Benefits of shipboard changes to the Ethiopian shipping lines corporation

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WORLD MARITIME UNIVERSITY
MALMO, SWEDEN

THE BENEFITS OF SHIPBOARD CHANGES TO THE
ETHIOPIAN SHIPPING LINES CORPORATION

by
ARAYA LULSEGED
ETHIOPIA

A paper submitted to the Faculty of the World Maritime University in partial satisfaction of the requirements for the award of a

MASTER OF SCIENCE DEGREE
in
(GENERAL MARITIME ADMINISTRATION)

The contents of this paper reflect my personal views and are not necessarily endorsed by the UNIVERSITY.

Signature: [Signature]
Date: 25/11-86

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Course Professor GMA-86

Co-assessed by: Senior Researcher Aslaug Hetle
Work Research Institute Oslo
The aim of this study is to analyze and evaluate the existing cost generating problems in the Ethiopian Shipping Lines Corporations and recommend the likely solutions that would enable it to reduce its costs in the operations and maintenance of its fleets.

Historical developments, causes and benefits of shipboard changes have been discussed extensively taking into account the International Shipping Developments in its general economic, technological and operational terms. Some of the experiences, concepts and works of the traditional maritime countries of Norway, Japan, Federal Republic of Germany and United Kingdom have been quoted in the proceedings of the study to justify the final conclusion reached.

The scope of the study strictly confines itself to cost saving through shipboard changes and as the result of the research findings and analysis, the need for shipboard changes in the Ethiopian Shipping Lines Corporations as cost effective measures, are emphasized as its conclusions. The particular changes to be implemented as shipboard changes, shipboard management, general purpose rating system, mixed-departmental matrix type organization and training of General Purpose (GP) rating systems through the utilization of the country's existing training institutions have been included as its recommendation.
ACKNOWLEDGEMENTS

This paper is submitted to the World Maritime University as part of the requirements of the course on General Maritime Administrations.

It is a great pleasure to me to express my deepest and warm gratitude to my course professor Aage Os for his kind advise and encouragements which were invaluable to my work.

I also thank senior researcher Aslaug Hetle of the Work Institute of Oslo whose rich experience and dedicated efforts to help me had been a source of inspiration during my field training program in the Work Research Institute of Oslo.

I am also indebted to professor K.No'moto who spared his time to provide me with relevant information and materials.
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1. Brief Background
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BIBLIOGRAPHY
Efficient low cost transport by ocean shipping is of major importance to all countries involved in International Trade. It is particularly important to the developing countries to enable them raise their levels of productions and consumptions by opening new markets and supply sources. It becomes therefore imperative for the National Fleets of developing countries to pursue the maintenance of the efficient low cost transport concept in serving the National Trade.

Though the scope of my study is limited to cost saving through shipboard changes in the National Line, its influence however plays a great role in the efficient low cost transport service to promote and expand the National Trade in the International markets.

The Ethiopian Shipping Lines Corporations which is the only National Line, operates liner services within various shipping conferences having a good backing from the Government in a form of cargo reservation system. Its yearly and uninterrupted income since the 1974 popular political changes in Ethiopia, has enabled it to expand rapidly and in the process of modernizing the fleets, new and relatively modern ships, unlike the traditional engine-room manned ships are appearing in the scene. Because of the steady flow of revenue generated by the liner service, the main underlying problems of cost generating factors remain to be unmasked.

In the proceedings of my study, I have made the necessary attempts to unmask the cost generating factors by identifying them as, lack of training of ratings, outdated
rating ranks and positions in the manning scales, unchanged traditional shipboard organization, and the non-existence of shipboard management system, inorder to justify the absolute need for the adoption and implementation of shipboard changes as cost effective measures.

Inorder to shade some light on the importance and benefits of shipboard changes, as cost effective measures, historical and technological changes in shipping, based upon the study made and experience gained by some of the traditional maritime countries have been discussed in detail more as a general informative and conceptual than in their deeper technical and professional contexts.

From the study made and facts collected, I have reached to the conclusion that the aquisition and operations of new and relatively modern ships, without a back-up training for the ratings and organizational changes onboard to match the shipboard technology, would affect the profit that would have been gained through cost reduction and the efficient low transport cost concept in the long run may fail as a result of costs pushing the governing conference tariff towards more rigidity.

The subject matters in this study have been divided in VIII chapters with each chapter attempting to expose the purposes of its content.

CHAPTER II This chapter deals with the definitions of changes on which the whole of the study is based on.

CHAPTER III In this chapter, the historical background and developments of shipboard changes sin-
ce prehistoricman have been presented in a concise manner. It also discusses shipboard related concepts, problems and constraints which gives high importance to shipboard changes.

CHAPTER IV
This chapter deals with the effects of costs in ship operations and the application of shipboard changes in the International Shipping scene. It also attempts to show the efforts made by some of the leading maritime countries in creating new ideas and concepts as well as innovations to take full advantage of shipboard changes to reduce their costs in order to be highly competitive in the International Shipping markets.

CHAPTER V
In this chapter the forces of resistance to changes have been identified in the implementation of shipboard changes.

CHAPTER VI
This chapter deals with the opportunities open to ship owners, through decision making process to either flag out to Open Registries or invest in technologically advanced ships as cost effective measures to survive in the International Shipping markets.

CHAPTER VII
This chapter covers briefly about the establishment of the Ethiopian Shipping Lines Corporations including its manpower and fleet strength. It also highlights the
need for shipboard changes due to the effects of cost generating factors which remained unmasked overshadowed by the good freight earnings through the monopolistic nature of its operations.

CHAPTER VIII

In this final and conclusive chapter the need for shipboard changes, in the Ethiopian Shipping Lines Corporations, is highly stressed as its conclusion and some guide lines of shipboard changes has been given as recommendations.
CHAPTER II CHANGES

1. Shipboard Changes
Shipping is defined as the business of transporting the trade, i.e., commodities or passengers by sea from a required port of origin to a required port of destination at the required time. It is reasonably safe to say that 95% of all goods in the International Trade are carried by ships over the seas and oceans which cover 3/4 of the surface of the earth. The sea transportation service in ton miles performed by ships is twice as great as that carried by all the world roads, railways and airways put together. (1)

This absolute phenomenon confirms the strong interdependent relations between International Trade and Sea Transport. As much as International Trade and shipping are totally interdependent, there exists also in respect to each other a conflict of interest which are diametrically the opposite. Shipping survives only when there is a high level of freight earnings in the carriage of International goods by sea and trade prospers when transport cost is lower than the difference between the marginal costs of production. Cheap and efficient transport services which are the constant demand of exporters and importers alike, can be offered only when cost effective measures are exercised in the operations, maintenance and management of the shipping activities so as to establish a competitive strategy. Costs in fact are the basic change generating forces which eventually determine the viability and existence of a Shipping Industry.
From this basic issue of understanding, we can assume that any decision or measure taken to adopt and implement changes onboard, shall purely depend upon the strength and
magnitude of the cost behaviour against the revenue earnings. These shipboard changes fall under two main categories referred as necessary and inevitable changes.

2. Necessary Changes
The economic development of Shipping Industry has demonstrated through its business cycle that in order for the Industry to survive and remain competitive, its cost parameters are kept as minimum as the market could permit and lower than its competitors.

In an International and complex Industry like Shipping in which different ship owning disciplines with a variety of social, economic and political backgrounds are interactively involved in a fierce competition, the widely accepted principle of the maintenance of the cost than competitors appears to be difficult and complicated as they are governed by the pricing mechanism in the process of demand and supply of shipping. The best possible way to safeguard the earnings from the potential loss threat is the ability to react or respond to the changing market conditions to a degree and extent necessary for an early recovery by not allowing costs to exceed the cost absorbing point. (2)

The major parts of costs in shipping are almost shipboard generated and are mainly identified as labour and fuel costs. To cut down these relevant costs, necessary changes have to be adopted and implemented onboard as soon as its effects are beginning to be felt by their trend indications towards cost absorbing point. The required shipboard changes in such cases are the necessary changes which do not involve any structural changes other than operational, administrative and managerial efforts to gain the lost ground of competitive strategy by employing all relevant technics and ideas over and above what has been
traditionally accepted and proved through times and experience to be effective and workable.

3. Inevitable Changes
When the operational costs of a Shipping Industry becomes extremely high and gives or indicates a constant trend exceeding the cost absorbing point without remaining in a break-even level, the need for inevitable changes becomes compelling without which its existence or viability in the market will seriously be jeopardized.

The most distinctive elements that have persistent and rising characters among the various costs are the labour and fuel costs. Being protected strongly by the terms and conditions of employment stipulated in the National Labour laws, the costs which arise from the labour forces onboard cannot be negotiated and are constant factors affecting competitiveness worldwide and are the main causes for the flagging out of quite a number of ships away from the flag state in the traditional maritime countries.

Fuel, one of the most important source of income whereby the economy of some of the developing oil producing countries entirely depends, is controlled and manipulated by Multi-Nationals and Organizations which could regulate prices without prior negotiation with the consumers to satisfy their economic needs. These two rising potentials, enhanced by worldwide economic recession and overtonnage overwhelmingly deteriorate the competitive positions of shipping industries thus pushing their costs higher and higher to the extent of being eliminated from the shipping market. When these persistent conditions prevail as governing environments of the market, shipboard changes becomes inevitable requiring structural changes onboard to reduce costs and remain competitive.
Notes.

(1) PP-14 Shipping—How It Works 1978
   Th. Rinman, R. Linden

(2) PP-76 Establishment Of A National Shipping Industry
   Dr. A. A. Monsef
CHAPTER III  HISTORICAL BACKGROUND AND DEVELOPMENTS

1. Shipboard Technology

1.1 Boatage Era

The basic knowledge of technology in sea transport originated from the earliest time when prehistoric man first hollowed out a tree by the use of fire and by experimenting, developed a craft to transport himself and his commodities over the rivers and lakes around him. Such technology of transport in their crude form might have evolved from his observation of a floating log by the bank of the river or a lake which might have tempted him to straddle it and then discover the way to steer it with a makeshift means.

The continuous efforts for better ideas and ways to improve his means of transport were motivated from the absolute need to survive. His determining needs being:

- To hunt, farm or find a better place to live on the opposite side or land beyond the water.
- To fish or fight waterborne enemy.
- To carry heavy things by floating it on water. (1)

In this primitive age, the only source of power to propel and steer the boat was man himself using his own energy through oars and wooden poles.

By increasing the size of the wooden boats more space was provided to allow men onboard to generate more power inorder to venture outward from his confined river/coastal life envisaging the hopes and possibilities of going beyond the horizon.

1.2 Sailingship Era

A new discovery after the Boatage Era was the sail. It was one of man's earliest inventions by which wind force was
used as a means of propulsion for ships and boats freeing the partial energy of man for other shipboard life supporting activities.

The first known pictures of any sailing craft came from Egypt on a painted vase of about 3100 B.C though sailing boat might have appeared in Mesopotamia around 4000 B.C. Around the same period some nautical geniuses introduced the stern rudder. For thousands of years every kind of sailing craft from ancient Egypt, Greece and Norsemen had used some forms of steering oars worked over the vessels quarters. Once the ancient Egyptians had tried using as many of as six of the oars, three in each quarters. The harnessing of wind as means of propulsion and the effective use of the rudder in the handling of the sailing vessels enabled men to cross the endless seas and oceans culminating in the discovery of new continents and trade routes.

The Sailingship Era remained for quite a long period of time without any substantial major changes in the design of power generation or alternative means of power and steering. The only normal changes made were the use of iron in building ships hulls to stand sea stress and to give more space for the accommodation of cargoes. Number and sizes of masts and sails were increased to attain good speed and maneuverability inorder to arrive at trading ports before competitors. During this long period of times of the Sailingship Era, which dominated most of the human history, the limitations and capabilities of the sailing ships started to unravel itself and appeared to outlived itself and needed some new developments.
- Sailing vessels posed high safety risks.
- Lack of watertightness of deck in heavy weather.
- Inability of wooden hull to withstand sea stresses
- Limitations in manuevering and sailing in restricted waters and canals.
- Long transit time and distance searching for good weather routes.
- The complete dependency on wind force as an essential means of propulsion.

Every sailing vessel and every voyage was a great economic gamble. Carrying capacity and speed sometimes were matters of less concern. The most important thing being to bring the vessel and its immensely valuable cargo in good conditions.

1.3 Powerdriven Vessel Era
The first time steam engine was used at sea replacing winddriven vessels was in 1802 when the vessel Charlotte Dundas was built on the Clyde by William Symington. It was an era of great breakthrough of Industrialization which brought the birth of new technology by which power to propel ships through mechanical means was possible. The power means to propel ships passed through successive stages even though the steam engine remained to be the standard engine for paddle steamers up to 1860. The screw propeller had been introduced a few years earlier by F.P Smith of Hendon. By 1892 a young German Engineer named Rudolf Diesel invented the Diesel Engine and it was the Danish under the leadership of Ivar Knudsen that put the Diesel Engine on the world oceans by fitting the vessel Selandia which sailed in February 1912 from the Danish Capital to Bangkok.

2. Training of Seafarers
2.1 Sailingship Era
Historically, man had been able to use the rivers, the
lakes, the seas and oceans as a means of transporting himself and his commodities. He was not by nature a seafarer. To him life at sea was a strange environment from what he was traditionally used to and had taken him years of practical experience onboard to master the practical arts and special skills which made him a real sailor. Seafaring like any other occupation of the times had been a learning while you work occupation for many centuries. (3)

Recruits went to sea through a sense of adventure or because otherwise attracted. Others entered by force of tradition, economic pressure or Shanghi-ing. When it came up to carrier patterns, they were even divided into three groups.

i - Vagabonds who take jobs at sea and ashore alternatively.

ii - Vocational seamen who remain in subordinate positions onboard.

iii - Vocational seamen who become officers. (4)

Whatever had been the motivating power for the recruits learning went through seizing all the opportunities of observing how the older experienced sailors performed a job of work and discovering for oneself how things were done. The principle at sea was that it was up to the seaman to acquire knowledge and skill and nobody had any concern for those who did not want to learn.

Learning to read the compass, knotting and the other numerous skills a seaman must have in his head and hands, must be studied during off-duty hours. As times went by conditions improved. Seafarers starting a seagoing life as an apprentice officer were bound by a writing called
indunture to serve the shipowner for a specified period of time in return for instruction in the art of seamanship and navigation together with food and accommodations. But to become an officer, and eventually a ship captain, a seafarer had to progressively step one at a time through the various ranks which required raw courage, stamina and will. It was Prince Henry The Navigator about five centuries ago who recognized the need for formal training of experienced ship officers and established a Navigation School at Sagres to instruct his ship captains and pilots more fully in the arts of navigation.

2.2 Powerdriven Vessel Era

Historical events gradually started to have a growing influence over the need for formal training of seafarers since learning only from experience often meant the perpetuation of old technics and ideas. The invention of the steam engines in the 18th century to replace the wind driven sailing vessels opened a new chapter in the shipping era consequently demanding an entirely new breed of seafarers. What was once traditionally dominated by deck officers and deck ratings had to be shared by engineers too.

The need for people with a knowledge of machinery and the reluctance of many seamen to become involved in engines led to the employment of specialists and the subsequent creation of the engine department. Engineering ratings like their colleagues in the deck department were promoted to the ranks of officers up to chief engineer from the ranks of coal trimmers and wipers step by step based upon their knowledge and skill at each required level.
During the decade which followed, modern ships with more complicated machineries and equipments came into the shipping scene requiring a high standard of training, knowledge and skill to operate and maintain them efficiently, safely and economically. Such requirements were recognized both by governments and shipowners alike. Many maritime countries in the world have now established Maritime Training Institutions for seafarers with the possible hope of transferring the traditional shipboard training to shore with a modern and effective training systems using simulators of all shipboard training requirements departing from the old gone with the wind pattern of learning while working tradition.

3. Shipboard Organization

3.1 Sailingship Era

Before the power driven vessels came into the commercial use, all functions onboard the old sailing vessels were performed by people who regarded themselves as seamen. Seamanship and navigation were the predominant professions demanding unilateral type of department.

Shipboard organization in its real term did not exist. It was around the 18th century that command organization was established in a watch system to be able to supervise and direct the hour to hour and day to day of shipboard works and maintenance. The crew were divided into two watches. The Starboard and Port watches. The Starboard watch being the captain watch with the second mate incharge and the Port watch being under the chief mate. General orders were flowing from the captain Fig.1 through the officers and occasionally direct to the seamen.
3.2 Power Driven Vessel Era

In the later half of the 18th century, after the appearance and use of the power driven vessels, the traditional and heirarchical shipboard organization started to emerge. Fig.2. The traditional Organization consists of three departments, the Deck, Engine and Catering.

The Deck department is responsible for the navigations of the vessel, the loading and safe carriage and discharging of cargoes, the maintenance of hull and superstructure steel works.

The Engine department, besides the operations and maintenance of the main propelling machineries, provides services such as electric power for lighting cargo and mooring
machineries, navigation and radio equipments, heating and air conditioning of accommodation and refrigeration for provision.

The catering section looks after victualling of the crew, the preparation and cleaning of cabins, public accommodations and saloons, the storing of provision and cleaning rooms and chambers of provision. Passengers if carried are the responsibilities of this department.

This type of organization is universally accepted by all shipping companies and its International Uniformity springs out from the balanced task structures consisting of watch keeping, operations and maintenance which are imposed by the technology of the conventional cargoship.

Each department could meet its main task requirement from power and skill resources within its own ranks. There is also a progression of ranks at each step of which there are distinct tasks assigned so that the officer gains experience in progressively more complex aspects of his department works. The assumption of such progression of experience being that by the time the officer comes at the top, he practically knows everything onboard and he would be able to take full responsibilities in the efficient, safe and economic running of the department.

In this context, the following characteristics of the traditional shipboard organization seem to be relevant:

- A high degree of role prescription— if a variety of individual occupies a role in a short period of time,— the role requirements must be clearly and specifically delineated.
- Exchangeable component structure—in order to ensure interchangeability of the individual, a standard and universal system of training & qualifications is needed.

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- Universal organization structure—in order to maximize the value of the above points the organizations in different ships should be as similar as possible.

- Central control—in order to ensure standard role performance decision making largely consists of the applications of detail rules, regulations and instructions formulated in head office.

- Chain of command—to ensure role performance by subordinates onboard, a clearly delineated and legally enforceable structure of authority relationships with information expected to flow up and orders down.

- Stable operation conditions—The assumption that the operational environment of the ship is predictable and that the variance that occurs is controlled by head office. (5)

Despite its rigid role oriented bureaucratic structure in its function, the traditional shipboard organization has the basic characteristics to maintain at least the minimum level of performance.

4. Fundamental Problems in The Traditional Shipboard Organization

The relative economic stability of the post war period up to 1960, provided the right kind of conditions for the traditional shipboard organization to function through the application of necessary changes only. Task structures consisting of the watch keeping, operations and maintenance in the deck and engine departments remain balanced. But after the 1960, faced with the low freight and increasing costs, shipping could not survive without the introduction of new technology to reduce the undermining costs.
which were particularly generated by crew costs. These technological changes mainly influenced by the need for reduced manning, had the characteristics of destabilizing the balance of the task structures onboard placing the traditional shipboard organization into unworkable conditions. The traditional shipboard organization Fig. 2 is a highly structured hierarchy where careered seafarers can enter from the lowest rank and make to the top after having fulfilled the required marine schooling and seati­me at every level of the ascending rank. The department so often functions as independent hierarchies with a long established barriers between them. There is no provision for crossover the formed walls of the separated entities to carry out interdepartmental coordinations and flexibilities.

5. Social Segregation
The difference between officers and ratings is also a fundamental aspect of the traditional shipboard organization. The two groups are in a rigid hierarchial relation to each other with a defined division of tasks, little or no mobility between the groups. Marked segregation during non working hours with a great difference of status and privileges.

Clear evidence of privileges and status as well as barriers between officers and ratings are observed in the manner in which officers’ cabins by virtue of their status and ranks are situated higher up in the superstructures while those of the ratings are crammed and affected by noise and engine vibrations. The day and mess rooms of the officers and ratings are separated with a marked difference of sizes quality and comforts. In some ships there are even three mess rooms for senior officers, junior officers and ratings. Each had
### Traditional Shipboard Organization

<table>
<thead>
<tr>
<th>Officers (Gentlemen Culture)</th>
<th>Departments</th>
<th>Catering</th>
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</thead>
<tbody>
<tr>
<td><strong>Captains</strong></td>
<td><strong>Chief Engineer</strong></td>
<td><strong>Steward</strong></td>
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<tr>
<td><strong>3 OFF</strong></td>
<td><strong>2-3 OFF</strong></td>
<td><strong>1-2 Cook</strong></td>
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<td><strong>Able Seamen</strong></td>
<td>Officers' Cabins located on upper decks according to hierarchy</td>
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<tr>
<td><strong>Donkeymen</strong></td>
<td>Officers' Dayroom</td>
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<tr>
<td><strong>&quot;Girls&quot;</strong></td>
<td>Officers' Messroom(s)</td>
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<th>Bridge</th>
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<tbody>
<tr>
<td>Deck</td>
<td>Engine Room</td>
</tr>
<tr>
<td>Deck Control Room</td>
<td>Control Room</td>
</tr>
<tr>
<td>Workshop</td>
<td>Workshop Engine</td>
</tr>
</tbody>
</table>

- Gymnasiun, Swimming Pool
- The cabins located down below main deck
- Crew Day Rooms
- Crew Messes

Source: Redesigning The Process Of Superstructure Design
separate territories so that the officers and ratings never have to meet each other. Work areas are also affected by the built nature of the offices of the senior officers near their cabin instead of being close to each other. Other notable character is the flow of order from the top downwards.

The military characteristic of the traditional shipboard organization came about from the need to maintain peace and order from the internal threat of mutiny and external threat of piracy.

The codification by law over centuries defines the officer as being responsible and makes him personally accountable for any failure in meeting the defined standards. The rating not being an accountable, is not to be held responsible. The statutory definitions of responsibility becomes a personal attribute of the officer and non responsibility that of the rating. This strict segregation on responsibility between officers and ratings is the basic factors for the existence of social distance from the ratings inorder to maintain status through obedience and respect. The degree and extent of the distance maintenance is not limited only to ratings but can sometimes find its way into the officers rank structures. The higher the status held by the superiors, the more the role content gives an image of a mystique character to the subordinates. The distance maintenance originates from any one of the following reasons.

- The work roles of some of the officers do not provide them with a feeling of competence.
- Some officers may be given responsibilities for opera-
tions for which due to technical and administrative changes do not have sufficient trainings.

- Officers are not able to demonstrate the competence which they do possess. (6)

It is perhaps worth mentioning here that it is the distance maintenance which makes it difficult for subordinates to demonstrate their competencies while it makes it possible and convenient to the superiors to protect themselves from the judgement of incompetencies by subordinates. Distance maintenance mechanism therefore builds up itself to have a persistent character meeting the needs of both superiors and subordinates. Its effects are so damaging that it reduces the effectiveness of their high level role competencies.

6. Lack of Equal Work Distribution
One of the major problems in the traditional shipboard organization is the redistribution of work in the rank structures. The origin of ranks in a department lies in the 24 hours operational nature of the ship. The need for watch keeping required the provision of competent and reliable releifs for the master and mate eventually bringing ranks to exist. Similar structure of ranks were also introduced in the engine department. The introduction of these ranks totally relieved the masters and chief engineers from watch keeping. Ranked officers below the Masters and Chief engineers started to share among themselves the watch keeping onboard increasing the load of work on them Fig. 3.

If we look at the distribution of the work loads across the rank structures in Fig.3, we can see that it is completely uneven. It levelled throughout the work loads in the junior officers level and suddenly rises steeply
at the chief and Second Engineer officers level eventually sinking down at the Master and Chief Engineer levels. According to work study investigation by Smith and Roggema, the workload of the Chief Engineer amounts about four hours while that of the Master varies with the frequency and sailing conditions.

Fig. 3 PERCEIVED WORKLOADS OF OFFICERS

The pattern of the low workload of the most top ranked officers is attributed to the following major factors.

- The wide experience and knowledge on their respective professions demand their presence for the normal restorations when things go wrong.
- Intervention during violations of rules onboard or in the enviromental areas.
- To take complete command of operations for the duration of any threat when external threat threatens. (7)

The above roles the senior officers play and their accountability in terms of discipline and professional standards have given them the undisputable status to keep away from participation in the day to day routine work and maintain distance from subordinates. The workloads are distributed by task roles in the officers rank levels of
the respective departmental structures with a substantial workload on the Cheif Officers and Second Engineers making thus th esenior officers positions overmanned.

7. Limitations of Continuous Learning
The traditional shipboard organization structures deprives of continuous learning in the senior officers level. We have discussed in the preceding chapters that through the proper training and sea time experience the officer qualifies for entry to each level of the rank structures in the respective departments. By the time he reaches at the top, the regulations qualify him through certifications to have received enough training and experience. But rapid changes in the pattern of trade have influenced the advancement in the management and technology with frequent changes which demands of a high degree of academic and training flexibilities to meet its sophisticated demands.

8. The Top Four Problems
The rank and status structure in the segregated departments of the traditional shipboard organization are one of the main causes for the lack of coordination at the top level. The conflicts arise between the Cheif officer and the Second engineer particularly when the pressure of coordination increased by the introduction of the general purpose crew. The Cheif and the Second engineer being the work leaders of their respective departments face conflicts in the assignments of the limited number of the crew to their differing priorities and arrangements which eventually goes to the captain table for final settlements.
If the Master supports the Second engineer, the Cheif officer feels deserted. If on the other hand matters are
settled in favour of the Chief officer, the master will be accused of giving preference treatment to the deck department and not understanding the engineering problems which will affect the professional pride and autonomy of the Chief engineer. If the Chief engineer deeply defends and pursues the case, of his department the second engineer feels reduced in his capacities to be unable to win his case. The conflicts and the process in search of coordinated solutions involves the four most senior ranks onboard.

9. Shipboard Management
The traditional shipboard organization has contributory effects on the problem related to shipboard management. The hierarchial insulated departments onboard have a tremendous influence over the head office to set up similar characterized departments to facilitate centralized control over the managements of ships.

As a result, unattractive technics of management emerges from the centralized managements ashore playing the directive rather than the supporting roles. Reports and demands for quantitative information become routine workloads. Stores and supply orders await approval of head office. What makes it even worse is the duplication of enquiries and information sent from the uncoordinated departments ashore funnelling on the master at the receiving end with ambiguous nature requiring frequent clarifications. Costs of communications and paper works substantially account for parts of the shipboard administration expenses.

Even though communications go formally through the master, direct influence and control is exerted upon the
departments onboard by the respective departments ashore. This divergent and fragmented action makes it impossible for the senior officers onboard to act as a team. In addition to it, the individual commitment and loyalties of the officers will be to his functional department ashore rather than the command of the ship as a whole which is a major setback.

The conflicting and uncompromising character of the centralization of management from the head office is the underutilization of the managerial capacities of those onboard and the failure to recognize the real facts that the ship as a workplace and a 24-hour society operating far away in different geographical areas is deprived of a reasonable degree of autonomy in decentralized management. In any case the traditional shipboard organization had lived so far and will continue to exist until the effects of the inevitable increasing ship operating cost parameters reach to such a magnitude as to be the justifying factors to its extinction.
Notes

(1) PP-1 Introduction To Naval Architecture
K. Nomoto

(2) PP-327 Illustrated History Of Ships 1979
E.L Cornwall

(3) PP-2 Vocational Training Of Seafarers-IL0
20th Session 1967

(4) PP-211 Deep Sea Sailors
Knut Weibust

(5) PP-769 Organizational Change In The Shipping Industry
J. Roggema and M.H Smith

(6) PP-13 AI-Doc.7171 Democratization Of Work Organizations Selfregulating Units Onboard Ships
Einar Thorsrud

(7) PP-772 Organizational Change In The Shipping Industry
J. Roggema And M.H Smith
CHAPTER IV EFFECTS OF COSTS AND SHIPBOARD CHANGES

1. The Shipping Scene And The Impact of Costs On Shipboard Changes.

Nowadays changes are taking place. The main aim of these changes being to lay down the strategic foundations of cost reduction so as to be able to remain highly competitive in the International Shipping market. However the ultimate need to have shipboard changes depend upon the degree and extent of the effect of ship operating costs have on profit making. Before World War II, technological advances in ship design, building and operations occurred mainly through the normal process of engineering evolution by practical experience stimulated from time to time by new developments such as the Diesel Engine. The contributions to the technological progress of planned programme of research and developments was small and no organization existed to pursue cooperative research in ship-technology.

The post War years brought about a steady growth of technological activities and the formations of many national research associations was to be the principal agent for cooperative research on behalf of the ship building and Shipping Industry. Other research associations and organizations as well as government laboratories and University departments contributed to the growing volume of ship technology. Although much of this work was relevant to the Shipping Industry, little of it was sponsored by shipping companies. (1)

The supporting fact for this may probably be that up to 1960s, shipping companies did not necessarily see to invest in ship technology for reasons of revenue earnings not being drastically affected by any major potential and
lasting cost emanating from failure to introduce technological changes. Whenever the effects of cost against earnings were detected or identified, it would be soon reduced or eliminated through the application of necessary changes.

The main threat of the decade which were commonly known in affecting freight were world wide economic recession and overtannaging. These impacts on freights were not discriminatory or necessarily unique. They were common backgrounds in the shipping market cycle affecting no one but all. In the 1960s, the world trade was in a favourable condition and it was a decade of bonanza for most of the shipowners. The need for tonnage rose by 10-15% a year and the biggest problem for the shipowners was to finance a rapidly growing and expanding fleet with their modest capital. There was no need for market analysis or strategies as the shipping trade was easily predictable. This was the year when the heavy industries were the dominant factors and it was these that gave the economic motivation and sustained the rapid expansion of marine transportation of raw materials. (2)

On the other hand the severe and chronic shortage of seafarers became a bone in the throat to the shipowners and the problem of manning became a great concern. The acute shortage of the seafarers were attributed to the unavailability of trained seafarers to replace the bil­ lets open by the experienced who left totally any ship­board service because of family commitments and poor social conditions onboard Fig.4. The reluctant attitude of the new generation of seafarers to seek for the seafar­ring life onboard due to better educational facilities, and better conditions of employment ashore the
failure of the Shipping Industry to offer careers which are attractive and challenging for a lifetime were additional if not the important factors which deteriorated the manpower situation.

Fig. 4 MOST FREQUENTLY MENTIONED REASONS FOR LEAVING SHIPBOARD SERVICE

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marriage</td>
<td>26%</td>
</tr>
<tr>
<td>Social condition at sea</td>
<td>21%</td>
</tr>
<tr>
<td>Poor pay</td>
<td>21%</td>
</tr>
<tr>
<td>Boring leisure time</td>
<td>18%</td>
</tr>
<tr>
<td>Insufficient leave</td>
<td>15%</td>
</tr>
<tr>
<td>Found job ashore</td>
<td>13%</td>
</tr>
<tr>
<td>Children</td>
<td>12%</td>
</tr>
</tbody>
</table>

Source: U.K Gallup Poll based upon interview of 400 Seamen

It was in the light of the acute shortage of seafarers that the shipboard changes were originally introduced. The whole philosophy being the introduction of labour saving machineries and equipments through automation. The stable condition and prosperous continuity of the booming period attracted more and more ships into the market. Living and social conditions started to be improved. Pay for seafarers onboard was raised correspondingly attracting increasing numbers of
seafarers to join the expanding fleet and also influencing more seafarers to be placed in the training pipeline. The heavy influx of the seafarers thus created a relaxing mood on the rate of progress of the shipboard changes as a whole.

The oil price shock on October 1973 brought the growth of ships to an abrupt and brutal end. The quadrupling of oil prices had a substantial effect on the world economy which in turn totally affected the world trade. Freight rate started to fall down at a very fast rate and what was believed and expected to be a decade of bonanza over night turned out to be a decade of the survival of the fittest. Only ships of low operating costs and high productivity remained to compete in the shipping market. Those with high operating costs went out of the market and ended up in layups and demolition yards.

Since the late 1970s, World shipping did not show any healthy sign of recovery from the initial impact of the oil crises and the subsequent short fall of world trade. Consequently freight rate remained low and the growth of fleet up to 1982-83 in new building encouraged by the low offer of dockyards rather than the need for the market further aggravated overtonnaging bringing down freight rates further to rock bottom.

Great number of ships were laid up and a considerable amount of tonnages demolished leaving behind thousands of seafarers jobless, affecting also those who were already in the training pipeline. The increasing number of the redundancy of seafarers became chronic problem for governments. On the other hand the cut throat competition in the shipping market from the Comecon and Developing
countries with state ownership, subsidy and low labour cost advantage posed a menacing threat to the economic existence of the fleets of the developed traditional maritime countries. The frequently heard comment "Spend what you like but keep the ship moving" virtually faded away and "You must fix it yourself or do without it until the next dry dock but whatever you do don't stop" became the routine of the day.(3)

The high labour and fuel costs significantly affected the total operating costs of the fleets of the traditional maritime countries. With unbearable high costs it was practically difficult to survive and effectively assume a competitive position in the hostile shipping environments of fierce competitions. Consequently the need to adopt and implement inevitable shipboard changes, which need structural changes, were seen and considered to be the only logical approach if operating costs in general and the potential labour cost in particular is desired to be reduced effectively.

Even though initiation on inevitable shipboard changes were already underway around the freight boom period of the 1960s, to alluviate the acute shortage of seafarers, the complete impact on its compelling need was not as much drastically felt as in the later stage of the 1970s. The developing and the Comecon countries, by virtue of the protection they get from their governments in addition to the comparative advantage of the labour costs managed to survive the debacle of the shipping depression whereas the developed traditional maritime countries who believe in free market competition and non-protection policy suffered under the economic orphanage struggling to maintain the legacy of the survival of the fittest.
2. Comparison Of Competitive Crew Costs

The major costs generally affecting the total operating costs of a ship are labour and fuel. Of the two most important costs, labour cost is the highest since payment of wages, social securities and other benefits depend upon the standard of living of the country producing the labour forces. Fuel occupies the second place, though can vary from countries to countries. However its price effects are more or less the same global wise.

In a study made in Plymouth in 1970, investigation were carried out to find out the relationship between the basic wages of an able seaman in various countries and the costs to the owner of one seafarer and found the following figures. (4)

![Fig.5](1970 COSTS IN U.S DOLLARS)

<table>
<thead>
<tr>
<th>COUNTRIES</th>
<th>ANNUAL AVERAGE COST</th>
<th>BASIC ANNUAL WAGE OF A.B</th>
<th>MULTIPLIER</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.K</td>
<td>6 200</td>
<td>1 320</td>
<td>4.7</td>
</tr>
<tr>
<td>NORWAY</td>
<td>8 400</td>
<td>1 920</td>
<td>4.4</td>
</tr>
<tr>
<td>JAPAN</td>
<td>6 600</td>
<td>1 400</td>
<td>4.7</td>
</tr>
<tr>
<td>AUSTRALIA</td>
<td>13 400</td>
<td>2 180</td>
<td>6.1</td>
</tr>
<tr>
<td>INDIA</td>
<td>1 800</td>
<td>320</td>
<td>5.6</td>
</tr>
<tr>
<td>U.S.A</td>
<td>21 400</td>
<td>4 320</td>
<td>4.9</td>
</tr>
</tbody>
</table>

After 11 years, 1981 the investigation was repeated again and found the following figures.
Fig. 6

(FEB. 1981 COSTS IN U.S DOLLARS)

<table>
<thead>
<tr>
<th>COUNTRIES</th>
<th>ANNUAL CREW</th>
<th>BASIC WAGE</th>
<th>NUMBER</th>
<th>MULTIPLIER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COST TO OWNER OF A.B</td>
<td>OF CREW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.K</td>
<td>1 152 000</td>
<td>7 800</td>
<td>26</td>
<td>5.7</td>
</tr>
<tr>
<td>NORWAY</td>
<td>1 475 000</td>
<td>11 750</td>
<td>22</td>
<td>5.7</td>
</tr>
<tr>
<td>JAPAN</td>
<td>1 280 000</td>
<td>10 926</td>
<td>23</td>
<td>5.0</td>
</tr>
<tr>
<td>U.S.A</td>
<td>2 060 820</td>
<td>13 122</td>
<td>32</td>
<td>4.9</td>
</tr>
<tr>
<td>GREECE</td>
<td>591 000</td>
<td>6 790</td>
<td>21</td>
<td>4.1</td>
</tr>
<tr>
<td>PHILIPPINES</td>
<td>432 000</td>
<td>3 600</td>
<td>32</td>
<td>4.9</td>
</tr>
<tr>
<td>ITF (WW)</td>
<td>664 000</td>
<td>9 705</td>
<td>29</td>
<td>2.3</td>
</tr>
<tr>
<td>ITF (FE)</td>
<td>520 000</td>
<td>6 883</td>
<td>32</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Based upon the various crew costs of different countries and given that other cost factors are taken the same, the following operational cost analysis were made between two ships manned by Phillipino and Norwegian Crew Fig.7.

As seen from Fig.7, the total operational cost of the ship manned by the Phillipino crew is USD 8 312 598 as compared to that of the Norwegian ship which amounts to USD 9 355 598. From the cost comparison, the competitive stand of the Phillipino ship against the Norwegian is favourably high. The Norwegian ship on the other hand has to save USD 1 043 000 a year to be in equal footing with its competitor inorder to be able to compete in the shipping market. The only sector in the operational costs Vulnerable for reduction is the labour cost. Since the annual cost for each crew member in the Norwegian ship sums up to USD 67 045.45, the amount of USD 1 043 000 can be saved by reducing the standing crew of 22 to 16. The reduction can be applied in accordance with the
method used in Fig.8.

Fig.7 COST COMPARISON

<table>
<thead>
<tr>
<th>CREW NOs.</th>
<th>BASIC CASE</th>
<th>PHILIPPINE</th>
<th>NORWEGIAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREW COST</td>
<td>871 000</td>
<td>432 000</td>
<td>1 475 000</td>
</tr>
<tr>
<td>INSURANCE</td>
<td>310 000</td>
<td>310 000</td>
<td>310 000</td>
</tr>
<tr>
<td>REPAIR &amp; MAIN.</td>
<td>380 000</td>
<td>380 000</td>
<td>380 000</td>
</tr>
<tr>
<td>STORES &amp; LUB.</td>
<td>220 000</td>
<td>220 000</td>
<td>220 000</td>
</tr>
<tr>
<td>OVERHEAD</td>
<td>170 000</td>
<td>170 000</td>
<td>170 000</td>
</tr>
<tr>
<td>ANNUAL OP COST</td>
<td>1 951 000</td>
<td>1 512 000</td>
<td>2 555 000</td>
</tr>
<tr>
<td>ANNUAL CAP COST</td>
<td>2 760 000</td>
<td>2 760 000</td>
<td>2 760 000</td>
</tr>
<tr>
<td>TOTAL FIXED COSTS</td>
<td>4 711 000</td>
<td>4 272 000</td>
<td>5 315 000</td>
</tr>
<tr>
<td>CREW COST AS %</td>
<td>( 18.5 )</td>
<td>( 10.1 )</td>
<td>( 27.7 )</td>
</tr>
<tr>
<td>FUEL &amp; PORT COSTS</td>
<td>4 040 598</td>
<td>4 040 598</td>
<td>4 040 598</td>
</tr>
<tr>
<td>TOTAL COST</td>
<td>8 751 598</td>
<td>8 312 598</td>
<td>9 355 598</td>
</tr>
<tr>
<td>CREW COST AS %</td>
<td>( 10% )</td>
<td>( 5.2% )</td>
<td>( 15.7% )</td>
</tr>
</tbody>
</table>

The other extreme case is the labour cost of a Japanese 30 crewman ship compared with the ITF seamen manned ship of flag of convenience Fig.9. The labour cost of the Japanese vessel amounts to USD 8.5 million a year while that of the FOC vessel is USD 4.2 million. Such astronomical high cost differential is a clear evidence for a
**Fig. 8**  
*Source: Ship Manning Present And Future*

<table>
<thead>
<tr>
<th>ORIGINAL SPECIFICATION</th>
<th>FEASIBLE</th>
<th>PHASED REDUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td><strong>ENGINE ROOM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHIEF ENGINEER</td>
<td>CHIEF ENGINEER</td>
<td>CHIEF ENGINEER</td>
</tr>
<tr>
<td>SECOND ENGINEER</td>
<td>SECOND ENGINEER</td>
<td>SECOND ENGINEER</td>
</tr>
<tr>
<td>THIRD ENGINEER</td>
<td>THIRD ENGINEER</td>
<td>THIRD ENGINEER</td>
</tr>
<tr>
<td>FOURTH ENGINEER</td>
<td>ELECTRICIAN/FOURTH ENGINEER</td>
<td>ENGINEROOM HAND/FITTER (G.P.)</td>
</tr>
<tr>
<td>ELECTRICIAN</td>
<td>DAY WORKER (G.P.)</td>
<td></td>
</tr>
<tr>
<td>STORE KEEP (P.O.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THREE DONKEYMEN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWO DAYWORKERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td><strong>HOTEL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHIEF STEWARD</td>
<td>COOK/CHIEF STEWARD</td>
<td>COOK/CHIEF STEWARD</td>
</tr>
<tr>
<td>COOK (P.O.)</td>
<td>STEWARD</td>
<td>STEWARD</td>
</tr>
<tr>
<td>ASSISTANT COOK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOUR STEWARDS</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td><strong>DECK</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAPTAIN</td>
<td>CAPTAIN</td>
<td>CAPTAIN</td>
</tr>
<tr>
<td>MATE</td>
<td>MATE</td>
<td>MATE</td>
</tr>
<tr>
<td>SECOND MATE</td>
<td>SECOND MATE</td>
<td>SECOND MATE</td>
</tr>
<tr>
<td>THIRD MATE</td>
<td>THIRD MATE</td>
<td>THIRD MATE</td>
</tr>
<tr>
<td>RADIO OFFICER</td>
<td>BOSUN (G.P.)</td>
<td>THREE - ABs (G.P.)</td>
</tr>
<tr>
<td>BOSUN (P.O.)</td>
<td>THREE - ABs (G.P.)</td>
<td></td>
</tr>
<tr>
<td>NINE - ABS</td>
<td>RADIO OFFICER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>33</td>
<td>17</td>
</tr>
</tbody>
</table>
complete loss of competitive stand for the Japanese ship in the shipping market. To be able to compete, the crew has to be drastically reduced to a level of 10 from the manning scale of 30. (5)

Fig. 9 COST COMPARISON BETWEEN JAPANES & ITF VESSEL

Million Dollars

Source: Ship Operation Automation III

In the two typical examples referred above, both the Norwegian and the Japanese ship, despite the big differences in cost, cannot survive unless they adopt and implement the inevitable shipboard changes which require structural changes. These relevant changes demand technological and organizational changes on board. (4)

3. Structural Changes

Cost is an acceptable element as a change generating force. Whenever cost of a great magnitude appears from any sector of the total operating costs like crew, fuel, stor-
es, maintenance etc, all kinds of necessary measures become mandatory. Experience however has shown that costs cannot be totally avoided but can only be reduced. The highest cost out of the total which is detrimental for shipboard rationalization, varies from countries to countries depending upon the social, economic and technological standards.

In the developed traditional maritime countries the labour costs are in general the highest of the total operating costs whereas in the developing countries, it can be maintenance or fuel costs. Despite the difference in the types of costs, in principle, both have the change generating forces. Having felt the dramatic effects of the labour costs which undermined their survival and competitive positions in the shipping market the developed traditional maritime countries since 1960 took the initiative and implemented the inevitable changes which required structural changes in the technical, operational and organizational fields. The countries involved into such technological changes include mostly Norway, Japan, Holland, and the Federal Republic of Germany.

Inevitable shipboard changes occur when ship operating costs rise and pass the limit of the revenue earnings. In the case of the Norwegian and the Japanese ships Fig. 7 and Fig. 9 the only way competitive market in shipping could be maintained is through the reduction of crew numbers. To do that most of the tasks onboard normally covered by the number of crew to be reduced have to be replaced by labour saving equipments and machineries. Utmost care being taken that an overall standard of competency and safety onboard in the general operation and maintenance of the ship, could effectively be maintained by the
remaining reduced crew.

Because of the constant flow of functions less affected by external influences and the advantage it offers for cost effective measures, automation in machineries are introduced in the engine department practically eliminating the watch keeping requirements and sparing the engine personnel for maintenance and inspection purposes. The introduction of automation in machineries to offset the labour needs entails a big impact on the traditional shipboard organization.

This organization which maintains the balanced task structures for its viability as discussed in the preceding chapters, begins to destabilize and decompose. Watch keeping, one of the three task structures characterizing the traditional shipboard organization, exists for deck departments only while it is eliminated in the engine department. This situation deprives of the effective use of the shipboard labour force in a cost effective manner, and reveals the need for inevitable changes involving shipboard organizational and technical changes.

3.1 Unattended Machinery Space

The major breakthrough in shipboard technology was first demonstrated by the Japanese ship M/S Kinkasan Maru in 1961. The most basic level of engine room automation consists of the remote control and automatic monitoring from the bridge of the main propulsion and auxiliary machinery system, automatic turndown or shut down in casualty situations. Other aspects include auto start or standby unit and automatic logging of designated machinery performance parameters. As a result of these
innovations, unattended 24 hours engine room operations became possible. Watch keeping requirement by engine personnel is completely eliminated. Engine room personnels can be utilized for a well planned and organized preventive maintenance program avoiding the requirement of shorebased maintenance which can affect the time space of the ship operations. In the conventional or traditional ships productivity by engine personnels is wasted by watch standing and data logging process.

Automated engine rooms have been proved to be reliable. A study of 300 ships in 1983 operating with the unattended engine room, revealed that after an initial breakin period, alarms averaged 1 every 5 days and faults averaged 1 every 10 days. The highest level of engine room automation is found in the Japanese superrationalized containerships Canberra Maru and Hkuba Maru. (7)

3.2 Superstructure Design
As technological innovations facilitated the running of the engine room by reduced manpower, has also superstructure design improved the working and living conditions on board. The ship as a 24 hours society makes it difficult to separate work, common leisure and private life as it is the case ashore. The superstructure lay out of a vessel design for operation by a small crew, provides greater segregation of working, leisure and private areas. The principle being not as a status division between the crew but to create a relaxing environment and separate the emotional connection from their work when off duty.

Crew cabins are located in the most remote section of the superstructure, while food service lounge and recreational
Figure 10. Superstructure Design.
Fig. 11. Heart rate in motorman.
Arrows indicate ladder climbing.

Source: Work Stress At Sea
spaces are reserved for the intermediate deck. The ship offices and archives, conference rooms and stores are found on or near the main deck. No segregation between the officers and ratings. Day and messrooms as well as recreational facilities are integrated to promote social contacts Fig. 10.

Through the reduction of ladders, more vertical traffic flow, physical and time waste is saved. A study made by Dr. Kare Rodahl in work stress at sea, shows the heart rate of a motorman in ladder climbing Fig. 11. The work areas of officers have been placed in a centrally located area to encourage communications among officers during working hours. Central meeting room for the shipboard management teams is also provided. These improvements in the design of ships heavily contributed in the productivity, safety and moral of the crew.

3.3 Bridge And Damage Control System

In general, improvements in automation in the deck department is not as advanced as that of the innovations in the engine room. Microprocessors are used in the bridge in position finding and collision avoidance devices improving navigational practices. However, bridges are becoming centralized to house responsibilities and duties of the officers regrouped in control and activity centres to be worked at reduced number of officers. These activity centres provide convenient positions for monitoring and controlling of loading, discharging and the permanently installed labour saving washing equipments particularly in the holds of liquid and dry bulk carriers. Better manpower utilization has been achieved through the use of automated damage control system. Fire and smoke sensors, bilge level sensors, automatic sprinkling and
smothering, auto door closing and auto pumping etc have eliminated the need for human attendance giving the opportunity for the manpower to be put to a more productive use.

3.4 Communications System

A lot of innovations have been made in both the internal and external shipboard communication systems. Internally, information exchange between crew members have been enhanced by the greater use of telephones, public address and paging system. Crew communications during mooring and unmooring and anchoring is carried out through the use of Walkie Talkies. A study in the use of monitoring TV system for the surveillance of key places such as the engine room, mooring and unmooring of ship, has been carried out to assist the reduced number of shipboard crew. The greatest advantage obtained is from the satellite communication which plays a great role in the external communication system of the ship.

The satellite communication, unrestricted by weather conditions have made the effective use of high quality voice, Tlx and ship shore communications possible. An advancement in this field enabled seafarers to communicate with their families from any part of the world. The possible linkkage of ship and shore computers through the satellite communication system renders key and important information to be exchanged for timely managerial decisions while the ship is at the open sea. The simplicity and efficiency in operating the communication components onboard increases the chance to the non requirement of the Radio Officer set by The SOLAS Convention.
3.5 Mooring And Anchoring
The area in which the reduction of manpower through automation found to be resistant is in the sector of mooring and unmooring conditions. Innovations in these sectors are of more mechanical nature rather than automatic. There are two methods designed to improve the reduced manpower requirement during moorings and anchoring. The first which is in actual practice, is the introduction of self-towing line baskets, constant tension winches, smaller and lighter but strong hawsers to ease the human energy in line handling which has the possibility of reducing the size of the mooring party.

The second method which is non-technical but administrative is, the introduction of a mobile mooring party which can be deployed by air or ship to assist the reduced crew onboard when the vessel is due to berth or moor.

3.6 Shipboard Organization
The departmentalized division of tasks and the coordination of tasks in a hierarchical rank system and social barriers, have made the traditional shipboard organization incompatible with shipboard technological changes. Solution put forward by various approaches converge on a redesign of an organization referred as matrix which conveniently and effectively meets the demands of shipboard changes. The matrix organization consists of an array of tasks on one axis and an array of skills on the other. This type of matrix Fig. 12 is a multiple skill role structure with the objective of increasing the versatility of individuals in order to cope with fluctuations of work loads.
The concept of the matrix organization is based upon de-departmentalization onboard and is streamlined towards task centered organization far less to do with the ranks. Its sets however preconditions of a high degree of basic and specialist skill, education and training. The officer is trained to a basic proficiency in a number of skills. His further qualifications deeply focus on one particular discipline. When the officer is assigned onboard a ship his qualified skills define his primary role and his basic proficiencies determine the areas where he works in a back up or assistant capacity which means that the officer is appointed to work in the primary and secondary roles.\(^8\)
The creation of primary and secondary roles increases the level of responsibilities and the work domain of the officer. In his primary role he will have the higher level of responsibilities for a shipboard system. He will be responsible for the planning, operation, control and execution of maintenance and administration back-ups for that system. In normal conditions the officer does most of the tasks himself. When the workload increases the other officers assist him and the leadership role on this concept always remaining in the officer having the primary role. The same principle applies for ratings as well. The difference is that the rating is given a broader and deeper training in manual and technical skills not necessarily to a certificate level. However the rating like the officers is responsible for the planning and execution of his own work.

The importance of the matrix type of shipboard organization can be enumerated in accordance with its advantages.

- The quick adaptation to a varying workloads and new technology through greater technical and theoretical education attained by the officers.
- Ample opportunity to apply theoretical knowledge and understanding to a new system.
- It provides opportunity for a shipping company to man ships in accordance to requirements of particular ships.
- Promotion to responsibility is built into the task roles from the beginning instead of being forced to wait for promotion.
- The increasing number of working relationship and flexible working patterns reduce the social isolation
of the individual.

- The removal of departmental boundaries and the shift from formal authority based on rank to a task based leadership. It provides for a much greater utilization of the individuals capacities and and removes many of the obstacles to collaborate working relationships advantageous both for the individual onboard and the company. There are also other types of organizations not as radical as the matrix but allowing some changes to take place to a better output requirement than the traditional shipboard organization such as the Interdepartmental and Semi-matrix Shipboard Organization.

i- Interdepartmental Organization

In this type of crew organization, the traditional shipboard departmental structure exists. The changes made are the combining of previously separate and distinct responsibilities into single job descriptions. This reconstruction of tasks in the engine room has brought certain names like the mechanic or electrician who are assigned to do the works done by different ranked personnel. In the deck department masters assume watch keeping and radio communications responsibilities with the deck officers. Not different from the other departments is the Catering where the stewards and the cooks take the tasks of cooking and baking while the steward utilitymen do all the types of tasks of the department.

ii- The Semi-departmental Matrix Organization

In this organization Fig.13, The departmentalized structures of the deck, engine in the officers level. Officers are semi-integrated or dual purpose trained having the required training and knowledge on two professional fields recognized by certification awards.
from Nautical and Engineering Training Institutions.

3.7 Decentralization of Management

Before the advent of wireless communications, shipboard management was left in the hands of the masters of ships.
not only in the operational, maintenance and management fields but also in canvassing cargoes and concluding business transactions. After the advent of wireless communications, centralized management from the shore office gradually started to emerge. There were specific reasons for such developments. The building of the post-war merchant fleets coupled with the introduction of new technology and then later on in the 1960s an increased concern with safety following several major disasters, reinforced the development of centralized control.

In the mid-1960s faced with low freight rates and increasing costs, many companies increased their efforts towards centralized management and rationalization. Some companies however began to question the wisdom of this approach and began to ask whether they had gone too far in this direction. This questioning stemmed partly from the general shift in managerial philosophy towards the recognition of the importance of human resources and the creation of opportunities for individual development. It became clear that centralization was under-utilizing the managerial capacities of those onboard at a time when manpower costs were rapidly increasing and recruitment becoming more and more difficult. In this situation it is understandable that the problem was defined as swinging the pendulum and returning power to the ship.

In many descriptions of decentralization projects, explicit reference is made to the autonomy of the ship and its master in an earlier era and the desirability of recreating this situation. It is this conception of decentralization that define the problem simply as one of devolving power down the line that have obscured the far more profound changes in company organization that have
Fig. 14  SHIPBOARD MANAGEMENT TEAM

OLD SITUATION ➔ PRESENT SITUATION

Source: ERGOSEA 81 Organizational Changes in Shipping.
resulted from attempts at decentralization. This is dangerous because of the reaction of shore staff to the simple notion that it cannot be achieved and at the same time they perceive it as a threat to their job security. A more important danger is that the use of the term decentralization obscure the scope of changes involved and the directions to be pursued in achieving them. With a more adequate theoretical understanding of the organizational issues involved, much of the anxiety and resistance in office personnel and misunderstandings among sea staff can be circumvented.

A better conceptual framework gives better practical guidelines for implementing and sustaining the change in the organization. Decentralization of management from shore to ship is a fundamental prerequisite for the operation of the shipboard management team through which the master will exercise his authority in the operational, maintenance and efficiency of the ship for the ultimate goal of cost effectiveness and productivity. The underlying theory of the shipboard management-team Fig 14 is that the best decisions are made by those individuals close to the scene of the problem.

Heavy emphasis is also given on the work planning role of the team. The main elements of the work planning involve lists of tasks to be done by priority and time, assessment and evaluation of availability of labour and sufficiency of stores and spares to meet maintenance and repair requirements. The work planning session is held in a periodic meeting of the ratings and the supervisory officers for the purpose of jointly reviewing planning maintenance and repair activities.
In order to support the greater role of decision making of the shipboard management team, information and accounting systems have to be created inorder to be able to formulate and work to agreed budgets and objectives covering the ship as a whole unit. The greater achievement onboard through the shipboard management team is not only limited to the cost effective running of the ship and participation of the crew in decision making, it is extended to the shore office in facilitating a mutual consultative relationship as opposed to the traditional hierarchical information up and decision down approach. It also changes the role of the shore offices from directing to supporting roles.

For effective and lasting results of the shipboard management the following preconditions should exist.

- The long-term assignment of at least the senior officers to the ship to allow for a much greater time span of responsibility and to allow them to accumulate experience of their ship and its trade to reduce their dependency upon head office.

- The establishment of the concept of a shipboard management team supported by training in team development and management techniques and provision of common office space on onboard.

- The definitions of performance objectives for the ship as a whole, supported by budgetary information and work planning systems. (10)
Notes

(1) PP-180 Committee Of Inquiry Into Shipping Report
   Rochdale

(2) PP-12 Plato Report 1985

(3) PP-679 Human Factors In The Design And Operations Of
    Ships. International Conference

(4) PP-23 Organizational Changes In Shipping In Europe &
    Israel Symposium Proceedings 1983

(5) PP-16 Ship Operation Automation III 1979
    Third International Symposium

(6) PP-155 Innovetions In Maritime Industry 1979
    Maritime Transportation Research Board (USA)

(7) PP-31 Effective Manning Of US Merchant Fleet
    National Research Council 1983

(8) PP-250 Emerging Organizational Values In Shipping
    Part 2
    J.Roggema & M.H Smith

(9) PP-59 ERGOSEA-81

(10) PP-777 Organizational Changes In The Shipping
    Industry
    J.Roggema & M.H Smith
CHAPTER V MAJOR FACTORS AFFECTING SHIPBOARD CHANGES

1. Resistance To Changes
Manning costs are the biggest factors in ship operating costs which dispositions the competitive stand of shipping companies of the traditional developed maritime countries. Drastic reduction of crew through major changes in the traditional role structure onboard are the only recommended and acceptable solutions to neutralize if not to eliminate this classic and ever increasing costs. Such major changes however cannot be carried out smoothly or peacefully without encountering any resistance both from within and outside. It is in the light of these that I wish to point out the major obstacles that confront ship board changes.

2. Codification
Shipping is considered to be one of the most conservative and traditional Industries. One of its distinctive characteristics is the inclusiveness of regulations applying to all aspects of ship design, operation and shipboard organization. Not only are these regulations comprehensive in their coverage they are also to a large extent codified in law.

The set ups of these laws and regulations tend to support and confirm its traditional and historical values. The two types of laws or regulations that bear most directly on manning innovations are manning scales that specify numbers and qualifications of seafarers for specific tonnages and power vessels and work environment laws which specify maximum numbers of hours of allowable work. The other factor to be considered in line with this is that changes overrun the ability of regulatory agencies to
react in timely fashion reviewing, accepting and incorporating in their regulations. Consequently, the overall effects pose resistance when introducing changes. The United State cross over law 46 USC 8104 (673) which stipulates that a seafarer may not serve in both deck and engine department in a single voyage can be quoted as a typical example. (1)

3. Labour Union
One of the big deterrents for changes are Labour Unions. When changes are introduced particularly concerning reduction of manning or job descriptions that require changes in the traditional work assignments, unions consider such changes as potential threats to the source of their livelihoods. As a result they resist changes and will continue to resist. The unions have the Institutional frameworks reflecting the traditional demarkation line onboard. This is reflected for instance by the Unions in Norway having one union for captains, one for deck officers, one for engineers and one for ratings. In the United States, they have three separate unions for deck officers, engineers and seamen. (2)

4. Dynamic Conservation of The System
Dynamic conservatism is a basic characteristic of all social systems. It may not passively resist change but actively seeks to maintain existing boundaries and internal relationship. Nowhere it is reflected to a great extent other than the Shipping Industry where the tendency to fight to remain the same is particularly strong. Shipping Industry comprises a set of subsystems each seeking to further its own interests often in a conflict with the other subsystems. The subsystem relate to each other in a structure of committees which are geared to regulate
conflicts of a distributive nature.

These committee structures and the interrelationship of the participating bodies on which the subsystems are functioning tend to live a life of their own, making collective role necessary for accepting changes difficult and unlikely. New insights and knowledge hardly permeate the system and its capacity for learning is thereby restricted. This closedness of the system stems from several factors.

First the shore-based institutions and organizations have developed to a large degree as a reflection of the structural characteristics of the shipboard organization. For example demarkation lines aboard are reflected in trade union structure training schools, company management structures and government departments.

Secondly, the greater proportion of officials in these bodies are ex-seafarers from the corresponding department and rank aboard ships. Understandably, they tend to interpret proposals for change against the background of their seagoing experience.

Thirdly, these officials tend to serve on several committees with the result that the same opinions and attitudes keep reappearing in different contexts.

Fourthly, the common seafaring background tends to promote an in-group culture which rejects contributions to problem solving from the outside. (3)

5. Social Integration Onboard
For centuries and through codification by law the position of the officer was mainly and traditionally based on
control and safety. As a result the officer is legally defined as being responsible. These responsibilities were identified and recognized through a possession of a certificate which also portrays its universal qualifications emphasising the professional character of the role of the officer. His certified professional knowledge gives him the status and the right to set standards and demand obedience and respect in his capability to handle critical situations.

The position and responsibility of the officer, is thus defined in terms of personal attributes. The officer is responsible and relied upon to observe both the professional standards in his work, and decency in his behaviour while the rating is considered as irresponsible and weak in his behaviour. These basic values in the system are at the core of the resistance to changes. What can be perceived as social integration directly contradicts these basic values. The values make an all or non distinction between officer and ratings in terms of personal capacity to take responsibility. It is assumed that this all or non distinction can not be sustained if both groups were to meet as equals during non-working hours. In the conventional shipboard organization norms exist to prevent such contacts. The norms of the rating groups can be seen as an attempt to protect the ratings from the ever present issues of responsibility and authority. Correspondingly similar norms in the officer groups serve and protect the officers position of authority which has to be defended though avoidance of contacts of ratings so that no respect shall be lost. These attitudes create heavy resistance when shipboard changes are introduced.
Notes

(1) PP-56 Effective Manning Of The US Merchant Fleet
    National Research Council

(2) PP-155 Innovations In The Maritime Industry
    Maritime Transport Research Board 1979

(3) PP-70 ERGOSEA-81
CHAPTER VI ALTERNATIVES FOR SHIPBOARD CHANGES

1. Decision Making In The Light Of Shipboard Changes

The competitive stand of a shipping company is highly influenced by the rising cost of ship operations. When costs in shipping operations are considered in terms of priorities, the significant parts of the costs, labour, fuel and maintenance have different impacts on different shipowning countries.

In developed traditional maritime countries, labour constitutes the highest costs followed by fuel and maintenance. Whereas in the developing countries, fuel constitutes the highest costs followed by maintenance and crew costs. Whatever the relative cost impact may be, shipping being an International Market Oriented Industry, provides a competitive environment in the acquisition of cargo through the effective use of the comparative advantages.

To remain competitive, the traditional maritime countries have mobilized their resources to embark on shipboard changes taking the full advantage of their technological know-how and financial resources.

However, despite the enormous economical and operational advantages shipboard changes might offer to the shipowners, actual involvement to its implementation worldwide has not been as quick and great as talked about. The slow pace of progress in shipboard changes is attributed to the restraints of shipowners decision making which are affected by the three major factors governing the present global shipping scene. These factors are:

- Overtonnaging
- Capital
- Open Registry
1.1 Overtonnaging

The balance between the demand of the world trade for ship tonnage and the supply of vessels available in the market determines the level of over or under tonnaging. Since the 1970s, due to the world wide economic recession, which affected the world seaborne trade, the supply of tonnage was far more than what the demand required and with the gradual increase of shipbuilding due to the low offer by the yards during the shipping depression, the situation further deteriorated creating surplus tonnage Fig.15. As a result, competition for the available cargo becomes so fierce bringing down the freight rate to rockbottom. In such uneconomic shipping environments, the desire to invest in the capital intensive advanced ships has been relatively cool.
1.2 Capital
Without the necessary capital available from money lending sources, investment in shipping using own capital alone is not considered to be viable. Banks and other financial Institutions which are traditional sources for loans are nowadays reluctant in lending money in the light of the existing overtonnages and dwindling freight rates. There is also a decline for loans particularly in the advanced vessels sector as banks fear of the inability to recover their money in case the shipowner is bankrupted. The technologically advanced vessels, because of their complexities and high requirements on standard of skills and training to operate them, have discouraging influence on the selling market for buyers from developing countries though similar problems may be anticipated from buyers in developed maritime countries.

2. Open Registry
To reduce ship operating costs and maximize their profits shipowners are flagging out their vessels from the National flag jurisdiction and are registering them in Open Registry countries whose laws allow to make it easy for ships owned by foreign nationals or companies to fly their flags Fig.16. The opportunities offered to the beneficial owners by the Open Registry Countries at a low registration and regular annual fees are immense in financial terms as and when compared to what the country of origin with its stringent laws offer Fig.17 clearly stipulates the operational cost difference between flag state and Open Registry Vessels.
### Figure 16.
**Beneficial Owners of Open Registry Fleets, 1984.**

<table>
<thead>
<tr>
<th>Country or territory of registry</th>
<th>Liberia</th>
<th>Panama</th>
<th>Cyprus</th>
<th>Bahamas</th>
<th>Bermuda</th>
<th>TOTAL</th>
</tr>
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<td><strong>Number</strong></td>
<td><strong>DWT</strong></td>
<td><strong>Number</strong></td>
<td><strong>DWT</strong></td>
<td><strong>Number</strong></td>
<td><strong>DWT</strong></td>
<td><strong>Number</strong></td>
</tr>
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<td>304</td>
<td>7447</td>
<td>3</td>
<td>7</td>
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<tr>
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<td>27214</td>
<td>440</td>
<td>9990</td>
<td>3</td>
<td>54</td>
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<td>18407</td>
<td>516</td>
<td>9877</td>
<td>368</td>
<td>8049</td>
</tr>
<tr>
<td>Japan</td>
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<td>10216</td>
<td>964</td>
<td>12705</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Norway</td>
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<td>6275</td>
<td>47</td>
<td>862</td>
<td>3</td>
<td>625</td>
</tr>
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<td>Spain, Federal Republic of</td>
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<td>2190</td>
<td>184</td>
<td>1310</td>
<td>85</td>
<td>680</td>
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<tr>
<td>Unspecified</td>
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<td>2850</td>
<td>164</td>
<td>2825</td>
<td>-</td>
<td>-</td>
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<tr>
<td>United Kingdom</td>
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<td>348</td>
<td>128</td>
<td>1935</td>
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<td>3322</td>
<td>82</td>
<td>1268</td>
<td>5</td>
<td>58</td>
</tr>
<tr>
<td>China</td>
<td>5</td>
<td>171</td>
<td>114</td>
<td>2926</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>10</td>
<td>989</td>
<td>73</td>
<td>1156</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Pakistan</td>
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<td>1292</td>
<td>25</td>
<td>466</td>
<td>-</td>
<td>-</td>
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<tr>
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<td>1356</td>
<td>5</td>
<td>140</td>
<td>2</td>
<td>32</td>
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<tr>
<td>Italy</td>
<td>16</td>
<td>950</td>
<td>34</td>
<td>380</td>
<td>5</td>
<td>120</td>
</tr>
<tr>
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<td>309</td>
<td>68</td>
<td>1015</td>
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<td>481</td>
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<td>Sweden</td>
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<td>939</td>
<td>23</td>
<td>70</td>
<td>4</td>
<td>36</td>
</tr>
<tr>
<td>75 countries, entities or territories, each managing less than 1 million dwt</td>
<td>75</td>
<td>3068</td>
<td>492</td>
<td>3610</td>
<td>43</td>
<td>396</td>
</tr>
<tr>
<td>Unidentified</td>
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<td>335</td>
<td>210</td>
<td>1683</td>
<td>46</td>
<td>854</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>1902</td>
<td>122930</td>
<td>3956</td>
<td>62080</td>
<td>596</td>
<td>10994</td>
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<tr>
<td>Share in total open-registry fleets</td>
<td>28.8%</td>
<td>60.7%</td>
<td>59.8%</td>
<td>30.7%</td>
<td>9.0%</td>
<td>5.4%</td>
</tr>
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</table>

Source: Based on data supplied to the UNCTAD secretariat by A. and P. Appledore Ltd.

a/ The beneficial owner is the person, company or organization which gains the pecuniary benefits from the shipping operations.

b/ The Government has advised that many of the vessels attributed to China are chartered ships, being operated by the China Ocean Shipping Company.
### Annual Operating Costs of North European and FOC Tanker Fleets
(in $000 at 1980 prices)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Convenience flag</strong></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>20,000-39,999 DWT</td>
<td>1,174</td>
<td>1,260</td>
<td>1,385</td>
<td>1,452</td>
<td>1,491</td>
<td>1,508</td>
<td>1,536</td>
<td>1,586</td>
<td>1,695</td>
<td>1,914</td>
<td>1,910</td>
<td>2,045</td>
</tr>
<tr>
<td>40,000-69,999 DWT</td>
<td>1,314</td>
<td>1,402</td>
<td>1,562</td>
<td>1,644</td>
<td>1,698</td>
<td>1,615</td>
<td>1,750</td>
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<td>2,274</td>
<td>2,160</td>
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<tr>
<td>70,000-99,999 DWT</td>
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<td>1,587</td>
<td>1,718</td>
<td>1,856</td>
<td>1,784</td>
<td>1,754</td>
<td>1,828</td>
<td>1,967</td>
<td>2,110</td>
<td>2,524</td>
<td>2,445</td>
<td>2,418</td>
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<tr>
<td>100,000-174,999 DWT</td>
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<td>2,250</td>
<td>2,429</td>
<td>2,471</td>
<td>2,405</td>
<td>2,231</td>
<td>2,193</td>
<td>2,184</td>
<td>2,262</td>
<td>2,500</td>
<td>2,330</td>
<td>2,314</td>
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<tr>
<td>175,000 + DWT</td>
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<td>3,293</td>
<td>3,521</td>
<td>3,567</td>
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<tr>
<td><strong>North European</strong></td>
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<tr>
<td>70,000-99,999 DWT</td>
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<td>4,510</td>
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<td>3,900</td>
<td>3,915</td>
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</tr>
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</table>

Data Source: Drewry Shipping Consultants Ltd, August 1983.
The Open Registry countries offer the following attractions.
- Operating Flexibility
- Ability To Choose Optimum Manning Sources
- Freedom From taxation
- Financial requirements (1)

2.1 Operating Flexibility
Ships under Open Registry can be operated with minimum constraints. There are no restrictions on where the ship must be built or repaired. No tax is imposed on repairs made outside the country. The owner is not subjected to extensive government trade and financial reporting requirements. Vessels are not restricted as to ports they may enter or customers that may be served.

2.2 Ability To Choose Optimum Manning Source.
The ability to obtain seafaring personnel from a worldwide manpower pool is of great significance to shipowners. Open Registry permits the owner to select what he believes to be the cost effective manning source. The owner will tend towards sources where manpower is relatively inexpensive, where trained personnels are available and where governments or union imposed work rules are minimal or non existent.

2.3 Freedom From Taxation
Aside from registration and annual fees, Open Registry countries generally impose no Tax.

2.4 Financial Requirement
Open Registry countries have Admiralty Codes which clearly establishes lien enforcement conditions acceptable to lenders so that banks will be willing to finance a vessel
Fig. 18. BRITISH SHIPPING FLEET 1980-1987.

Figures in number of ships 1986-1987 forecast included.

GCBS 15/5-86
Fig. 19 NORWEGIAN FLEET 1980-1986

Figures in number of ships

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registered in the Open Registry Countries. All the aforesaid advantages which have strong bearing on the maximization of profits and reduction of costs have big impact on shipowners decision making in the registration of their ships under the Open Registry countries. The considerable advantages to be explored from the Open Registry, relieves shipowners from the financial burden in investing their capital in new technology. The growing number of ships flagging out from flag states of the traditional maritime countries and registering under the flag of open registry countries, is tremendously increasing having a dramatic effect on the numbers and competitive stand of national fleets. Fig.18 and Fig.19 depict the down turn trend in the number of ships flying the flags of the traditional maritime countries of the United Kingdom and Norway. The cost benefit advantage, the Open Registry countries are offering, enables ship owners to remain highly competitive in the World Shipping Market.

To take the full advantage of the cost benefits and to remain in a better competitive position, more and more ships are still flagging out particularly and mostly from the developed traditional maritime countries. The new United Nation Convention on Conditions for Registration of ships which was adopted on the 7th. Feb. 1986 is a major indication on the International level of the recognition of the existence of Open Registry vessels and their contributory roles to the promotion of the World Trade.

3. Decision Making In The Light of Flag State
The decision to flag out to Open Registry countries or to remain under the National Flag depends upon the effects the operational costs have on the marginal profits of the
shipowners to warrant them to remain competitive in the shipping market.

While many shipowners from the traditional maritime countries prefer to flag out to Open Registry countries, other shipowners on the other hand remained under their flagstate wishing to operate their vessels despite the imposition of taxes, interference and control of the government in the welfare and social benefits of the national labour force employed onboard the ships.

A strong belief is built by these groups of shipowners on the philosophy that they could also as well operate their vessels competitively so long as they invest in technologically advanced vessels. The economic concept being to fit in the new vessels with fuel saving engines and manning them with highly trained and skilled reduced crew, supported by advanced computer based automation with the extensive use of Maritime Satellite telematics concepts.

The virtual non-existence of direct subsidy in shipping in the Industrialized countries has left shipowners particularly those operating their vessels under the national flag, to spend more time and money in research and developments of new ideas and concepts in shipping so that they can survive in the market by availing the most suitable, efficient and cheapest tonnage ahead of their competitors to those demanding ocean transport service. To support this view, I would refer briefly to efforts which are currently being made by some of the traditional maritime countries.

In the Federal Republic of Germany, the latest and ultra modern technologically advanced container ships M/S Norasia Susan and M/S Norasia Samantha were launched on October and December 1985. Each container ship is of 27300 DWT.
with carrying capacity of 1550 TEUs manned by a crew of 14 with a possible reduction to 8. It is an interesting case to compare these ships with the two newly built general purpose ships of the Ethiopian Shipping Lines Corporation M/V Abiot and M/V Abai Wonze whose total DWT amounts to 20840 Tons both manned by 64 crew and yet can not match one container ship in manning and capacity. There had been a total of 23 innovations implemented in the two container ships which were the result of 15 years extensive research. The main areas in which cost reductions has been greatly focussed on are, fuel saving, crew reduction and safety. When the numbers of the innovations are distributed according to the areas focussed, it ends up with 3 innovations on safety, 10 innovations on fuel saving and 10 in crew reduction incorporated. When these container ships enter the shipping market, there will not be any doubt as to their competitive strength with low cost advantage and economic of scales. (2)

In Norway, technologically advanced vessels with reduced crew had long been used by some shipowners not long after the oil crises of 1973. Recently, shipowners have embarked on a new generation of ship automation under a new research program named "Ship Operation of The Future". This program highlights the need to develop effective application of advanced technology and human resources to ensure profitable and safe ship operation under the Norwegian flag. This approach brought particular success in providing shipowners with recommendation on how to improve future ship operation and instrumentation on the basis of the experience from general computerization and automation developements in land based Industries. The philosophy followed in Norway departs to a certain extent from those of the other Industrialized Countries like Japan.
and the Federal Republic of Germany. Backed by the results of four years research it is believed that much of the technical developements onboard are insufficiently user oriented and the main aim is to employ today’s advanced technology effectively rather than produce hardware innovetions. This new technology will involve new builds and existing vessels. The Ship Operation of The Future program reflects the wide spread realization among the Norwegian shipowners that only rapid and effective implementation of technological developements can keep them Internationally competitive in the years to come.(3)

In Japan where the costs of ship operations are dramatically high, the technologically advanced vessels in the existing market have managed to cut down costs through reduced manning and automation of machineries and control equipments. The utmost need to cut costs further has influenced the Japanese to develop the Robot Ship Fleet concept which is also called the Intelligent Ship Project. The concept envisages a fleet consisting of a mothership with a crew of 20-30 and 4-5 remote control slave barges all of which will be of the modern sail assisted type Fig.19 a. The Robot Ship fleet aims to take the process of automation one step further. All control functions will be centralized in the mothership which will carry the crew. The Robot barges will be controlled from the mother ship via a sophisticated system of radio control.

The Robot barges will operate under remote control only when on the high seas. In crowded sealanes and when entering and leaving the harbour crew will be transferred from either the mother ship or shore depending upon the
proximity of the operational areas. Research in communications, propulsion, steering and sial system for the trial voyage was completed in 1984 for its maiden voyage to take place in 1989 between Tokyo and Los Angeles. From the three Industrialized and traditional maritime countries one can observe and assess the diversified and the various stages of the technological achievements which will make shipping in the future more competitive and more complex. The continuous progress and developments in technology ahead of competitors seems to be the governing rule of the future for the survival of the fittest. (4)

Notes

(1) PP-11-5 Economic Impact Of Open Registry Shipping Republic Of Liberia
(2) PP-78 Sea Trade March 1985 (Norasia)
(3) Ship Operation Of The Future 1985 Veritas World Arne Sagen, SD
(4) PP-7 Ocean Going Sail Assisted Robot Ship Fleets Japan Marine Machinery Developments Association Dr. Noboru Hamada
CHAPTER VII - THE ETHIOPIAN SHIPPING LINES CORPS.

1. Brief Background

The Ethiopian Shipping Lines Corporations was established on the 26th of March 1964 as Ethiopian Shipping Lines Share Company with a share capital of USD 24,155. Of the total share, the Ethiopian Government had 49% with the other 51% owned by Dutch Nationals and Firms residing in Holland. Based upon the bilateral agreement reached between the Ethiopian and the Dutch Government in the establishment of the Shipping Lines, the organization, management and operations was placed under the responsibilities of the Dutch subject to the consultation and approval of the Board of Directors who were the governing bodies.

Being an infant Industry to begin with, its share capital was not adequate enough to enable it finance for ship acquisition. Through bilateral arrangements with Verolme United Shipyard and Engineering Co. in Holland, it was possible to secure credit facilities and in 1965 the following ships were built.

<table>
<thead>
<tr>
<th>NAME</th>
<th>TYPE</th>
<th>DWT</th>
<th>PRICE IN US</th>
</tr>
</thead>
<tbody>
<tr>
<td>M/T LALIBELLA</td>
<td>TANKER</td>
<td>34,075</td>
<td>9,231,090</td>
</tr>
<tr>
<td>M/V LION OF ETHIOPIA</td>
<td>D/C</td>
<td>6,550</td>
<td>4,651,108</td>
</tr>
<tr>
<td>M/V QUEEN OF SHEEBA</td>
<td>D/C</td>
<td>6,550</td>
<td>4,651,108</td>
</tr>
</tbody>
</table>

Prior to or during the building of the ships, there were neither trained and qualified seagoing National officers and ratings to man the ships nor qualified National personnels with a managerial skill in shipping available for assignments in the Head Office. The posts open other than those occupied by the Dutch, were filled by people coming or transferred from the Port Administrations and other
non-shipping personalities. Ships were managed by Dutch officers and other mixed crews or ratings who included National personnel. In 1966, the Ethiopian Shipping Lines Share Company started its first and historical ship operations by joining the UK/North Continent-Red Sea conference which served the European and Red Sea Trade Routes.

At the end of the year the company began to face financial difficulties and ended up with a substantial loss. Almost all the foreign shareholders left the company selling their shares to the Ethiopian Government increasing its holdings to 99.9%. While the Government was in the process of finding a measure to curtail the increasing loss, the situation further deteriorated by the 1967 Israel and Egyptian War which resulted in the closure of the Suez Canal. The number of calls of ships to the Ethiopian Ports around the Cape and the Horn drastically reduced and the export and import trades of the Nation were practically paralyzed.

The need to acquire additional tonnage to serve the export and import trades became the topmost National priority. To back-up the short fall tonnages, and to control the rising freight rates, four additional second hand ships were purchased by the Shipping Lines bringing the total number of ships to seven. At the end of 1972, the total loss amounted to USD 11.1 Million. During the same year the management of the company was transferred to Nationals keeping only few expatriates in the technical and operation departments. The nature of the exorbitant loss however induced the government to take the appropriate steps in calling foreign experts in shipping management to study the overall loss aspects and recommend the likely solutions to the acute problems.
Based upon the recommendations of the experts, the older ships of the company with higher operating costs were sold and the company was left with only four ships instead of seven. By the end of 1973, the total loss was accounted to be about USD 13 mill., which the government subsidized to save the company from total liquidation. By 1974 there were only three ships in the company. Despite the enormous losses however, the company had gained some experience in shipping and a good number of seagoing officers were trained in Holland in the various Nautical and Engineering fields. (1)

Major causes for the loss of the company:

- Insufficient backing by the then government during the initial stage of the establishment of the Shipping Company through protection policy in cargo reservation or flag preference.

- Lack of management and reliance on expatriates.

- The closure of the Suez Canal as the result of the Israeli Egyptian War which increased the operational costs.

- The decline of trade in the established trade routes.

- Competition from outsiders.

After the popular Ethiopian Peoples Revolution of 1974, the economic and management situations of the shipping sector changed through the complete backing of the Revolutionary Government and for the first time in the history of the Shipping company profits started to show
favourably in its yearly financial statement of accounts. Training of personnels which was traditionally reserved for sea going officers only was extended to members of head office staffs to increase the manpower efficiency, competency and managerial skills both in the top and middle management.

2. Present Position

Fig. 20 ORGANIZATION

The Ethiopian Shipping Lines Corporation which is under the Ministry of Transport and Communications is now the only State Owned Shipping Company currently serves 20-25% of the total National trades. Its status was officially promulgated in 1983 by Legal Notice No. 80 of 1983 article 4 issued by the minister of Transport and Communications pursuant to the authority vested in him by article 3 and 5 of the Supervision and Control of Certain Public Enterprises by Certain Ministries Proclamation Number of 131/1977. The assets, rights and obligations of the Ethiopian Shipping Lines Share Company was transferred to
the Corporation as covered by article 5 of the same Legal Notice.

The increasing backing of the Revolutionary Government in all the essential and relevant sectors of the economic and political needs of the Corporation since 1974 was the greatest contributing factors which gave the impetus in the rapid growth of the National Fleets. From three dry cargo linerships in 1974, the fleet has grown since then to eleven Fig. 21.

Fig. 21 FLEETS AND TRADE ROUTES

<table>
<thead>
<tr>
<th>Nos</th>
<th>Names of Ships</th>
<th>GRT</th>
<th>Type</th>
<th>Trade Routes</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>M/V ABIOT</td>
<td>10 820</td>
<td>DRY CARGO</td>
<td>NORTH CONT</td>
</tr>
<tr>
<td>2</td>
<td>M/V ANDINET</td>
<td>11 691</td>
<td>DRY CARGO</td>
<td>NORTH NONT</td>
</tr>
<tr>
<td>3</td>
<td>M/V NETSANET</td>
<td>11 691</td>
<td>DRY CARGO</td>
<td>NORTH CONT</td>
</tr>
<tr>
<td>4</td>
<td>M/V ABAI WONZE</td>
<td>10 830</td>
<td>DRY CARGO</td>
<td>NORTH CONT</td>
</tr>
<tr>
<td>5</td>
<td>M/V LION OF ETH</td>
<td>5 181</td>
<td>DRY CARGO</td>
<td>NORTH CONT</td>
</tr>
<tr>
<td>6</td>
<td>M/V QUEEN OF SHEEB</td>
<td>5 181</td>
<td>DRY CARGO</td>
<td>NORTH CONT</td>
</tr>
<tr>
<td>7</td>
<td>M/V KEIY KOKEB</td>
<td>1 599</td>
<td>DRY CARGO</td>
<td>MEDITERRAN.</td>
</tr>
<tr>
<td>8</td>
<td>M/V WOLWOL</td>
<td>1 599</td>
<td>DRY CARGO</td>
<td>MEDITERRAN.</td>
</tr>
<tr>
<td>9</td>
<td>RO/RO MESKEREM</td>
<td>1 599</td>
<td>CATTLE/CAR</td>
<td>COASTAL</td>
</tr>
<tr>
<td>10</td>
<td>M/T NEBELBAL</td>
<td>1 317</td>
<td>TANKER</td>
<td>COASTAL</td>
</tr>
<tr>
<td>11</td>
<td>RO/RO KARAMARA</td>
<td>998</td>
<td>DRY CARGO</td>
<td>COASTAL</td>
</tr>
</tbody>
</table>

SOURCE: Ethiopian Shipping Lines Corporation list of Nationally Owned Vessels.

The trade routes of the Linerships which were confined to only Red Sea-North Continent has now been expanded into two Trade Routes which now includes The Adriatic and the Mediterranean serving 70% of the National Trade in the whole Europe. The Ethiopian Shipping Corporation is a mem-
Fig. 22. Shore Based Personnels.

<table>
<thead>
<tr>
<th>Place</th>
<th>ETHIOPIANS</th>
<th>EXPATRIATES</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td>AA Head Office</td>
<td>71</td>
<td>-</td>
<td>71</td>
</tr>
<tr>
<td>Assab Br. Office</td>
<td>5</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Rep.Office Rdam</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Rep.Office Trieste</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>80</strong></td>
<td><strong>3</strong></td>
<td><strong>83</strong></td>
</tr>
</tbody>
</table>

Fig. 23. Sea Going Personnels.

<table>
<thead>
<tr>
<th>Department</th>
<th>Officers</th>
<th>APP.Officers</th>
<th>Ratings</th>
<th>Total</th>
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<tr>
<td>Deck</td>
<td>23</td>
<td>12</td>
<td>77</td>
<td>112</td>
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<tr>
<td>Engineers</td>
<td>30</td>
<td>1</td>
<td>63</td>
<td>94</td>
</tr>
<tr>
<td>Catering</td>
<td>5</td>
<td>-</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>58</strong></td>
<td><strong>13</strong></td>
<td><strong>200</strong></td>
<td><strong>271</strong></td>
</tr>
</tbody>
</table>

Fig. 24. Cadets Under Training

<table>
<thead>
<tr>
<th>Countries</th>
<th>Nautical</th>
<th>Engineering</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>10</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Poland</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Greece</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23</strong></td>
<td><strong>28</strong></td>
<td><strong>51</strong></td>
</tr>
</tbody>
</table>

Source: ESLC Personnel Department.
ber of the EDACRA and UK/North Continent-Red Sea Conferences for its North Continent Trades where as in its Mediterranean Trades it is a member of The Mediterranean Red Sea Agents Agreement. The shore based manpower of the Corporation has doubled the last 10 years from its original number of 40. The sea going personnels has also shown a growing number Figs.22,23 and 24, although there is no figure available for comparison since in the earlier stages they were employed on contract bases. The above mentioned figures show the total manpower strength of the Corporation. The rapid growth in the number of ships to serve the growing trade of the Nation is not however matching with the training of the sea farers as lead time are required. As a result, there is a high demand of qualified officers at the senior level until those in the training pipeline are ready to fill the billets.

3. The Need For Shipboard Changes
A fact accepted through experience in the shipping market cycle is the tendency of cost effective operations and efficiency becoming relaxed during freight boom period as a result of good earnings which overshadows costs. In the depressed freight market period on the other hand, cost effectiveness and efficiency are highly pursued and turned to the competitive environment inorder to place oneself in a better competitive positions than competitors for the acquisition of cargo. It is the need to survive and compete in the free shipping market during depression that shipowners resort to all types of rational measures and decisions to the extent of flagging out to Open Registry countries or investing in high technologically advanced ships or introducing new ideas and changes. Shipping being International and competitive, is highly influenced by market forces. The ups and downs of the
business and the great risks involved are the traditional and classical backgrounds of shipowners who through its adversities and successes accumulate the necessary experiences and knowledge to battle and challenge it still further.

The Ethiopian Shipping Lines Corporation which is a State Owned Shipping Company, operate purely Liner Services. As a conference member in the trade routes it serves, it enjoys the conference Tariff Rates in a virtually non-existent of Shippers Council. It also gets the backing of the government in the form of cargo reservation through the Foreign Exchange Control. These enormous advantages have given the Corporation good economic leverage to become one of the leading profit making Industries in the country. The rapid growth and expansion of the Fleets can be accounted for these reasons in the absolute terms.

The stablized and almost predictable flow of revenue from the monopolistic nature of the Liner Service, has an inspirational effect on the production of new projects and developement plans considered to be essential to the benefit of the Shipping Lines. It the pursuance of the process to achieve these projected goals that influences the creation of a tendency to concentrate on and highly protect the steadiness and if possible increase the flow of revenue.

The consequence of such tendencies eventually develop an envoirement which overshadows and overlooks the emergence of cost generating forces which will be potential threats both for the Shipping Lines and the National economy. It is a simple fact that one way of increasing revenue is by reducing costs. Cost effectiveness and productivity are the most essential elements in ship operations. The eco-
nomic results of these two elements have the potential power to place the Shipping Lines in a commanding positions to convince the conference to reduce freight rates which are important and relevant enough for the promotion and expansion of the National Trade in foreign markets. If the conference fails to respond, it has the relative strength to pull out and operate as an outsider to protect the National Trade.

If on the other hand costs are tolerated to continue to exist without rationalization, the tendency will be an increase of more and more costs as a result of the internal and external influences. The situation will then reach to a point whereby the Shipping Lines will be subjected to either attempt to increase freight or demand subsidy which may have a direct negative effect on the growth and expansion of the National Trade. It is therefore to avoid any future unpleasant economic consequences that I am attempting to justify the need for the shipboard changes in the Ethiopian Shipping Lines Corporations.

3.1 Technological Developments.
Since 1980, the Ethiopian Shipping Lines Corporations has purchased 7 dry cargo ships of which 4 of them are newly built in 1984 and 1985 as multi-purpose ships and the other 3 are second hand standard type of ships. The tonnage of these ships account for 75% of the fleet owned by the Corporation.

Though the design of the ships vary from ship to ship, and according to the types of trades, in general their machinery systems are technologically advanced as compared with the old traditional engine room manned type of ships. They have automated machinery control, monitoring and alarm systems which can reduce the manpower requirement.
for continuous watch-keeping. The control and monitoring systems from the engine room or from the bridge, over the various components of the machineries enable the engine-room personnel to have more time for maintenance than the watch keeping. In the deck department however, there is no significant change in automation and the deck personnel maintain the normal watch-keeping, maintenance and operations.

This imbalance of the task structures enhanced by the traditional shipboard organization of the deck, engine and catering departments have increased costs and affected the effective utilization of the manpower available onboard. Because of the shipboard imbalance of tasks, some departments get more overtime pay than the other departments.

In a low waged 24-hour society, the existence of such differences in income harbours and encourages the birth of undesirable elements of dissatisfaction among the crew members. The virtual absence of any systematic and easy solutions applicable to all, has given each department an excuse to create work by which to pay its personnel independently to keep the moral and income interest of the barriered personnel onboard.

The effects of the imbalance of task structures reveal also that the workload intensity of the departments are not corresponding and that the rating of one department is less occupied than the other indicating the availability of unutilized manpower force which would have been used to reduce the cost in overtime works.
Fig. 25 OVERTIME PAY OF CREW IN 1983

IN US DOLL.

<table>
<thead>
<tr>
<th>VESSELS</th>
<th>CREW</th>
<th>GRT</th>
<th>SALARY</th>
<th>O/TIME</th>
<th>%/SAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>M/V RAS DEDGEN</td>
<td>40</td>
<td>6615</td>
<td>242 485</td>
<td>105 834</td>
<td>43.6</td>
</tr>
<tr>
<td>M/V LION OF ETH</td>
<td>39</td>
<td>5181</td>
<td>236 247</td>
<td>78 074</td>
<td>33.0</td>
</tr>
<tr>
<td>M/V QUEEN OF SH</td>
<td>39</td>
<td>5181</td>
<td>259 583</td>
<td>92 223</td>
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<tr>
<td>M/T NEBELBAL</td>
<td>17</td>
<td>1317</td>
<td>136 940</td>
<td>49 370</td>
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<tr>
<td>M/V KARAMARA</td>
<td>16</td>
<td>998</td>
<td>114 742</td>
<td>34 212</td>
<td>29.8</td>
</tr>
<tr>
<td>M/V KEIYKOKOEB*</td>
<td>17</td>
<td>1599</td>
<td>150 530</td>
<td>37 142</td>
<td>24.7</td>
</tr>
<tr>
<td>M/V WOLWOL*</td>
<td>17</td>
<td>1599</td>
<td>130 606</td>
<td>43 358</td>
<td>33.2</td>
</tr>
</tbody>
</table>


Fig. 25 shows the 1983 overtime pay of the crew of the existing fleet of the Corporation.

The last two named ships in the list with asterisks are not traditional engineroom manned type of ships like the others and yet their overtime costs, considering their sizes, are relatively very high.

3.2 Training Of Seafarers

The Ethiopian Shipping Lines Corporation has given great importance for the training of officers in the various fields of the profession while no attempt has been given to the training of ratings. Officers are recruited from almost all the permanently employed and certificated officers have their training and examinations in UK and Holland and their proficiencies are higher than the STCW requirements.
Fig. 26. **Educational Background Of Ratings.**

**Source:** Collected Data From Ethiopian Shipping Lines Corps.

<table>
<thead>
<tr>
<th>BRANCH</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
<th>G6</th>
<th>G7</th>
<th>G8</th>
<th>G9</th>
<th>G10</th>
<th>G11</th>
<th>G12</th>
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</thead>
<tbody>
<tr>
<td><strong>DECK</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bosun</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>6</td>
<td>-</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Bosun Mate</td>
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<td>-</td>
<td>1</td>
<td>1</td>
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<tr>
<td>O/Seaman</td>
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<td>7</td>
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<tr>
<td>Deck Boy</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

**ENGINEER**

|              |    |    |    |    |    |    |    |     |     |     |
| Foreman      | -  | -  | -  | 3  | 2  | -  | -  | -   |     |     |
| Fitter       | -  | -  | -  | -  | -  | -  | -  | 10  |     |     |
| Pumpman      | -  | -  | -  | -  | -  | -  | -  | 1   |     |     |
| Motor Men    | -  | -  | 4  | 3  | 4  | 3  | 3  | 2   | 10  |     |
| Wiper        | -  | -  | 1  | -  | -  | 1  | -  | 1   | 9   |     |
| Engine Boy   | -  | -  | -  | -  | -  | -  | -  | 1   | 6   |     |

**CATERING**

|               |    |    |    |    |    |    |    |     |     |     |
| Cheif Cook    | 3  | -  | 1  | 2  | 1  | 2  | -  | -   | 2   |     |
| 2nd. Cook     | 1  | -  | 2  | -  | -  | -  | -  | 3   |     |     |
| Stew/ Ist.    | -  | 1  | 1  | 3  | 1  | -  | -  |     |     |     |
| Stew/ II      | 3  | 1  | 1  | 2  | 1  | 1  | 4  | 1   |     |     |
| Mess Men      | -  | 1  | 1  | 1  | 2  | -  | 5  |     |     |     |
| Laundry Men   | 1  | 1  | -  | 2  | -  | -  | 2  |     |     |     |
| Galley Boy    | -  | -  | -  | -  | -  | -  | -  | 6   |     |     |

- 5 3 2 8 4 9 7 1 18
With regard to the ratings, there is neither a pre-sea, post-sea nor shipboard training program except learning while working which is the perpetuation of old technics and ideas without a basic foundation.

Through the research conducted in 1985, it was found out that the educational background of the senior ratings in general and those of the Catering Department in particular are extremely low. Fig. 26.

Since 1982, the Ethiopian Shipping Lines Corporation has raised the standard in the educational backgrounds for the recruitment of ratings to that of the recruitment for officers except that the recruit has to complete high school with no emphasis on grade mark requirements. Fig. 26 can be referred to show the big numbers of high school student seamen employees at the lowest rank of the respective departments.

The existence of a gap between the senior and junior rates on the educational backgrounds is breeding unrecognized problem onboard of which the corporation is not aware. The senior rates who have realized the educational gap with the juniors feel insecure of their positions and job and as result are reluctant in imparting their practical knowledge and skill to the junior rates by keeping the distance maintenance mechanism. The fear can be understandable when one assesses the new fresh seamen employees who come from various academic, vocational and technical high schools. The existence of such imbalance in education and training between officers and ratings and between the senior and junior ratings coupled with the non-existence of training for ratings in general, entails a great negative consequence on the overall productivity and competency which totally reflect on cost.
### Fig. 27. Technical Costs

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<td>40</td>
<td>722</td>
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<td>7</td>
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<td>478</td>
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<td>544</td>
<td>443</td>
<td>512</td>
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20% of $1 184 092 accounted = 1 236 818

Fig. 28. Victulling costs.

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<td>11,754</td>
<td>23,108</td>
<td>23,486</td>
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<td><strong>Total</strong></td>
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<td><strong>396,264</strong></td>
<td><strong>206,446</strong></td>
<td><strong>325,684</strong></td>
<td><strong>323,053</strong></td>
<td><strong>275,917</strong></td>
<td><strong>1,607,364</strong></td>
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</table>

5% of 1,607,364 accounted = 80,368

results Fig.27 and Fig.28. Even though it is practically difficult to identify and account the costs incurred as a result of lack of training, it has been estimated by responsible people concerned that of all the technical costs excluding docking, 20% of the cost Fig.27 is accounted for the lack of training while the cost accounted for victualling Fig.28 amounts to 5%.

3.3 Shipboard Organization
Despite the replacements of the old vessels by newly designed and equipped Unmanned Machinery Space vessels of the Shipping Lines, the traditional shipboard organization still remain intact and unaffected reducing the level of efficiency and productivity.

The technological changes in the control and monitoring systems of ship machineries, have no any imposition on the respective departments to function in isolation from one another like the old traditional engine-room manned ships. It infact influences the imballance of task structures to exist onboard providing the opportunity for inter-departmental flexibility of the crew. The traditional shipboard organization is incompatible in a technologically changing shipping envoirements and needs rationalization

Deck and engineering ratings in their traditional roles are no longer appropriate and departmental barriers must be removed and the quality of recruits raised through effective training in a wide range of engineering and seamanship skills so that they may be fully effective in the manning and maintenance of the ship on deck and in the engine-room.

The heirarchial rank structure among the rating groups onboard is unnecessarily and largely extended Fig.29, that the performance of their prescribed roles is limited for
tasks which require fewer people of limited number of ranks. The unnecessary different heirarchial rank structure and the limited performance of the prescribed roles have undermining effects on productivity and unutilization of the manpower force in a cost effective manner.

Fig.29 PRESENT RANK STRUCTURE OF RATINGS ONBOARD

<table>
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<th>DECK DEPARTMENT</th>
<th>ENGINE DEPART.</th>
<th>CATERING DEPART.</th>
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<td>FOREMAN</td>
<td>CHEIF COOK</td>
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<td>CARPENTER</td>
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<td>MOTorman</td>
<td>STEWARD I</td>
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<td>BOATSWAIN MATE</td>
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<td>STEWARD II</td>
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<td>ABLE SEAMAN</td>
<td>ENGINE BOY</td>
<td>MESSMAN</td>
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<td>ORD/ SEAMAN</td>
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<td>LAUNDARY MAN</td>
</tr>
<tr>
<td>DECK BOY</td>
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<td>GALLEY BOY</td>
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</table>

The permanent employment nature of the officers and ratings in the Ethiopian Shipping Lines Corporation which maintains crew stability, the possibility of assignments of the well trained National Officers on the top level of the ranks on the modern vesels have not been fully exploited to the best economic advantages by the decentralization of management from the shore offices.

The functionally organized departments ashore have direct access to each ship of the fleet and direct control and influence is exercised upon each department onboard. The volume of communications flow from shore to ship and vise versa when the ships call home ports, is so heavy generating substantial costs. All matters ranging from administrative, technical and operational natures are discussed
and solved through telephone, T1xes and letters from a distant of nearly one thousand kilometers. Not only heavy expenses are involved but also the potentialities of the trained officers onboard remain isolated.

Notes

(1) PP-(1-5) Ethiopian Shipping Lines Corporation Report 7th. Nov. 1969 (Ethiopian Calendar)
CHAPTER VIII - CONCLUSIONS AND RECOMMENDATIONS

1. Conclusions

Today, more than ever, rapid and dramatic changes are taking place onboard. These changes which are mainly related with shipboard technology and organization are heavily influenced by the acute need for cost reduction and productivity. These two factors are and will remain the most highly motivating forces for the emergence and deployment of technologically advanced vessels in the International Shipping markets. The era in the building of the traditional types of ships is gradually coming to an end replaced by the building of semi and fully automated ships manned by reduced but highly educated and trained crew with an effective shipboard organizational system in which more emphasis is given on task rather than role-based performances.

Technological, organizational and managerial developments in International Shipping is becoming highly complex and rationalized that any Shipping Industry cannot escape from the sphere of its influences. These influences therefore demand the acceptance of changes. There is of course a danger to be watched to have changes adopted simply for the sake of changes. The governing conditions under which the Shipping Industry is existing and operating have to be thoroughly analyzed and evaluated in line with the required changes and the results are the most important elements in the determination of the degree and extent of the changes to be adopted and implemented. The encouraging measures being taken by the Ethiopian Shipping Lines Corporation in having ships built and purchased with semi-automated machinery systems, is appropriate and
goes in line with the Trade requirements. However the areas concerning shipboard changes that must go with it appears to be overlooked and some short-falls of high magnitude remain to exist in terms of costs.

Because of the profit making position it occupies, the entity of the Corporation may probably not be affected presently. If the costs exist to continue, it will not only reduce the eventual earnings from the Shipping business, but also pose a potential threat in the long run as indicator on the freight charge to be considered excessive and to have not contributed to the promotion of the National Trade for which one of its responsibilities stands for. It is therefore the appropriate time for the Ethiopian Shipping Lines Corporation to mobilize all the necessary efforts to adopt and implement shipboard changes suitable and possible to its governing conditions. Such changes however cannot be successfully achieved without a corresponding follow-ups in the Head office.

2. Recommendations

Considering all the prevailing conditions under which the Ethiopian Shipping Lines Corporation is organized and operating, the implementation of the following recommendations can contribute to the reduction of the existing costs and increase productivity.

1- Training of Ratings
2- Introduction of General Purpose Rating System
3- Shipboard Management Team
4- Mixed-departmental Matrix Organization On Board

2.1 Training Of Ratings
The technical and victualling costs indicated in Fig. 27 and Fig. 28, have emanated from the effects of the lack of training of the ratings in all categories. The effects would have been worse in a capital intensive technologically advanced vessels which demand a high standard of training and skill.

The training of the ratings regarding deck and engineering personnel can effectively be improved through mutual arrangements with the Ethiopian Navy by taking the full advantage of the Naval Seamen Training Centre which is located in Asmara. The Navy which used to conduct a yearly based sandwich training system to its Naval Seamen has since 1983 embarked on a new scheme of two years education and training system whereby graduates are awarded a diploma after the successful completion of the prescribed courses Figs 30-31-32.

The Naval Seamen Training Center has been evaluated by the Ministry of Education in its academic syllabus and competencies of the teaching staffs and have been fully accredited. Graduates from the Training Center are considered to have finished the regular and standard academic high school. The requirement for the entry of the Training Centre is completion of Junior High School.

In the case of the Ethiopian Shipping Lines Corporation and in the event that the training period is considered to be long or the need to train seamen as general purpose crew arises, the Corporation can directly recruit the required personnel and a training package can be arranged in consultation with the training staffs. The training package can be implemented without difficulties as the Training Center is well equipped and facilitated to meet the need of the Corporation.
### Fig. 30. SEMESTERWISE PERIOD DISTRIBUTION

#### TECHNICAL COMMON—CORE

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**Note:**
1. Physical Training is to be conducted before classhours (3 periods a week).
2. The academic and professional theoretical training of the third semester should be completed before the 12th week or the semester so as to leave three weeks for infantry training and swimming.

**Source:** Naval Training
## CURRICULUM FOR DECK BRANCH

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Sub Total: 390 435 322 1147

## CURRICULUM FOR ENGINEERING BRANCH

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<td>Sub Total</td>
<td>210</td>
<td>510</td>
<td>525</td>
<td>1170</td>
</tr>
</tbody>
</table>

Source: Naval Seamen Training Manual
With regard to training of personnel from the Catering Department, the experience and training capability of the Ethiopian Catering and Tourism Training Institution located in Addis Ababa can effectively be exploited to the benefit of the Corporation.

The Catering And Tourism Training Institution which was established in 1969 is presently under the Ethiopian Tourism Commission which is empowered to administer the Institution by Proclamation No.182 of 1980 article 8 section 9.

The main objectives of the Institution are to train new entrants to the Industry in the fields of hotels and Tourism, to conduct advance courses for those who have taken the basic professional trainings and to upgrade the existing employees in the Hotel and Tourism Industries. (1)

The Catering and Tourism Training Institution conducts the following Trainings.

<table>
<thead>
<tr>
<th>TYPES OF COURSES</th>
<th>DURATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Receptionist</td>
<td>1 Year</td>
</tr>
<tr>
<td>2. House Keeping</td>
<td>1 Year</td>
</tr>
<tr>
<td>3. Food &amp; Beverage Service</td>
<td>1 Year</td>
</tr>
<tr>
<td>4. Tourist Guides</td>
<td>1 Year</td>
</tr>
<tr>
<td>5. Food &amp; Beverage Cost Control</td>
<td>1 Year</td>
</tr>
<tr>
<td>6. Food Preparation</td>
<td>2 years</td>
</tr>
</tbody>
</table>

Enrollment in the Institution requires successful pass of the high school leaving examinations with grades above C in five subjects except for Courses 2 & 3 where the requirements are only senior high school education level. In addition to these requirements recruits have to
## Fig. 33. Statement Showing the annual total number of regular CTTI Graduates from each Department

### Annual Turn Out of Graduates

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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<th></th>
<th></th>
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<tbody>
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<td>1. Front Office</td>
<td>9</td>
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<td>122</td>
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<td>8</td>
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<td>27</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>3. Food &amp; Beverage Service</td>
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<td>12</td>
<td>7</td>
<td>13</td>
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<td>29</td>
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<td>-</td>
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<td>14</td>
<td>-</td>
<td>25</td>
<td>60</td>
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<td>5. Tourism</td>
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<td>-</td>
<td>17</td>
<td>-</td>
<td>-</td>
<td>32</td>
</tr>
<tr>
<td>6. Food &amp; Beverage Cost Control</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>2</td>
<td>30</td>
<td>32</td>
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<tr>
<td><strong>Grand Total</strong></td>
<td><strong>17</strong></td>
<td><strong>26</strong></td>
<td><strong>27</strong></td>
<td><strong>13</strong></td>
<td><strong>17</strong></td>
<td><strong>36</strong></td>
<td><strong>14</strong></td>
<td><strong>5</strong></td>
<td><strong>12</strong></td>
<td><strong>22</strong></td>
<td><strong>94</strong></td>
<td><strong>89</strong></td>
<td><strong>159</strong></td>
<td><strong>531</strong></td>
</tr>
</tbody>
</table>

### Notes:
1. The 2 PDRY's graduates from Food & Beverage Cost Control Department were at Up-grading level.
2. The number of foreign graduates in 1982 - 1984 was 15, out of which 14 were from PDRY and one from Tanzanian Embassy in Addis Ababa.
3. The graduates of 1984 from Housekeeping department were not only trained in Housekeeping but were also given Cashiering Course.
4. Graduates are awarded diplomas if they take a two-year Course, or otherwise Certificates.

### Source:
### SUBJECTS COVERED DURING FOOD PREPARATION

#### 2 YEARS COURSE

<table>
<thead>
<tr>
<th>PROF. THEORETICAL SUBJECTS</th>
<th>GENERAL SUBJECTS</th>
<th>PROF. PRACTICAL SUBJECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchen organization</td>
<td>English</td>
<td>Soup Preparation</td>
</tr>
<tr>
<td>Introduction to food stuffs</td>
<td>French</td>
<td>Sauces, gravies, meat preparation</td>
</tr>
<tr>
<td>Menu making &amp; composition</td>
<td>Commercial Subjects</td>
<td>Cold side dishes &amp; Salads</td>
</tr>
<tr>
<td>portion control</td>
<td>Tourism</td>
<td>Vegetable Preparation</td>
</tr>
<tr>
<td>Quantity calculation</td>
<td></td>
<td>Farinaceous dish preparation</td>
</tr>
</tbody>
</table>

- Egg dishes preparation
- Fish dishes preparation
- Sweets & deserts preparation
- National dishes preparation
- Psychology
- Hygiene
- Nutrition
- Food cost control
- Intro. to different Hotel Dept.

*Source: CTTI Information Manual*
<table>
<thead>
<tr>
<th>PROFESSIONAL SUBJECTS</th>
<th>GENERAL SUBJECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food cost control</td>
<td>English</td>
</tr>
<tr>
<td>Food preparation</td>
<td>French</td>
</tr>
<tr>
<td>Catering</td>
<td>Tourism</td>
</tr>
<tr>
<td>Statistics</td>
<td>Psychology</td>
</tr>
<tr>
<td>Economics</td>
<td>Nutrition</td>
</tr>
<tr>
<td>Accounting</td>
<td>Hygiene</td>
</tr>
<tr>
<td>Management</td>
<td>Introduction to Diff. Hotel Depts.</td>
</tr>
</tbody>
</table>

Source: CTTI Information Manual
pass the entrance examination to be given by the Institution. Between 1969 and 1984 the Catering and Tourism Training Institution had graduated a total of 531 students Fig.33 of which fifteen students were foreigners from Peoples Democratic Republic of Yemen and Tanzanian Embassy in Ethiopia.

As most of the chief stewards and none of the cooks onboard had any formal training from a recognized Catering Institution other than the normal experiences acquired from various and ordinary Hotel Services, Food Preparation and Food and Beverage Cost Control courses could be recommended for future training Fig.34 and Fig.35. Cost of training per person per year is estimated to be USD 250 which is negligible as compared to the cost incurred as a result of lack of training.

2.2 Introduction Of GP Rating System

The departmental barriers and the too many hierarchial ranks in the rating group, entail more expense to remunerate them for their unproductive role rather than task oriented performances. The carpenter rank and position for instance is not required in steel ships and their proper task performances are gone with the old wooden sailing ships. The store keeper and the boatswain mate positions do not require any special skill more than what the Able Seamen can do. In the Catering department, except the cooks, all other hands perform tasks that are not requiring special skills. The fitter's task assignments can be covered by a trained foreman. The engine boy billet is not necessary and can be phased out if formal training is implemented. Most of the billets are therefore vulnerable for reduction. It is therefore recommended to elimi-
nate all the existing ranks and positions in the future and replace them by the General Purpose Rating System.

The following factors favour the recommendations:

- The ratings being permanent employees, there is no problem of crew instability or high turnover.

- The future ships to be owned by the Corporation are no more of the traditional engineroom manned type of ships and technology demands GP crew of well trained background.

- Training of ratings has not yet been formally established and it the appropriate time that the future training stream starts with a new batch of GP crew.

- The GP crew system provides the necessary groundwork for future flexibility in meeting the demands of technologically advanced ships.

- Preferential treatment and protection through departmental barriers will be eliminated.

For the effective implementation of the GP crew System, the following outline of training scheme is recommended as a guide line. It is advisable that in the future all the ratings of all the departments serving onboard except the cooks to be General Purpose ratings classed as GP-1, GP-2 and GP-3 according to the level of their training standards which are divided into three levels, as Level-1, Level-2 and Level-3 as shown in Fig.36. The training packages of each level of the training which can be arranged in a manner to meet the requirements of
Regulations II/6 and III/6 of the STCW Convention of 1978 can also be worked out in consultation with the training staffs of the Naval Seamen Training Center drawing the necessary back-up forces from the seagoing officers if and when the need arises. The training packages should have the necessary ingredients to qualify the GP ratings to have a flexible role for shore assignments.

Fig. 36 OUTLINE TRAINING SCHEME FOR GP RATINGS

<table>
<thead>
<tr>
<th>CLASS</th>
<th>GP-1</th>
<th>GP-2</th>
<th>GP-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAINING LEVELS</td>
<td>PROF</td>
<td>SEA</td>
<td>PROF</td>
</tr>
<tr>
<td>SUBJECT TIME EXAM</td>
<td>SUBJ</td>
<td>TIME</td>
<td>EXAM</td>
</tr>
<tr>
<td>LEVEL 1</td>
<td>ALL</td>
<td>ALL</td>
<td>ALL</td>
</tr>
<tr>
<td>LEVEL 2</td>
<td>ALL</td>
<td>ALL</td>
<td>ALL</td>
</tr>
<tr>
<td>LEVEL 3</td>
<td>ALL</td>
<td>ALL</td>
<td>ALL</td>
</tr>
</tbody>
</table>

Upon the successful completion of each level of the required training, there will be an examination and those who pass be awarded certificates. The training at each level continues progressively reaching an advanced level when a GP rating reaches to class GP-3.

The class number given would have no any bearing at all on ranks or positions other than for categorizing and certification purposes. A foreman position as work leader of the ratings can be reached only after the successful completion of the three training levels and good recom-
mendation from superiors. Outstanding ones should also be given the chance to join the cadet training for officership not only for motivation purposes but also to benefit from their good training, experience and skill at that stage to strengthen the manpower competencies essential to the attainment of productivity and safety. Certain amount of remunerations however can be fixed as a reward or incentive for those GP ratings who successfully pass every level of the given examinations.

Each level of the training packages should be conducted at regular interval in a well programmed manner with not less than a minimum of 2 years at each level. This system of training can enable the Ethiopian Shipping Lines Corporation to gradually phase out the existing cumbersome and heavily structured rank system of the rating groups which are depriving of the proper utilization and effectiveness of the manpower force available onboard.

2.3 Shipboard Management Team

Team work is the prime importance to management functions. It enables a number of priority area, such as communications, delegations, creativity and motivation to be used to benefit the team and the Corporation. This approach, while it cannot solve all problems over night, is relatively easy to understand provides a stepping stone from the traditional fragmented separate departments to a more integrated and coordinated team oriented management system.

The following factors are supporting facts for a possible introduction of the Shipboard Management team on board the ships of the Corporation.
- The permanent employment of officers and ratings maintains crew stability.

- The proximity of the Liner Trade Routes to the origin of places of production of the vessels makes it easier for access to repair facilities and supply centers for spares and stores.

- The strategical locations of the representative offices along the trade routes having the potentialities to play supporting roles. - The availability of variety of communication means for ship-shore office communications.

- Ships becoming a 24 hours society, socio-technical and career system, demand the participation of shipboard crew in an organized manner for the best performance and output for the designed purpose of the ship.

The shipboard Management Team should consist of the most senior officers of each department and the foreman. The master who acts as a coordinator of the team shall also chair during the meeting of the team. Until experience is gained and the training standard is improved to a degree in using data processing and computer systems, the standard means of communication with the Head Office and other supporting facilities can be Telexes and SSBs in addition to the other normal and customery means of telephones and letter writings. The Head Office and the representative offices abroad and at home should and must play supporting rather than directing roles.

The Shipboard Management Team, however should not be left to ride free by itself. A policy guide line under which
it fulfills its obligation has to be formulated, heavy emphasis being made on the running, controlling and operating the ship within the allocated and agreed budget which the Head Office has to fix after the consultation and evaluation of the Shipboard Management Team.

2.4 The Mixed-departmental Matrix Organization

The Mixed-departmental Matrix Organization is recommended but not in its full contexts at the introductory stage. Exception should be made on the non-requirement of the Semi-integrated officers and the overlapping task roles of the ratings in the light of the existing training standard and qualifications of the officers and the ratings which would make it incompatible.

**Fig.37 THE MIXED-DEPARTMENTAL MATRIX ORGANIZATION**

However as the level of the training standard is raised and experiences gained, there can be a room in the future to advance it further by introducing the integrated officers system.

In the Mixed-departmental Matrix Organization Fig.37, the Traditional shipboard departments exist in the officers
level while they should totally be eliminated in the ratings level forming the GP crew pattern. Due to the special nature of the profession in the Catering Dept., the cooks have to be the only exception to remain under the Catering Department outside the Gp pattern.

The organizational responsibilities onboard shall be divided between the Chief Officer and the Chief Engineer. The Chief Officer shall be responsible for the general employment and welfare matters of the GP ratings while the Chief Engineer shall be responsible for the work control as future ships are becoming technical and knowledge oriented. The master who is the ultimate responsible person of the entire ship will exercise his authority through the Shipboard Management team.

Through the proper training of ratings, with greater emphasis on the essential requirements of professional knowledges and skills to meet the actual needs of shipboard services, the Mixed-departmental Matrix Organization which encompasses the General Purpose Rating System can be adopted and implemented acceptably.

These changes onboard could help a great deal in saving some of the significant labour costs affecting the Ethiopian Shipping Lines Corporation. To support this argument, cost saving calculation is made, as indicator, based upon the manning scale of one of the newly built multi-purpose ships m/v Abai Wonze of 10,830 DWT manned by a crew of 32.
Fig. 38 LABOUR COST SAVING M/V ABAI WONZE

IN USD/YEAR

<table>
<thead>
<tr>
<th>RANKS</th>
<th>NOS</th>
<th>SALARIES</th>
<th>NOS</th>
<th>SALARIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFFICERS</td>
<td>11</td>
<td>72 240</td>
<td>11</td>
<td>72 240</td>
</tr>
<tr>
<td>Boatswain</td>
<td>1</td>
<td>3 072</td>
<td>1</td>
<td>3 072</td>
</tr>
<tr>
<td>S/Keeper</td>
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<td>Able Seamen</td>
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<td>O/Seaman</td>
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<td>Foreman</td>
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<td>3 072</td>
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<td>Fitter</td>
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<td>4 704</td>
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<tr>
<td>Wiper</td>
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<tr>
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<td>2nd Cook</td>
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<td>2 352</td>
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<tr>
<td>Steward I</td>
<td>1</td>
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<td>-</td>
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<td>Steward II</td>
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<td>Laundry Man</td>
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<td>1 560</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

TOTAL 32 119 160 23 101 328
Savings from salaries 119 160 - 101 328 = USD 17 732
AVG O/T Pay Fig. 25 30.4% of total salary/year = 36 344
50% of O/T saved = USD 18 172

TOTAL SAVING 17 732 + 18 172 = USD 35 904/year

Even though the number of crews are reduced to 23 it can be considered still to be overmanned as compared to the
The manning scale of the Norwegian ships of similar sizes shown in Fig.39 and Fig.40. (24)

**Fig.39 MANNING SCALE ON TRADITIONAL ENGINE-ROOM MANNED VESSELS**

<table>
<thead>
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<th>3,000 and under 5,000</th>
<th>5,000 and under 8,000</th>
<th>8,000 and under 12,000</th>
<th>12,000 and under 20,000</th>
<th>20,000 and under 50,000</th>
<th>50,000 and under 100,000</th>
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</thead>
<tbody>
<tr>
<td>Manning</td>
<td>Master</td>
<td>Mates</td>
<td>Radio Officer</td>
<td>Boatswain</td>
<td>Able seamen</td>
<td>Ordinary seamen</td>
<td>Youngsea (ordinary seamen jrs.)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
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<td>20</td>
<td>21</td>
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Source: Norwegian Ship Control Legislation 1982
<table>
<thead>
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<th>8,000 and under</th>
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<td>1</td>
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</tr>
<tr>
<td>Mates</td>
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<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Radio Officer</td>
<td>1</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Boatswain</td>
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<td>1</td>
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<td>1</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
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<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>5</td>
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</tr>
<tr>
<td>Ordinary seamen</td>
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<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
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</tr>
<tr>
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<td>1</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>Engineers</td>
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</tr>
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<td>1</td>
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</tr>
<tr>
<td>Repairman</td>
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<td>1</td>
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</tr>
<tr>
<td>Motormen</td>
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<td>2</td>
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24-Figs. 39 and 40 are based on the Norwegian Regulations from before the amendments of January 1986, opening for even further reductions.