioned into the structure of FIGAS with a view to examining the practicality of its being managed and operated by a private sector organisation, the scope for operational efficiencies which could reduce its operational deficit and the role of Government in financing and controlling that deficit.

Similarly, it is recommended that the Government should relinquish its role as a direct ship operator. This may be accomplished by Government taking a share in Coastal Shipping Limited and leasing the Forrest, or the new ferry vessel to CSL at an appropriate rate. FIC at present act as operators for CSL and there seems no reason why this arrangement should not continue. FIC have the necessary experience and also the greatest incentive to maintain efficiency, as the largest user of the service. While it may be argued that FIC could use this position to favour their own settlements, strong supervision at Board level, not least by Government, should ensure an evenhanded treatment of all users of the service. Any necessary subsidy to the enlarged CSL should be agreed well in advance, according to stated principles and beyond that the company should continue to cover its costs from revenue, with tariff levels set by commercial considerations. Government's contribution should be seen as financing a sufficient degree of overcapacity to provide standby facilities in an emergency and not as a subsidiser of last resort who can finance any deficits and thus avoid tariff increases as costs rise. Only in this way can management be given appropriate incentives to efficiency and the Government avoid being subjected to continual pressure to increase subsidy and keep tariffs down.

Appendices

A

Details of Camp Airstrips

Appendix A. Details of Camp Airstrips

Location	Orientation	Dimensions	Comments
Johnson Harbour	01/19	360 x 30	Somewhat rutted, with bare patches. A longer E/W orientated strip would be useful.
Port Louis	11/09	360 x 25	Suggested new strip required as matter of urgency.
Green Patch	08/26	400 x 30	Very rough strip requiring urgent attention. Could be lengthened to 600 yards.
Rincon Grande	06/24	400 x 45	Very draggy airstrip, requiring rotavation and extension to 600 yards.
Salvador	04/22	600 x 30	Good airstrip.
Teal Inlet	06/24 16/34	500 x 30) 330 x 28)	Good airstrip
Douglas Station	05/23 14/32	500 x 30) 380 x 30)	West end of long runway is rough and requires some improvement.
Port San Carlos	10/28 07/25	600 x 30) 275 x 30)	A lot of work has shown results, though main runway still has some bare patches.
San Carlos	11/29	575 x 30	Some further drainage work still required.
Darwin	Various	550 x 30	Some hollows require filling, but very good airstrip in general.
Swan Island	16/34	440 x 25	Very poor runway, because of crossfalls and short length.
Great Island	18/36	500 x 25	Bare patches require attention.
North Arm	01/19 03/24	620 x 30) 470 x 30)	Some further work required on cross strip. Aerial constitutes hazard on southern approach to cross strip.

Appendix A. Details of Camp Airstrips (cont..)

Location	Orientation	Dimensions	Comments
Speedwell Island	02/20 11/29	400 x 20) 300 x 20)	Reasonable
George Island	10/28	400 x 28	Very rough strip requiring considerable work.
Sea Lion Island	12/30 03/21	580 x 50) 500 x 50)	Draggy airstrip, requiring rolling and other improvements.
Bleaker Island	15/33 03/21	415 x 30) 200 x 30)	Very good strip, but short and could benefit from extension.
Lively Island	08/26 01/19	360 x 25) 400 x 30)	Very rough strip, urgently requiring improvement.
Walker Creek	02/20 09/27	390 x 30) 570 x 30)	Requires some reseeding; bare patches.
Fitzroy	06/24 10/28	630 x 30) 470 x 30)	North strip very boggy at East end. South strip extremely rough and requiring urgent attention.
Port Howard	01/19	480 x 30	Existing runway reasonable, but alternative E/W strip required.
Fox Bay East	12/30 02/20 15/33	550 x 25) 275 x 25) 200 x 25)	A great deal of work required, including rolling, reseeding and hole filling.
Fox Bay West	14/32	500 x 40	Very soft strip which will probably have to be relocated since attempts at drainage have been unsuccessful.
Port Stephens	13/31	600 x 25	Very soft strip in autumn and winter. May have to be relocated unless drainage scheme can improve situation.
Weddell Island	15/33	380 x 25	Rough strip requiring some work.
Beaver Island	13/31	390 x 18	Soft portions of strip require drainage.

Appendix A. Details of Camp Airstrips (cont..)

Location	Orientation	Dimensions	Comments
Dunnose Head	06/24 10/28 01/19	600 x 25) 400 x 25) 500 x 25)	Main runway requires drainage and cutting. Subsidiary runways should be reinstated by filling in craters.
Chartres	09/27 07/25 13/31 06/24	600 x 25) 350 x 20) 220 x 20) 370 x 18)	Good airstrip
Roy Cove	10/28	570 x 30	Strip requires some attention to bare patches. New cross strip required.
Carcass Island	12/30	600 x 30	Reasonable strip.
Hill Cove	01/19 09/27	520 x 20) 350 x 30)	Some work still required on bumpy portion of strip. Aerial to East of main runway is a hazard.
Saunders Island	10/28 11/29 15/33	680 x 30) 560 x 30) 500 x 30)	Very rough airstrip which urgently requires considerable work to make it acceptable.
Keppel Island	07/25	900 x	
Golding Island	11/29	530 x 15	Satisfactory for light use, but airstrip ruts easily.
Pebble Island	10/28	600 x	

Source: FIGAS (Comments taken largely from circular letter from Director of Civil Aviation to All Farm Owners/Managers Aug. 1985).

B

Analysis of FIGAS Passenger Trips 1985

Appendix B : Analysis of FIGAS Passenger Trips 1985

Table B1: Distribution of FIGAS Passenger Trips 1/4/85-9/9/85

	Trips to & from Stanley		Other Trips		Total Trips
	No.	%	No.	%	No.
Bleaker Island	1	.1	2	.6	3
Darwin	196	10.9	36	10.1	232
Douglas Station	32	1.8	8	2.2	40
Fitzroy	13	.7	9	2.5	22
George Island	7	.4	15	4.2	22
Great Island	6	.3	4	1.1	10
Green Patch	43	2.4	7	2.0	50
Johnson Harbour	25	1.4	4	1.1	29
Lively Island	8	.4	2	.6	10
North Arm	61	3.4	22	6.2	83
Port Louis	11	.6	2	.6	13
Port San Carlos	115	6.4	14	3.9	129
Rincon Grande	1	.1	-	-	1
Salvador	38	2.1	7	2.0	45
San Carlos	78	4.3	18	5.1	96
Sea Lion Island	15	.8	9	2.5	24
Speedwell Island	8	.4	12	3.4	20
Teal Inlet	52	2.9	8	2.2	60
Walker Creek	11	.6	5	1.4	16
Beaver Island	5	.3	2	.6	7
Carcass Island	25	1.4	3	.8	28
Chartres	64	3.6	14	3.9	78
Dunbar	23	1.3	4	1.1	27
Dunnose Head	51	2.8	8	2.2	59
Fox Bay East	285	15.8	23	6.5	308
Fox Bay West	57	2.8	10	2.8	61
Golding Island	15	.8	6	1.7	21
Hill Cove	125	7.0	12	3.4	137
Keppell Island	22	1.2	6	1.7	28
Pebble Island	57	3.2	18	5.1	75
Port Howard	150	8.3	29	8.2	179
Port Stephens	50	2.8	10	2.8	60
Roy Cove	67	3.7	5	1.4	72
Saunders Island	38	2.1	13	3.6	51
Weddell Island	40	2.2	8	2.2	48
West Point Island	9	.5	1	.3	10
Total E.F.	721	40.1	184	51.7	905
Total W.F.	1,077	59.9	172	48.3	1,249
Total Trips	1,798	100.0	356	100.0	2,154
Percentage of total trips	83.5%		16.5%		100%

Source: FIGAS

Table B2 : Air Trips per Head on FIGAS - Principal Settlements
(to/from Stanley)

	1976			1984/5		
	Trips	Est. Pop.	Trips/head	Trips	Est. Pop.	Trips/head
Darwin-Goose Green	432	144	3.0	637	84	7.6
Douglas	68	17	4.0	104	12	8.7
Fitzroy	86	23	3.7	42	23	1.8
Green Patch	52	19	2.7	140	18	7.8
North Arm	129	43	3.0	198	23	8.6
Port San Carlos	155	31	5.0	374	23	16.3
Salvador	117	15	7.8	123	15	8.2
San Carlos	92	29	3.2	253	24	10.5
Teal Inlet	81	25	3.2	169	15	11.3
Walker Creek	30	19	1.6	36	15	2.4
Chartres	114	28	4.1	208	24	8.7
Fox Bay East)						
Fox Bay West)	267	66	4.0	1,092	68	16.1
Hill Cove	170	51	3.3	406	43	9.4
Pebble Island	71	24	3.0	185	20	9.2
Port Howard	80	44	1.8	487	43	11.3
Port Stephens	90	36	2.5	162	28	5.8
Roy Cove	69	22	3.1	217	20	10.8
Weddell Island	30	15	2.0	130	10	13.0

Source: FIGAS and Jones & Orme

C

Forecast of Passenger Trips: Volume and Modal Split

Appendix C : Forecast of Passenger Trips - Volume & Modal Split

	1984/5			1994/5								
	Estimated Actual			System 1			System 2			System 3		
E. Falklands	Total[1]	Air	Road	Total[2]	Air[3]	Road	Total[4]	Air	Road	Total	Air	Road
Bluff Cove	75	-	75	86	-	86	172	-	172	172	-	172
Darwin	1575	754	821	1811	829	982	3622	-	3622	3622	-	3622
Douglas Station	225	130	95	259	143	116	518	-	518	259	143	116
Fitzroy	430	71	359	495	78	417	990	-	990	990	-	990
Green Patch	375	162	213	431	178	253	862	-	862	431	178	253
Johnson Harbour	150	94	56	172	103	69	344	-	344	172	103	69
North Arm	430	270	160	495	297	198	990	-	990	600	300	300
Port Louis	112	42	70	129	46	83	258	-	258	129	46	83
Port San Carlos	430	419	11	494	461	33	988	-	988	988	-	988
Rincon Grande	75	3	72	86	3	83	172	-	172	86	3	83
Salvador	280	146	134	322	161	161	644	-	644	322	161	161
San Carlos	450	312	138	518	343	175	1036	-	1036	1036	-	1036
Teal Inlet	280	195	85	322	215	107	644	-	644	322	215	107
Walker Creek	280	52	228	322	57	265	644	-	644	450	50	400
	5167	2650	2517	5942	2915	3027	11884	-	11884	9579	1199	8380

Appendix C : Forecast of Passenger Trips - Volume & Modal Split (Cont...)

	1984/5			1994/5								
	Estimated Actual			System 1			System 2			System 3		
W. Falklands	Total[1]	Air	Road[5]	Total	Air	Road [6]	Total[7]	Air[8]	Road	Total	Air	Road
Chartres	298	253	45	348	278	70	480	111	369	480	111	369
Dunbar	104	88	16	121	97	24	167	39	128	144	68	76
Dunnose Head	226	192	34	264	211	53	364	84	280	314	147	167
Fox Bay East	1176	1000	176	1375	1100	275	1896	440	1456	1896	440	1456
Fox Bay West	233	198	35	272	218	54	375	87	288	375	87	288
Hill Cove	524	445	79	612	490	422	844	196	648	728	343	385
Port Howard	685	582	103	800	640	160	1103	256	847	1103	256	847
Port Stephens	229	195	34	269	215	54	371	86	285	320	150	170
Roy Cove	275	234	41	321	257	64	443	103	340	282	180	62
	3750	3187	562	4382	3506	876	6043	1402	4641	5642	1782	3860
Islands												
Bleaker	10	10	-	11	11	-	11	11	-	11	11	-
George	71	71	-	78	78	-	78	78	-	78	78	-
Great	32	32	-	35	35	-	35	35	-	35	35	-
Lively	32	32	-	35	35	-	35	35	-	35	35	-
Sea Lion	78	78	-	86	86	-	86	86	-	86	86	-
Speedwell	65	65	-	72	72	-	72	72	-	72	72	-

Appendix C : Forecast of Passenger Trips - Volume & Modal Split (Cont...)

Islands	1984/5 Estimated Actual Total	Air	Road	1994/5 System 1 Total	Air	Road	System 2 Total	Air	Road	System 3 Total	Air	Road
Beaver	23	23	-	25	25	-	25	25	-	25	25	-
Carcass	91	91	-	100	100	-	100	100	-	100	100	-
Golding	68	68	-	75	75	-	75	75	-	75	75	-
Keppell	91	91	-	100	100	-	100	100	-	100	100	-
Pebble	244	244	-	268	268	-	268	268	-	268	268	-
Saunders	166	166	-	183	183	-	183	183	-	183	183	-
Weddell	156	156	-	172	172	-	172	172	-	172	172	-
West Point	32	32	-	35	35	-	35	35	-	35	35	-
	1159	1159	-	1275	1275	-	1275	1275	-	1275	1275	-
Total	10076	6996	3079	11599 (+5000)	7696 (+5000)	3903	19202 (+5000)	2677 (+5000)	16125	16496 (+5000)	4256 (+5000)	12240

Notes:
1. Based on 15 trips to and from Stanley representing 80% of total trips.
2. Increased by 15%.
3. Increased by 10%.
4. Based on 30 trips to and from Stanley, representing 80% of total trips.
5. Based on 15% of trips being internal to W. Falkland.
6. Based on 20% of trips being internal to W. Falkland.
7. Case 1, multiplied by $\frac{20}{14.5}$
8. 40% of Case 1, air journeys.

D

Wool Clip: Forecasts of Volume and Modal Split

Appendix D : Wool Clip - Forecasts of Volume & Modal Split

(tonnes)

E. Falkland	1984/5 Total	1984/5 O/L	1994/5 Total	System 1 CSL	System 1 O/L	System 2 CSL	System 2 O/L	System 3 CSL	System 3 O/L
Stanley Dairy	10	10	12	-	12	-	12	-	12
Berkeley Sound	50	-	58	58	-	-	58	58	-
Bluff Cove	9	9	10	-	10	-	10	-	10
Blue Beach	25	-	29	29	-	-	29	-	29
Brookfield	12	-	14	-	14	-	14	-	14
Darwin/Walker Creek	364	-	419	419	-	-	419	210	209
Douglas Station	49	-	56	56	-	-	56	56	-
Estancia	11	11	13	-	13	-	13	-	13
Teal Inlet	78	-	90	90	-	-	90	90	-
Fitzroy	90	-	104	104	-	-	104	-	104
Salvador	52	-	60	60	-	-	60	60	-
Greenfield	11	-	13	13	-	-	13	-	13
Horseshoe Bay	22	-	25	25	-	-	25	-	25
Kingsford Valley	9	-	10	10	-	-	10	-	10
Long Island	10	-	12	-	12	-	12	-	12
Maryfield	12	-	14	14	-	-	14	-	14
Mount Kent	9	-	10	-	10	-	10	-	10
Mullett Creek	1	-	1	1	-	-	1	-	1
Murrell	9	9	10	-	10	-	10	-	10
North Arm	227	-	261	261	-	-	261	261	-
Port Louis	34	-	39	37	-	-	37	37	-
Port San Carlos	98	-	113	113	-	-	113	-	113
Port Sussex	10	-	12	12	-	-	12	-	12
Rincon Grande	29	-	33	33	-	-	33	33	-
Riverside	1	-	1	1	-	-	1	-	1
Weir Creek	-	-	-	-	-	-	-	-	-
Wiamea	16	-	18	18	-	-	18	-	18
Wreck Point	13	-	15	15	-	-	5	-	5
	1252	40	1452	1371	81	-	1452	807	645

Appendix D : Wool Clip - Forecasts of Volume & Modal Split (Cont...)

(tonnes)

	1984/5		1994/5						
				System 1		System 2		System 3	
W. Falkland	Total	O/L	Total	CSL	O/L	CSL	O/L	CSL	O/L
Bold Cove	11	-	13	13	-	-	13	-	13
Boundary	13	-	15	15	-	-	15	15	-
Chartres	98	-	113	113	-	-	113	-	113
Coast Ridge	20	-	23	23	-	-	23	23	-
Crooked Inlet	11	-	13	13	-	-	13	13	-
Dip Point	-	-	-	-	-	-	-	-	-
Dunbar	12	-	14	14	-	-	14	14	-
Dunnose Head	11	-	13	13	-	-	13	13	-
Fox Bay West	95	-	109	109	-	-	109	109	-
Hill Cove	121	-	139	139	-	-	139	139	-
Hope Harbour	11	-	13	13	-	-	13	13	-
Lakelands	19	-	22	22	-	-	22	22	-
Little Chartres	18	-	21	21	-	-	21	-	21
Manybranch	10	-	12	12	-	-	12	-	12
Narrows	14	-	16	16	-	-	16	16	-
Pickthorne	11	-	13	13	-	-	13	13	-
Port Howard	141	-	162	162	-	-	162	-	162
Port North	14	-	16	16	-	-	16	16	-
Port Stephens	125	-	144	144	-	-	144	144	-
Shallow Harbour	13	-	15	15	-	-	15	15	-
	766	-	886	886	-	-	886	565	321

Appendix D : Wool Clip - Forecasts of Volume & Modal Split (Cont...)

	1984/5	1994/5	
			All Systems
Islands	Total	Total	CSL
Bleaker	9	10	10
Box	1	1	1
Carcass	6	7	7
George/Barren	10	12	12
Golding	6	7	7
Great	10	12	12
Keppel	11	13	13
Lively	24	28	28
New	6	7	7
Pebble	42	48	48
Saunders	31	36	36
Sea Lion	6	7	7
Sedge	2	2	2
Split	1	1	1
Speedwell	23	26	26
Weddell	35	40	40
West Point	9	10	10
	233	267	256

		Total	Overland	CSL
Total 1984/5	E Falkland	1252	40	1242
	W Falkland	766	-	766
	Islands	233	-	233
		2252	40	2222

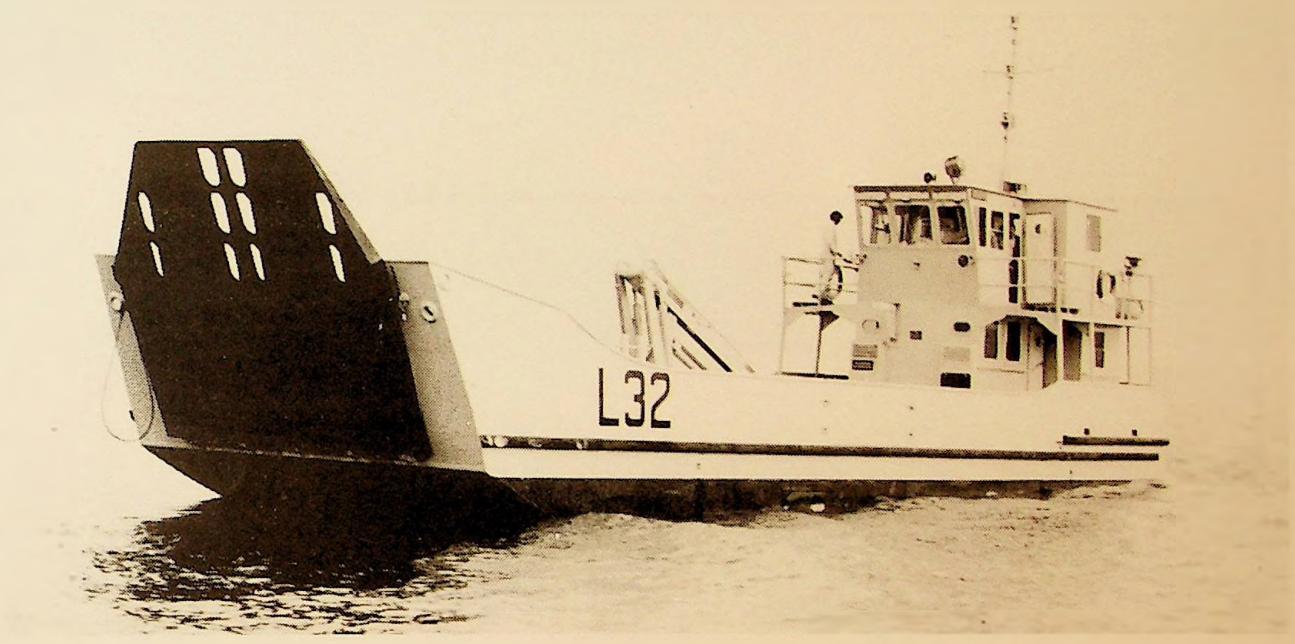
			System 1		System 2		System 3	
		Total	CSL	O/L	CSL	O/L	CSL	O/L
1994/5	EF	1452	1371	81	-	1452	807	645
	WF	886	886	-	-	886	565	321
	I	267	267	-	267	-	267	-
	Total	2605	2524	81	267	2338	1639	966

E

Example of Recommended Ferry Vessel

Cheverton

23 Metre Twin-Screw Loadmaster



Designed for logistic transport of men, stores and vehicles in remote shallow water areas this all steel Loadmaster is also capable of open sea passages. A reinforced main deck taking heavy tracked vehicles and a good liquid cargo capacity make this a very versatile craft.

DIMENSIONS

L.o.a.	22.86	m
Beam	6.10	m
Draught (loaded)	1.07	m
Displacement (light)	64.3	tonnes
Fuel capacity	2700	litres
Fresh water capacity	338	litres
Deck load capacity	30	tonnes
Bulk liquid cargo capacity	59 130	litres

PROPULSION MACHINERY

Twin Detroit Diesels GM6V71N, naturally aspirated, fresh water heat exchanger cooled marine dielsels; Allison hydraulically operated 2 : 1 reverse/reduction gearboxes. Each engine continuously rated at 174 shp (129.8 kW) at 1800 rpm.

PERFORMANCE

Speed (continuous) – light 9 knots
– loaded 8.5 knots

Range (using 90% of available fuel) 270 n. miles

Figures based on U.K trials conditions.

CONSTRUCTION

Pontoon type hull partitioned into watertight compartments, heavily constructed of mild steel (BS 4360, Grade 43A), shot blasted and pre-weld primed.

ELECTRICAL SYSTEM

24 V. Two banks of batteries (4 x 6 V, 265 Ah) switched so that either engine started from either battery bank; charged by engine alternators or diesel driven generator set in engine room. Full cathodic protection provided by zinc anodes of minimum one year life.

STERN GEAR

316 stainless steel 63.5 mm diameter propeller shafts running in mild steel sterntubes with bronze bearings. Aluminium bronze propellers.

STEERING GEAR

Hand hydraulic system. Emergency tiller provided.

GENERAL ARRANGEMENT

The engine room/machinery space is located aft with wheelhouse and crew's cabins arranged on two levels above.

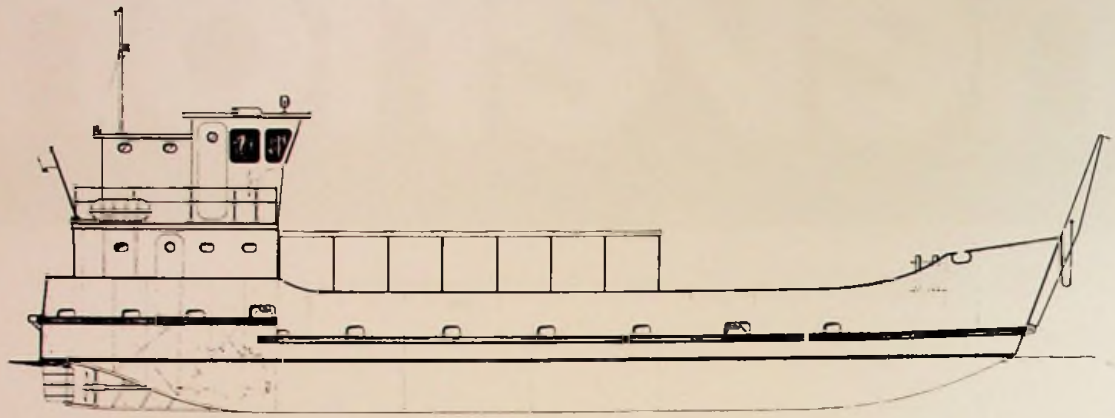
Wheelhouse - centre line console with engine instruments and controls plus transfer pump switches. Chart table to port. Doors, port and starboard, to bridge wings. Access via vertical ladder from lower cabin

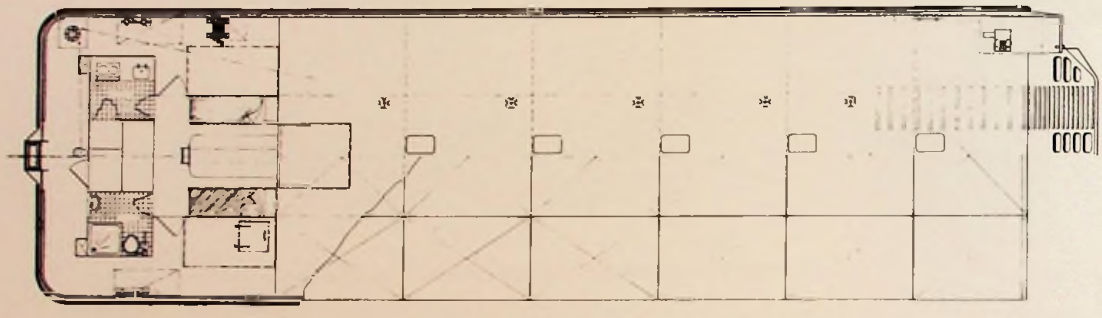
Upper cabin - aft of wheelhouse with access via door to port. Four berths, hanging locker, storage cupboard.

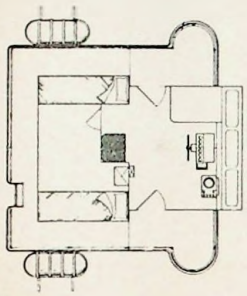
Lower cabin - two berths to port and to starboard with folding table between. Separate galley, to port, with 2-burner gas cooker and oven, sink and refrigerator. Toilet compartment, starboard, with marine WC, shower and washbasin. A secure stowage is arranged between the galley and toilet compartment.

Engine Room - houses main and auxiliary engines, air conditioning compressors, batteries, ballast and fuel tanks and cargo discharge pumps. Access from deck hatch to starboard of lower cabin. Engine removal hatches, port and starboard, facilitate engine changes.

Load deck - fitted with flush watertight hatches over void and tank spaces. Stiffened to support heavy tracked vehicles. Bow ramp lowered/raised by hydraulically operated winches; sight holes at outer end facilitate helmsman's forward vision.







AIR CONDITIONING

Upper and lower cabins air conditioned by individual 16 000 Btu/hr cooling units driven by compressors in engine room.

DECK FITTINGS

Lashing rings for cargo; elephant foot type fittings for vehicle axle lashing. Mooring bollards forward and aft. Hydraulically operated capstan (2 tonnes) with warp stowage drum on after deck. Hydraulically operated crane mounted portside forward. Portable awning extending approximately 8 m forward from deckhouse.

BILGE SYSTEM AND BALLAST PUMPING

Electric bilge pump for engine room and under deck voids; fire/deckwash connection on deckhouse front. Second electric pump floods/discharges fore and after ballast tanks to trim vessel and facilitate beach loading.

FINISH

Marine specification paints and varnish used throughout.

SHIPPING SPECIFICATION

23.00 m x 6.10 m x 6.55 m x 65 tonnes.

Minor modifications to layout and equipment or alternative propulsion machinery may be incorporated if practicable
Specification and data subject to alteration without notice.

Cheverton Workboats

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A subsidiary of Fairey Marine Limited, an operating company within Fairey Holdings Limited, the Engineering Sector of S. Pearson & Son PLC.

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