



AUDITOR GENERAL

1995/96: REPORT 2

Performance Audits

BRITISH COLUMBIA FERRY CORPORATION

Fleet and Terminal Maintenance Management

Operational Safety



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British Columbia Ferry Corporation



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Auditor General's Comments



Auditor General's Comments



This report, my second to the Legislative Assembly for the 1995/96 year, contains the results of two performance audits carried out in the British Columbia Ferry Corporation.

Performance audits look at how organizations have given attention to economy, efficiency and effectiveness in the conduct of their operations. The concept of performance auditing, also known as value-for-money auditing, is based on two principles. The first is that public business should be conducted in a way that makes the best possible use of public funds. The second is that people who conduct public business should be held accountable for the prudent and effective management of the resources entrusted to them.

In my past reports, I have commented on the significant economic and social impact Crown corporations have on the province and the

large amounts of public money entrusted to them. Accordingly, I consider it essential that performance audits by my Office be conducted in these organizations. The two audits carried out in the British Columbia Ferry Corporation are the first such audits carried out in a major Crown corporation by my Office. We will carry out more in the future.

I believe it is appropriate that our first performance audit in a major Crown corporation be in the British Columbia Ferry Corporation. The Corporation operates one of the largest ferry systems in the world. This system plays a key role in the province's coastal transportation network, providing linkages between communities along the mainland coast and between those on the mainland coast and Vancouver Island, the Queen Charlotte Islands and many smaller islands lying in the Strait of Georgia and farther north. The continued success of the corporation relies on its conducting this extensive service in a safe and reliable manner.

In our first audit, we examine the corporation's maintenance program for its vessels and terminals. We assess the adequacy of the program and the extent to which it is measuring how well results are achieved, including obtaining value-for-money. In our



second audit, we look at the corporation's number one priority, safety. Our focus is on assessing whether the corporation is meeting the requirements for operating a safe coastal ferry transportation system.

In our reports, we make recommendations relating to the corporation's ability to determine the cost-effectiveness of its maintenance activities, and to its safety and administrative procedures. I am pleased to note that the corporation is taking steps to implement many of these recommendations.

I greatly appreciate the cooperation shown to my audit staff by the corporation's executive and staff during the audits.

George L. Morfitt, FCA
Auditor General

Victoria, British Columbia
January 1996



Introduction



Introduction



This report contains the results of two performance audits conducted in the British Columbia Ferry Corporation in 1994/95.

The British Columbia Ferry Corporation—also called BC Ferries—was created on January 1, 1977, by the *Ferry Corporation Act* to “establish, operate, administer and maintain a ferry, shipping and related service.” The corporation grew out of the BC Ferry Authority that was set up in 1960 with two vessels to operate a frequent ferry service between the Lower Mainland and Vancouver Island. In October 1985, the size of the fleet increased when 14 saltwater ferries operated by the Ministry of Transportation and Highways were transferred to the corporation. By March 31, 1995, the corporation had 40 vessels serving 42 terminals on 24 routes (Exhibit 1.1). This makes it one of the largest ferry operations in the world.

In 1994/95, the corporation’s fleet carried 22.5 million passengers and 8.4 million vehicles. Revenues generated that year were \$353.2 million (which included an operating grant of \$34.0 million received from the Province) and expenses incurred were \$384 million.

In its 1993/94 annual report, the corporation presents its mission as “dedicated to satisfying customer, community, and government needs for safe, efficient, effective and reliable ferry transportation services.” It also describes among its values safety—“our highest priority” and reliability—“capital assets are maintained and replaced to ensure operational reliability.”

On September 1, 1994, a major reorganization of the corporation resulted in a change to the structure of senior management. The new organization is shown in Exhibit 1.2.

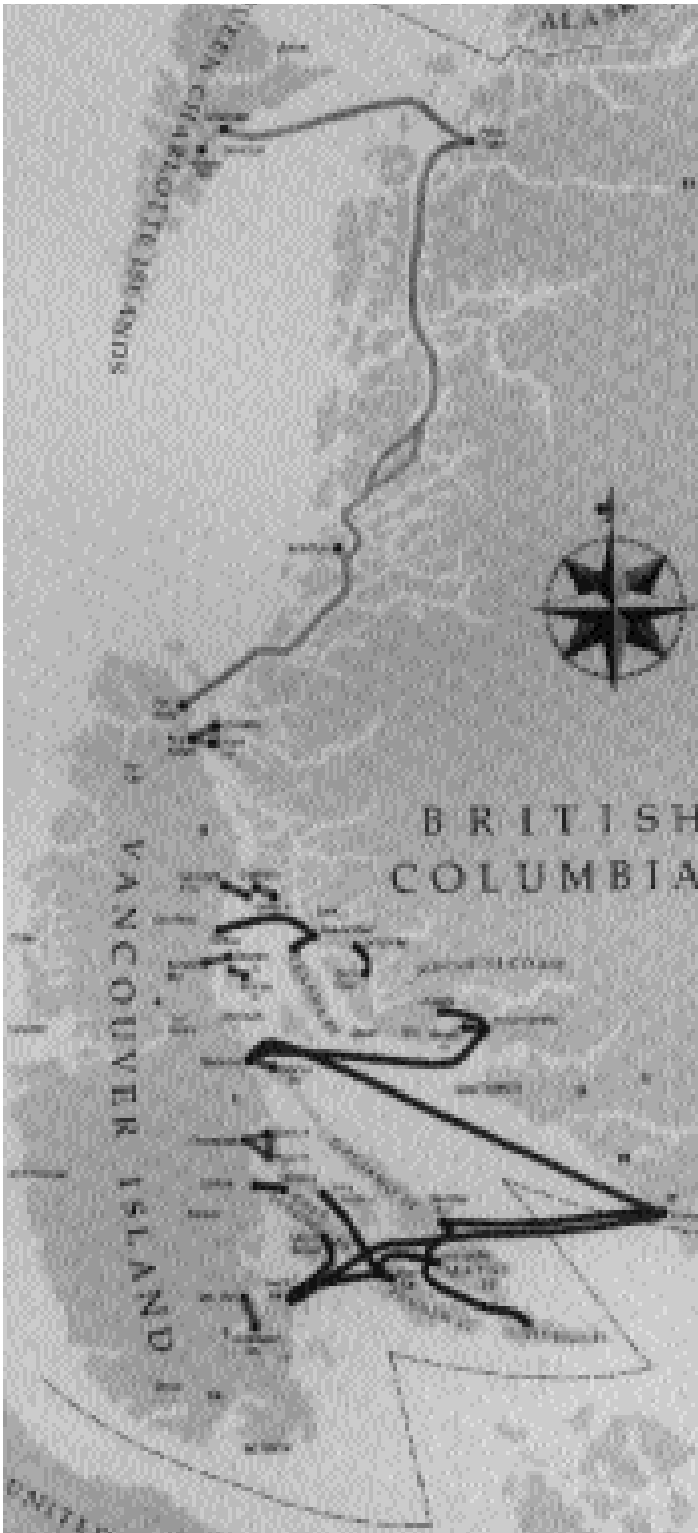
In the first audit included in this Report, we looked at the management processes the corporation relies on to ensure that its maintenance program supports the objectives outlined in its mission statement. The objective of maintenance management in the organization is to ensure that all of its physical assets are maintained effectively, economically and efficiently. We assessed the adequacy of the corporation’s maintenance program and the extent to which it is measuring the achievement of intended results, including obtaining value-for-money.

Our second audit in this Report deals with operational safety, the safety of persons and property from danger arising from the operation of ferries or from activities within terminal facilities.



Exhibit 1.1

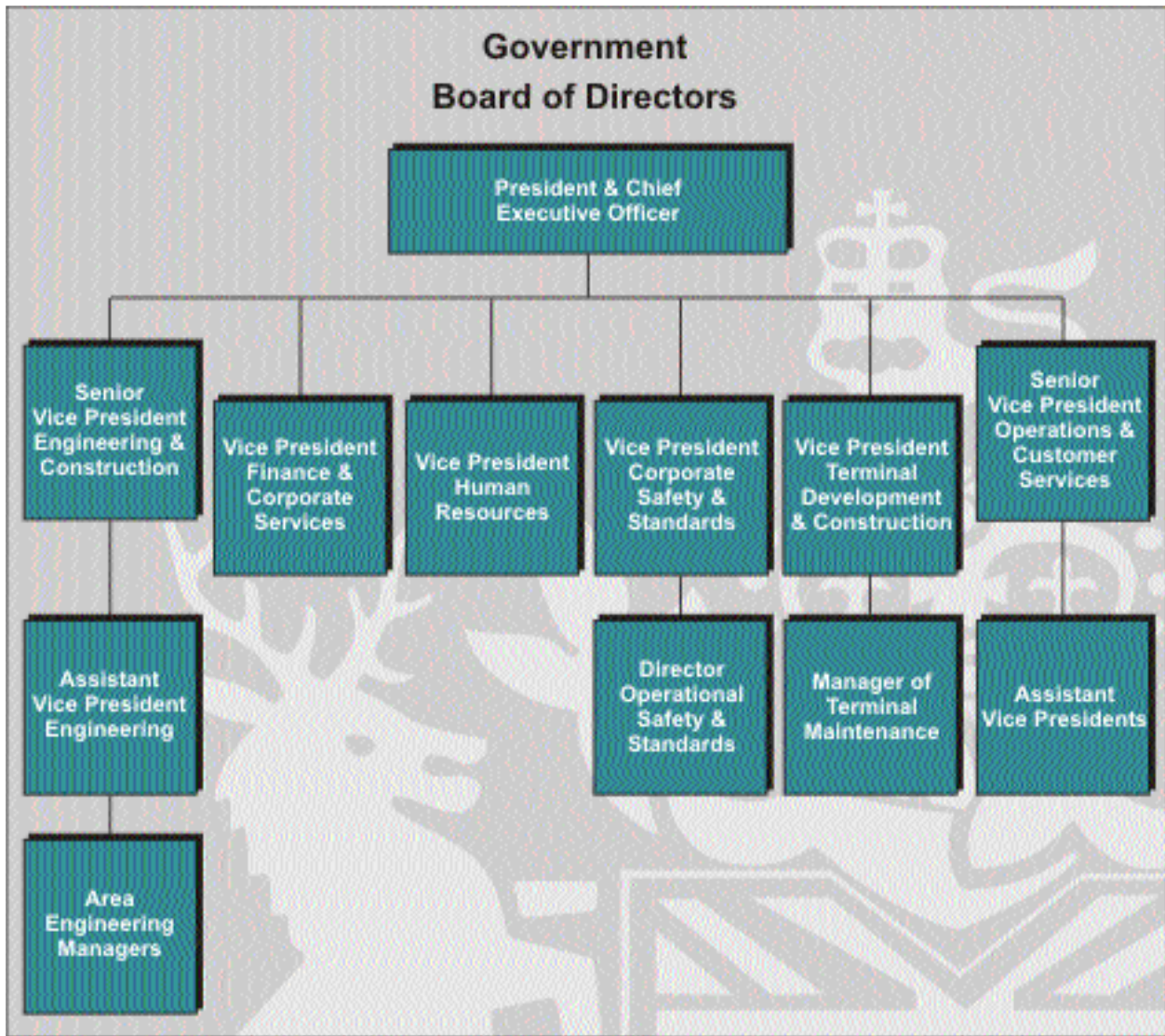
Route Maps of British Columbia Ferry Corporation



Source: British Columbia Ferry Corporation

Exhibit 1.2

Organizational Chart of British Columbia Ferry Corporation's Senior Management



Source: British Columbia Ferry Corporation

Providing ferry services involves a number of risks that could potentially have significant impacts on operations. As a result, the corporation stresses that operational safety is its highest priority. Our audit examined whether the corporation is meeting the requirements for operating a safe ferry transportation system.

The corporation's response to these audits is published along with our reports. The corporation has indicated that a number of



initiatives are under way to address many of the issues we raised. We will publish accounts of the organization's progress in our future annual reports to keep legislators and the public informed of the results of these initiatives, and will also follow-up on these matters when we carry out future audits in the corporation.



*Fleet and Terminal
Maintenance Management*



British Columbia Ferry Corporation

Fleet and Terminal Maintenance Management



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British Columbia Ferry Corporation

Fleet and Terminal Maintenance Management



An audit of how the British Columbia Ferry Corporation manages maintenance of its fleet and terminal assets

The British Columbia Ferry Corporation has 40 vessels and 42 terminals that have to be properly maintained in order to provide a safe and reliable service.

To be able to provide a service that is not only safe and reliable, but also cost-effective, the corporation needs an asset maintenance program that is both effective and efficient.

Audit Purpose and Scope

The purpose of this audit was to assess the adequacy of the corporation's maintenance program and the extent to which the corporation measures achievement of the program's intended results, including obtaining value for money.

We defined maintenance as those activities that are required to ensure that capital assets—vessels and terminals—are safe and reliable from an operational point of view, and reasonably protected from loss of value resulting from “wear and tear” associated with use. We looked at the preventive maintenance, repair, refit and minor rehabilitation components of the corporation's maintenance program.

Our audit included both fleet and terminal assets. Because of their significance to the corporation's operations, we focused our review of terminal assets on marine structures—ramps, towers, and lifting devices.

We carried out our review between October 1994 and January 1995, and considered the impact of initiatives that were under way at that time. Our examination was performed in accordance with value-for-money auditing standards recommended by the Canadian Institute of Chartered Accountants, and accordingly included such tests and other procedures we considered necessary in the circumstances.

Overall Conclusions

We concluded that the corporation's vessels, related equipment, and terminal assets—specifically, marine structures—are maintained so that they are operationally safe and reliable. However, we could not determine whether the corporation's maintenance activities are cost-effective because the corporation does not have the information necessary to permit such an assessment.

The corporation's maintenance program lacks several elements required to enable the corporation to ensure that vessels and terminals are being maintained in a cost-effective manner. The corporation needs to define clearly objectives for its maintenance program, and to establish standards for asset condition, cost, and maintenance practices. In addition, the corporation does not currently have an adequate information system by which the costs and results of maintenance activities can be measured.

The corporation recognizes the need for better information about its maintenance program and has, over the past 18 months, been developing a maintenance management system to address the problem. In view of the corporation's commitment to implement such a system, we plan to return to assess the results of this undertaking in the future.

Key Findings

Vessels and terminals are well maintained

The corporation maintains its fleet to meet or exceed standards established by equipment manufacturers, the Canadian Coast Guard, and other authorities involved in vessel certification. We found no instance where certification has been withheld because of maintenance not being performed to the standards established by these authorities.

Marine structures are also well maintained, with no recent maintenance-related equipment failures having been experienced.

Adequate preventive maintenance is carried out

The corporation has determined that most equipment on vessels should be subject to preventive maintenance. Over time, engineers on each vessel have developed adequate maintenance procedures and work routines based on manufacturers' specifications and "good engineering practices" which, in some cases, exceed manufacturers' recommendations. Those responsible for maintenance on each vessel understand the required procedures. We noted, however, that preventive maintenance procedures are

not consistent throughout the fleet, or even between vessels of the same type.

For terminals as well, preventive maintenance inspection and servicing are based on the experience of those responsible for doing the work. There is a regular inspection and servicing program for critical equipment, but inspection and service documentation need to be improved. Much of the maintenance is scheduled on the basis of individual memory and informal records rather than through a systematic approach. However, Terminal Maintenance Branch personnel are currently determining which equipment should be subject to preventive maintenance, and are developing preventive maintenance schedules.

Adequate repair, refit and minor rehabilitation work is carried out

Repair, refit, and rehabilitation work priorities are identified and required work is carried out. Work is scheduled by reconciling priorities and available resources. Priorities are based on safety, efficiency, and the ramifications of not doing the work.

Work on a vessel is supervised by the vessel's Senior Chief Engineer and is inspected by representatives from the Canadian Coast Guard and classification societies. In the past, most inspection and refit of equipment or component parts on vessels has been done over a four-year cycle, with timing determined by requirements of the Coast Guard and classification societies although specific work to be done is determined by the corporation. The corporation has recently been authorized by the Coast Guard to extend the refit cycle to five years. Safety and reliability, rather than cost-effectiveness, is the major concern of the Coast Guard and classification societies.

Repair, rehabilitation, and modification work for terminals is subject to on-the-job supervision by trade foremen and post-completion inspection by foremen and area superintendents.

More emphasis on cost-effectiveness is needed

The corporation lacks assurance that the optimum amount of maintenance is being done in a cost-effective manner.

Until recently, cost-effectiveness of maintenance has not been a major issue for the corporation. However, we found evidence of a growing awareness of the importance of cost-effectiveness.

The corporation needs to set clear measurable objectives and standards that describe what is considered to be adequate maintenance. Although the work carried out is adequate, better documentation is required as well as better cost tracking. Work



documentation varies from one vessel, or terminal maintenance area, to another.

The corporation's current financial information system does not provide the type of information that senior management needs to manage a maintenance program. Reporting focuses on inputs (what was acquired and what it cost) rather than outcomes (results). This has been identified by the corporation as a critical management issue, and a corporation-wide Maintenance Management Project is under way to address it.

One of the goals of the Maintenance Management Project is to create a corporate system that will achieve the optimum amount of maintenance at the appropriate cost, in order to maximize cost-effectiveness. Another goal of the project is to provide the foundation for an effective and efficient asset management program. Corporate level implementation of the system is targeted for mid-1997.

Inventory management practices need improvement

The corporation has a significant unrecorded investment in inventories of maintenance parts and supplies on vessels and at terminals. These inventories are not adequately managed.

Each vessel carries an inventory of parts and consumables. It is the responsibility of engineering staff on vessels to manage these inventories properly. Better inventory records are needed to properly manage these inventories.

Terminal Maintenance also lacks formal inventory management. The supplies of materials and equipment in each terminal maintenance yard are neither tracked nor controlled and there are no comprehensive inventory records. Instead, each area has an informal process for tracking inventory. Most are based on simple organization of the inventory and a visual survey.

The corporation does not evaluate the performance of its maintenance program

The corporation needs to develop data collection and analysis processes in order to be able to assess whether its maintenance program is effective and value for money is achieved.

Internal reporting on maintenance is inadequate

The lack of an adequate information system hampers the corporation's ability to provide meaningful performance information about the effectiveness and cost of its maintenance program to its Board of Directors.



Background



The British Columbia Ferry Corporation has a sizable asset base to maintain. As at March 31, 1995, the fleet consisted of 40 vessels ranging in age from 1 to 45 years. Exhibit 2.1 shows the percentage of vessels built by decade. Exhibit 2.1 shows the percentage of vessels built by decade. Approximately 58% of the fleet was built before 1970. The vessels have an average life expectancy of 40 years, and are carried on the books

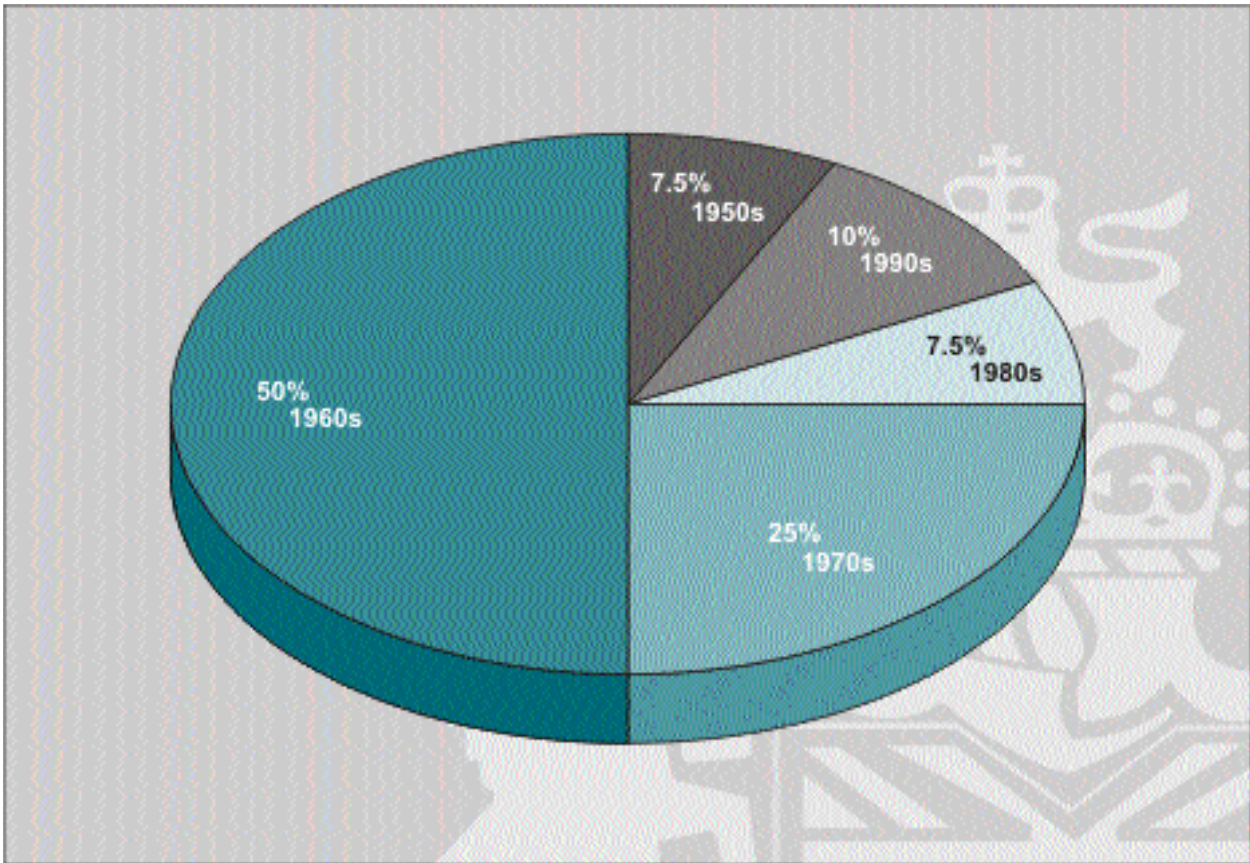
of the corporation at a depreciated cost of \$420 million. The estimated replacement cost of the fleet is \$2.2 billion.

The corporation classifies its vessels into four groups:

- **Spirit** class, includes the *Spirit of British Columbia* and the *Spirit of Vancouver Island*.

Exhibit 2.1

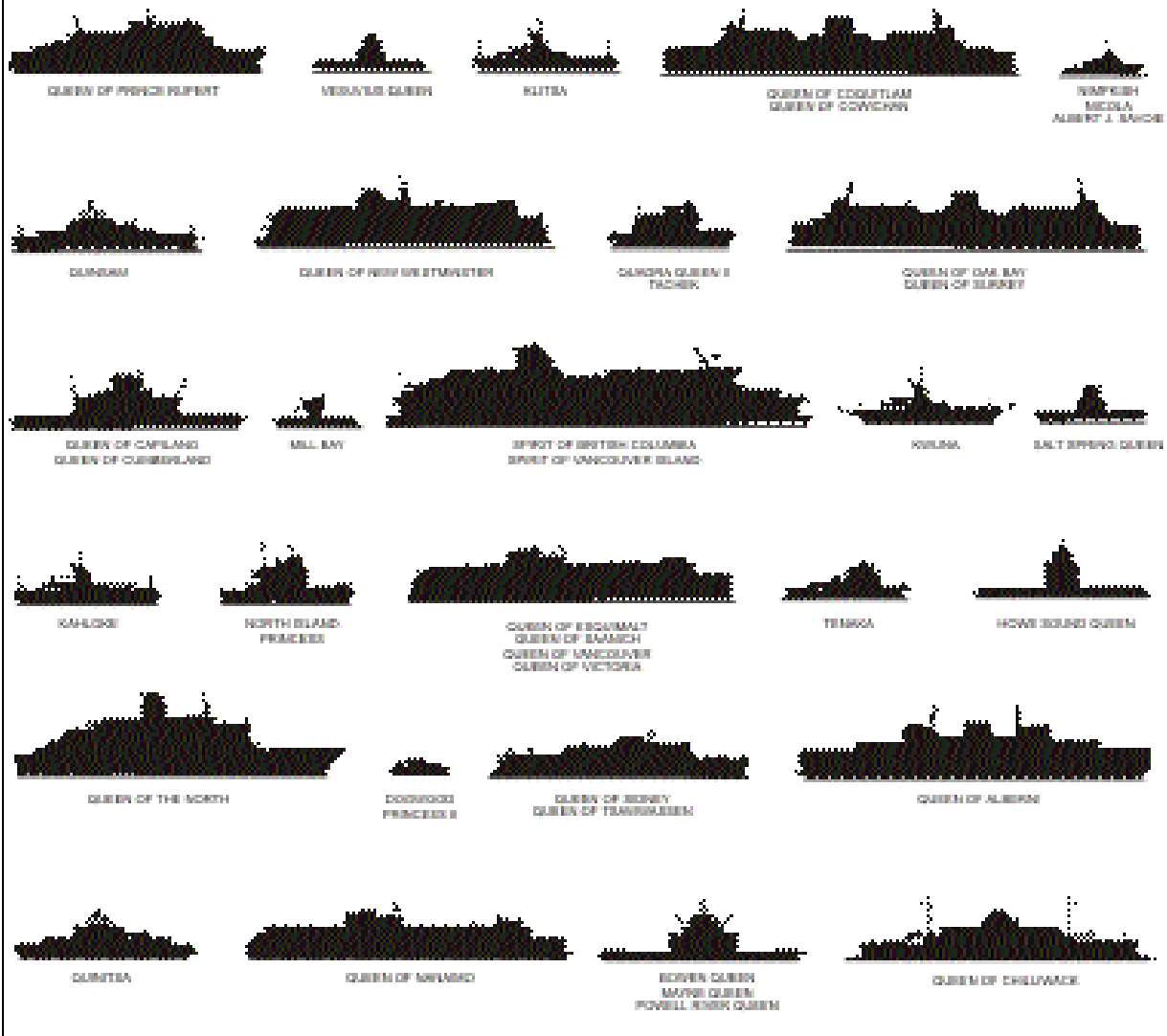
Percentage of Vessels Built by Decade



Source: British Columbia Ferry Corporation



profile of the Fleet



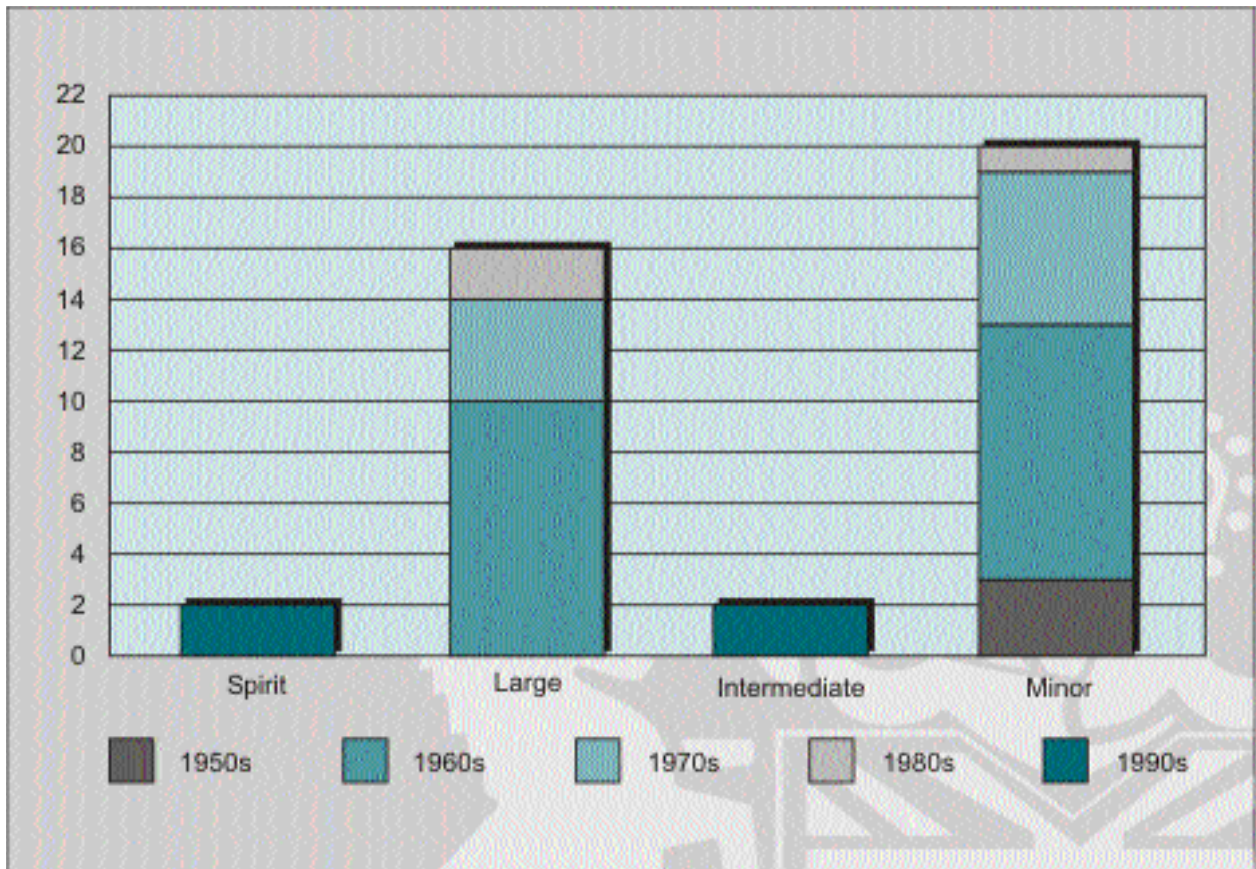
Courtesy: British Columbia Ferry Corporation

Profile of the Fleet

- **Large** class includes the *Queen of Sidney*, *Queen of Tsawwassen*, *Queen of Vancouver*, *Queen of Victoria*, *Queen of Esquimalt*, *Queen of Saanich*, *Queen of Nanaimo*, *Queen of New Westminster*, *Queen of Prince Rupert*, *Queen of the North*, *Queen of Alberni*, *Queen of Coquitlam*, *Queen of Cowichan*, *Queen of Chilliwack*, *Queen of Oak Bay*, and *Queen of Surrey*.
 - **Intermediate** class includes the *Queen of Capilano* and *Queen of Cumberland*.
 - **Minor** class (vessels having a gross tonnage of less than 1,000 tons), included the *Vesuvius Queen*, *Mill Bay*, *North Island Princess*, *Nicola*, *Albert J. Savoie*, *Garibaldi II*, *Howe Sound Queen*, *Tenaka*, *Bowen Queen*, *Mayne Queen*, *Powell River Queen*, *Quadra Queen II*, *Tachek*, *Klitsa*, *Kahloka*, *Nimpkish*, *Kwuna*, *Quinitsa*, *Dogwood Princess II*, and *Quinsam*.
- Exhibit 2.2 shows the number of vessels by class and the decade built.

Exhibit 2.2

Number of Vessels by Decade Built



Source: British Columbia Ferry Corporation

The corporation spends approximately \$35 million a year to repair and refit its vessels. Exhibit 2.3 shows the breakdown of costs incurred to repair and refit the vessels for the years 1992 to 1995.

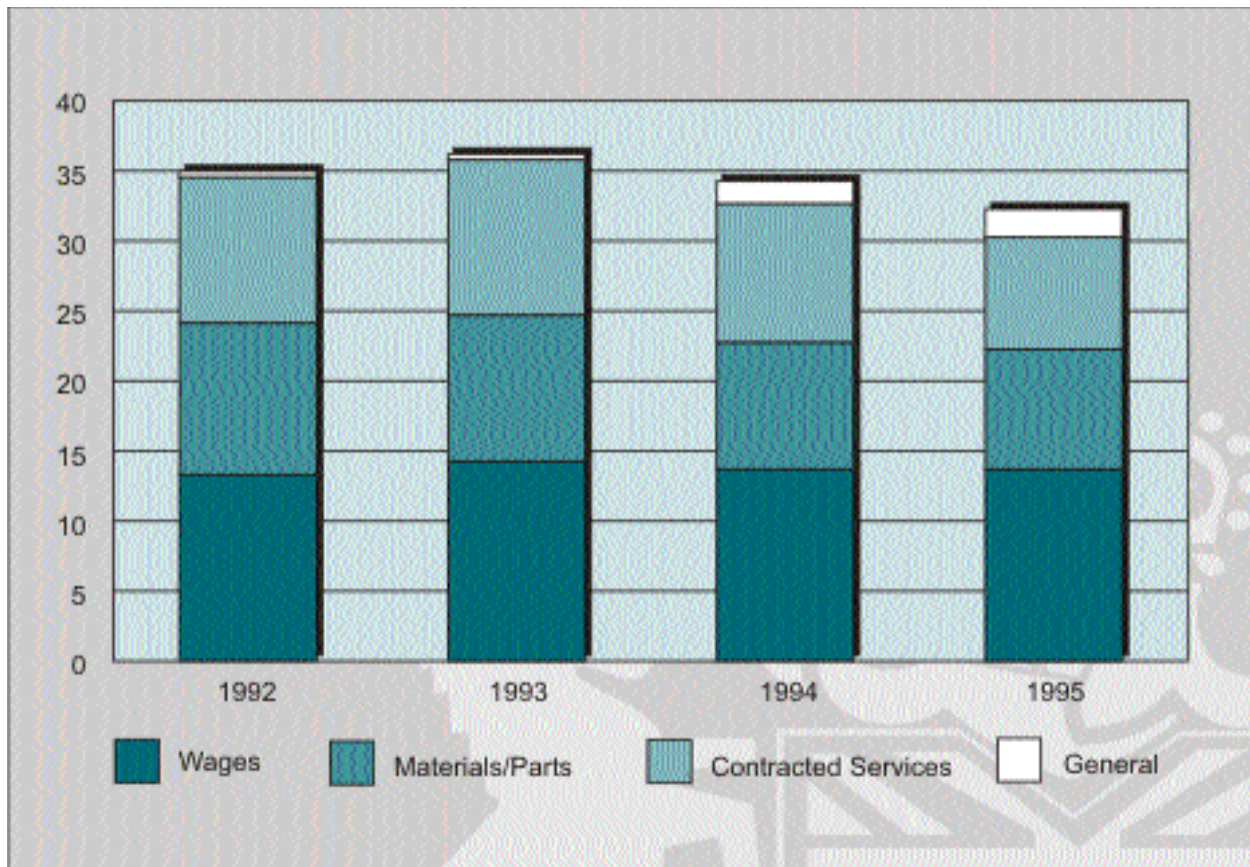
The corporation spends an additional \$25 million on engineering staff and supplies for the day-to-day operation of the vessels, including preventive maintenance but not including fuel costs.

The corporation serves 24 routes with 42 terminals and related shore-based structures that have an average life expectancy of 30 years. It also uses 613 marine structures: boarding ramps, lifting towers, and those structures in and adjacent to the water that form the docking approaches and berths. These structures have a design life of 15 years. Berths, buildings, and equipment are carried on the books of the corporation at a depreciated cost of \$143 million. The estimated replacement cost of these structures is \$350 million.

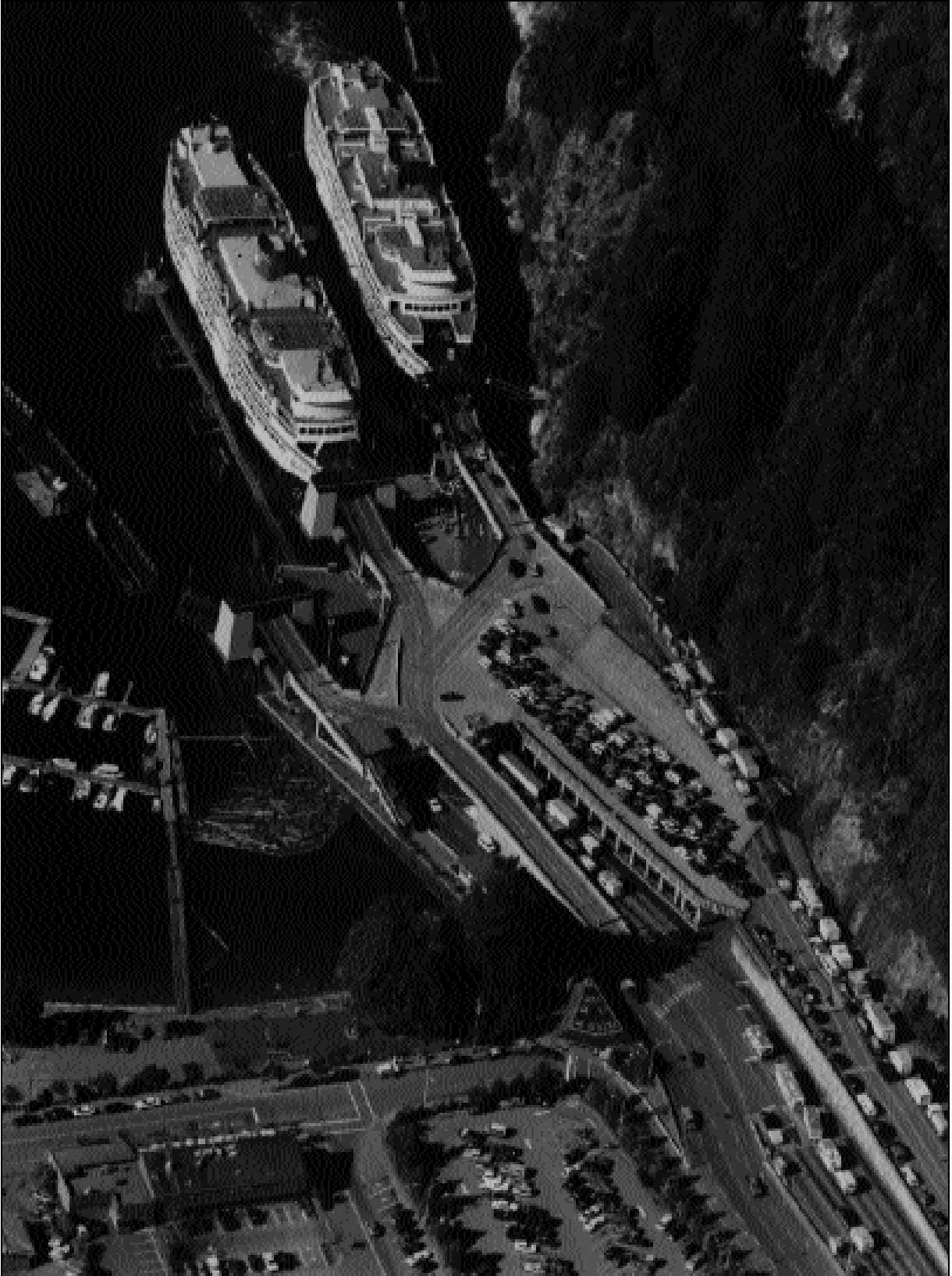
Exhibit 2.3

Cost of Vessel Repair and Refit

For the fiscal years ending March 31, 1992 to 1995 (\$ Millions)



Source: British Columbia Ferry Corporation



Courtesy Airphoto 85

Horseshoe Bay terminal

Exhibit 2.4 shows the breakdown of terminal maintenance costs for the years 1992 to 1995.

The Need for an Adequate Maintenance Program

An adequate maintenance program should ensure that maintenance of the corporation's physical assets is carried out effectively, economically, and efficiently.

The corporation's 1994/95 annual report describes its mission

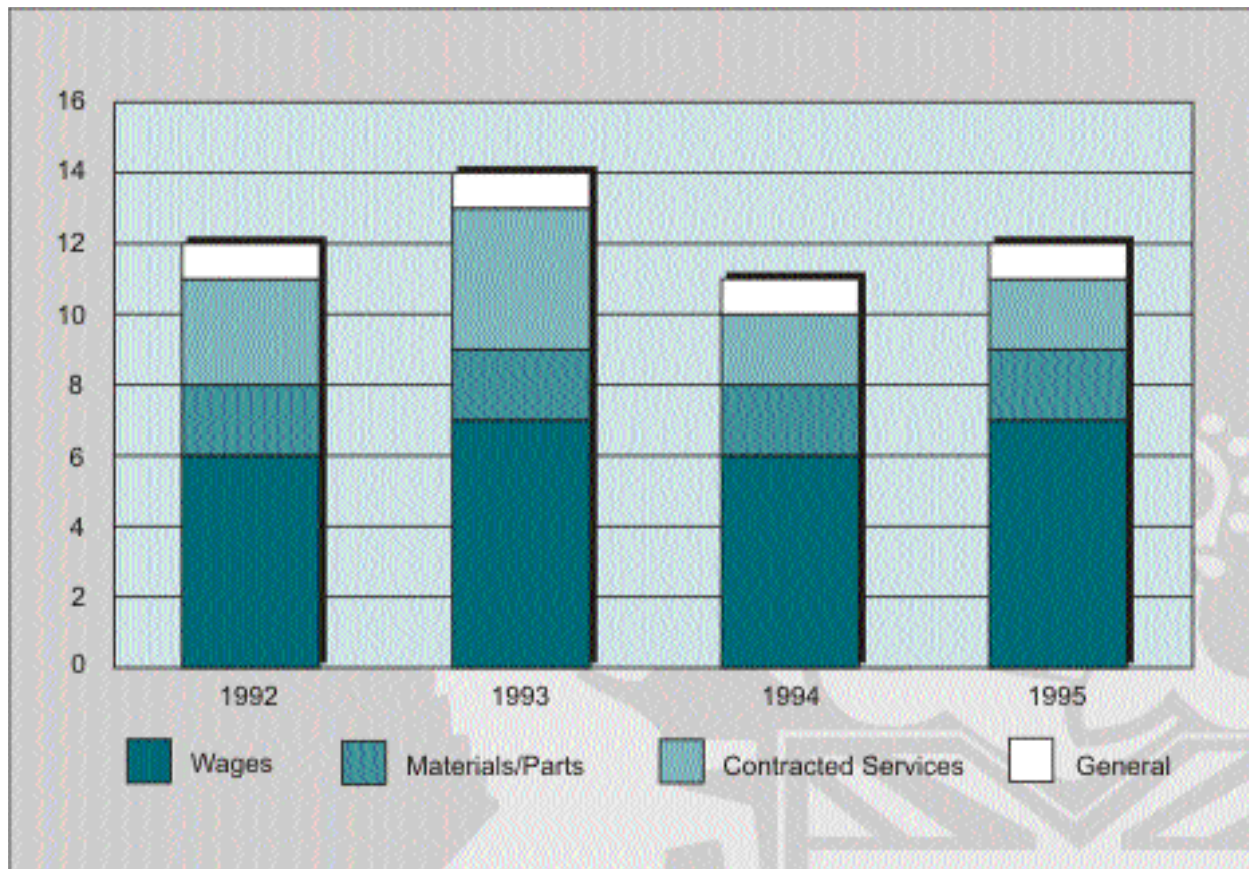
as being "dedicated to satisfying customer, community, and government needs for safe, efficient, effective and reliable ferry transportation services." It also states that maintaining vessels and terminals to ensure operational reliability is a corporate priority.

To ensure safe and reliable operations, the corporation's assets—vessels and terminals—require proper ongoing maintenance. Machinery and equipment must be inspected, cleaned and lubricated regularly, repaired or rebuilt as

Exhibit 2.4

Costs of Terminal Maintenance

For the fiscal years ending March 31, 1992 to 1995 (\$ Millions)



Source: British Columbia Ferry Corporation

required, and replaced occasionally (the latter is a capital, rather than a maintenance, decision). If the corporation is to ensure that its maintenance activities are both effective and cost-effective, it needs

an adequate maintenance program. By “adequate” we mean a program that is organized and managed in a manner that is likely to contribute to achieving the goals set out in the corporation’s mission statement.

Managing Assets for Least Lifetime Cost

One of the goals of an organization should be to minimize the total lifetime cost of its assets. Total lifetime cost of an asset includes its acquisition cost, operating cost, maintenance cost, and the opportunity cost associated with an asset being unavailable for use, minus any proceeds of sale.

The quality of initial construction (a function of design, materials, and workmanship) and the rate of deterioration are related. Generally speaking, the better built an asset is, the longer it will last and the less maintenance it will require to remain in acceptable condition. However, acquiring high quality sometimes costs more in the long run than accepting lesser quality. To maximize value for money from an asset, the corporation must balance the quality and cost of acquisition against the requirements for, and cost of, maintenance over the asset’s lifetime (or a portion of it).

Other factors also affect acquisition decisions. For assets that will eventually be resold, projected sale proceeds should be considered at the time acquisition decisions are made. As well, the costs of operation must be considered in addition to the costs of acquisition and maintenance. In some cases, lower operating costs may offset higher acquisition costs.

Maintenance management should start at the time an asset is acquired and carry on throughout its useful life, up to the time of replacement of the asset. Activities should include preventive maintenance and repair, and periodic refit or rehabilitation so that these activities contribute to the achievement of the corporation’s mission of operating a safe, efficient, effective, and reliable ferry service.

Regular maintenance and periodic rehabilitation are required to keep vessels and terminals in safe and usable condition. These assets deteriorate over time as a result of use and weather. Steel components are particularly hard hit by the salt water environment; wooden structures, on the other hand, are subject to attack by wood-boring worms (the marine equivalent of termites). As well, because of the size and mass of the vessels, vessels and marine structures experience enormous forces during docking maneuvers, especially in poor weather.

Opportunity costs include those economic costs associated with an unreliable piece of equipment. These costs are sometimes revenue that is lost because service cannot be provided. In other cases, they are the costs of having extra equipment available to take the place of a failed unit—sometimes a spare, sometimes a rental unit.

Attaining least lifetime cost for an asset is not always possible. A number of factors may limit the ability of the corporation to do so. For instance, limited funds at the time of acquisition may preclude some choices. Or, lack of information on the costs of operation or maintenance may make it very difficult to balance acquisition with operating or maintenance costs. Other factors—such as a limitation on the corporation’s authority to make certain decisions—may also make it difficult for the corporation to behave in an strictly economic manner.



In the following sections of the report, we present our findings according to the following themes:

- **maintaining vessels and terminals,**
- **managing the maintenance process,**
- **evaluating the extent to which the program is achieving its intended results, and**
- **reporting to the Board of Directors.**



Maintaining Vessels and Terminals



To provide safe and reliable ferry service, the corporation must perform adequate maintenance on its vessels and terminals. This includes preventive maintenance, repairs, annual refits of vessels, and minor rehabilitation of terminals. It is also important that these maintenance activities be appropriate to satisfy regulatory requirements.

In our audit we visited a representative sample of vessels in the fleet, all the major terminals, and several of the smaller terminals. To help us in assessing the adequacy and appropriateness of the corporation's maintenance processes, and to perform a visual inspection of the assets to evaluate their condition, we used the services of technical experts in the maintenance area.

Conclusion

We concluded that the corporation's vessels, related equipment, and terminal assets are maintained so that they are operationally safe and reliable. The corporation conducts a sufficient level of inspection and maintenance activity, and operates near to a "zero mechanical failure" rate. There have been no significant maintenance-related equipment failures in recent years.

The corporation maintains its fleet to meet or exceed standards established by equipment manufacturers, the Canadian Coast

Guard, and other authorities involved in vessel certification.

Findings

General Condition of Assets

We found that vessels and terminals are maintained so that they are operationally safe and reliable, and reasonably protected from loss of value resulting from "wear and tear" associated with use.

On the basis of our physical inspection (review of the engine room and general physical condition of the vessels), interviews with engineering staff, review of maintenance procedures and records, (including work logs, daily inspection check lists and records that record pressures, temperature, fuel consumption), we concluded that the vessels are well maintained.

A review of records of inspection and testing work completed by the Canadian Coast Guard and relevant classification societies showed that the maintenance work carried out is sufficient to satisfy all of the requirements placed on the corporation. We found no instance where certification has been withheld because of maintenance not being performed to the standards established by these authorities. We also found that any deficiencies identified are dealt with appropriately.

We also determined that the terminals we inspected were well maintained. By "well maintained"



Courtesy: British Columbia Ferry Corporation.

Right Angle Drive Unit weighing 15 tons being removed from vessel for transport to Deas Dock for overhaul

we mean we found there to be an appropriate level of inspections, timely repairs and basic preventive maintenance activities sufficient to ensure a safe and reliable ramp system operating as near as possible to a zero failure rate. Our inspections of terminals indicated, for example, that lifting cables and sheaves were properly greased and aligned to protect them from premature deterioration and that wear resulting from use was within acceptable limits, hydraulic systems showed no evidence of excessive wear or fluid leakage, and there was evidence of recent adjustments and repairs to marine structures.

All loading ramp structures are subject to an annual detailed inspection by an independent materials engineering and inspection firm. The inspection includes a variety of specialized tests designed to assess material integrity. A review of the reports of the most recent inspections at each of the terminals we visited confirms that no serious or unusual deficiencies were found during the inspections.

Corporation records indicate no significant maintenance-related equipment failures in recent years.

The corporation maintenance procedures include preventive maintenance, repair, refit and minor rehabilitation. These processes are described in more detail below.

Preventive Maintenance

Preventive maintenance is the cornerstone of a maintenance program. It is work that can be forecast and undertaken to prevent equipment failure or to detect impending equipment failure and mitigate its effects. While it often takes the form of regular inspection, the tightening or adjustment of moving parts, and lubrication, it can also involve the monitoring of equipment to ensure it is operating within a predetermined acceptable range for certain characteristics. For example, operating temperature or pressure can be monitored to ensure that equipment failure does not occur as a result of excessive temperature or internal pressure. An indication that equipment is operating at too low or too high a temperature or pressure is usually evidence that the equipment is

malfunctioning and that corrective action is required.

We expected the corporation to have decided which items of equipment require preventive maintenance, and to have established procedures describing what preventive maintenance work will be done, how and when it will be done, and by whom.

Maintenance Procedures

The corporation carries out its preventive maintenance program employing routine, planned, preventive and condition-based maintenance procedures. Maintenance is carried out on a range of equipment on vessels and at terminals, including pumps, motors, generators, emergency

lighting, sewage systems, and uniform power sources for computers. Preventive maintenance and some repair work are done by engineers assigned to individual vessels. Each vessel has a preventive maintenance program developed for that vessel. There is also regular inspection and servicing of all critical equipment at terminals.

The corporation carries out its preventive maintenance in an adequate manner. Most assets are subject to preventive maintenance, and maintenance activities are regularly carried out. Experience indicates that few mechanical failures in the corporation can be traced to lack of adequate preventive maintenance.



Deas Dock Refit Complex

Courtesy: British Columbia Ferry Corporation

Canadian Coast Guard and Classification Societies

The Coast Guard is responsible for the development and administration of standards concerning vessel hull and machinery design, construction, floatation and stability, life saving equipment, and pollution prevention systems.

Coast Guard standards define how vessel owners and operators should care for their vessels to ensure the structural strength and the watertight integrity of a vessel, the safety and reliability of propulsion and steering systems, and the effectiveness of other essential systems.

Classification societies—such as Lloyd’s Register of Shipping and the American Bureau of Shipping—are international organizations that develop and administer standards for the design, construction, and hull and machinery maintenance of vessels. Ship owners and operators are not required to use the services of classification societies, but many choose to do so to secure advantage in areas of underwriting insurance or asset resale. Classification society records and inspection surveys are taken into account in the evaluation of insurance risk, and can affect insurance premiums paid by the ship owners and operators.

A classification society has its surveyors periodically visit vessels to ensure that they are complying with the society’s rules. If significant defects become apparent or damages are sustained between the visits by the surveyors, the owner and operator are required to inform the society. Any modification to a vessel that could affect its classification must receive prior approval from the society if the vessel is to remain in class.

In addition to classification approval, Coast Guard approval must also be obtained for vessel modification.

Repair, Refit, and Minor Rehabilitation

In addition to preventive maintenance, the corporation must repair equipment that breaks and also periodically refit its vessels and carry out minor rehabilitation on terminals. We looked for an organized process for identifying and responding to emergent repair needs, including procedures to determine work priorities, allocate resources, and define work requirements and responsibilities. We also looked at how the corporation plans, organizes, carries out, and documents its refit and minor rehabilitation work.

Fleet

Much of the corporation’s fleet maintenance program is driven by the requirements of the Canadian Coast Guard and classification societies (Lloyd’s Register of Shipping and American Bureau of Shipping). Each vessel normally undergoes an annual refit, both to meet regulatory requirements and to carry out necessary repairs and refurbishing. Representatives from the Canadian Coast Guard and the classification society with which the vessel is registered attend the refit to inspect and certify the work being carried out.



Courtesy: Airphoto '85

Vessels in private dry-dock

Annual refit requirements for each vessel are determined from a variety of sources, including a refit schedule that is updated annually and work lists that have been developed for each vessel. These lists detail the mandatory maintenance and inspection work to be carried out. Until recently, most inspection and refit of vessels and on-board equipment has been carried out over a four-year cycle. Under the four-year cycle, twenty-five percent of the vessels' total equipment is refitted each year with the vessels undergoing dry-docking every second year.

However, advances in technology, particularly in paint and anti-corrosion methods, have reduced the need for a biennial dry-docking. Within the past year, the corporation has been authorized by the Coast Guard to extend the refit cycle to five years. This will allow the corporation to reduce its dry-docking requirement to twice in the five year period and to refit twenty percent of its equipment each year instead of twenty-five percent. This should reduce costs.

The Senior Chief Engineer responsible for a vessel supervises all refit work and ensures that the refit plan is carried out. At the completion of refit, the vessel undergoes a sea trial and the Senior Chief Engineer carries out a review of the vessel, noting work done and work not completed. On the basis of the sea trial and the review of the vessel, the Senior Chief Engineer prepares a report on the refit, describing work done and items not completed and why.

The primary ship refit facility for the corporation is at Deas Dock in Ladner. Most refits are carried out at this location by the vessel's engineering staff and the Deas Dock trades personnel. The corporation's repair and refit program uses corporation resources as well as private sector services. All dry-docking and some refits on minor vessels are done in private shipyards. Specialized services are also acquired from the private sector, as needed.

We believe that the corporation's procedures are adequate for planning and carrying out the repairs and refit work required to ensure that the vessels are safe and reliable.

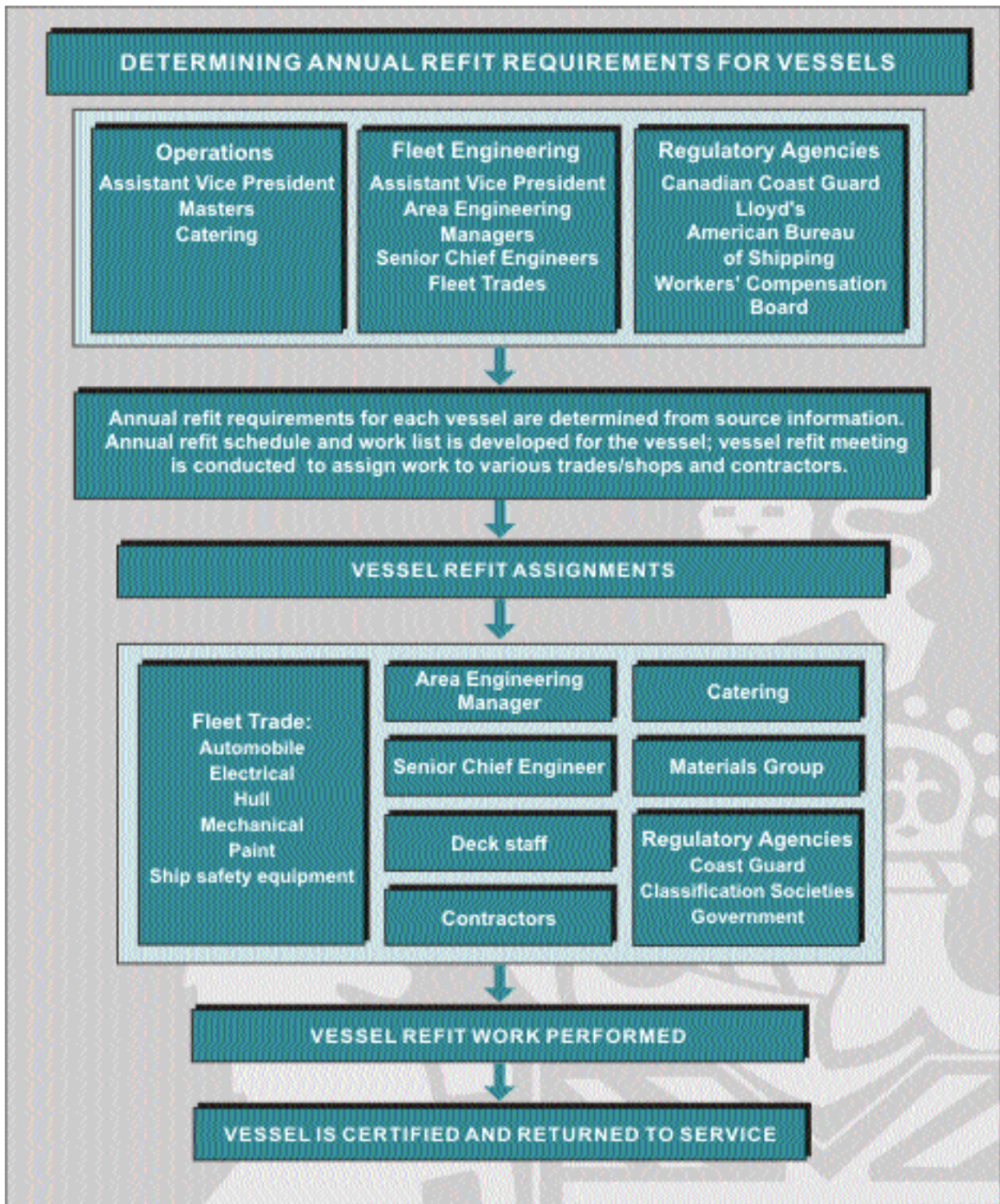
Exhibit 2.5 shows the various groups involved in the refit of a vessel before it goes in for refit. The departments on the vessels (Catering, Deck, and Engineering) draw up individual lists of required work. These are combined into a single list at a refit meeting held to review and coordinate work requirements and to allocate the work to the various trades. Work that can be scheduled for completion during the time the vessel is in service (before or after refit) is identified, together with the due date. Work that can only be done during refit is grouped into manageable work packages for inclusion in the vessel's refit specification.

Terminals

The corporation carries out quarterly and annual inspections at

Exhibit 2.5

Annual Refit Determination



Source: British Columbia Ferry Corporation

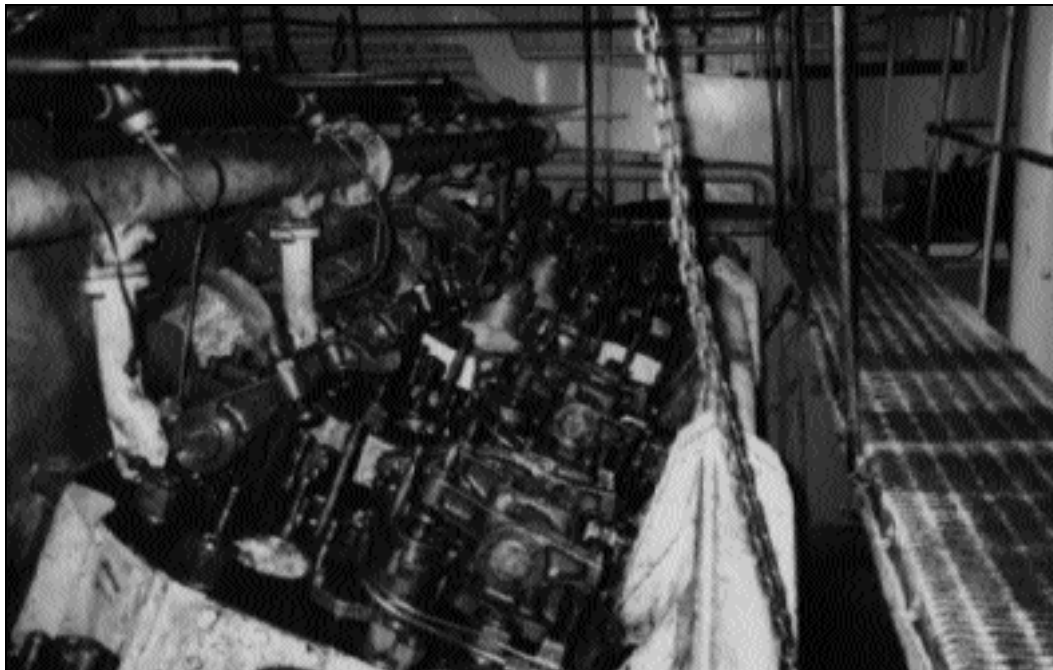
each terminal. These form the basis for identifying requirements for repair and rehabilitation. In addition to the inspections carried out by terminal maintenance staff, ramp attendants and terminal supervisors carry out supplemental inspections on a periodic basis. The latter have received training to assist them with their inspection and diagnostic role. Testing of all ramps and towers is also carried out annually by independent technical surveyors to identify requirements for repair or rehabilitation.

Work priorities are determined by the Area Superintendents of Terminal Maintenance, using the inspection reports to generate work orders for repairs. Priorities are based on safety, efficiency, and the ramifications of deferral. For example, some work can be deferred without risking additional

deterioration and expense; other work must be done without delay in order to minimize total cost.

Work orders describe generally what work is to be done and by whom. It is the responsibility of the work crew to determine specifically what is required and how to do the work, based on experience and available technical information. The corporation has recently developed, using the services of a consultant working in consultation with Terminal Maintenance staff, a *Design Standards Manual*. It presents a consistent approach to constructing and maintaining ramps, with a view to standardizing equipment and maintenance procedures.

Repair, rehabilitation, and modification work for terminals is quality-assured by the on-the-job



Courtesy: British Columbia Ferry Corporation

Main engine overhaul aboard a vessel during refit at Deas Dock

Deferred Capital Replacement

The scope of this audit was limited to maintenance—those scheduled and unscheduled activities designed to prevent or remedy premature loss of utilization of assets. However, in the course of our work, it has become apparent to us that the corporation must plan and undertake an extensive program of significant terminal rehabilitation and replacement if it is to continue to serve all of the routes it does at the present time.

The corporation has a history of extending the useful life of terminal assets by imposing operating restrictions—such as load limits on trestles—rather than rehabilitating or replacing deteriorating marine structures. This has resulted in a significant backlog of deferred capital rehabilitation and replacement work. The Terminal Development and Construction Division has a draft list of rehabilitation, replacement, and new construction projects for the next five years amounting to \$235–245 million.

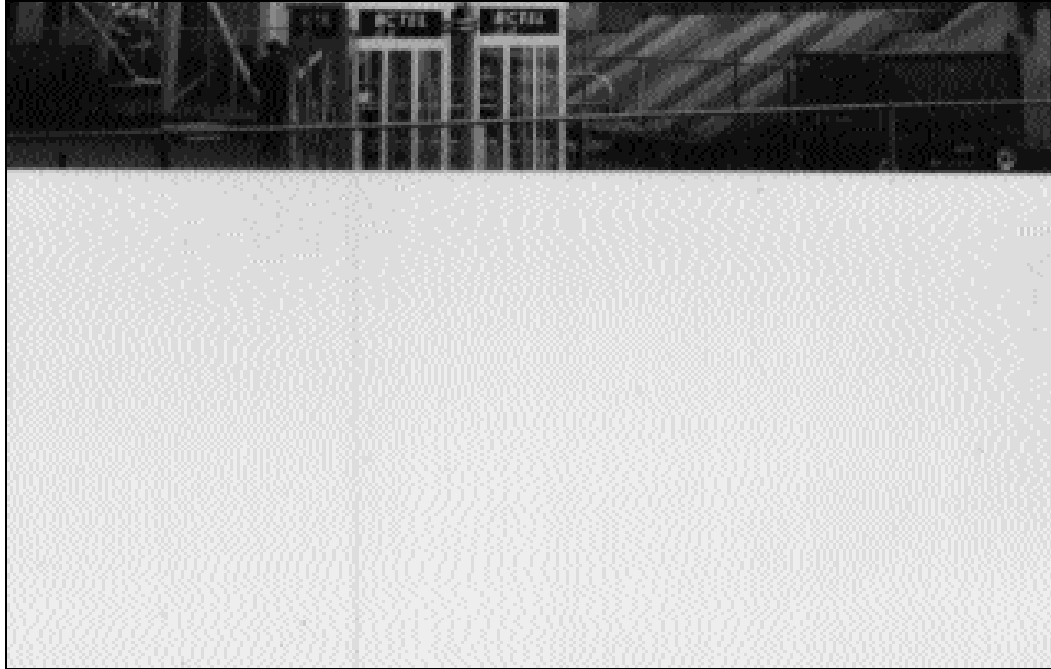
As well, on some of the older vessels, there is a limited amount of maintenance work that has been deferred. At the time of our audit, the corporation had a number of fleet repair items slated to be undertaken over the next few years:

- Steel work is required on the *Queen of Sidney* within the next year to comply with Coast Guard and classification society requirements.
- The car decks of the older vessels are starting to show corrosion. When corrosion reduces steel plate thickness by 30%, Coast Guard and classification rules require repair or replacement of the plating.
- Some vessels have considerable steel work replacement requirements in non-critical areas.
- To bring all vessels up to a standard that will allow another 5–10 years of life, the corporation estimates that an expenditure of approximately \$5.5 million will be required to replace steel.
- Vessels built before 1974 had a substantial amount of asbestos materials used in them (an acceptable material at that time). The removal of this material will be a continuing cost as long as these vessels are in service.

supervision of foremen and the post-completion inspection of foremen or the Area Superintendent.

There is a backlog of repair and rehabilitation work, as shown by the number of outstanding work orders in each area. However, not all of these have a high priority, and some would not be cost-beneficial to carry out. Some involve capital replacement decisions.

Although most repair work and some rehabilitation work is done as part of the regular terminal maintenance program, most terminal rehabilitation work is carried out as part of the corporation's capital program (as is a portion of the terminal repair work). This work is usually assigned to project managers in the Terminal Development and Construction Division, who work



Tower and ramp structure

closely with the Terminal Maintenance Branch.

We believe that the corporation plans and carries out repairs and minor terminal rehabilitation work (done by Terminal Maintenance staff) in an adequate manner.



Managing the Maintenance Process



To manage the maintenance process so that an optimum amount of maintenance is performed in a cost-effective manner, the corporation must have set clear objectives and have a process to gather information that will allow it to monitor, evaluate, and report on its maintenance program.

We expected to find defined maintenance objectives, clearly assigned responsibilities, and a system that: ensures that the work carried out is properly documented; provides information that is responsive to the needs of operational management; is accurate, up-to-date and presented at a level of detail that is meaningful to users; and is capable of providing reports as needed.

Conclusion

We concluded that the corporation's maintenance program lacks several elements required to enable the corporation to ensure that vessels and terminals are being maintained in a cost-effective manner.

The corporation has not set clear measurable objectives for its maintenance program.

In addition, the corporation needs a better management information system. Without information about the results, costs and productivity of maintenance activities, its managers are unable to ensure that they are providing the right mix of maintenance

services, to the right assets, at the right frequency, time, and cost.

Although responsibilities have been clearly assigned, financial accountability needs to be improved.

The corporation also needs to improve its inventory management practices.

Findings

Responsibility for Maintenance Management

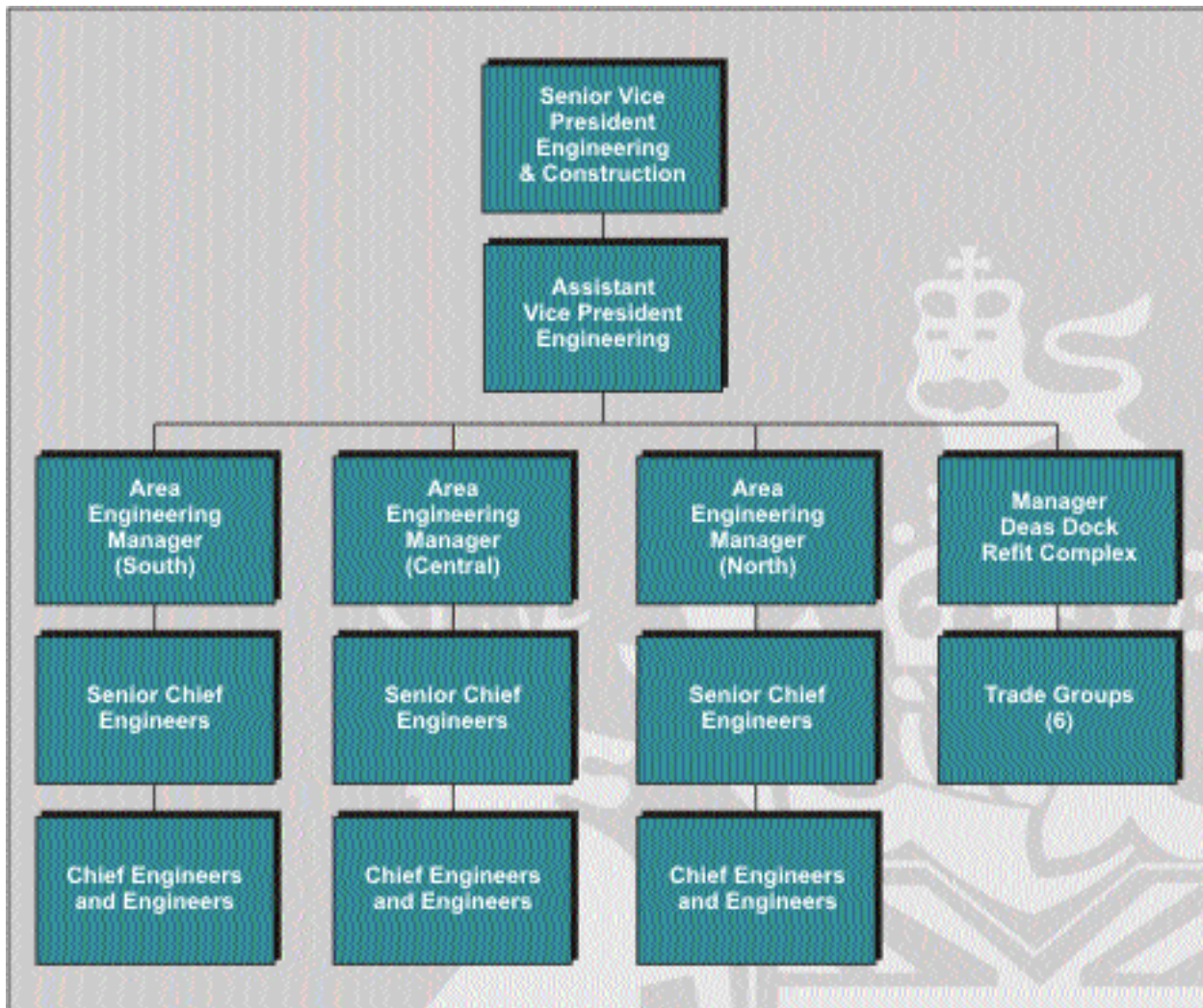
Fleet

On a vessel, the Master has (under the *Canada Shipping Act*) ultimate responsibility for the operation of the entire vessel while it is in service but, organizationally the engine room and all related maintenance on board the vessel are the responsibility of the Senior Chief Engineer. The Engineering & Construction Division is responsible for the efficient operation and physical integrity of the corporation's fleet of vessels. Exhibit 2.6 shows a partial organization chart for the Engineering Division.

On each vessel, one of the Chief Engineers is appointed as the Senior Chief Engineer, designated senior to the others, and is assigned extra managerial duties in addition to those of a Chief Engineer. Among these duties is the administration of the on-board maintenance. Maintenance is carried out on a daily basis by the vessel's engineering staff. As well, staff from the Deas Dock Refit Complex

Exhibit 2.6

Partial Organization Chart Depicting the Reporting Relationships for the Engineering Division



Source: British Columbia Ferry Corporation

are available to perform repairs requiring additional or special resources.

Each major vessel has four watches. Crew size is determined, first, by the Canadian Coast Guard certification requirements and, second, by the collective agreement between the B.C. Ferry and Marine

Workers' Union and the British Columbia Ferry Corporation.

The Deas Dock Refit Complex is devoted mostly to vessel repair and refit and to rehabilitation of equipment that can be removed from vessels for rebuilding. Facility staff are organized into six trade groups: mechanical, paint, electrical,

hull, automobile, and ship safety equipment. There are approximately 175 to 200 employees in total, including casual employees. Staff levels and distribution between trades are based on historical allocations. The Deas Dock Refit Complex also has satellite shops at Swartz Bay, Horseshoe Bay, Departure Bay, and Little River. In addition, radar technicians and response teams are on call 24 hours a day.

Although responsibility and authority for fleet maintenance have been adequately established, financial accountability is not clear.

The budgeting process is fragmented. Each of three Area Engineering Managers is responsible for operational and financial management of the 11 to 17 vessels assigned to their area. The operating cost of each vessel is charged entirely to the Area Engineering Manager's budget but refit costs are shared between the budgets of the three Area Managers and the Manager-Deas Dock Refit Complex.

The Senior Chief Engineers, who are responsible for carrying out the maintenance on board vessels, have little input into developing the budget for their vessels. In the past, the vessel was not the starting point for the budgeting process. Rather, budgets were developed on a global basis, not item-by-item, and were therefore not based on work that should be carried out during the next year. The reason for this approach is partly the lack of accurate information about the time and costs of carrying out maintenance and refit work. For

the 1994/95 fiscal year the corporation started to move to vessel-based budgeting.

If maintenance work is carried out by a vessel's crew, the costs are charged to the Area Engineering Manager's budget. If the work is carried out by Deas Dock staff, the costs are charged to the Deas Dock budget, although it is reported as a charge to an individual vessel. In both cases the Senior Chief Engineer is responsible for the quality of the work, but has limited control over—and is not held accountable for—the costs.

In addition, the Area Engineering Managers who oversee the refit work do not control, and are not responsible for the refit costs charged to their vessels for work done by Deas Dock personnel. Also, costs are charged to the engineering budget for maintenance work carried out for the Deck and Catering Departments. These departments request work but are not responsible for the costs.

We believe that the above arrangement does not provide appropriate accountability to ensure that those who have authority to request work are also responsible, and held accountable, for the work carried out.

Recommendation: The corporation should develop an appropriate budgeting process that clearly allocates financial accountability.

Terminals

On shore, Terminal Maintenance Branch is responsible for maintaining all the terminal facilities. Branch staff initiate most of the maintenance and repair work, but also respond to requests for service from the terminal managers and other operating staff.

The corporation has divided its terminal maintenance operations into five geographical areas—Deas Dock, Sidney, Nanaimo, Little River (Comox), and Powell River—each headed by an Area Superintendent. The Area Superintendents are responsible for prioritizing work and for ensuring satisfactory completion of maintenance and repairs. They have been allocated a budget and spending authority for all work to be carried out in their area. Responsibility for specific terminals is assigned to particular

areas on the basis of optimizing accessibility and minimizing response times.

There are currently 115 staff involved in the terminal maintenance activity.

We found that the working and reporting relationships between those responsible for maintaining terminal assets and those that work in the terminals has, historically, been satisfactory. However, during the course of our audit, responsibility for terminal maintenance was transferred, as part of a corporation-wide restructuring, to the Operations & Customer Services Division from Terminal Development & Construction. As a result, the Terminal Maintenance Superintendents now report to Assistant Vice Presidents in the new division, but responsibility for establishing policies, standards,



Single lane ramp built in the late 1960's at Swartz Bay

and practices for terminal maintenance remains in the Terminal Development & Construction Division. It is too early to assess the effects this transfer of responsibility will have on terminal maintenance operations.

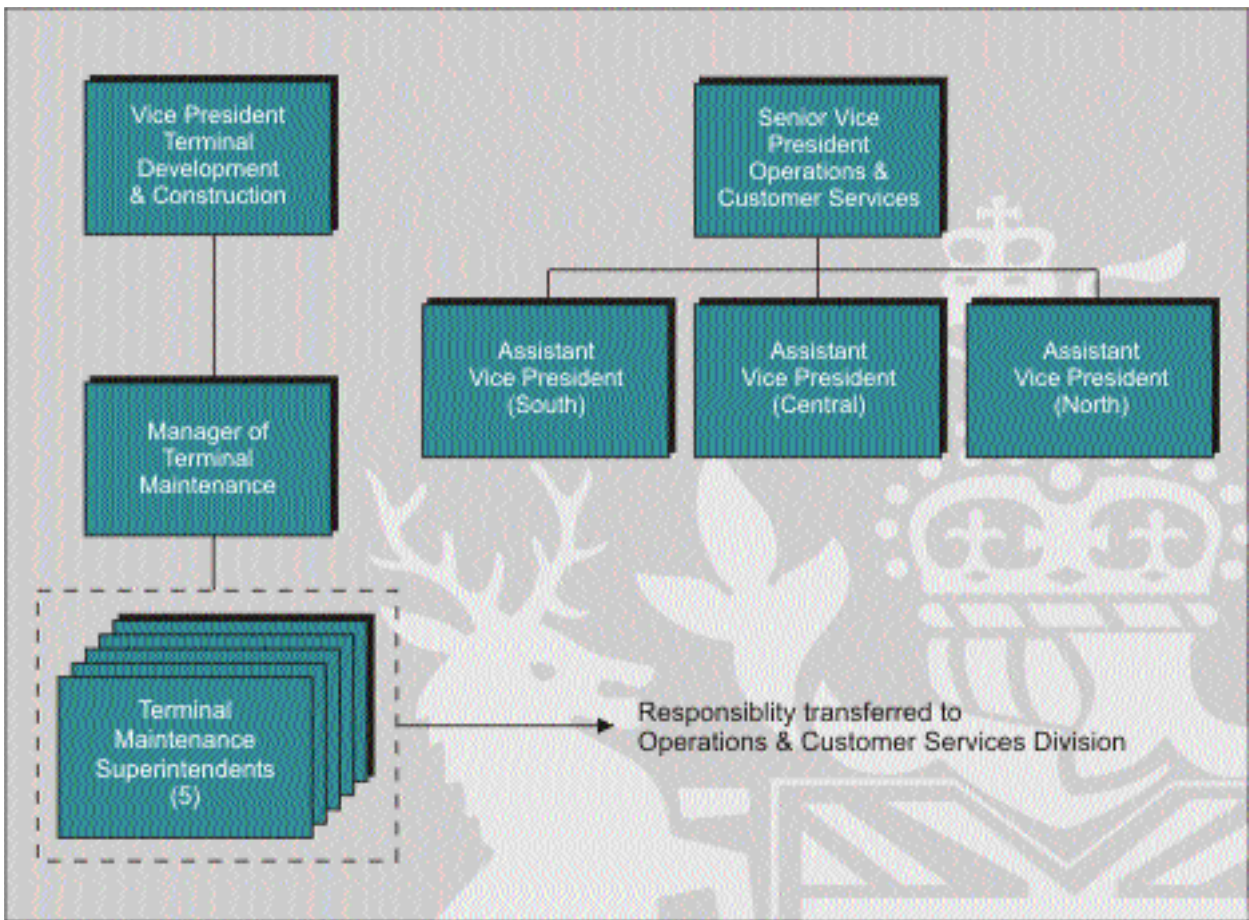
Exhibit 2.7 shows the organizational structure for the Terminal Maintenance Division.

Loss of Productivity

Deas Dock is the point of assembly for employees who carry out the majority of the maintenance work required at Horseshoe Bay and Tsawwassen terminals. Some of this work takes place in the extensive shops at Deas Dock, however many of the staff must travel from Deas Dock every day. Once travel time is deducted, staff

Exhibit 2.7

Partial Organization Chart Depicting the Reporting Relationships for the Terminal Maintenance Division



Source: British Columbia Ferry Corporation

who service Horseshoe Bay are left with only about three or four hours per day for actual work. Staff who service Tsawwassen have somewhat more time available for work. A feasibility study done in 1991 indicated that relocation of the point of assembly for some employees from Deas Dock to North Vancouver would generate approximately \$100,000 net savings per year after a first year transition loss of approximately \$75,000. The corporation has to date not changed the point of assembly as proposed in the feasibility study.

Recommendation: The corporation should address, without further delay, the loss of productivity associated with having staff, who perform terminal maintenance at Horseshoe Bay and Tsawwassen terminals, assembling at Deas Dock.

Maintenance Objectives and Performance Standards

To be able to assess the effectiveness of its maintenance program, the corporation must determine what it hopes to achieve from that program. We expected the corporation to have clearly stated maintenance objectives that describe what the maintenance program is intended to accomplish—objectives that are in line with the corporation’s mission and strategic plan, and that include obtaining good value for money spent on maintenance. We also looked for objectives that are expressed in terms capable of being measured.

As well, we expected the corporation to have standards that describe the outcomes—target levels

of operational performance—it wishes to achieve through its maintenance program. We looked for well-defined standards that are documented, congruent with program objectives, and measurable. We expected they would include value for money as a performance objective.

The corporation’s annual report clearly describes its mission as being “dedicated to satisfying customer, community, and government need for safe, efficient, effective and reliable ferry transportation services.” It also states as a corporate priority the maintenance of vessels and terminals to ensure operational reliability.

The two divisions of the corporation that have primary responsibility for maintenance—Fleet Engineering and, what was until recently, Terminal Engineering—have also developed mission statements in recent years. Both organizations describe their missions in similar terms, referring to safety, reliability, and economic efficiency:

“Fleet Engineering Division endeavors to support the corporation mission statement by operating and maintaining the corporation’s fleet at the optimum level and provide safe reliable transportation.”

“Terminal Engineering Division is committed to providing the planning, construction, and maintenance of the corporation’s terminal facilities with continued emphasis on safety, reliability, and cost effectiveness.”

Measurable Objectives

Fleet Engineering Division, during the 1994/95 budget process, described its key objectives to be maintaining safety and reliability, eliminating unnecessary maintenance and services, and reducing inventory while maintaining reliability. It also listed a number of specific goals in support of these objectives including establishing standards for maintenance. It did not, however, state any of these objectives and goals in measurable terms. “Reliability” and “unnecessary maintenance,” for example, are not defined, nor is there any indication of how achievement of these objectives will be assessed.

Similarly, key objectives for Terminal Engineering are described in its mission statement—“safety and reliability” and “minimiz[ing] the combined costs of maintenance and replacement of capital assets”—but not in measurable terms, and there is no indication of how achievement of these objectives will be assessed.

Value for Money as an Objective

Until recently, cost-effectiveness of maintenance has not been a major issue for the corporation. The dominant goal of all maintenance activities has been to maintain service and to ensure that assets are safe and functional.

During our review, however, we found evidence of a growing awareness of the importance of cost-effectiveness. The current goal statements of Fleet Engineering specify value-for-money issues such as researching and evaluating

new or replacement machinery, maximizing use of existing machinery, evaluating and pursuing cost saving practices, and using outside technical assistance and contractors to greatest advantage. The mission statement for Terminal Engineering also acknowledges the importance of obtaining good value for money by minimizing the combined costs of maintenance and replacement of capital assets. However, the corporation has not established standards or benchmarks against which the cost-effectiveness of its maintenance program can be assessed.

Performance Standards

Standards translate the broad statements describing the objectives of the corporation’s maintenance program into clear and measurable indicators of success or failure. They describe what the characteristics of a successful maintenance program are, how those characteristics will be measured, and what the minimum acceptable level of performance will be. Maintenance standards could be expressed in terms of optimum operating status and acceptable variances, responses to equipment failure, or other performance-related criteria.

Because the corporation has not adequately defined its maintenance objectives, it has been unable to establish standards or benchmarks of performance in terms of asset condition, cost, or maintenance process. For example, although the corporation values safety, reliability, and efficiency, it is not clear as to how these attributes will be measured or what the

minimum levels of acceptable performance will be.

Most of the fleet maintenance standards used by the corporation are those established by the requirements of the Canadian Coast Guard, equipment manufacturers, or classification societies. Other standards are defined as “good engineering practice” which is, in turn, defined by personal standards based on each individual’s experience.

There are no formal standards for outcomes in terminal maintenance. It is understood by corporation staff that non-operational ramps must be restored quickly, interference with vessel movement must be minimized, and assets must be repaired to good operating condition but cost of repairs must not be excessive.

In general, we found a culture in the organization that is geared towards adequate maintenance of assets. Nevertheless, to ensure that maintenance activities are better focused and that value for money is obtained, we believe the corporation should more specifically define its maintenance objectives. First, the general objectives of safety, reliability, and value for money need to be translated into measurable objectives. Second, standards need to be developed to translate these into measurable indicators of success or failure.

We noted that, as part of the corporation’s strategic planning process, each division is currently developing goals, performance measures related to those goals, and performance targets.

Recommendation: The corporation should establish clear, measurable results-based objectives for its maintenance program, and include performance standards relating to those objectives.

Standardization of Preventive Maintenance Procedures

Although a number of sister ships share similar maintenance requirements, required procedures have not been standardized. For the newest vessels in the fleet, the two “Spirit” class vessels and the *Queen of Capilano* and *Queen of Cumberland*, maintenance programs had not been developed at the time the vessels were put in service. Engineering staff on these vessels subsequently developed procedures based on equipment manufacturers’ manuals and good engineering practices.

Emphasis on preventive maintenance is also different in each of the five Terminal Maintenance areas. Although there is a regular inspection and servicing program for all critical equipment, the procedures are based mainly on the experience of those responsible for doing the work. The maintenance practice followed is largely reactive to conditions detected in the infrastructure; if something is broken or identified during routine inspections as needing attention, it is fixed.

Over the past several years, as part of the implementation of a computerized maintenance management system, Terminal Maintenance personnel have been working on developing preventive maintenance schedules and

procedures for equipment. Scheduling is being developed based on equipment failure records, manufacturers' specifications, and trial and error. For example, the manual for structural and mechanical maintenance of the Swartz Bay "Spirit" class ferry ramp, prepared by the designer, describes inspection and servicing activities and frequencies, locations and access to components, and servicing procedures.

We believe that a more consistent approach to maintenance of similar assets would enable the corporation to identify and apply the most effective and efficient processes.

Recommendation: The corporation should develop consistent maintenance procedures for performing similar maintenance activities on similar asset groups.

Maintenance Information

Documentation of the preventive maintenance work carried out on vessels is limited, though information can be gathered from various forms, checklists, logs, memoranda, reports, and other correspondence maintained on each vessel. This information is typically little more than brief descriptions of the work carried out and the date the work was done. Tracking the maintenance history of a piece of equipment therefore requires reviewing a number of log books covering a period of time. Some engineers maintain their own records of work performed on major machinery components, but these records do not show maintenance costs. In fact, cost information is available only by

major expenditure functions and not by particular equipment or areas of the vessel. Thus, without an organized equipment history, management does not have historical information to support future decision-making.

For terminals, records are kept of quarterly preventive maintenance inspections and maintenance work performed. Each ramp has a log book in which brief notes about repair work completed are recorded. In addition, checklists are prepared for routine inspections. However, since there are no corporation-wide standards for documentation, work history information varies from one Terminal Maintenance area to another. As a result, the corporation does not have the information that would enable it to ensure that its maintenance activities are carried out cost-effectively.

Current Information System

The corporation's current financial information system is primarily a budget-expenditure tracking system. It does not provide the type of information that senior management needs to manage a maintenance program. Instead, reporting focuses on inputs (what was acquired and what it cost) rather than outputs and outcomes (results). It does not track information on the cost of maintenance carried out on the vessels. For repairs and refit, for example, costs are recorded by vessel—say, *Spirit of Vancouver Island*—but not by department of the vessel (Catering, Deck or Engineering) nor by type of equipment repaired or refitted (i.e. port engine #1).

Several recent reviews conducted by the corporation have concluded that the corporation's information systems do not effectively support operations. Missing are data collection and analysis processes that it needs to determine whether its maintenance program is effective, economical, or efficient. The corporation recognizes this as a critical management issue and has launched the Maintenance Management Project (described below) to address it.

The Terminal Maintenance Branch is further ahead than the rest of the corporation in developing a comprehensive maintenance management information system. Over the past several years, prior to the initiation of the Maintenance Management Project, it has been introducing an Advanced Maintenance Management System. The system is currently well-established in the Nanaimo and Little River offices. Implementation in other Terminal Maintenance area offices has been limited by funding.

Computerized Maintenance Management System

A significant output of the corporation's Maintenance Management Project will be a Computerized Maintenance Management System. The system is designed to support a maintenance management program covering both fleet and terminal maintenance and repair functions, and to provide a foundation for an effective asset management program. It is intended to provide information to facilitate planning, estimating, and budgeting for replacement, repairs, refits, and modifications to vessels, terminals, and marine structures. It is also expected to provide information that will facilitate the evaluation and reporting of program performance.

The system will include capabilities for:

- work planning, scheduling, and tracking
- time collection
- accounting and budgeting
- materials management
- fuel consumption recording
- computer aided drafting and design
- office automation
- telecommunications
- interfaces to existing systems:
 - materials management
 - financial
 - payroll
 - human resources
 - corporate purchasing

Source: British Columbia Ferry Corporation

The Maintenance Management Project

The project was initiated in 1993 in response to board and senior management concerns about whether the corporation should be acquiring new vessels, modernizing existing vessels, or looking at some other option. The corporation recognized that it was unable to make fact-based decisions because it lacked adequate information. The project team has confirmed that lack of management information is one of the most serious issues the corporation faces in its efforts to develop an effective asset management program and, in particular, to perform an optimum amount of fleet and terminal maintenance at appropriate cost.

The primary goal of the Maintenance Management Project is to create a corporate system that will achieve the optimum amount of maintenance at the appropriate value, in order to maximize cost-effectiveness. A second goal of the project is to provide the foundation for an effective and efficient asset management program.

The system is intended to support maintenance management covering both fleet and terminal maintenance and repair functions, and to provide a foundation for an effective asset management program. One of the tasks of the project team is to develop a system that can be applied across the whole corporation to provide needed information—currently unavailable—to facilitate planning, estimating, and budgeting for replacement, repairs, refits, and modifications to vessels, terminals, and marine structures. Another task is to ensure that the system

provides information to facilitate the evaluation and reporting of performance.

The corporation has earmarked \$10 million for the development of this system over three years. Implementation of the system is targeted for completion by mid-1997.

Recommendation: The corporation should continue its efforts to develop an adequate maintenance management information system—one that is capable of providing appropriate information to operational managers in the corporation, as well as information required for accountability reporting.

Inventory Management

To ensure that necessary repairs can be made to the corporation's equipment, the corporation maintains an inventory of spares and replacement parts. In total, these inventories represent a significant investment. Excessive inventories represent unnecessary investment; inadequate inventories represent unnecessary risk in terms of the potential impact of equipment failure on the ability of the corporation to meet its maintenance objectives.

We looked for inventory management practices that contribute to the corporation being able to achieve the objectives of its maintenance program. We expected the corporation to have inventory policies that address demand, sources and availability of spares, life expectancy of components and assets, and decisions about which items to inventory, in what quantities, and at which locations. As well, we expected to find an



inventory management system that provides information about quantity, costs, age, and location of inventoried items.

Most of the corporation's inventory is held at Deas Dock and includes capital spares (items of high value that normally have low turnover ratios, and items repaired and serviced by the trades as part of the repair/exchange program), and consumables (items that must be replaced on an ongoing basis). The Materials Management Department has a computerized inventory system that tracks quantity, location, and cost of inventory at Deas Dock. At the time of our audit, approximately \$10 million in capital spares and \$5.4 million in consumables were located there. A further \$5–7 million of inventory is held on board the 40 vessels, and \$1.2 million is held at the five terminal maintenance yards. These values for inventories held on board the vessels and at the terminal yards are only estimates because there are no complete records and they are not included in the financial statements of the corporation.

Each vessel is expected to have the correct spares on board for all propulsion and energy systems, as required for the effective operation of the vessel and as required by the Canadian Coast Guard and the classification societies. We found that each vessel has an inventory of parts and consumables on board but better inventory records are needed to properly manage these inventories.

Similarly, inventory held by Terminal Maintenance is neither tracked nor controlled, and no comprehensive inventory management system or inventory records exist. Instead, each area has a different and informal process for tracking inventory, with most using simple generic organization of inventory and a visual survey.

We concluded, therefore, that the corporation's inventory management system needs improvement. As a result, although it has significant inventories at various locations, it cannot ensure that these inventories are managed effectively or efficiently.

Recommendation: The corporation should develop an appropriate inventory management process, and implement it throughout the organization.



Evaluating Performance



To assess the effectiveness of its maintenance program, the corporation should evaluate the extent to which it is achieving its intended results.

We expected the corporation to conduct periodic performance evaluations to determine the extent to which maintenance objectives are achieved and to make improvements where possible.

Conclusion

We concluded that the corporation has not carried out any formal evaluations on the performance of its maintenance program, in particular the cost-effectiveness of the program.

Findings

Since the corporation does not collect the necessary information, it cannot carry out formal evaluations of fleet or terminal maintenance performance. The corporation informally assesses its performance by noting how often a vessel is unable to sail at its scheduled time because of mechanical failure or a ferry is unable to load or unload as a result of a ramp breakdown.

The corporation also relies on outside evaluations of its vessels by Canadian Coast Guard and classification societies. These organizations regularly inspect the vessels and report any concerns to the corporation.

The corporation's Operational Safety and Standards Division carries out audits of vessels about three times a year. As part of these audits it reviews the condition of equipment on board the vessels. The audits of major vessels during August 1994 showed the vessels to be "generally in good mechanical condition," and that maintenance to be "carried out well and in a timely manner."

Although the results of the corporation's maintenance program—no significant recent failures—reflect the adequacy of maintenance work, we believe that, without evaluating the performance of the maintenance program against standards and benchmarks, the corporation has no assurance that maintenance objectives or value for money is achieved.

Recommendation: The corporation should periodically evaluate its maintenance program to determine if it is achieving its intended results and if the corporation is obtaining value for money from its maintenance.





Reporting to the Board



We believe senior management, as part of its regular reporting, should provide the Board of Directors with sufficient information to be able to form an opinion about the extent to which the corporation is achieving its maintenance objectives and whether its performance is improving, is remaining the same, or is deteriorating over time.

Recommendation: Senior management should regularly report to the Board of Directors on the extent to which it is achieving the intended results of its maintenance program.



Conclusion

We concluded that reporting to the Board of Directors on the results of the maintenance program is not adequate.

Findings

At the present time, there is limited accountability information provided to the board about the corporation's maintenance program. Maintenance program information is related mainly to budget compliance. Although confirmation that the maintenance program is operating within defined financial limits is important to management and the Board of Directors, it does not reveal much about the extent to which the program is achieving its intended results, nor does it facilitate comparison of the effectiveness of the program relative to past performance or other benchmarks.

Corporation Response



The British Columbia Ferry Corporation welcomed the opportunity to work with the Auditor General of British Columbia in undertaking audits pertaining to the Management of Fleet and Terminal Maintenance and Operational Safety.

These two areas are Corporate priorities and, within the past year and one half, significant restructuring of the organization has taken place to focus these priorities within revised strategic and operational plans. To support these priorities, the Corporation has commissioned independent reports and employed external consultants to assist in shaping and directing programs of improvement.

The reports of the Auditor General provide additional information and suggestions for continued improvement in both maintenance and operational safety programs. While some differences in view, on specific items, developed during the conduct of the audits, the overall direction and recommendations of the reports have been accepted by the Corporation and will be incorporated in strategic and operational plans.

In respect of the report on Fleet and Terminal Maintenance, conclusions offered by the Auditor General include, among others, the following:

- *We concluded that the Corporation's vessels, related equipment, and terminal assets—specifically, marine structures—are maintained so that they are operationally safe and reliable.*

- *The Corporation maintains its fleet to meet or exceed standards established by equipment manufacturers, the Canadian Coast Guard, and other authorities involved in vessel certification.*
- *Marine structures are also well maintained, with no recent maintenance-related equipment failures having been experienced.*
- *The Corporation has determined that most equipment on vessels should be subject to preventative maintenance. For terminals, preventative maintenance inspection and servicing are based on the experience of those responsible.*
- *Repair, refit and rehabilitation work priorities are identified and required work is carried out. Priorities are based on safety, efficiency, and the ramification of not doing the work.*
- *The Corporation lacks assurance that the optimum amount of maintenance is being done in a cost-effective manner. A Corporation-wide Maintenance Management project has been initiated by the British Columbia Ferry Corporation which is intended to create a Corporate system that will achieve the optimum amount of maintenance at the appropriate cost, in order to maximize cost effectiveness.*

In evaluating specific observations and conclusions made in the report, the Corporation advised the Auditor General that over 175,000 voyages are taken annually, carrying over 22 million passengers and 8.4 million vehicles. The occurrence of sailings

cancelled because of a mechanical problem on the vessel or the terminal interface structure is very unusual and, on a percentage basis, extraordinarily small.

B.C. Ferries uses the requirements of the Canadian Coast Guard and the marine Classification Societies (Lloyd's Register of Shipping and the American Bureau of Shipping) as a minimum standard and sets its own, and considerably higher, standard for its vessel maintenance.

Maintenance standards for terminals comply with any applicable regulatory standards, manufacturers' recommendations or standards recommended by the designers of the various components.

The Corporation recognizes the need for a more consistent standard of documentation. To this end, two years ago the Corporation took the initiative of ordering an internal review of its maintenance management procedures. Subsequently it was decided to replace the existing manual system of documentation with a new, computer-assisted, maintenance management program, which considerably expands the Corporation's capacity to do multi-year planning and scheduling of maintenance activities while at the same time harmonizing both vessel and terminal maintenance records.

Over a five year period this new program is expected to show a very positive return on the required investment and will enhance management's ability to achieve an even higher utilization of our fleet by reducing maintenance time as well as maintenance costs.

With regard to the specific key findings:

- 1. Vessels and terminals are well maintained:*
 - Agreed.*
- 2. Adequate preventative maintenance is carried out:*

We agree with the comment that preventative maintenance procedures are not necessarily consistent from vessel to vessel. In fact, in many instances the procedures exceed the requirements and recommendations of the machinery or equipment manufacturer. This, in part, reflects the desire of our engineering staff to go the extra mile and, if anything, err on the side of safety and caution, rather than risk a breakdown or failure at an inconvenient time. The more detailed maintenance history and conditioning monitoring that will be available once the new maintenance management system is in place will assist the engineers in the timing of some maintenance, which will probably result in more extended periods between overhaul of some machinery. However, our terminal maintenance trades staff and our shipboard engineering officers will continue to put safety in front of all other considerations, and if there is any concern that a mechanical or electrical problem could occur during a voyage or the loading or discharging of a vessel, they will continue to err on the side of caution.

3. *Adequate repair, refit and minor rehabilitation work is carried out:*

Vessel refits are carefully scheduled with each vessel currently undergoing an annual refit where machinery and equipment are opened up and internally inspected and maintained and overhauled as required.

In addition, some vessels are currently drydocked on an annual basis and some every second year. These drydockings are to ensure that the hull plating and underwater propulsion and steering components can be carefully inspected, and dismantled and overhauled before being reinstalled. Improvements in paint coatings technology in the last decade have allowed the regulatory bodies to extend the mandatory drydocking of ships to twice in a five year period. Drydockings are a significant component of our total maintenance costs and as the Corporation has been an industry leader in applying improvements in paint coatings as they have become available, we have already started switching to the extended drydocking cycles where possible, and expect to see a corresponding decrease in overall maintenance costs.

An important component of the Corporation's 10 Year Capital Plan is the renewed emphasis on rehabilitation and upgrading of terminal structures and vessels in a timely manner to extend their expected useful life.

4. *More emphasis on cost effectiveness is needed:*

We agree that more emphasis on cost effectiveness and value for money analysis is required. Recent changes in the senior management of the Corporation have resulted in a major re-emphasis on the need for accurate budgeting and the need for the timely feedback of actual costs to the front line user. A new work scheduling and cost control system that has been put in place at our Deas Dock Refit Complex has allowed this key maintenance and refit centre to produce a statement of the actual work done.

The maintenance management program the Corporation is developing will result in more emphasis on cost effectiveness and value for money analysis.

5. *Inventory management practices need improvement:*

We agree that better inventory management records need to be kept both on board our vessels and in our terminal maintenance yards. More comprehensive records coupled with each site and vessel having access to the information once the inter-vessel and inter-site communication phase of the maintenance management program is in place will give the Corporation a better ability to reduce on board and individual terminal inventories. It will be possible to share inventory components that may not be required for immediate use in the event of the need to replace machinery, electrical and electronic components.



6. *The Corporation does not evaluate the performance of its maintenance program:*

The Corporation has historically evaluated its performance in general terms but is now developing specific performance criteria to measure the effectiveness of its maintenance program.

7. *Internal reporting on maintenance is inadequate:*

At present, the Corporation includes reports to the Board of Directors on its vessel and terminal maintenance only on an exception basis as part of the President and Chief Executive Officer's monthly report. It will in future include a report to the Board on the effectiveness and cost of its maintenance program.



Operational Safety



Operational Safety



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British Columbia Ferry Corporation

Operational Safety



An audit to assess whether the corporation meets the requirements for operating a safe coastal ferry transportation system

The British Columbia Ferry Corporation is an integral part of British Columbia's coastal transportation system. Its mission is "to satisfy customer, community and government needs for safe, efficient, effective and reliable ferry transportation services." The corporation takes this mission seriously, especially as the risks it faces range from minor damage of equipment to injury or death to passengers or crew, and loss of a vessel or terminal. Given these risks, operational safety is viewed as the highest priority of the organization.

Audit Purpose and Scope

The purpose of the audit was to assess whether the corporation is meeting the requirements for operating a safe coastal ferry transportation system.

We focused our audit on the safety of passengers, crews, vessels and terminals, and on the prevention of damage to property. We looked at current processes in place, planned changes, and the historical safety record of the corporation.

Our audit excluded occupational health and safety matters that fall under the *Workers Compensation Act*, and issues related to marine pollution, such as prevention, containment, and clean-up.

The criteria we used in the audit were based on the requirements of the *Canada Shipping Act* and the regulations, codes and standards made pursuant thereto, the standards of the corporation, and good management practices.

Our review was carried out between October 1994 and February 1995. Our examination was performed in accordance with value-for-money auditing standards recommended by the Canadian Institute of Chartered Accountants and accordingly included such tests and other procedures we considered necessary in the circumstances.

Overall Conclusion

We concluded that the corporation meets most of the requirements for operating a safe coastal ferry transportation system. At the same time, however, we identified a number of important areas where safety and administrative procedures should be improved. The corporation recognizes the need for these improvements and is moving to address them.

Although we found a number of areas that need attention, we are not implying that the ferry system is unsafe. The corporation's employees, surveyors with the Canadian Coast Guard we interviewed, and insurance consultants are all of the opinion that the corporation has a good safety record and that the system is safe, given its diversity and complexity and the volume of passengers it transports.

We found the corporation is committed to operational safety. This commitment is well integrated into corporation plans, structure, policies and procedures, delegation of authority, and decision making processes. It is also well understood by staff. The concepts embodied in the safety policies and strategic plan are consistent with the requirements of both the *Canada Shipping Act* and the International Safety Management Code.

The corporation's vessels carry all the emergency equipment required under the *Canada Shipping Act*. The equipment has been approved by Canadian Coast Guard and is kept in good working order. The corporation also staffs its vessels with crews that possess qualifications equal to or higher than those required by the *Canada Shipping Act*, and its terminals with employees who meet the organization's standards.

We think the corporation should focus its attention on the following three areas. First, the corporation should monitor emergency drills and practices system-wide to ensure they are carried out consistently and according to federal regulations and corporate policies. It should also review the conduct of these drills to evaluate officer leadership, crew skills and proficiency, and communication. At a limited number of randomly selected fire and boat drills we attended, we noted significant problems in these areas and think the corporation should assess the extent to which these problems may exist throughout the fleet. Second, the corporation should provide more training in some areas to ensure employees properly perform their assigned duties in emergencies. It should also assess whether crew size and capability are sufficient to deal with emergencies involving the number of passengers carried by its vessels. Third, the corporation should request a ruling from the Board of Steamship Inspection about its practice of operating its two northern overnight vessels with some interior watertight doors in the open position.

Key Findings

The corporation is committed to operational safety and the process of demonstrating this commitment is ongoing

The corporation has several ongoing initiatives to strengthen its commitment to operational safety. The formulation of the strategic plan and the adoption of the International Safety Management Code has led to the identification of safety as the corporation's highest priority. The organization has been restructured with a greater focus on operational safety and is in the process of establishing clearly the operational safety responsibilities and authority of all personnel. Policy and procedures manuals are being revised.

The corporation has approved emergency equipment which is kept in good working order

The corporation's vessels carry all the emergency equipment required under the *Canada Shipping Act* and the equipment has been approved by the Canadian Coast Guard. Emergency equipment on board vessels and at terminals is kept in good working order. The condition of this equipment varies with age and the corporation recognizes the need to update the equipment on some minor vessels even though the equipment meets Coast Guard standards.

The corporation staffs its vessels and terminals with qualified personnel

The corporation staffs its vessels with employees who meet or exceed the qualifications set out in the *Canada Shipping Act*, and its terminals with employees who meet the operational safety standards of the corporation. Staff are trained in lifesaving procedures to Coast Guard standards. Nevertheless, staff expressed a need for more training in emergency crowd control and refresher training for returning seasonal employees to be able to more effectively carry out their assigned responsibilities in case of an emergency. The corporation has not reviewed the impact of changes in crew continuity on team cohesion and emergency response to establish the effect, if any, on safety. While crew sizes meet or exceed *Canada Shipping Act* requirements, the corporation has carried out an assessment of four vessels to determine whether present levels of staffing are sufficient to deal with emergencies involving the numbers of passengers carried. A similar assessment has not recently been carried out for the other vessels.

The corporation lacks a comprehensive risk management process for operational safety

The corporation's approach to risk management is to review specific marine incidents, rely on the work of insurance consultants, and carry out audits and inspections. These steps are useful but do not provide the corporation with a comprehensive analysis of the primary risks and the costs associated with them. It also needs to analyze incident trends to determine the causes of marine accidents, including the impact of human error.

The corporation does not monitor emergency drills and practices system-wide to ensure consistency and uniformity

The annual recertification conducted by the Canadian Coast Guard requires that, as part of the process, a ship's crew be deemed sufficient and capable of operating the vessel and dealing with any emergency that may arise, and that it successfully complete a fire and boat drill before it is allowed to sail. To ensure that staff continue to meet these requirements, the corporation is also required to conduct fire and boat drills on a regular basis for each vessel. The corporation does not, however, actively monitor these activities system-wide to ensure their consistency and uniformity, nor does it evaluate a crew's ability, in an emergency, to handle the number of passengers carried. We attended a limited number of randomly selected drills. While some aspects of the drills were performed satisfactorily, we observed significant problems. Improvement was required in officer leadership, skills and proficiency of ships' crews, and communication. We also noted that drills sometimes were not done to the satisfaction of Canadian Coast Guard surveyors, and that BC Ferries crews themselves had concerns about the nature, extent and quality of the drills. The corporation should determine the extent to which problems exist with fire and boat drills, and develop an effective program to address any identified concerns.

The corporation should request a ruling about its practice of sailing its two northern vessels with some interior watertight doors open

The corporation's two northern vessels sail with some interior sliding watertight doors in the open position. The *Canada Shipping Act* and the corporation's own guidelines require that such doors be closed during sailing. The corporation operates this way because experience has indicated that opening and closing the doors by inexperienced people could result in serious accidents. It requested concurrence from the regional office of the Canadian Coast Guard with an interpretation of the regulations regarding the operation of these doors, which would permit them to operate with some of

the doors open. The Corporation received this concurrence from that office. Because there is no evidence that the Board of Steamship Inspection, a body within Transport Canada that adjudicates on ship safety matters, has reviewed this issue, we believe it would be prudent for the corporation to seek a formal ruling from the Board to determine whether it is appropriate to operate in this manner.

The corporation's implementation strategy for managing and evaluating its major operational safety initiatives is under development

The corporation is well into a period of significant transition from a highly centralized to a regionalized structure. A key element in this change process is a stronger focus on operational safety that involves many changes within BC Ferries. The strategic plan, which has been under development for about a year, and the planned adoption of the International Safety Management (ISM) Code, provide goals, objectives and strategies for key initiatives. To complete the process, the corporation needs to assign responsibilities, identify important benchmarks, establish an implementation time frame, and define the reporting process. The strategic plan, when complete, will help the corporation manage and evaluate this change process.

The corporation is not evaluating whether it is achieving its safety objectives

The strategic plan identifies the need for a safety performance framework, and some performance indicators have been developed. However, the corporation has not yet established a full range of safety performance indicators to evaluate the extent to which its safety performance objectives are being met.

The corporation needs to provide its Board of Directors with additional safety information

Reports are provided to the Board of Directors about individual operational safety matters as and when required. However, the extent to which operational safety objectives are met has not been reported to the Board even though safety is the stated highest priority of the corporation.



Background



What Is Meant by Operational Safety?

Operational safety, in the context of a coastal ferry transportation system, can be defined as the safety of persons or property from danger arising from the operation of a vessel in the marine environment or from related operations within the confines of associated terminal facilities. The risks the corporation faces thus include:

- risk of injury or death to persons and damage to property;
- risk of legal liability to the corporation in the case of injury or death to persons and damage to property;
- risk of damage to, or destruction of, the vessel; and
- loss of credibility and reputation resulting from a major operational safety incident.

Key Legislation

The operations of the British Columbia Ferry Corporation (BC Ferries) are regulated primarily by the *Ferry Corporation Act*, those sections of the *Canada Shipping Act* which apply to intraprovincial ferries and the *Transport of Dangerous Goods Act*.

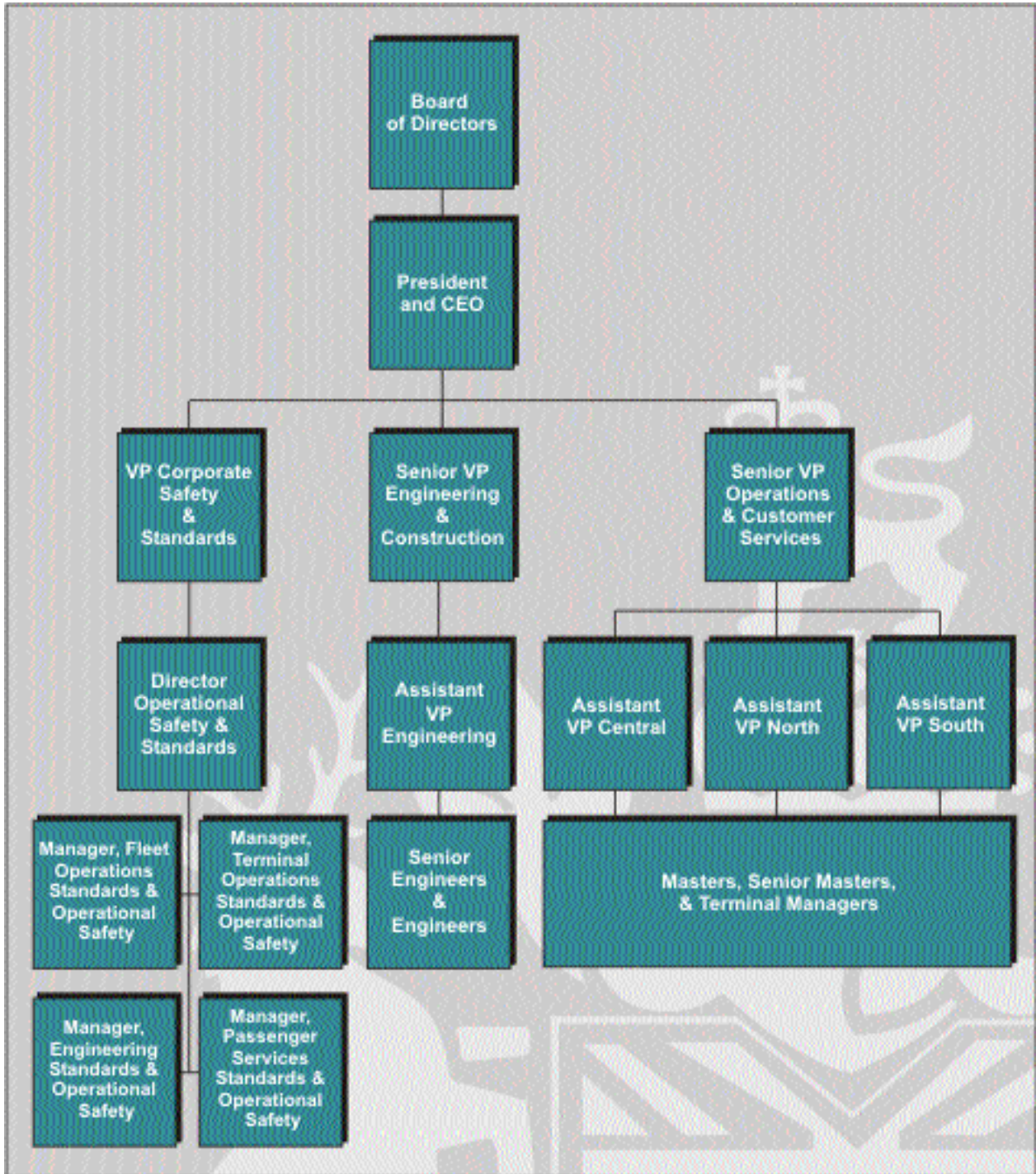
An Organization in Transition

As we undertook this audit of operational safety, the corporation was in a period of transition and significant change. In the spring of 1992, a significant program of organizational development and restructuring began. An operational safety review was carried out; a strategic direction workshop was held with the importance of safety clearly articulated; and a committee struck to look at the impact of vessel scheduling on operational safety. More recent changes included a new executive structure, decentralization, and other initiatives such as a reduction in the number of divisions. This also included creation of the Standards Division, strategic planning with safety as a primary value, and implementation of the recommendations from the Nemetz Inquiry which investigated a major incident at the Nanaimo ferry terminal in 1992 involving the loss of three lives. Other initiatives include the Lloyd's audit conducted in preparation for adoption of the International Safety Management (ISM) Code, and an external study on ramp technology. As well, the corporation appointed a Vice President, Corporate Safety and Standards, with overall responsibility for operational safety, occupational health and safety, security, and environmental activities. This move assigns responsibility for monitoring, auditing, and reporting on operational safety to a specific senior manager; previously the

Exhibit 3.1

Operational Safety Organization Structure

This partial organization chart of the corporation depicts the reporting relationships for operational safety



Source: British Columbia Ferry Corporation



Courtesy: British Columbia Ferry Corporation

MV Spirit of British Columbia with emergency equipment visible on the promenade deck

responsibility for operational safety spanned several divisions and individuals.

As stated, the corporation has decided to implement the International Safety Management Code, a framework to improve operational safety and protect the environment. The Code, which requires that a marine carrier develop, implement, and maintain what is called a Safety Management System, is slated to be fully implemented by the corporation by June 1, 1997. It will involve careful and comprehensive documentation

of all management procedures that are planned, organized, executed, and checked in accordance with the Code.

Achieving Operational Safety

To achieve operational safety, a ferry transportation system must satisfy the statutory requirements contained in legislation. These include the requirement:

- to acquire and maintain approved fire detection/ extinguishing equipment and lifesaving equipment; and

The International Safety Management Code

The International Maritime Organization has determined and categorized the reasons for the loss of ships worldwide as follows:

- grounding 21%
- foundering 44%
- fire/explosion 16%
- collision 12%
- other 7%

As part of a new program to reduce the number of incidents and the heavy costs associated with loss of life and vessels, the International Maritime Organization, an agency created by the United Nations, recently developed the International Safety Management Code, an international maritime standard for the safe operation of ships and the prevention of pollution. The International Maritime Organization has urged governments to implement this Code as soon as possible but not later than June 1st, 1998.

The Code provides for the issue of a document of compliance to any ship-owning company that complies with it. A basic condition is that the ship owner develop, implement and maintain a Safety Management System comprised of the following safety-related functional requirements:

- 1) a safety policy, in which the company describes how it will ensure safety at sea, prevention of human injury and avoidance of damage to property. The company should ensure that the policy is implemented and maintained at all levels on ship and ashore;
- 2) instructions and procedures to ensure safe operation of ships in compliance with relevant legislation;
- 3) defined levels of authority and lines of communication between and among shore and shipboard personnel; in particular, the designation of a person or persons ashore, having direct access to the highest level of management, whose responsibilities include monitoring the safety aspects of the operation of each ship;
- 4) procedures for reporting accidents and non-conformities with the provisions of the Code and for their investigation and analysis;
- 5) procedures to prepare for and respond to emergencies; in particular, the establishment of programs for boat and fire drills and a variety of emergency scenarios; and
- 6) procedures for internal audits and management reviews to verify that corporate activities comply with the Safety Management System.

- to staff its vessels and terminals with properly qualified and trained employees.

To achieve operational safety, a ferry corporation should also:

- have a strong corporate commitment to operational safety;
- identify operational risks and develop an appropriate management strategy;



- provide opportunities for employee development;
- ensure that its operational safety policies and procedures are being followed on a continuous basis; and
- conduct periodic evaluations of the extent to which corporate operational safety objectives are being met.

Our audit examined the extent to which the corporation meets these criteria which were based on the requirements of the *Canada Shipping Act*, codes and standards made pursuant thereto, the standards of the corporation, and good management practices. In the following sections of the report we present our findings.



Committing to Operational Safety



An important element of a safe ferry system is an unequivocal commitment to operational safety. The commitment must be clear, understood by all staff, well-integrated into the operating environment, and appropriately reflected in the organization's plans, structure, policies and procedures, delegations of authority and decision-making processes.

Conclusion

The corporation's commitment to operational safety is clear and it is understood and accepted by corporation employees. The process of putting this commitment into practice is ongoing.

Since 1992, the corporation has undertaken numerous initiatives to strengthen its commitment to operational safety. A corporate statement about operational safety has been developed and is being acted on. Safety objectives have been clearly articulated, policies and procedures manuals are being revised, significant organizational changes are being made, and the responsibilities and authority of all operations personnel pertaining to operational safety are being clearly established.

Findings

Clear Objectives

The corporation should have clearly written objectives that describe and establish corporate direction for achieving operational

safety. These objectives should deal with the prevention of injury, loss of life, and loss or damage to property. They should also ensure that operational demands do not compromise safety.

We found that the corporation has recently articulated clear operational safety objectives which are consistent with the Canada Shipping Act and the International Safety Management Code.

The draft strategic plan of BC Ferries describes its mission as being to satisfy customer, community and government needs for safe, efficient, effective and reliable ferry transportation services. Corporate values support this, indicating that safety is the highest priority. These messages appear to be understood by corporation employees; most employees told us that operational safety objectives are clearly written, useful in their work, and readily available. We also found that the corporation's employees, surveyors with the Canadian Coast Guard, and insurance consultants believe that operational safety is a fundamental value of the corporation.

The corporation has recently developed a policy to ensure safety on board vessels and at terminals, and written values, goals and strategies to build and maintain a culture of safety throughout the organization. The concepts embodied in this policy and in the corporation's strategic plan are consistent with the requirements

of both the *Canada Shipping Act* and the International Safety Management Code.

Policies and Procedures

Corporate policies and procedures, the means by which organizations achieve their goals, should reflect overall corporate safety objectives.

In preparation for adoption of the International Safety Management Code, the corporation requested that Lloyd's Register of Shipping conduct an audit in September 1994 to compare the corporation's policies and procedures with the requirements of the International Maritime Organization. This audit pointed out that safety policies were contained in a number of different manuals and that the contents appeared to be varied. Also, there was no documentation of an established policy to describe the corporation's objectives and how they would be achieved. The audit recommended that obsolete and outdated manuals be withdrawn and physically removed from all locations.

The corporation acted on the recommendation and has made substantial revisions to its operations manuals and expects to begin distributing them throughout the fleet in June 1995. The old manuals will continue to be in effect until September 1995 and will be progressively withdrawn commencing at that time as the new manuals are introduced. In the meantime the policies and procedures contained in the corporation's operations manuals continue to be outdated and do not include all safety issues.

The audit conducted by Lloyd's also noted that the corporation does not specify English as the working language, nor does the company ensure that ships' personnel are able to communicate effectively in the execution of their duties. The corporation has begun to define operational safety positions requiring a working knowledge of English and plans to issue a policy on this matter soon. Poor communication can have significant safety ramifications. For example, the corporation determined that a recent loading incident at a major terminal involved human error and that a crew member's deficiencies in English language skills was a contributing factor in the incident.

Communication

To achieve its operational safety objectives, the corporation must ensure these objectives are communicated clearly to all personnel with operational responsibilities.

The corporation's communication methods include dissemination of current policies and procedures, direct communication by the President and CEO and the senior management team, and issuing of corporate directives. It also holds operational safety meetings, encourages feedback from the Council of Masters and Council of Senior Chief Engineers, and has introduced regionalization to improve communications and decision-making. Employees appear to understand the information they receive about operational safety.

Responsibilities and Authority

For the corporation to successfully integrate operational safety objectives into everyday work practices, it must ensure that safety is a significant part of individual responsibilities and authority.

The corporation has taken steps to deal with the deficiencies noted in the Lloyd's audit. Implementation of the International Safety Management Code by June 1, 1997, is expected to establish clearly the responsibility and authority of operations personnel for operational safety. This will improve the level

of communication and cooperation between shore and vessel crews, and will clarify lines of responsibility and authority, thereby reducing the potential for marine incidents. The introduction of a Vice President, Corporate Safety and Standards, assigns responsibility for monitoring, auditing, and reporting on operational safety to this function. The corporation has begun recruiting for the position of International Safety Management Coordinator. This position will be responsible for ensuring that all conditions, activities, and tasks that impact on operational safety both ashore and afloat are planned,



MV Queen of Cumberland serving Gulf Island routes

Courtesy: British Columbia Ferry Corporation



organized, and executed according to Code requirements. The corporation uses the “Senior Masters” concept to establish accountability for operational safety on each vessel.

While the responsibility and authority for operational safety at terminals rests clearly with the terminal manager, the terminal supervisor, a position recently created at all major terminals, has an essential safety role to play in parking lots and at ramps. This position was created as a result of a reorganization of terminals in 1993. As well, operational safety for vessel masters and engineers has been clearly established with the introduction of the Council of Masters and Council of Senior Chief Engineers in October 1993.

Recommendation: The corporation should ensure that safety policies and procedures are current, complete, and properly documented.



Managing Risks



Operation of a safe coastal ferry transportation system requires that a corporate strategy be in place to deal with the operational risks faced each day. Large organizations generally address this issue through a comprehensive risk management program. The key components of comprehensive risk management are processes to:

- identify the risks inherent in its operations;
- monitor the experience of other transportation services and changes in marine technology;
- conduct incident investigations;
- carry out cost–benefit analysis of alternatives;
- revise operational safety objectives, policies and procedures, and standards as required; and
- monitor the results.

Conclusion

The corporation’s approach to risk management is to review individual marine incidents, rely on the work of insurance consultants, and carry out audits and inspections. These steps are useful but do not provide the corporation with a comprehensive analysis of its primary risks and the costs associated with them. It also needs to analyze incident trends to determine the causes of marine accidents, including the impact of human error.

Findings

One approach now used by the corporation to assess risk is to rely on the work of its insurance consultants who regularly conduct inspections and evaluations using defined criteria, to determine insurance rates. The insurance consultants indicate that the corporation presents less risk than many other carriers and, as a result, represents one of the lowest risks in the London insurance market.

The corporation also assesses risk by conducting internal incident investigations. At present, significant marine incidents are reported to BC Ferries head office, the Transportation Safety Board, and the Canadian Coast Guard. Written reports are completed for all marine incidents with copies sent to the regional manager and head office. All incidents are analyzed, and a formal investigation is conducted if the cause of the incident is considered serious. The chair of the investigation panel is appointed from outside the region where the incident occurred. Representatives are also present from Operations, Labour Relations, Safety and Standards, and Engineering. Reports and recommendations for improvement are made following the investigation.

Another method to assess risk is the work undertaken by the corporation’s Standards Division, which carries out audits and inspections at terminals and on vessels. These audits result in reports and recommendations to



Courtesy: British Columbia Ferry Corporation

MV Spirit of British Columbia leaving the Tsawwassen ferry terminal

the region concerned and, where the situation warrants, to senior management. The division's aim is to ensure that the *Canada Shipping Act* and the corporation's standards are being adhered to. At the same time, the corporation relies on information gathered by the annual vessel inspections of the Canadian

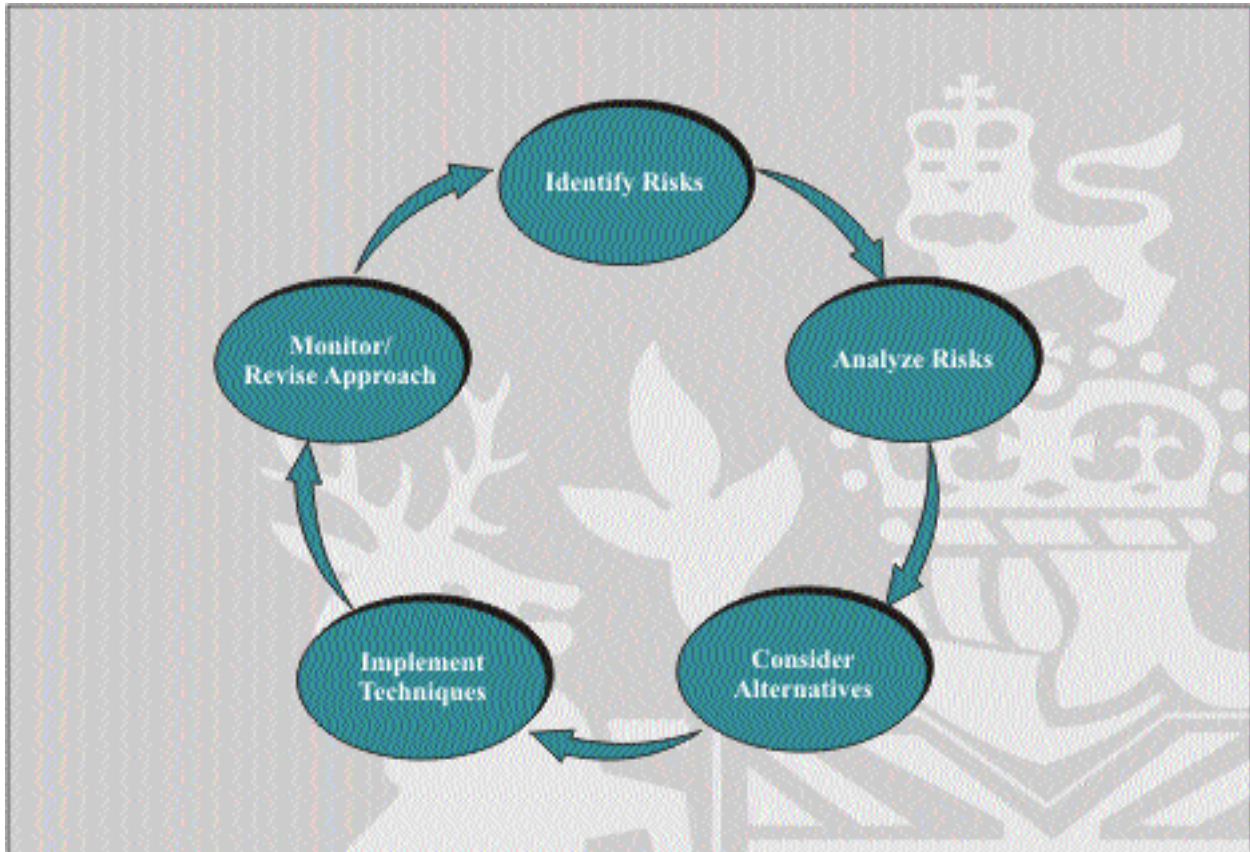
Coast Guard. These activities provide the corporation with some information relevant to risk assessment.

These approaches to risk management do not provide the corporation with an overall-risk analysis that would determine what its primary risks are, the

Exhibit 3.2

A Risk Management Model

A typical process for managing risks in a large organization



Source: Risk Management Branch, Ministry of Finance and Corporate Relations, Province of British Columbia

consequences of the risks and the associated costs.

Statistics from a number of sources indicate that human factors are responsible for 75–80% of all marine incidents. In the remaining 20–25 %, the human response often makes the difference between a successful and an unsuccessful outcome. The Tavistock Institute in the United Kingdom analyzed a number of collisions and reported that human factors played a role in 96% of them.

We found that, while the corporation does an analysis after each reported incident, there is no coordinated effort to analyze incident trends or determine root causes of human error over time. We reviewed reports of marine incidents involving the corporation during the period 1985–1995 and found that approximately 58% of them were attributed to human error. This compares favorably with the international statistics noted above. No comprehensive analysis

has been undertaken by the corporation to determine whether the incidents are just isolated, unconnected events or whether there are systemic problems in job design or operations procedures that consistently result in human error. The corporation, however, has begun to address this issue by initiating a review of the human and technical interactions involved in loading ramp procedures and producing a paper on human factors in roll on, roll off ferry safety.

At present, marine incidents are reported to head office based on the level of seriousness; however, the criteria are not well defined. As a result, there may be a lack of uniformity in the reporting of incidents, and some may not be reported, evaluated or investigated. The corporation acknowledges that this has been a problem in the past, but the seriousness threshold has now been lowered and, as a result, more incidents are now being reported.

Another significant matter, which has been consistently identified by the corporation as a potential problem relates to the convergence of vehicle and foot passenger traffic at Horseshoe Bay terminal. The corporation has reviewed the situation in the past and modifications were carried out which significantly reduced, but did not eliminate, the risk which previously existed. The corporation believes that a major reconstruction which is currently being planned should resolve the remaining safety risk for foot passengers.

Recommendations:

The corporation should:

- *introduce a comprehensive risk management program directed at improving the level of operational safety; and*
- *undertake a comprehensive review of marine incidents on vessels and at terminals to determine root causes, including the impact of human error.*



Purchasing and Maintaining Emergency Equipment



In providing its customers with ferry transportation the corporation equips its vessels and terminals with a range of emergency equipment. We expected the emergency equipment and its maintenance to meet the requirements of the *Canada Shipping Act* and the corporation's own needs.

Conclusion

The corporation's vessels carry all of the emergency equipment required under the *Canada Shipping Act* and the equipment has been approved by Canadian Coast Guard. The equipment is kept in good working order. The condition of the equipment varies with age and the corporation recognizes the need to update the equipment on some minor vessels. Some equipment that is not statutorily required, needs improvement.

Findings

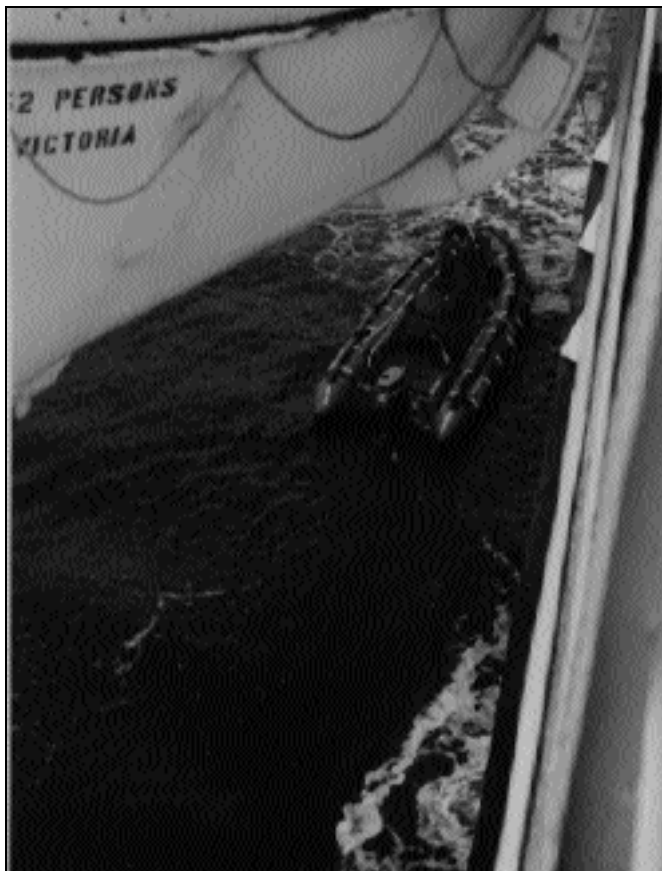
Emergency equipment includes fire detection and extinguishing equipment, as well as lifesaving equipment. Fire detection and extinguishing equipment includes items such as sprinkler systems, fire alarms, fire pumps, fire hoses, nozzles, fire extinguishers, breathing apparatus, and fire suits. Lifesaving equipment includes lifejackets, marine evacuation systems, life rafts, and lifeboats and associated launching devices. During the 1994/95 fiscal year the corporation spent approximately \$1.6 million

for the purchase and maintenance of emergency equipment.

The corporation has a two-part process to ensure its vessels and terminals have appropriate emergency equipment and that the equipment is properly maintained. The first part involves the Canadian Coast Guard carrying out an annual inspection of all emergency equipment on board each vessel. Any deficiencies are reported to the ship's Master for correction. In the second part, the corporation, through its Standards Division, carries out regular inspections of vessels and their safety equipment, and terminals to ensure they are in good working order and meet the corporation's requirements.

We found that the corporation's emergency equipment is approved and kept in good working order. Fire detection and extinguishing equipment is appropriately located throughout each vessel and at terminals to help with early detection and containment of fires. Life saving equipment is also appropriately located throughout each vessel for rapid deployment. All equipment is inspected for deterioration during the period of the inspection certificate issued by the Canadian Coast Guard, and is replaced if necessary.

There are, however, some areas where certain specific equipment improvements are needed. We noted some recurring problems with the proper latching of remotely closing vessel fire doors. The corporation informed us that it



Open lifeboat and newer high speed rescue boat

recognizes this problem occurs. They advised that operation of fire doors is monitored by read out displays on the bridge, or by a member of the crew being physically present during the operation of the doors, to deal with any problems which may arise. We also noted some problems with equipment that the corporation has acquired which is in addition to statutory requirements. For example, rescue boats at some major terminals cannot be retrieved because of poorly designed equipment and there are technical difficulties with some vessel navigation equipment on Spirit class vessels. The corporation has implemented the recommendation of the Nemetz

Inquiry to install high speed rescue boats on all major southern vessels. The corporation, in the interest of safety, has also installed high speed rescue boats on its northern vessels, the *Queen of the North* and the *Queen of Prince Rupert*.

The corporation has recognized that some of the lifesaving equipment on some older minor vessels has become obsolete and that more modern equipment—for example, rigid hull inflatable boats—are more easily handled and provide a better level of protection for passengers and crews. We noted that a business case dated January 10, 1995, requests approval for the expenditure of \$500,000 over a two year period for lifesaving equipment on minor vessels including emergency rescue boats. This has since been included in the corporation's capital improvement plans for the 1995/96 fiscal year.

A basic requirement of the *Canada Shipping Act* is that there be a lifejacket for each passenger and crew member. This requirement is validated through the annual inspection and recertification process of the corporation's vessels by the Canadian Coast Guard. On overnight vessels with passenger berths such as the *Queen of the North*, lifejackets are stowed in cabins and on deck equivalent to the number of passengers carried under a specific vessel license. However, the Act also requires that, on such vessels, an additional number of lifejackets be carried and conspicuously stowed on deck to ensure their accessibility in an emergency. We found that, based on these requirements, the *Queen*



of Prince Rupert, also an overnight vessel, had a shortfall of 82 adult- and 6 child-size lifejackets. This deficiency was rectified immediately when we brought it to the attention of the corporation.



Staffing of Vessels and Terminals



Properly qualified and trained employees are an important requirement of a safe and effective organization. This is especially true in a coastal ferry transportation system where marine emergencies can result in injuries, the loss of life, and serious damage to, or loss of, a vessel or terminal.

Conclusion

The corporation staffs its vessels with employees who meet or exceed the requirements set out in the *Canada Shipping Act*, and its terminals with employees who meet corporation standards. However, the corporation should provide more training in emergency crowd control and additional refresher training for returning seasonal employees. The corporation should also review the impact of changes in crew continuity on team cohesion and emergency response to establish the effect, if any, on safety. The corporation has carried out an assessment of four vessels to determine whether present levels of staffing are sufficient to deal with emergencies involving the numbers of passengers carried. Similar assessments have not recently been carried out for the other vessels.

Findings

Qualified and Certificated Personnel

The *Canada Shipping Act* sets out the necessary qualifications for deck watch personnel including: an

examination for color vision and a practical knowledge of the use and limitations of radar for navigation and collision avoidance; position fixing equipment; echo-sounding devices; magnetic and gyro compasses; and lights, buoys and similar aids to navigation. Important also is: a practical knowledge of the International Regulations for Preventing Collisions at Sea; the International Code of signals; danger, causes, prevention, detection and fighting of shipboard fires; and coastal navigation and ship handling. Deck officers are also expected to have knowledge and experience in the immediate actions to be taken in respect of collisions, grounding, explosion, dragging anchor, and vessels in distress.

A master of a vessel requires a higher level of competence and certification derived from passing an examination for practical knowledge of:

- navigation;
- fire fighting;
- towing and being towed;
- damage control;
- assisting vessels in distress;
- weather information and its use;
- handling a ship in all circumstances;
- use of stability information, and maintaining adequate stability;
- safe stowage of cargoes; and
- pollution prevention measures.



Courtesy: British Columbia Ferry Corporation

Crew being trained in operation of high speed rescue craft

In our examination, we found that corporation vessels are staffed by personnel who meet or exceed Canadian Coast Guard requirements. Similarly, results from our staff survey indicate the corporation's employees believe that vessels and terminals are staffed by qualified personnel.

Training

The corporation spent \$4.7 million (1.5% of the corporation's expenditure budget) during the 1993/94 fiscal year on training: 40% of this is mandated

by regulatory bodies, 40% is for internal corporation requirements, and 20% is discretionary training. The corporation does not gather cost information specifically on safety training.

Training is delivered in one of two ways: in-house or through external training centers. One form of in-house training is through familiarization programs to introduce employees to new positions. For example, deck officers on southern routes are given 20 days on-the-job familiarization to phase into new



Courtesy: British Columbia Ferry Corporation

Certificated bridge personnel on MV Spirit of British Columbia

positions. Another form of in-house training is the conduct of regular fire and boat drills onboard all vessels.

Employees are trained using the “Train the Trainer” concept. This involves training an employee, or group of employees, who then go back to their respective regions and provide training to employees located in that region.

Mandatory training for ships’ crews is clearly defined under the *Canada Shipping Act*. It includes a requirement for certain prescribed formal training sessions that are

provided through external educational centers such as the Pacific Marine Training Campus of the British Columbia Institute of Technology. The corporation is also working with local colleges to develop some of these courses so that skills can be upgraded at the regional level. The prescribed courses in Marine Emergency Duties (MED) cover basic safety, survival crafts, marine fire fighting, officer certification, and senior officer certification. Other courses include a range of navigation courses such as Ocean Navigator I and II.



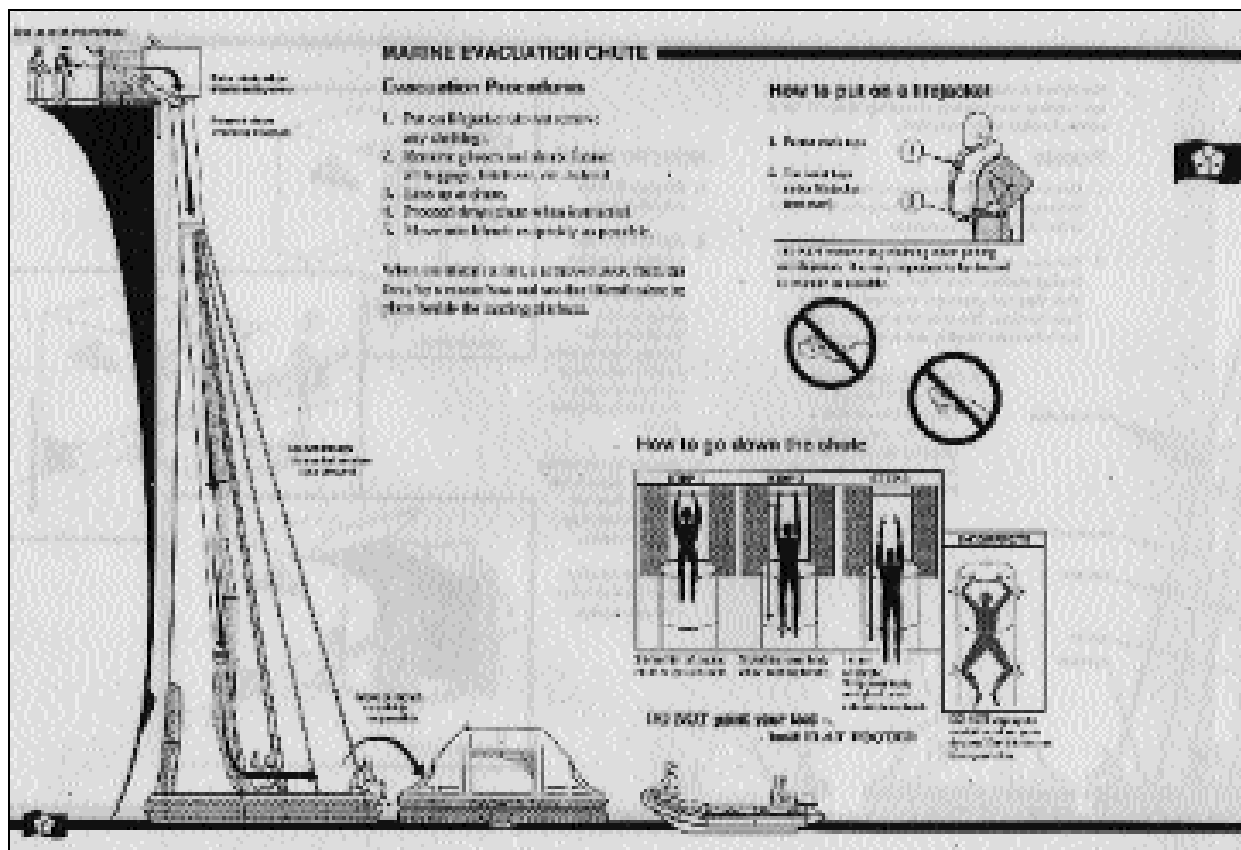
Courtesy: W.J. (Bill) Brown

Simulated firefighting carried out during MED training

Completion of the MED training course is mandatory for certificated masters, mates, engineers and persons wishing to have a certificate as a lifeboatman qualified in marine emergency duties. Although not a statutory requirement, the corporation sends deck crew to receive MED training on its own initiative. This enhances the level of training and expertise available in cases of emergency. We found that more deck crew desire MED training than are being given the opportunity. We were informed by the corporation that due to lack of space in training institutions, the corporation is limited by availability. A potential benefit of providing the training is that overall safety could be enhanced by having deck crew with higher qualifications than a lifeboatman's certificate. Also, such a strategy

would provide greater flexibility to the corporation when moving personnel from vessel to vessel, regardless of the equipment carried. We believe it would be useful for the corporation to evaluate the opportunities for providing more training as well as the related costs and benefits.

The corporation operates 40 vessels of differing sizes and equips these vessels with the evacuation equipment best suited to the size of vessel. This equipment includes davit launched liferafts, throw over liferafts, and conventional lifeboats. The corporation has recently fitted marine evacuation chutes to four of its newest vessels—the *Spirit of Vancouver Island*, the *Spirit of British Columbia*, the *Queen of Capilano*, and the *Queen of Cumberland*. Its purpose is to evacuate the largest



Courtesy: British Columbia Ferry Corporation

Marine Evacuation Chute

number of passengers and crew in the shortest possible time. In this system, a heavy fabric chute hangs vertically from the disembarkation deck to an inflatable landing platform. Liferrafts are deployed separately and are used to transport people from the landing platform. This lifesaving and evacuation appliance is Canadian Coast Guard approved.

Marine evacuation chutes are normally deployed once per year for the annual inspection by Coast Guard. Deployment is a simple operation involving the removal of a restraining bracket and pulling a lever. The annual inspection provides corporation employees with hands-on training in the use

of the chute. This is supplemented by videos, verbal refresher instruction and the use of a chute on a training vessel at Deas Dock. It is recognized that hands-on training opportunities with the marine evacuation chute are limited, as with other evacuation equipment such as davit-launched or throw-over liferafts.

A significant component of emergency procedures is the crew's capacity to direct and control large numbers of persons. It is common marine practice for able-bodied passengers to assist in these circumstances. For example, on Spirit Class vessels, which have a total crew of up to 55 depending on the number of passengers, the role

of approximately 38 catering staff is to calm, reassure, direct and control up to 2000 passengers. This clearly requires a degree of skill and training. Although the corporation provides some training in crowd control, many employees of the corporation are concerned that they do not receive enough training in this area. The corporation has indicated that it has no immediate plans for reviewing ways to improve emergency crowd control training.

Tower controllers and assistant terminal agents are, we found, receiving the necessary training and experiential opportunities they need to ensure they are properly qualified. Development of a ramp operator course and introduction of an equipment operator position have occurred to improve operational safety in terminal and ramp operations. Improvements to ramp training has focused on major terminal double ramp operations. The corporation is now working to improve training for single ramp operations and some ramp specific training has been developed.

The nature of ferry operations requires heavy reliance on casual employees during peak traffic periods from May through September. Notwithstanding that they possess the formal qualifications to hold their position, they may not have the benefit of recent practice in performing their emergency duties and they may not be fully aware of the unique safety features of each vessel they are assigned to, or the location of safety equipment. Our survey of employees indicated that a significant number do not feel they receive adequate emergency

refresher training upon their return to duty.

Crew Sizes and Rotation

Crew sizes vary according to passenger counts and are based on compliance with *Canada Shipping Act* requirements. We found that the corporation meets, and in some cases exceeds, these requirements. The Act also requires that the corporation satisfy itself that the crew is sufficient and capable of operating the vessel and dealing with any emergency that may arise. With the exception of the *Queen of Capilano*, and the *Spirit of British Columbia*, the corporation has not carried out an assessment recently of other vessels to determine whether staffing requirements are sufficient to deal with emergencies involving the number of passengers carried by a vessel. While this was done many years ago when these vessels entered service, we believe it would be prudent for the corporation to reaffirm that crew sizes are sufficient and capable of dealing with emergencies.

The corporation uses part-time employees to deal with fluctuating seasonal passenger volumes. Many of these employees have worked for the corporation for long periods of time. They are introduced into regular crew complements in peak periods. Staff were concerned that frequent changes in crew continuity resulting from fluctuating demand hinders team cohesion and the ability for crew members to respond as a team in an emergency. A high percentage of ships' personnel we contacted, for example, believe that frequent changes in crew continuity reduce the level of operational



safety. The corporation advised us that the proposed human resource management program will look at the heavy reliance on casual employees and aggressively manage leave entitlements to resolve the crew continuity issue.

Our survey of staff indicated that many employees were concerned about their ability to respond in an emergency with crew sizes that meet statutory requirements. Some employees were especially concerned about their ability to perform simultaneous fire fighting, boat launching, and crowd control duties on minor vessels, given the present crew complements.

Value for Money

The corporation does not, we found, periodically analyze its training programs to ensure that it is delivering the right programs to the right people at the right times and at least cost. A significant problem is that the corporation lacks processes to determine the cost and effectiveness of its operational safety training programs. These issues have also been identified by the corporation as needing attention.

Recommendations

The corporation should:

- *consider ways to provide more refresher training, and conduct research for improving emergency crowd control strategies; and*
- *carry out an assessment of all vessel classes to determine whether crews are sufficient and capable of dealing with emergencies involving the numbers of passengers carried.*



Executing Operational Safety Policies and Procedures



To be in compliance with the *Canada Shipping Act* and its own operational safety objectives, the corporation must ensure that its operational safety policies and procedures are being carried out. To accomplish this, it is important that the corporation conduct periodic exercises simulating emergencies, and carry out inspections and audits. The results of exercises, inspections, and audits should be reported to senior management. It should also encourage employees and the general public to report unsafe practices and conditions.

Conclusion

The corporation carries out fire and boat drills as required by regulations and the results of the drills are reported to senior management. However, the corporation does not monitor such drills on a system-wide basis to ensure their consistency and uniformity, nor does it evaluate the crew's ability to handle the number of passengers carried in an emergency. We attended a limited number of randomly selected drills. While some aspects of the drills were performed satisfactorily, we observed significant problems. Improvement was required in officer leadership, skills and proficiency of ships' crews, and communication. We also noted that drills sometimes were not done to the satisfaction of Canadian Coast Guard surveyors, and that BC Ferries crews themselves had concerns about the nature, extent

and quality of the drills. The corporation should determine the extent to which problems exist with fire and boat drills, and develop an effective program to address any identified concerns.

The corporation needs to clarify whether its practice of operating its two northern vessels with some interior watertight doors in the open position meets regulatory requirements.

Preboarding inspection practices for commercial vehicles are carried out in accordance with the *Transport of Dangerous Goods Act* and corporation policies. However, there is a lack of uniformity amongst terminals in preboarding inspection practices intended to identify and regulate the transportation of dangerous goods by non-commercial vehicles.

The corporation encourages its employees and the general public to report unsafe practices and conditions.

Findings

Fire and Boat Drills

The annual vessel recertification process, as legislated under the *Canada Shipping Act*, requires that a ship's crew successfully conduct and pass a fire and boat drill. Some of the corporation's vessels occasionally do not qualify for an inspection certificate at the first attempt. This is due to crew not performing some aspect of the drill to the satisfaction

Fire and Boat Drill Evaluation Criteria

Evaluation criteria developed and used in the audit to assess randomly selected vessel fire and boat drills:

- Leadership by the master and/or chief officer.
- Coordinated and organized response to emergency scenarios.
- Realism in drills.
- Commitment to fire and boat drills.
- Clear understanding of one's duties and role in fire and boat drills.
- Performance of essential parts of drill, including instructing of crew in their emergency duties.
- Knowledge of function and use of emergency equipment.
- Correct use of procedures and avoidance of potentially dangerous actions.
- Activation of essential emergency equipment.

of the attending Coast Guard surveyor. In these cases the crew are required to repeat the exercise until they can demonstrate proficiency in that particular part of the drill.

The corporation is also required to conduct fire and boat drills during the period of the certificate to ensure continued compliance. Regulations require that such drills be conducted at intervals of not more than one week in the case of the two northern vessels, and not more than two weeks in the case of all other vessels. In addition, in the case of all vessels, a fire and boat drill is required if more than 25% of the crew has been replaced. The Standards Division checks ships' documentation to see that fire and boat drills have been completed. System-wide monitoring of the critical components of the drills, or of crowd control procedures to ensure uniformity and consistency, do not take place, however.

A properly qualified and trained crew has the ability to respond appropriately and quickly to emergencies. As part of our audit, we attended a limited number of fire and boat drills on randomly selected major, intermediate, and minor vessels to test a crew's state of readiness. Crews may respond differently to real life emergency situations, but in the drills we attended we made the following observations. On one vessel, fire and boat drills were carried out with a high level of skill and proficiency. For the others, while some aspects of the drills were performed satisfactorily, we observed significant problems related to officer leadership, crew skills and proficiency, and emergency communications. Leadership was noticeably lacking in some masters and chief officers during the execution of fire and boat drills. While some masters and chief officers were clearly in

... continued training is vital and requires more than lifeboat drills, where the crew musters, the boat is turned out and lowered a meter or so, raised and secured and an entry in the log is made. Realistic fire drills are difficult to stage at sea but with ingenuity they can be effective. An exercise witnessed a couple of years ago on a Sealink ferry during normal turnaround in Calais involved a total black-out, closing down all ventilation and forcing rescue parties to work in the dark

Lloyd's Ship Manager, April 1994

command of the situation, others did not perform to the level one would have expected of professional mariners. In one situation, for example, although a chief officer was notionally in charge, command in reality was carried out by a seaman. In another case, a chief officer failed to question or instruct crew members on any aspect of their fire and boat drill duties. We also found that employees were not always given instructions in their emergency duties during the drills.

We also noted a lack of uniformity and consistency of crew skills and proficiency in the execution of fire and boat drills. The drills we witnessed lacked realism and were done by rote rather than with a demonstration of creative thinking or problem solving under conditions of duress. Fire extinguishers were not discharged nor was instruction given in their use. On several occasions, we witnessed members of fire parties descend into engine rooms or other enclosed spaces without safety lines attached or without backup from other crew members. In boat drills, we heard no instruction being given in crowd control and little or no instruction of crews at their fire and boat stations.

Finally, we noted communication between masters and chief officers responsible for the fire party, and between masters and passengers, varied greatly.

We found that crews themselves had concerns about the nature, extent and quality of the drills and about their ability to handle the number of passengers carried by the vessels in an emergency situation. A significant number of employees also indicated that the drills were not consistent by watch (a 10- or 14-day work period) and by master and vessel. While a significant number of employees told us that drills were meaningful to them, they indicated that they were of the opinion that the training they received in emergency preparedness and crowd control was insufficient. However, the corporation states that in real life situations, crews have responded with skill, competency and efficiency.

A specific concern of staff was the lack of time to carry out proper fire and boat drills. For example, a muster (a verbal questioning by deck officers to determine whether crew members understand their emergency responsibilities) is



Fire and boat drills are regularly carried out on all ferries

sometimes carried out instead of a regular fire and boat drill. This practice is not in compliance with the *Canada Shipping Act*. We were informed by employees that when drills are conducted, they are often run through quickly, leaving insufficient time to debrief.

As a result of a Canadian Coast Guard inspection that identified significant deficiencies, the President and CEO announced that a program for the review of crew proficiency in fire and boat drills would be designed and implemented by June 1, 1995.

Watertight Doors on Northern Vessels

The Hull Construction Regulations of the *Canada Shipping Act* require that all sliding watertight doors be kept closed during navigation except when necessarily opened for the working of the ship. This requirement is also reflected in both the existing and the draft revised Marine Operations Manual of the corporation.

It has come to our attention that the *Queen of the North* and *Queen of Prince Rupert*, which are unique in the fleet in that they carry berthed passengers below the vehicle deck, sail with some interior watertight doors in the open position. The corporation operates this way because it believes that opening and closing the doors by inexperienced people could result in serious accidents. Under this arrangement the master can close the doors by remote control in case of an emergency.

In 1981 the corporation requested that the regulations be interpreted as allowing the doors to be left open except in emergencies, or when the Master, or Officer in charge, deemed it prudent to maintain them in the closed position. The request was based on concerns for passenger safety in that the layout of the accommodation necessitated a transit of the doors to access washroom facilities in a separate area of the vessel. The response from the Canadian Coast Guard's Acting Regional Director, Ship Safety, Western Region, was: "the application of the regulations should be an operational decision, taking into consideration the vessel's



Courtesy: British Columbia Ferry Corporation

Tower controllers clearing vessels at Swartz Bay

operation, design and layout together with external factors such as weather, sea conditions, environment and traffic.” The corporation interprets this as allowing some interior doors to be kept open.

In August 1995, at our request, the corporation sought confirmation of Ship Safety’s acceptance of the corporation’s interpretation and requested a ruling on the subject by the Board of Steamship Inspection, a body within Transport Canada that adjudicates on ship safety matters.

In its response the regional office of the Coast Guard stated that it agreed with the corporation’s

interpretation of the advice received from the Coast Guard in 1981. A ruling from the Board of Steamship Inspection was not requested by Coast Guard, as it believed the Board had reviewed the situation previously. However, when we contacted the Ship Inspection Directorate of Transport Canada and the regional office of Coast Guard to obtain a copy of the ruling, they could find no record of the Board having addressed this issue. In view of this, we believe it would be prudent for the corporation to request a ruling from the Board of Steamship Inspection to determine whether it is appropriate to operate with some of the interior watertight doors open.

Emergency Passenger Evacuation

For recently constructed ferries, the Canadian Coast Guard requires that, in an emergency, a vessel be abandoned by all persons onboard and the survival craft be 100 meters distant from the ship within a period of 30 minutes. (This standard was also introduced recently by the International Maritime Organization and is applicable to new ships only.) The Coast Guard assesses compliance with this criteria by conducting an exercise with a number of corporation staff and others acting as ferry passengers, and a corresponding amount of lifesaving equipment, and then extrapolating the results to an entire vessel load.

We found that such tests have been carried out successfully with the *Queen of Capilano* and the *Spirit of British Columbia*. The corporation has not carried out recently comparable tests for other vessels in the fleet.

Marine evacuation chute technology meets the requirements of the *Canada Shipping Act*, and was researched by the corporation before being put in to use. Crews, however, have concerns about the evacuation of children, handicapped and elderly persons with the chute. To overcome employee reservations about the chute, we believe the corporation should reinforce with all operations personnel that it believes this system is the best method for evacuating the greatest number of people in the shortest time whether they be able-bodied or otherwise.

Transportation of Dangerous Goods

The corporation is required to regulate strictly the transportation of dangerous goods on all vessels. To do so, it uses a dangerous goods electronic data base to oversee the movement of all such materials. Employees find that this system works well for commercial vehicles, which are regulated and readily identifiable through proper documentation and the use of vehicle placards. The corporation, as a matter of policy, makes public safety announcements at terminals and onboard vessels, provides tags for propane tank valves, and carries out random inspections of car parks and vessel vehicle decks.

There is, however, the potential for illegal transportation of dangerous goods in non-commercial vehicles such as cube vans and campers. This could place vessels, passengers, and crews in danger should a spillage, fire or explosion occur. While random spot checks of non-commercial vehicles are being carried out, concerns were expressed by employees about the infrequency of these inspections. The policy requires that random spot checks be carried out on each route once per eight hour shift. We believe that it would be prudent for the corporation to carry out an assessment to determine the level of risk presented by non-commercial vehicles and whether the present standard for random spot checks adequately addresses the risk.

At ferry terminals, there is also a lack of consistency amongst terminals in pre-boarding inspection practices with respect to checks of propane tank valves on recreational

vehicles. While this is part of loaders and parkers routine, it is not being consistently carried out as required.

Vessel Clearance

Vessel clearance is an important operational safety issue. Following the recommendations of the Nemetz Inquiry in 1992, the corporation instituted significant procedural changes to prevent vessel clearance accidents. A subsequent study of ramp operations commissioned by the corporation in 1994 noted that current procedures were very complex. Its recommendations focused on the need for simple, uniform vessel clearance procedures in which authority and responsibility are clearly laid out. The corporation is considering these recommendations. Employees we canvassed indicated they follow the clearance procedures.

Educating Ferry Passengers

The corporation has initiated a number of measures to increase public awareness of emergency practices and procedures onboard vessels. These include local initiatives to familiarize regular commuters, commercial vehicle drivers, and school children with ferry safety equipment and emergency procedures. Among the methods being used are live demonstrations onboard vessels, videos, and school visits.

Reporting Unsafe Practices and Conditions

As part of its commitment to operational safety, the corporation encourages both its employees and the general public to report

unsafe practices and conditions. Announcements onboard ship, for example, encourage the general public to bring safety concerns to the attention of ships' crews.

The process for reporting operational safety matters by employees is currently not well defined. Employees told us that, with the current process, they have some concerns about how well the corporation responds to identified problems. Several employees noted that the corporation does not let them know what action, if any, it has taken on their reports. Senior management told us that the corporation addresses the concerns raised, but does not always do a good job of communicating to staff how it did so.

Reporting Results of Tests, Inspections, and Audits

As part of the accountability process, it is important that the results of tests, inspections, and audits be reported to senior management. We found that the results of regular corporation fire and boat drills are reported directly to the Assistant Vice President for each region. We also found that the audit reports of the Standards Division are available for review by the Vice President, Corporate Safety and Standards, as well as by the President and CEO of the corporation.

The results of vessel inspections by the Canadian Coast Guard are reported to the master through the issuance of a certificate and by a verbal briefing by a Coast Guard surveyor. The master is notified of deficiencies which are



not serious enough to prevent the vessel from sailing but which nevertheless must be corrected. We believe that, in the event a Canadian Coast Guard surveyor cannot issue an inspection certificate, the corporation should request a report detailing the circumstances.

Recommendations:

The corporation should:

- *ensure system-wide uniformity and consistency of crew skills and proficiency in the execution of fire and boat drills, and a crew's ability to handle the number of passengers carried in an emergency;*
- *determine the extent to which the problems associated with officer leadership, skills and proficiency of ships' crews, and communications noted during our observations at a limited number of randomly selected fire and boat drills, exist elsewhere in the fleet, and develop an effective program to address identified concerns;*
- *request a ruling from the Board of Steamship Inspection on its practice of operating northern vessels with some interior watertight doors in the open position;*
- *assess the level of risk presented by non-commercial vehicles transporting dangerous goods and determine whether the random spot checks adequately address the risks; and*
- *ensure uniformity and consistency in the application of dangerous goods pre-boarding inspection practices for non-commercial vehicles.*



Evaluating Operational Safety Objectives



It is important for organizations to periodically evaluate the extent to which they are achieving their objectives. Accordingly, we expected the corporation to have developed an evaluation framework and performance indicators to measure the extent to which it is achieving its operational safety objectives.

Conclusion

The corporation has not developed an evaluation framework or measures for assessing the extent to which it is achieving its operational safety objectives.

Findings

Implementation Strategy

The corporation is in a period of significant transition from a highly centralized to a regionalized structure. A key element in this change process is a stronger focus on operational safety involving many changes within BC Ferries that have been highlighted throughout this report. We found that, at the time of our audit, the corporation had developed corporate and divisional strategic plans which identify safety as its highest priority. Our review of these plans indicates that the corporation has formulated a mission statement, objectives, and strategic initiatives. However, we did not find assignment of key responsibilities, important performance benchmarks, an implementation time schedule, or a monitoring and reporting process.

In our opinion, inclusion of these remaining elements in the strategic plan will help the corporation manage and evaluate the change process.

Evaluation Framework

In both its mission and corporate value statements, the corporation underlines that safety is its highest priority. We found, however, that the corporation has not translated these general statements into a useful evaluation framework with achievable performance indicators that can be periodically measured and assessed. The corporation has recognized the need for improvement and is currently working to develop performance measures.

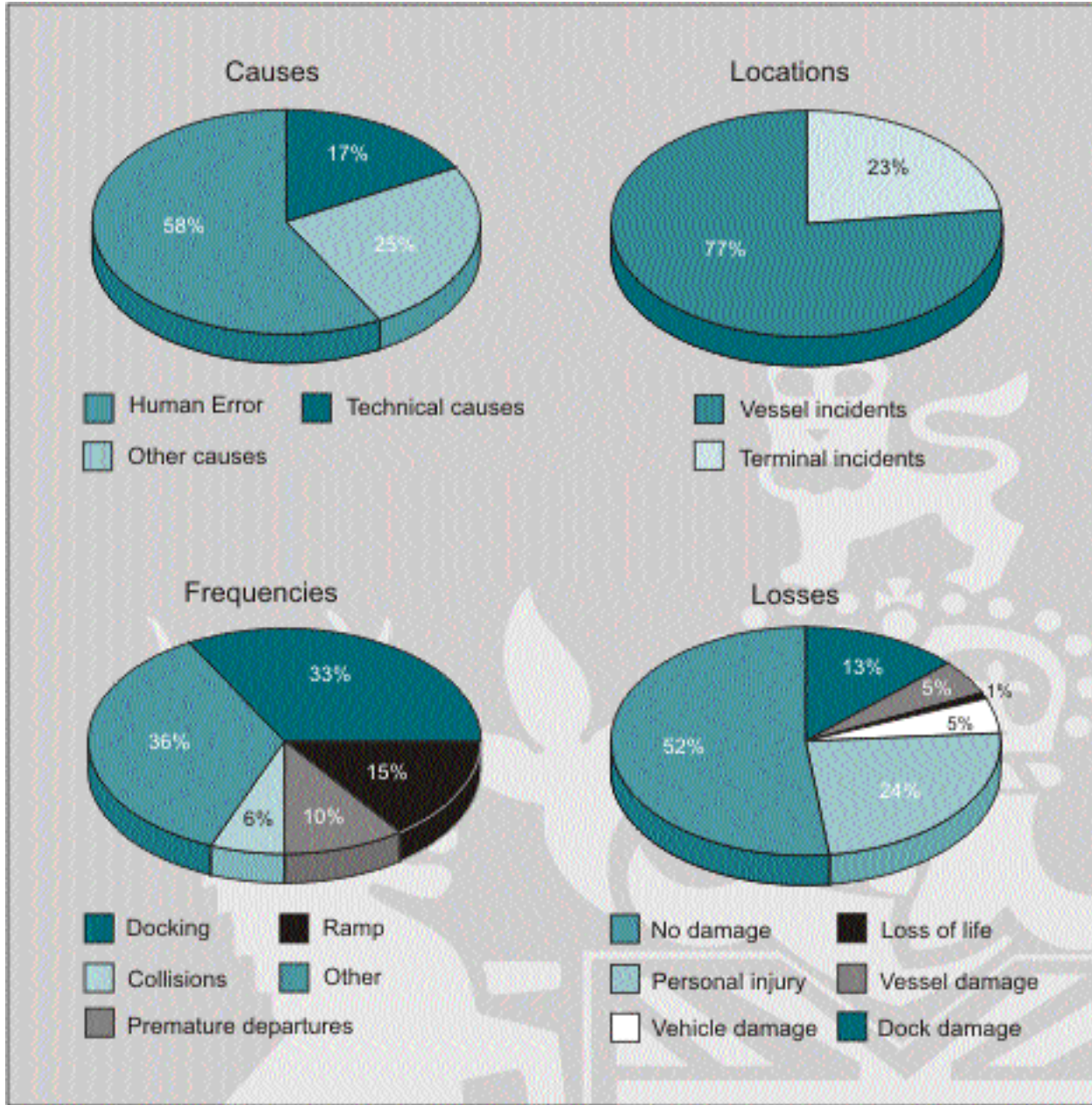
We attempted to compare the safety record of this system with that of both Washington State Ferries and Marine Atlantic, who also operate coastal ferry systems, but neither was able to provide us with historical safety information. We therefore focused on analyzing the historical safety record of the corporation. Accordingly, we reviewed documentation provided by the corporation covering all of the marine incidents involving the corporation which occurred during a ten year period (Exhibit 1.3).

From our examination, we developed a number of statistics which describe performance over the 10-year period, 1985–94. In total, there were 109 marine incidents reported. Our analysis indicated that 63 (58%) incidents in

Exhibit 3.3

Marine and Terminal Incidents

Analysis of a total of 109 marine incidents involving the corporation during the period 1985-1994



Source: Prepared from information provided by British Columbia Ferry Corporation

that time resulted from human error, 19 (17%) from technical problems, and 27 (25%) were from other circumstances such as weather or sea conditions. Eighty-four (77%) of the marine incidents occurred on vessels at sea, while 25 (23%) occurred at terminals.

The most frequent marine incidents were 36 docking (33%), 16 ramps (15%), 6 collisions (6%), and 11 premature departures (10%). During this 10-year period, there was 1 incident in which 3 lives were lost directly as a result of operations. Twenty-six (24%) incidents involved personal injury, 6 (5%) incidents involved vehicle damage, 5 (5%) incidents involved vessel damage, and 14 (13%) incidents involved dock damage. There were 57 (52%) reported incidents in which no damage was reported. These statistics should be viewed in the context of the corporation carrying 200 million passengers and travelling 4 billion passenger miles during the ten year period.

We believe that the kind of proactive analysis we did to obtain the figures shown above is what the corporation should be undertaking on a regular basis. It provides information about the nature of the incidents, their cause, and other relevant data.

Notwithstanding the lack of an evaluation framework to assess the extent to which safety objectives have been achieved, we found that the corporation's employees, Canadian Coast Guard marine surveyors that we interviewed, and the insurance consultants, are of the opinion that the corporation has a good safety record and that,

considering the diversity and complexity of the system and the volume of passengers and vehicles it transports, it is a safe coastal ferry transportation system.

Recommendations

The corporation should:

- *complete the development of the comprehensive implementation strategy to manage and evaluate initiatives aimed at improving operational safety; and*
- *develop an evaluation framework and appropriate performance indicators to determine the extent to which corporate safety objectives have been achieved.*





Reporting to the Board



It is important that the corporation management provide its Board of Directors with regular and timely reporting on operational safety matters. This should include information on the extent to which operational safety objectives have been met, since this has been identified as one of the corporation's main goals.

Conclusion

There is reporting to the Board of Directors on individual operational safety matters as and when required. This information is provided to the President and CEO by the Senior Vice President, Operations and Customer Services, in his monthly report. However, information is not provided to the board on the extent to which operational safety objectives are met.

Findings

While there is no specific requirement to report operational safety matters to the board, we found that the President and CEO reports on individual operational safety matters at board meetings. For example, monthly operations reports go to the board, noting significant incidents occurring in the regions. This information originates from each of three Assistant Vice Presidents responsible for vessel and terminal operations. However, even though safety is the stated highest priority of the corporation and is a major corporate goal, information

concerning the extent to which safety objectives are met is not provided to the Board.

Recommendation: The corporation should provide information to the board on a regular basis about the extent to which operational safety objectives are being met.



Corporation Response



The British Columbia Ferry Corporation undertakes over 175,000 sailings annually and conducts in excess of 2,000 drills and safety-related exercises. The Corporation places Operational Safety as the highest priority in its strategic and operational plans. Accordingly, the activity of the Auditor General in conducting an overall assessment of operational safety issues was viewed as another in a series of reviews and assessments that will assist the Corporation in achieving its stated goals.

In late 1994, the Corporation was significantly restructured. The objectives of that restructuring were broad, and included a fundamental change to decentralization of operational activity, consolidation of fleet engineering and construction activity, and strengthening of an expanded Corporate Safety and Standards division. The primary objective of this new division is to assist in the continued, rigorous evaluation and ongoing improvement in the safety performance of the Corporation's fleet and terminal operations.

Over the past year, and through the period of review by the Auditor General, there have been a series of ongoing changes and new initiatives aimed at improving operational safety and proficiency levels throughout the fleet. These activities have often involved external audits, recommendations for change generated internally, and reviews by Canadian Coast Guard.

As an example, the Auditor General notes some deficiencies in the evaluation

of fire and boat drills. The Corporation agrees that there is a lack of consistency between vessels and the absence of a consistent set of evaluation criteria against Corporate-wide standards of performance. This deficiency was identified by the Corporation, in part through its ongoing work with Canadian Coast Guard and also through independent external audits.

This has resulted in the Corporation implementing several initiatives just prior to or during the Auditor General's review. These include:

- *Adoption of a program to implement the comprehensive International Safety Management Code of the International Maritime Organization. The British Columbia Ferry Corporation was the first major marine carrier in Canada to set this objective.*
- *Implementation of standardized shipboard emergency drill programs coupled with regional safety proficiency review teams.*

The results of these initiatives could not, by virtue of timing, be included in the Auditor General's study, but will have a material impact on some of the areas cited for improvement.

In respect of the Operational Safety report, the key conclusions offered by the Auditor General include, among others, the following:

- *The Corporation's commitment to operational safety is clear and it is understood and accepted by Corporation employees.*

- *Since 1992 the Corporation has undertaken numerous initiatives to strengthen its commitment to operational safety.*
- *Operational safety objectives have been clearly articulated.*
- *The Corporation's vessels carry all of the emergency equipment required under the Canada Shipping Act and the equipment has been approved by Canadian Coast Guard. The equipment is kept in good working order.*
- *The Corporation staffs its vessels with employees whose qualifications meet or exceed the requirements set out in the Canada Shipping Act and its terminals with employees who meet Corporation standards.*
- *The Corporation carries out fire and boat drills as required by regulations and the results of the drills are reported to senior management.*
- *Pre-boarding inspection practices for commercial vehicles are carried out in accordance with the Transport of Dangerous Goods Act and Corporation policies.*
- *As part of its commitment to operational safety, the Corporation encourages both its employees and the general public to report unsafe practices and conditions.*

These general observations and others made by the Auditor General support activities underway by the Corporation and define areas for further assessment and action by the Corporation. In some cases, the Auditor General was critical of some Corporate practices and offered positive recommendations for

improvement. These will be pursued by the Corporation.

In other areas of the report, the Corporation agrees with the observation that the "Corporation's commitment to operational safety is clear and it is understood and accepted by Corporation employees." This commitment to safety is the focus of all the Corporation's activities and is reflected in the Corporation's Strategic Plan and in the planned certification under the International Safety Management Code.

The Auditor General notes, and the Corporation agrees, that employees, the Canadian Coast Guard and insurance underwriters acknowledge that it is a safe ferry system. This is supported by the Auditor General in the statement that the Corporation meets the requirements for operating a safe coastal ferry transportation system, with some noted areas that should be improved.

There is no comparison of safety records with other marine transportation systems who could not provide the Auditor General with safety related information. The Auditor General's review of accidents and incidents within B.C. Ferries indicated that 58% were caused by human error. The report also observed that the norm for human error as the cause of marine accidents world-wide is in the region of 75-80%.

The Corporation is not averse to, and welcomes, examinations of all its operational activities by both internal and external agencies authorised and capable of making assessments. For this reason the Standards Division and the regional safety proficiency teams are staffed with carefully selected senior personnel. External agencies such as the

Canadian Coast Guard, classification societies and insurance underwriters conduct continuous and regular assessments of all aspects of the Corporation's activities.

The Corporation's position with respect to specific findings by the Auditor General are detailed hereunder:

- 1. The Corporation is committed to operational safety:*
 - Agreed.*
- 2. The Corporation has approved emergency equipment which is kept in good working order:*
 - Agreed.*
- 3. The Corporation staffs its vessels and terminals with qualified personnel:*

The Auditor General observes that B.C. Ferries "staffs its vessels with employees who meet or exceed the qualifications set out in the Canada Shipping Act, and its terminals with employees who meet the operational safety standards of the Corporation."

It is acknowledged that some employees expressed concerns about management of crowds in an emergency. This concern and awareness is likely present in most transportation companies moving large numbers of people. It is also a sign that those who are charged with the safety of passengers in an emergency take their responsibilities very seriously, particularly as the reaction of crowds in emergencies is changeable. The Corporation does provide training in crowd control. The safety of passengers is foremost

in the responsibilities assigned to all crew members. There have been occasions in the past where ship's crews have needed to control crowds and provide support and assistance to passengers. B.C. Ferries' personnel response has always been of a high standard, meeting the requirements of the situation.

The Auditor General notes that the crew sizes "meet or exceed" Canada's Shipping Act requirements. The Corporation is satisfied that the levels that have been established by the Canadian Coast Guard and the Corporation are satisfactory. This matter is not taken lightly and the established crewing levels are arrived at after thorough examination and consultation with Canadian Coast Guard and are constantly under review. However, as recommended by the Auditor General, the Corporation will conduct further assessments to validate the manning levels.

- 4. The Corporation lacks a comprehensive risk management process:*

The Corporation acknowledges that some improvement can be made in the assessment and management of risk. Steps were taken in early 1995 to improve the management of risk, by upgrading the categorisation and analysis of accidents and incidents, and by the decision to adopt and achieve certification under the International Safety Management Code. The Auditor General's recommendation for the introduction of a comprehensive risk management program is an intrinsic part of the adoption of this Code.

5. *The Corporation does not monitor emergency drills and practices system-wide:*

The Corporation acknowledges the Auditor General's observation that the monitoring of emergency drills and practices could be improved. This aspect of safety management was strengthened by the establishment of a Safety and Standards division, and in early 1995 by the creation of regional safety proficiency teams, which on a regular basis are now reviewing the effectiveness of training and drills throughout each region.

The Auditor General made critical comment respecting officers' leadership and the skills and proficiency of ships crews. As noted by the Auditor General, these observations were based on attendance at "a limited number of randomly selected drills." There are over 2000 safety drills conducted in Corporation vessels annually, not including drills and exercises which are also scheduled and completed immediately after ships' annual refit. Nor does it include drills and exercises now scheduled by the regional safety proficiency teams.

Officers are expected to perform at Corporate and Canadian Coast Guard standards and this performance in routine drills is being assessed by senior operational staff.

As observed by the Auditor General, the Corporation does staff its vessels with personnel whose qualifications and experience meet or exceed statutory or regulatory standards.

The Auditor General observes that on occasion Canadian Coast Guard will identify specific issues or problems with some aspect of a drill exercise. This results, in most cases, with a request to re-do elements of a drill. This activity is not uncommon and is encouraged by the Corporation to ensure the highest levels of knowledge and proficiency. On no recorded occasion has a vessel or crew of the Corporation failed to achieve Canadian Coast Guard licensing through failure of crews for proficiency reasons. While the Corporation acknowledges areas where improvements are needed, it does not agree with the Auditor General's observation that significant problems exist.

The performance of British Columbia Ferry Corporation officers and crews in real emergencies has always been of a high standard and on occasions been recognised by national safety and bravery awards.

The Corporation acknowledges that improvements in this area are possible and desirable. Corrective and improvement programs have been prepared and implemented. Further work will also be done in these areas through Corporate management, the Council of Masters, the Council of Senior Chief Engineers, training and upgrading programs, and evaluation of personnel.

In order to ensure the effectiveness of these Corporate initiatives, and to address the concerns of the Auditor General, a request will be made of the Auditor General to attend further fire, life

boat, and other drills with Corporate Safety and Standards officers, operational personnel, and Canadian Coast Guard representatives. These exercises will be conducted within 12 months.

6. *The Corporation should clarify whether it has an exemption to sail its two Northern vessels with internal watertight doors open:*

These two vessels have operated for over 25 years, with Coast Guard knowledge and approval, with some of the internal watertight doors in the spaces below the car deck open to allow passengers to pass through safely. These doors are in an automatic release mode, capable of closing in approximately 30 seconds and can be activated remotely. This practice is acceptable and is in accordance with Canadian Coast Guard regulations which state:

“The master and persons in charge of the navigation and engine room watches shall ensure that all sliding watertight doors are kept closed during navigation except when necessarily opened for the working of the ship, in which case such doors shall always be ready to be immediately closed and the master shall ensure that notices to this effect are posted in the Chart Room and at the doors on each side of the bulkhead.”

The masters’ decision to sail with some internal watertight doors open has been validated in writing with the Canadian Coast Guard and is supported by the Corporation. The working of the vessel would be seriously affected, and the ability of

passengers to access accommodation would be seriously impeded if they were closed at all times.

Importantly, the Corporation several years ago recorded the death of an employee who was crushed by the heavy, hydraulically powered doors. The prospect of allowing untrained passengers to routinely operate these internal door mechanisms in the area of passenger accommodation is considered by the Corporation to be imprudent and potentially unsafe. This history and important passenger safety issue was omitted from the Auditor General’s observations.

7. *The Corporation’s implementation strategy for managing and evaluating its major operational safety initiatives is under development:*

The Corporation generally agrees with this finding, however the assignment of responsibilities has always been clear, and the Strategic Plan which has been implemented and the Corporation’s policies clearly delineate this responsibility.

8. *The Corporation is not evaluating whether it is achieving its safety objectives:*

Safety performance is evaluated and reported regularly. However, establishment of targets or specific performance measures has not been formally structured by the Corporation. This activity is now underway.

9. *The Corporation needs to provide its Board of Directors with appropriate safety information:*



The Board is provided with safety and incident reports. However, reporting against targets or specific performance measures is incomplete. The Board will be provided with this information as the International Safety Management Code is introduced and reporting systems developed.



Appendix



Appendix



Office of the Auditor General: Audit Objectives and Methodology

Audit work performed by the Office of the Auditor General falls into three broad categories:

- Financial auditing;
- Performance auditing; and
- Compliance auditing.

Each of these categories has certain objectives that are expected to be achieved, and each employs a particular methodology to reach those objectives. The following is a brief outline of the objectives and methodology applied by the Office for performance auditing.

Performance Auditing

Purpose of Performance Audits

Performance audits look at how organizations have given attention to economy, efficiency and effectiveness.

The concept of performance auditing, also known as value-for-money auditing, is based on two principles. The first is that public business should be conducted in a way that makes the best possible use of public funds. The second is that people who conduct public business should be held accountable for the prudent and effective management of the resources entrusted to them.

The Nature of Performance Audits

An audit has been defined as:

... the independent, objective assessment of the fairness of management's representations on performance, or the assessment of management systems and practices, against criteria, reported to a governing body or others with similar responsibilities.

This definition recognizes that there are two primary forms of reporting used in performance auditing. The first—referred to as attestation reporting—is the provision of audit opinions on reports that contain representations by management on matters of economy, efficiency and effectiveness.

The second—referred to as direct reporting—is the provision of more than just auditor's opinions. In the absence of representations by management on matters of economy, efficiency and effectiveness, auditors, to fulfill their mandates, gather essential information with respect to management's regard for value for money and include it in their own reports along with their opinions. In effect, the audit report becomes a partial substitute for information that might otherwise be provided by management on how they have discharged their essential value-for-money responsibilities.

The attestation reporting approach to performance auditing has not been used yet in British Columbia because the organizations we audit have not been providing comprehensive management representations on their performance. Indeed, until recently, the management representations approach to value for money was not practicable. The need to account for the prudent use of taxpayers' money had not been recognized as a significant issue and, consequently, there was neither legislation nor established tradition that required public sector managers to report on a systematic basis as to whether they had spent taxpayers' money wisely. In addition, there was no generally accepted way of reporting on the value-for-money aspects of performance.

Recently, however, considerable effort has been devoted to developing acceptable frameworks to underlie management reports on value-for-money performance, and public sector organizations have begun to explore ways of reporting on value-for-money performance through management representations. We believe that management representations and attestation reporting are the preferred way of meeting accountability responsibilities and are actively encouraging the use of this model in the British Columbia public sector.

Presently, though, all of our performance audits are conducted using the direct reporting model, therefore, the description that follows explains that model.

Our performance audits are not designed to question government policies. Nor do they assess program effectiveness. The *Auditor General Act* directs the Auditor General to assess whether the programs implemented to achieve government policies are being administered economically and efficiently. Our performance audits also evaluate whether members of the Legislative Assembly and the public are provided with appropriate accountability information about government programs.

When undertaking performance audits, auditors can look either at results, to determine whether value for money is actually achieved, or at managements' processes, to determine whether those processes should ensure that value is received for money spent.

Neither approach alone can answer all the legitimate questions of legislators and the public, particularly if problems are found during the audit. If the auditor assesses results and finds value for money has not been achieved, the natural questions are "Why did this happen?" and "How can we prevent it from happening in future?" These are questions that can only be answered by looking at the process. On the other hand, if the auditor looks at the process and finds weaknesses, the question that arises is "Do these weaknesses result in less than best value being achieved?" This can only be answered by looking at results.

We try, therefore, to combine both approaches wherever we can. However, as acceptable results

information and criteria are often not available, our performance audit work frequently concentrates on managements' processes for achieving value for money.

We seek to provide fair, independent assessments of the quality of government administration. We conduct our audits in a way that enables us to provide positive assessments where they are warranted. Where we cannot provide such assessments, we report the reasons for our reservations. Throughout our audits, we look for opportunities to improve government administration.

Audit Selection

We select for audit either programs or functions administered by a specific ministry or public body, or cross-government programs or functions that apply to many government entities. There are a large number of such programs and functions throughout government. We examine the larger and more significant ones on a cyclical basis.

We believe that performance audits conducted using the direct reporting approach should be undertaken on a five- to six-year cycle so that members of the Legislative Assembly and the public receive assessments of all significant government operations over a reasonable time period. Because of limited resources, we have not been able to achieve this schedule.

Our Audit Process

We carry out these audits in accordance with the value-for-money auditing standards established by the Canadian Institute of Chartered Accountants.

One of these standards requires that the "person or persons carrying out the examination possess the knowledge and competence necessary to fulfill the requirements of the particular audit." In order to meet this standard, we employ professionals with training and experience in a variety of fields. These professionals are engaged full-time in the conduct of performance audits. In addition, we often supplement the knowledge and competence of our own staff by engaging one or more consultants, who have expertise in the subject of that particular audit, to be part of the audit team.

As performance audits, like all audits, involve a comparison of actual performance against a standard of performance, the CICA prescribes standards as to the setting of appropriate performance standards or audit criteria. In establishing the criteria, we do not demand theoretical perfection from public sector managers. Rather, we seek to reflect what we believe to be the reasonable expectations of legislators and the public. The CICA standards also cover the nature and extent of evidence that should be obtained to support the content of the auditor's report, and, as well, address the reporting of the results of the audit.



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