Grain Transportation and Handling in Western Canada

Executive Summary

July 1979

Report for
The Grains Group
Department of Industry,
Trade and Commerce

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Mr. A.W. Burges
Director General, Transportation
Grains Group
Department of Industry, Trade and Commerce
Ottawa, Ontario
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Subject: Grain Transportation and Handling in Western Canada

Dear Mr. Burges:

With this letter is transmitted our Report presenting the results of an Operations Analysis of Grain Transportation and Handling in Western Canada. The work was carried out by Booz, Allen & Hamilton Inc., in association with IBI Group, during the period August 1978 through June 1979.

SCOPE

In accordance with the terms of reference, existing and future operations of the grain transportation and handling system were analyzed extensively under a number of alternative assumptions regarding future grain export demand through the 1985/86 crop year. Operational and institutional changes, and investments in new facilities and equipment, such as West Coast terminal expansion, rail cars and locomotives were examined. The distribution system was simulated under alternative conditions with a computer model, developed for this project to study the impact of various mixes of operating and capital improvements. Relevant operations of the Canadian Wheat Board (CWB), the Railways and the major grain elevator companies were analyzed, as directed by the terms of reference.

EXCLUSIONS

Specifically excluded from the terms of reference were two important factors:

- Possible changes to the statutory rates ("Crow Rates") for grain; and
- Grain marketing, sales contracts and marine shipping arrangements by the Canadian Wheat Board (CWB) and the grain companies.

Where relevant, implications of both of the above factors regarding more efficient use of the grain distribution system are pointed out in this report. The terms of reference also excluded grain movements east of Thunder Bay and Armstrong.

MAJOR RECOMMENDATIONS

Many recommendations are presented in the report. The most significant of these are summarized as follows:

Information, Planning and Control Systems

.Improved information, planning and control systems are required to direct the right grain to the right terminal at the right time to meet vessel loading demands.

Other Operational and Institutional Improvements

A lengthy agenda of other operational and institutional improvements should also be implemented to improve the level of cooperation and the incentives for each participant to contribute to efficient operations of the grain distribution system. A target of 15 percent improvement in car fleet utilization, or more if possible, should be sought. All participants, not just the railways, have a major role to play in improving car utilization.

Capital Investments

Even with the operating and institutional improvements recommended, major capital expenditures will be required to meet delivery requirements for grain movements through 1985/86. It is recommended that:

- In addition to the 2,000 covered hopper cars now on order by the CWB, 1,900 hopper cars be ordered for delivery in each of the 1980/81, 1981/82, 1982/83 and 1983/84 crop years with a further 1,700 cars for delivery in 1984/85. A total of 9,300 cars over the six year period will be needed requiring an investment of about $400 million 1979 dollars. The actual number of cars purchased in years after 1980 can be adjusted up or down in light of the effectiveness of operational improvements and actual demand volumes. It is estimated that up to an additional 4,000 cars costing about $173 million may be necessary if the operating improvements recommended are not achieved but the traffic is available. It is suggested that the 9,300 cars be considered a minimum for planning purposes.

- Since acquisition of the new hopper cars outlined above, coupled with targeted operational improvements, are not likely to provide sufficient capacity to preclude lost sales in years of high demand, additional terminal capacity should be constructed on the West Coast. Anticipated rail capacity limitations to Vancouver are such that Prince Rupert is the preferred site. The 10 million bushel storage capacity terminal proposed for Prince Rupert would meet this requirement, and current negotiations to this end should be brought to the action stage as quickly as possible.

It is recognized that there will probably be years between now and 1985/86 in which world grain demand and/or Canadian production will be such that some of the new plant may not be fully utilized. The investment is

justified, however, by the fact that substantial sales would be lost in years of top demand if the facilities were not acquired, and the additional income generated in Canada by three such years of top sales would more than return the total cost of the new facilities.

Grain Transportation Improvement Task Force

To expedite implementation of the recommended improvements, a Grain Transportation Improvement Task Force should be set up, headed by a Managing Director with stature in the grain industry, and reporting to an Executive Committee chaired by the Minister responsible for the Wheat Board and comprising the Chief Commissioners of the CWB and Canadian Grain Commission (CGC), the Chief Executive Officers of CN and CP and two of the Presidents of the six major grain companies. The Task Force would have an action-oriented mandate to propose, oversee and monitor the implementation process during its limited lifetime of up to four years, and would make recommendations regarding a body to continue the improvement and monitoring process, subsequently, if appropriate. The Task Force would be made up of about ten experienced persons, hired on a full-time basis and drawn largely from the grain industry and the railways, plus a small support staff.

CWB Transportation Staff

The staff responsible for administering the Block Shipping System, which now reports to the CWB, plays a central role in planning and controlling the grain delivery activities of the grain companies and railways. There are problems in the level of coordination and cooperation now achieved under this arrangement, some of which are due to a perceived potential conflict of interest by the CWB which has a direct interest in marketing Board grain yet whose staff control rail car allocations for both Board and Non-Board grains. These problems are aggravated by the perception of at least some of the grain companies that the CWB staff have from time to time been arbitrary and unnecessarily secretive in the process of allocating rail cars to the companies and assessing penalties against the companies for shipping infractions.

There are a number of important factors to be assessed in considering whether it would be better for the Block Shipping Staff to report to another body such as the CGC or the Task Force. On balance, from the viewpoint of operational efficiency, the consultant team favors relocation of the Block Shipping Staff to report to the Managing Director of the Task Force. This would provide a neutral "home" for this important function and would enhance the Managing Director's ability to achieve implementation of the necessary improvements.

An early decision on this matter is desirable, preferably by the Minister responsible for the Wheat Board (or, subsequently, by the Task Force).

COMPENSATORY RAIL RATES FOR GRAIN

There is a substantial body of opinion among major participants in the production, handling and transportation of grain in Canada, that some way must be found soon to provide a compensatory return to the railways for moving grain. Failing this, the lack of capital renewal of relevant rail facilities will become critical, vitally affecting the grain industry, the railways and other important industries.

While this issue was excluded from the Operations Analysis, it has been noted throughout the analysis and this Report that the introduction of compensatory rates is desirable, not only to achieve the required cash flow for locomotives and for expanded main line capacity but also to enhance the likelihood of achieving many of the identified operating improvements through the incentives provided by a flexible rate structure which would reward efficient use of rail services for grain transport.

It is, therefore, most important that the implementation of the operational improvements recommended in this Report not be seen as a reason to delay resolution of the Crow Rate issue, but that the introduction of compensatory grain rates be pursued in parallel with the operational improvements and be treated as of equally high priority.

OPERATIONS ANALYSIS REPORT

This report is presented in three volumes:

- Volume 1: Executive Summary
- Volume 2: Technical Report
- Volume 3: Appendices

Volume 1 is a digest of the more detailed Technical Report, with an essentially parallel chapter structure to facilitate cross references. Readers of Volume 1 will receive a summary of the most important analyses, findings and recommendations, while those requiring a more detailed account should refer to Volume 2. Volume 3 presents the Appendices for the Report.

ACKNOWLEDGEMENTS

The consultant team wishes to acknowledge with thanks the cooperation and advice of you and your staff, the grain companies, railways, Canadian Wheat Board, Canadian Grain Commission and others. Particular thanks is due to the Industry Liaison Committee, comprising representatives of the grain companies, producers and organized labor, with which the team met regularly during the project. The findings and views expressed in this Report are, however, those of the consultant team which accepts full responsibility for them.

We trust that this Report will contribute to the further growth and prosperity of one of Canada's most economic sectors and one which is based on renewable resources - the grain industry and related agricultural, handling, transportation and processing industries.

Very truly yours,

BOOZ ALLEN & HAMILTON Inc.

Charles W. Hoppe
Vice President

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Neal A. Irwin
Managing Director

GRAIN TRANSPORTATION AND HANDLING IN WESTERN CANADA

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

GRAIN TRANSPORTATION AND HANDLING IN WESTERN CANADA

EXECUTIVE SUMMARY

I. INTRODUCTION

Transportation and handling of grain is of vital importance to Canada and has been the subject of numerous analyses. The primary objective of this operations analysis is to develop recommendations to improve throughput of export grain. The overall approach focuses on practical solutions to the logistics problems experienced in moving grain from the farms to the vessels, so that the potential for increased grain sales can be attained.

This analysis was carried out by Booz, Allen & Hamilton Inc. and IBI Group under the direction of the Grains Group of the Department of Industry, Trade and Commerce. The project was also assisted by an Industry Liaison Committee comprising representatives from the major grain companies, producers and labor that provided review, comment and assistance for carrying out the analyses presented in this report. In addition, this project benefited from the complete cooperation of CN and CP Rail, and the Canadian Wheat Board.

II. TERMS OF REFERENCE

There is growing concern regarding the ability of the grain distribution system to handle increasing volumes, particularly in terms of the supply of railway cars required to carry an anticipated increase of about 50 percent in export volumes by the mid-1980's. Related requirements for locomotives, rail main line capacity, and western terminal elevators are also a concern. This operations analysis was prompted largely by these concerns and the anticipated impacts in terms of losses in export sales, producer income and foreign exchange.

The main elements of emphasis from the terms of reference for this project include the following:

1. THE OBJECTIVES WERE ACTION-ORIENTED

The objectives of this operations analysis were oriented toward action. The specific objectives were:

- To make an assessment of the operational efficiency of key components of the contemporary grain transportation system in Western Canada
- To define significant institutional, operational and capacity constraints in the present system and prescribe cost minimizing remedies in accord with a range of alternative export volume and system configuration scenarios
- To identify probable operating and capital equipment needs for the movement of grain over the next several years under these scenarios
- To develop an improvement plan which would:
  - Minimize institutional and operational constraints
  - Be based on specified techniques (e.g. systems analysis and management, computer applications, etc.)

- To establish the appropriate implementation mechanisms, i.e.:
  - Roles of key personnel
  - Required levels of expertise and training
  - Reporting relationships most appropriate for overall control function.

2. TERMS OF REFERENCE FOCUSED ON OPERATIONS OF MAJOR PARTICIPANTS

The operations analysis was structured into two phases: An initial "Immersion Phase," of one month duration in which the consultant team became familiar with the grain transportation and handling system through review of earlier studies and discussions with key participants; and the Qperations Analysis Phase which was scheduled for completion in nine months, from September 1978 to June 1979. This schedule was essentially maintained.

The main topics to be covered in the Operations Analysis were as follows:

- Canadian Wheat Board
  - Grain and oilseeds export and domestic traffic
  - Quota System
  - Block shipping system
  - Movement of Non-Board grains
  - Liaison among the Wheat Board, railways and grain companies
- Railway System
  - Collection network (overview)
  - Branch line network
  - Line haul
  - Terminal operations
  - Motive power and equipment

. Grain Trade

- Primary elevator system
- Terminal elevator system (ports)

.. car coordination
.. pooling
.. Non-Board grains

3. SOME IMPORTANT SUBJECTS WERE NOT INCLUDED IN THE TERMS OF REFERENCE

A number of items relevant to the overall question of grain handling and transportation in Western Canada were specifically excluded from this Operations Analysis, as follows:

. Possible changes in the statutory rates for rail movement of grain

. Grain movement east of Thunder Bay and Armstrong

. Grain marketing activities of the Canadian Wheat Board and grain companies.

The statutory rate issue is perhaps the most significant of these, in that the pricing structure for goods and services is a major determinant of any system's operating efficiency and capital investment levels. The existence of statutory grain rates confers an apparent financial benefit on producers of export grain, and contributes significantly to the lack of railway system renewal and expansion. The lack of flexible rail pricing systems does not provide incentives for more intensive or efficient use of the system. The specific exclusion of possible alternative rail rate structures emphasizes the operating orientation of this operations analysis which is, therefore, directed at other means of improving the capacity and throughput of the system. Instances are identified, however, in which the presence of compensatory rates would be beneficial in achieving improved operations. Every effort has been made to render the recommendations compatible with either the continuance of statutory rates or their replacement with some form of compensatory rates.

4. EXTENSIVE DATA COLLECTION AND ANALYSES WERE CARRIED OUT

Extensive data collection and analyses were carried out in addressing the above terms of reference, including:

- Field observations of country elevators, railway and port/terminal operations
- Statistical analyses of transit times, throughput levels and capacities
- Assessments of market growth rates and fluctuations
- Day-to-day observation of communications, operating and control activities by the major participants in the grain distribution process
- Detailed computer analysis of railway car cycles
- Development and application of a computerized simulation model for studying the dynamics of the entire grain distribution system under alternative operating and equipment/facilities assumptions.

The highlights of the data collection, analyses and major findings are summarized in Chapters III through XI of this Executive Summary. Considerable detail on the data, analyses and findings of the operations analysis is presented in the Technical Report and in the Appendices issued as companion volumes to this Executive Summary.

III. MARKET TRENDS AND FORECASTS

Market trends over the past decade were analyzed to provide data on the average annual rate of growth and the extent of year-to-year fluctuations experienced. Annual production levels were tabulated, along with domestic consumption, export volumes, the directional split (east and west) of grain movements from Western Canada, and annual farm carry-over volumes. Seasonal fluctuations of deliveries to country elevators and export volumes from Canadian ports were also assessed, and it was noted that substantial supply and demand peaks exist in a typical year.

1. FORECASTS WERE REVIEWED AND ASSESSED

Forecasts of 1985 grain movement requirements from several sources were analyzed and put into a consistent format in terms of units used and types of grain and movements included. The various forecasts are summarized in Exhibit 1. These various forecasts were combined into two alternative forecasts:

- A high forecast representing the perception of the Canadian Wheat Board (CWB) and others as to what Canada can realistically expect to produce and sell on the world market, plus domestic consumption

- A low forecazt representing the opinions of some other agencies and individuals as to what would be likely to move, reflecting in part transportation and handling constraints on the system.

It was concluded that the high forecast would provide the most realistic basis for the operations analysis since the low forecast reflects the very constraints this analysis focuses on overcoming.

2. ANNUAL VARIATIONS AND DIRECTIONAL MOVEMENTS WERE QUANTIFIED

In addition, recognizing that there are substantial annual variations in harvests and marketing, the extent of variation in movement requirements was evaluated for each

EXHIBIT 1
Forecasts of Total Production
of Principal Grains in 1985

	FORECASTS (Millions of Bushels)		
	DOMESTIC	EXPORT	TOTAL
Canadian Wheat Board	860 [1]	1,040 [2]	1,900
Canada Grains Council	1,170	480 [3]	1,650
Canada Grains Council [4]	905	900	1,805
Canada Grains Council [5] (Revised March 1979)	925	870	1,795
Cargill Grain	905	850	1,800
Westburn Development Consultants [6][7]	800	850	1,650
Saskatchewan Wheat Pool [7][8]	1,080	825	1,905

Notes:

[1] Not estimated by CWB. This rough estimate comes from the Grain Commission.

[2] As converted from tonnes by the Grain Commission and Westburn.

[3] As converted from barley equivalent bushels by Westburn using October 1977 forecasts.

[4] As adjusted by Westburn; not official Council forecast.

[5] Converted from tonnes by study team.

[6] Demand projections; total supply estimated at 1,540 (but higher in earlier years).

[7] Western Canadian grains only.

[8] For 2000, not 1985.

forecast. The variation was expressed in terms of a "top" and "bottom" of the range, as well as the mean, for each of the high and low forecasts. All three levels (top, mean and bottom), as estimated for the high forecast, were used in the analysis as a basis for estimating car supply requirements, as outlined in the following table:

1985/86 VOLUMES
USED AS A BASIS FOR
CAR SUPPLY ESTIMATES
(Millions of Tonnes)

	WESTWARD	EASTWARD	TOTAL
Bottom	13.0	12.2	25.2
Mean	13.2	16.5	29.7
Top	15.0	19.5	34.5

The range of demand estimates is shown graphically in Exhibit 2.*

3. A RANGE WITHIN THE HIGH FORECASTS WAS USED

Analysis showed that the 1985/86 top of the "high" forecasts for total exports and total major movements are in line with a linear extrapolation of past trends. The new Canada Grains Council forecast also straddles the high forecast. Accordingly, the high forecasts were used as the basis for estimating system capacity and rail car supply requirements through to the 1985/86 crop year, in order to show the implications of potential lost sales if sufficient capacity is not provided to meet such demand levels. At the same time, the mean and bottom estimates of the high forecasts were also taken into account to show the implications of investing to meet high demand volumes and subsequently experiencing lower rates of growth in demand.

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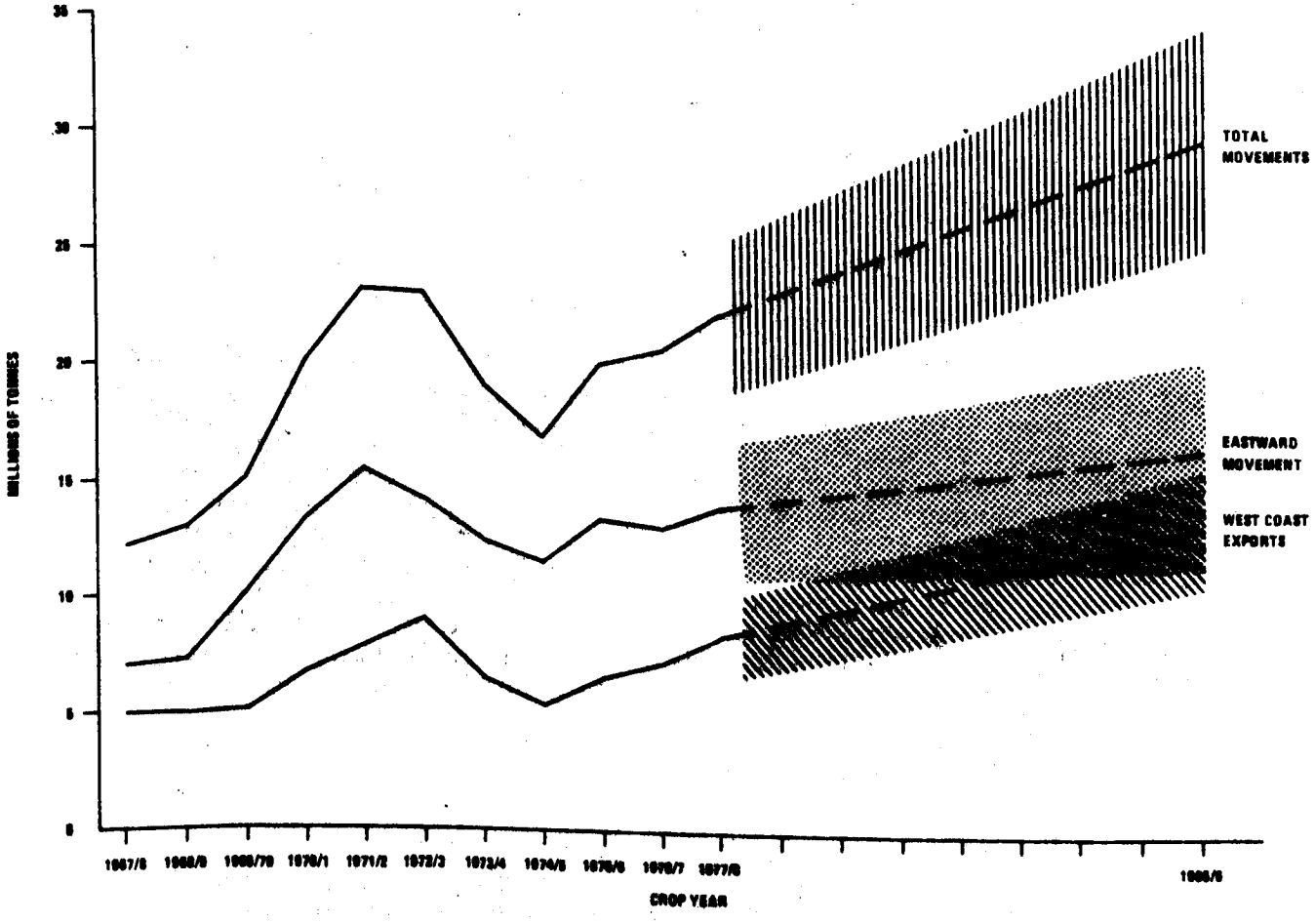
* The ranges shown in Exhibit 2 do not correspond with that shown for the table on this page. The ranges taken for car supply calculations in each direction are less than those shown in the demand forecasts (Exhibit 2) because of offsetting variations in eastward and westward flows; a very low year for west coast exports is likely to be partly offset by somewhat higher eastward exports. This is described more fully in the Technical Report, Chapter III.

EXHIBIT 2
Expected Growth in Movement of
Principal Western Canadian Grains



IV. SYSTEM DYNAMICS

During the course of the 1978/79 crop year, severe vessel delays occurred in Vancouver. The situation in Vancouver deteriorated to such an extent the the Canadian Wheat Board (CWB) chose not to bid on some Japanese contracts, rather than risk Canada's reputation by not meeting its grain export contract commitments. The CWB stated it had foregone about a half billion dollars in export sales in the prior year due to the uncertainty of satisfying export delivery commitments at the ports. Additionally, in the 1977/78 pool account, the Wheat Board incurred $18.4 million in vessel demurrage on the West Coast. This expense reduces the ultimate payment to producers for the year. The lost sales and demurrage payments are of great concern to the producers, the grain trade, and the general economy of the country.

1. THE CASE STUDY OF VANCOUVER SHOWED COMPLEX AND INTERRELATED PROBLEMS

In early December 1978, the number of vessels waiting in Vancouver rose alarmingly causing the Wheat Board to call a widely publicized special meeting of the key participants in Vancouver in an effort to effect an immediate improvement as well as to consider longer range solutions to the problems of meeting vessel commitments on the West Coast. Recognizing the concerns of all parties with vessel loading delays in Vancouver, a special case study was made by the consulting team of the key elements in the export grain logistics system to clarify understanding of the problems experienced in Vancouver during the first 20 weeks of the 1978/79 crop year (August 1 through mid-December 1978). The study included a week-by-week, and in some cases, day-by-day analysis of the following events: vessels arriving, vessels loading, vessels waiting, terminal stocks, offloads to vessels, unloads, loads on hand in the port terminals, loads on wheels or enroute to port terminals, primary elevator stocks, car allocation programs and shortfalls. A graphical example of the ship delay analysis in Vancouver is shown in Exhibit 3.

A detailed description of the analysis and findings is presented in Chapter IV of the Technical Report and Appendix B. The principal causal factors contributing to ship queues can be summarized as follows:

- Bunching of ship arrivals in weeks 9 to 18
- Grain in terminal elevator bins not grain required for ships in queues. For Chinese and Japanese contracts, delays resulted from not having the proper protein grades
- Wrong grain ordered in country for ships arriving (may be caused by lead time for delivery in country being longer than lead time available from receipt of accurate ETA's on incoming ships)
- Insufficient storage capacity to handle assortment of grades and peak demands.

While some action was taken to order the required types of grain in the country, the volumes and timing were inadequate. In the case of the Chinese vessels, this may have been due to an attempt to maximize movement through Thunder Bay before the freeze-up; in the case of the Japanese vessels, the reason is not clear, but as a consequence, bids were not tendered in the following month to avoid further jeopardizing of the Japanese market. Even if sufficient car orders had been issued on a timely basis relative to the vessel demand, the evidence shows that the grain distribution system responds too slowly to call forward a substantially different mix of grain than the original order. As shown in Chapter IX, the planning cycle calls for arrival at the ports of all the grain ordered in week 4 by the end of week 6. In fact less than 40 percent of the grain typically arrives by the end of week 6 and some is still trickling in at the end of week 11.

2. SYSTEM INTERFACES ARE CRITICAL

Another finding of the case study is that the interface between the rail system and the terminals, particularly at Vancouver, has an important impact on the throughput attained by each of these system components. There are times when the terminals are unable to work to capacity because of an insufficient number of rail cars waiting to be unloaded, and there are

other times when the railways are suffering car cycle delays because cars are queued up waiting to be unloaded. The former situation may result in some cases from avalanches or other disruptions of rail service, but is more likely to result from failures in the overall inventory planning and control systems, which result in the wrong grain being received while certain terminals are left waiting for the required types and grades of grain. The latter situation, rail cars queuing to be unloaded, may result from congestion in the terminals, which could be due to lack of expected vessel arrivals or to planning and control problems which resulted in the wrong types of grain being in the terminals; another cause can be failure to activate more shifts per week at the relevant terminals (for unloading, cleaning, drying or shiploading) in order to clear away the railway backlog. In December, 1978 a large part of the problem was the result of a labor dispute in Vancouver.

The findings of the Vancouver case study led to the development of a computer model to analyze better the complexities and interactions of the logistics system.

3. A COMPUTER MODEL WAS DEVELOPED TO TEST THE DYNAMIC INTERACTIONS OF THIS SYSTEM

The Grain Transport and Handling computer model developed covered the main elements of the grain handling and distribution system:

- Ordering and loading cars at the primary elevator
- Railway movement
- Terminal operations and processing of grain in the port
- Ship arrival and loading.

This model simulates all elements of the grain handling system including capacity limitation introduced by the limits of car supply, the ability to deliver, load and pick up cars in the country, congestion and delays on the main lines, dispatch and holding yard limitations in the ports, and the capacities of the various processes within each terminal as well as ship loading. A more detailed outline of model logic is contained in Appendix C to this report.

Four runs of the model were carried out, focusing on deliveries to the Port of Vancouver:

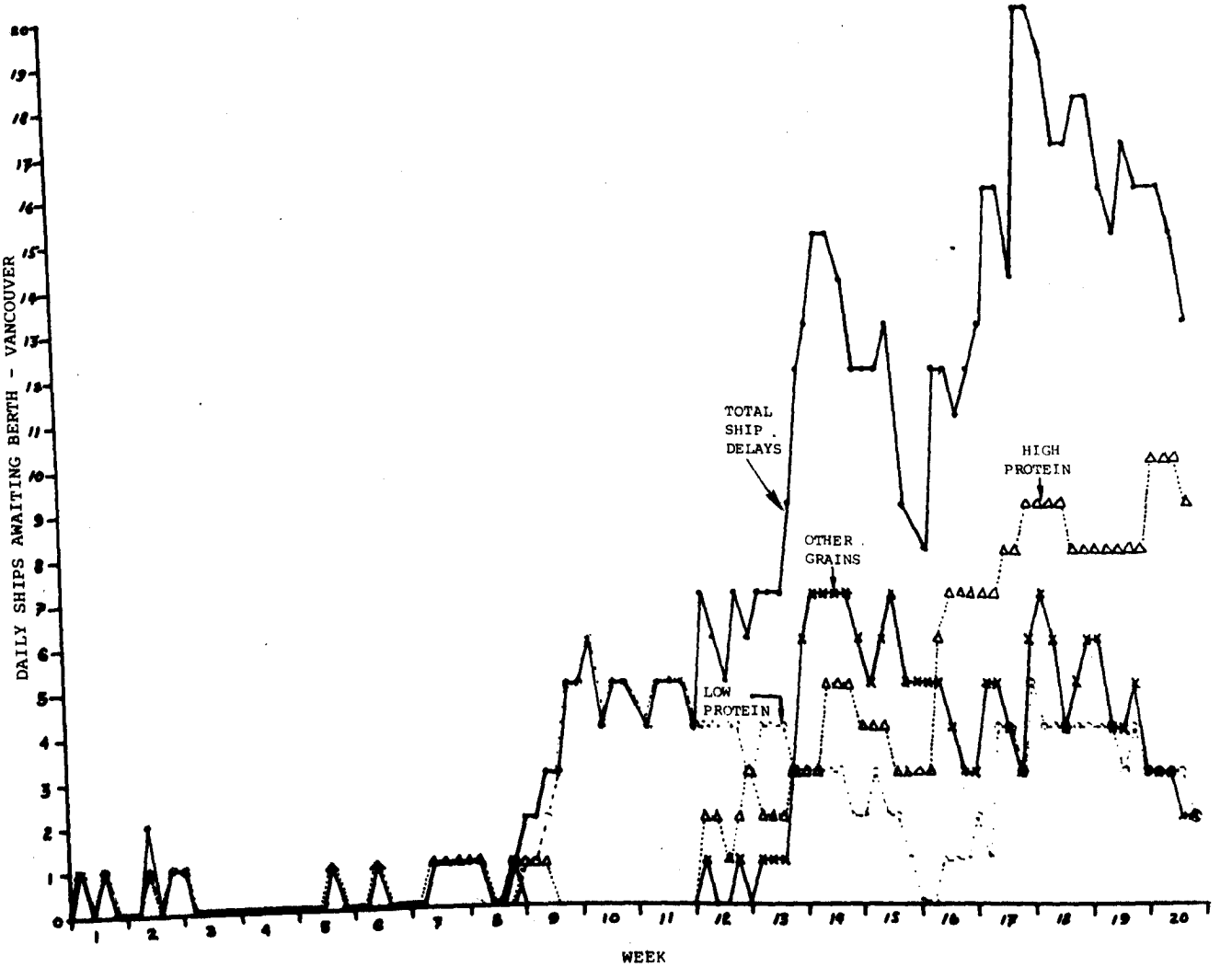
- A "calibration" run for 1978 to ensure that the model was performing realistically
- A 1985 run with committed terminal throughput and storage capacity improvements, but no additional rail cars
- A 1985 run with committed terminal throughput and storage capacity improvements and with additional rail cars
- A 1985 run with additional shifts operated and some further improvements to the existing and committed Vancouver terminals, plus the additional rail cars as in the third run.

The 1985 runs assumed top of the high forecast range demand volumes.

The broad findings were as follows:

- The 1978 run reproduced week-by-week volumes, transit times, number of ships queuing, etc., in a realistic manner, week by week
- The second run showed that more rail cars are definitely needed by 1985, and without them over 200 vessels would be queuing in Vancouver by the end of the year
- The third run showed that, with the additional rail cars, terminal throughput could be the constraining factor, and over 100 vessels would be queuing by the end of 1985 in Vancouver even with the added terminal capacity now committed or under construction
- The final run showed that even if committed Vancouver terminals were run with additional shifts and other throughput capacity improvements, plus the additional rail cars, the system would be marginal and probably not adequate for 1985 volumes, with ship queues reduced to the range of 25-50 vessels waiting.

EXHIBIT 3
Vessels Waiting By Grain Types
Vancouver Crop Year 1978/79



While other model runs would have been desirable, the four runs were sufficient to draw these basic conclusions.

The main finding of the model runs and related analyses was that running the Vancouver terminals "flat out," even with additional rail cars and committed expansion plans plus some additional throughput improvements, would not meet West Coast grain delivery requirements in 1985 at the top end of the high demand forecast. Capital investment in additional West Coast terminal facilities, beyond those presently under construction or committed, will therefore be required if lost potential grain sales are to be avoided. General congestion and main line rail capacity limitations suggest that the new terminal facilities should be constructed in Prince Rupert rather than Vancouver. A facility in the 10 million bushel storage capacity range may be needed for 1985 volumes.

V. GRAIN CAR CYCLES

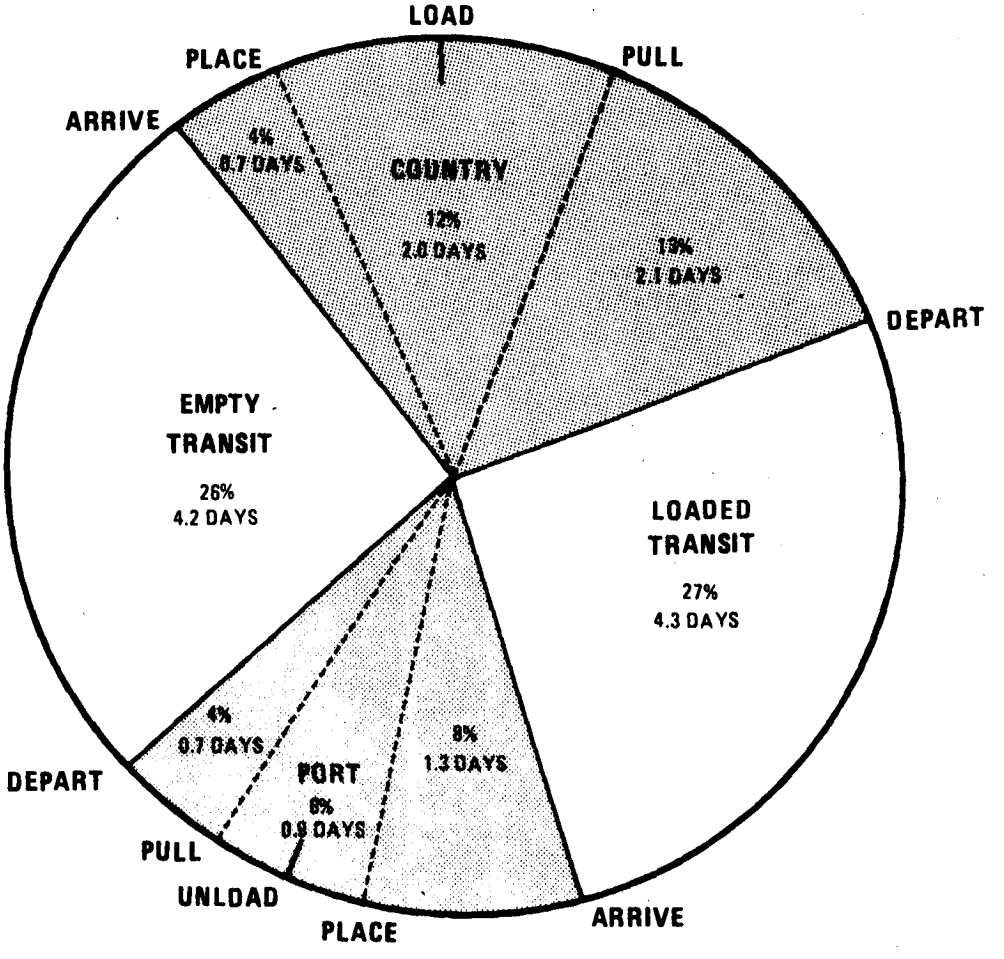
One of the major concerns of the operations analysis was whether the rail transportation system has the capacity to move grain from the country elevators to the terminal elevators in the ports on a timely and efficient basis both now and in the future. If not, the analysis proposes to estimate the added capacity requirements, considering trade-offs between alternative investments to meet present or projected sales commitments. For example, some participants have suggested that marketing efforts be directed at achieving more uniform and predictable ship arrivals, thereby reducing loss of capacity due to peaking in the demand for railway equipment and facilities. Others have suggested that additional buffer storage at the ports (especially on the West Coast) is a more realistic alternative, since buyers in the world market buy to minimize their own peaking problems. This often inherently conflicts with reducing the peak problem on Canada's west coast. Alternatively, others suggest that the solution is not greater elevator capacity, but rather the purchase of more grain cars.

Further complicating the issue are suggestions that the existing grain car fleet is poorly utilized and the capacity of the railways to meet export delivery commitments is constrained by the low priority given to grain traffic (reflecting railway losses at Crow Rate levels) and scarce resources (also reflecting an inadequate return on investment, primarily locomotives, main line capacity and yard capacity).

1. RAIL CAR CYCLES WERE ANALYZED

Much attention in the operations analysis was therefore directed at developing a better understanding of car cycle times (the time required for a rail car to make a complete round trip from the time it is loaded at the country elevator, moved to the terminal elevator, unloaded, and returned empty to the country) for grain movements. Analysis of car cycles provides insight into which elements of the movement may be taking longer than necessary, and the extent to which improvements might be achieved. Clearly, if car cycles can be reduced, the utilization of the existing car fleet would be improved and the necessity to purchase new rail cars correspondingly reduced. Exhibit 4 illustrates the components of the car cycle using overall CN car cycle data.

EXHIBIT 4
Grain Car Cycle Components



TOTAL CYCLE 16.2 DAYS*

*BASED UPON CN THIRD QUARTER DATA (CN DATA BASE PROVIDES DETAIL OF COMPONENTS AS SHOWN, CP DATA BASE DOES NOT).

A detailed analysis of loaded car movements was carried out based on computerized records from the Canadian Wheat Board (72,864 loaded car records for four railways: Canadian Pacific, Canadian National, Northern Alberta and Great Slave Lake) covering the winter, spring and fall of the 1977/78 crop year. It is the loaded car movement times which reflect any delays during the movement of grain from the country elevator to the ports. The delays, which may or may not influence the railways' performance, are very significant in terms of the system's responsiveness to the CWB.

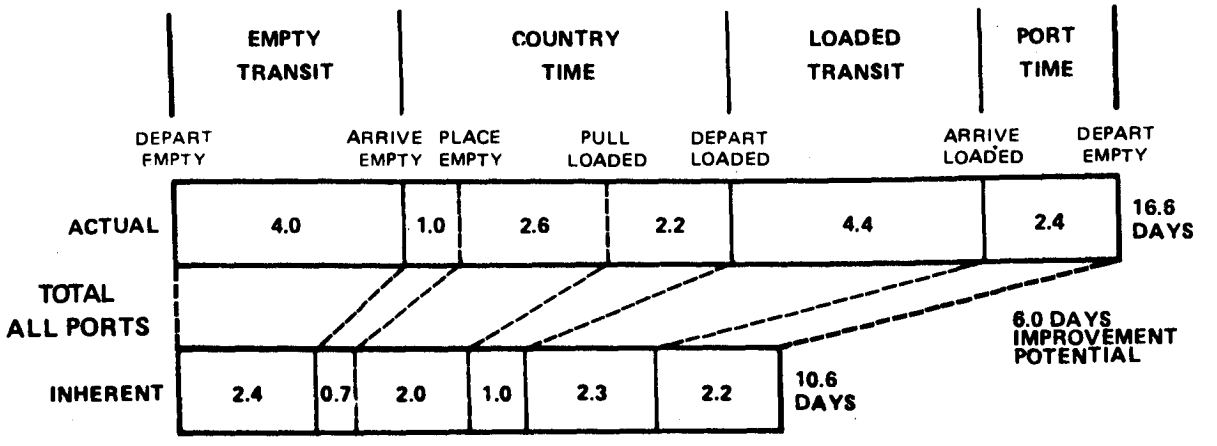
For the same crop year, a large sample of both loaded and empty grain car movements was obtained in computerized form from both CN and CP, and these also were studied. This analysis produced details on car cycles to each of the four ports, for each season of the year and for each railway, in 1977/78. In addition, a more detailed analysis was made of car cycle times from each of the 14 sampled blocks (7 on the CP system and 7 on the CN system), in order to provide a more specific assessment of car cycle times from each of these origins.

2. POSSIBLE CAR CYCLE REDUCTIONS WERE ASSESSED

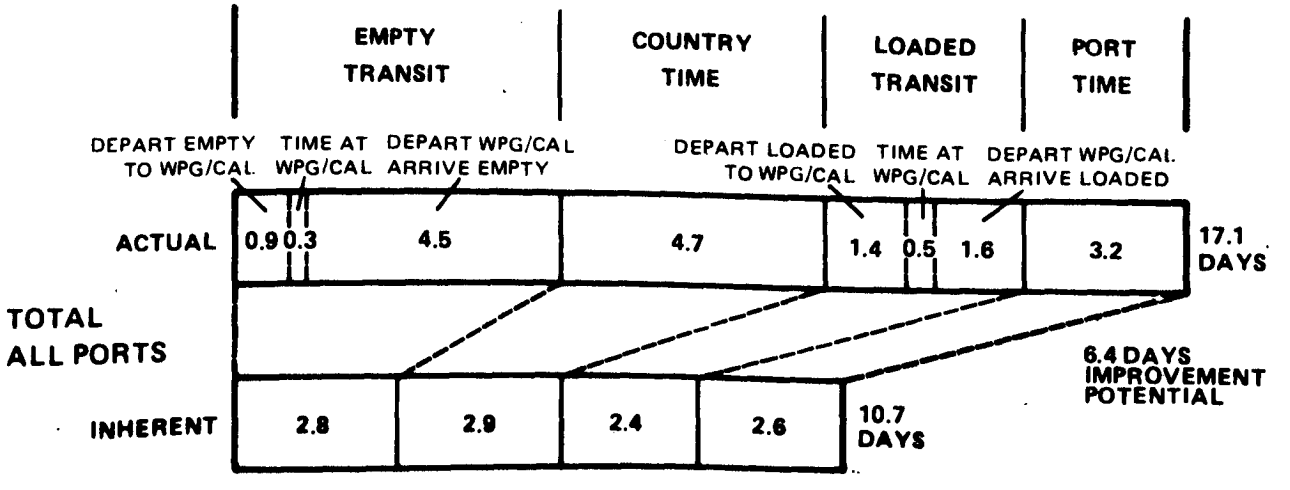
The concept of "Inherent Cycle Time" was developed and used to provide a measure of cycle component times which are achievable, given present operating patterns. A comparison was made between inherent and actual cycle times to provide an indication of the amount of reduction in cycle times which might be achieved and to ascertain those parts of the car cycle which might have the greatest potential for improvement. The results of the comparison between actual and inherent car cycle times are summarized graphically in Exhibit 5. They indicate that, in total, average cycle times of 16-18 days are actually experienced, while the inherent cycle times are calculated to be in the range of 10-11 days. It must be stressed that the inherent cycle time would probably never be achievable on a sustained basis in practice, because it requires that all operations (loading, unloading, switching, hauling, etc.) be carried out without significant perturbations or mistakes. To allow for this, based on the consultant's experience, a target for improvement was set at 40 percent of the difference between the actual and inherent cycle times. It is assumed this target might be achieved through operating improvements. The result of this achievement would be a car cycle reduction of about 15 percent, and a like increase in utilization of the car fleet. If the

EXHIBIT 5
Actual vs Inherent Car Cycles

CN
SEVEN BLOCK SAMPLE



CP
SEVEN BLOCK SAMPLE



target is achieved, car cycles would be decreased by about 2½ days, from 16-18 days to 13-15 days. This 15 percent improvement in overall car cycles equates to approximately 4,000 cars saved.

It should be noted here that reductions in rail car cycle times will require concerted action by all participants, not just the railways. Compensatory rail rates and imaginative price structures would be beneficial in providing monetary incentives to achieve more efficient use of the grain car fleet.

VI. PRAIRIE OPERATIONS AND REQUIREMENTS

The grain storage and handling system on the Prairies, (on-farm storage and the primary elevators) represents the largest reservoir in the system for storing grain and the means by which grain enters the distribution system. As such the operations on the Prairies vitally affect the operation of the other system components, including rail operations, terminal operations, and the ability to call forward and deliver required types and volumes to meet vessel loading demands. The ability of the primary elevator to accomodate producer deliveries, the level of service provided, and elevator pricing structures, all have a direct impact on the interests of producers and their assessment of the effectiveness of the distribution system.

In order to assess these impacts and areas for improvement, analyses were carried out in the following areas:

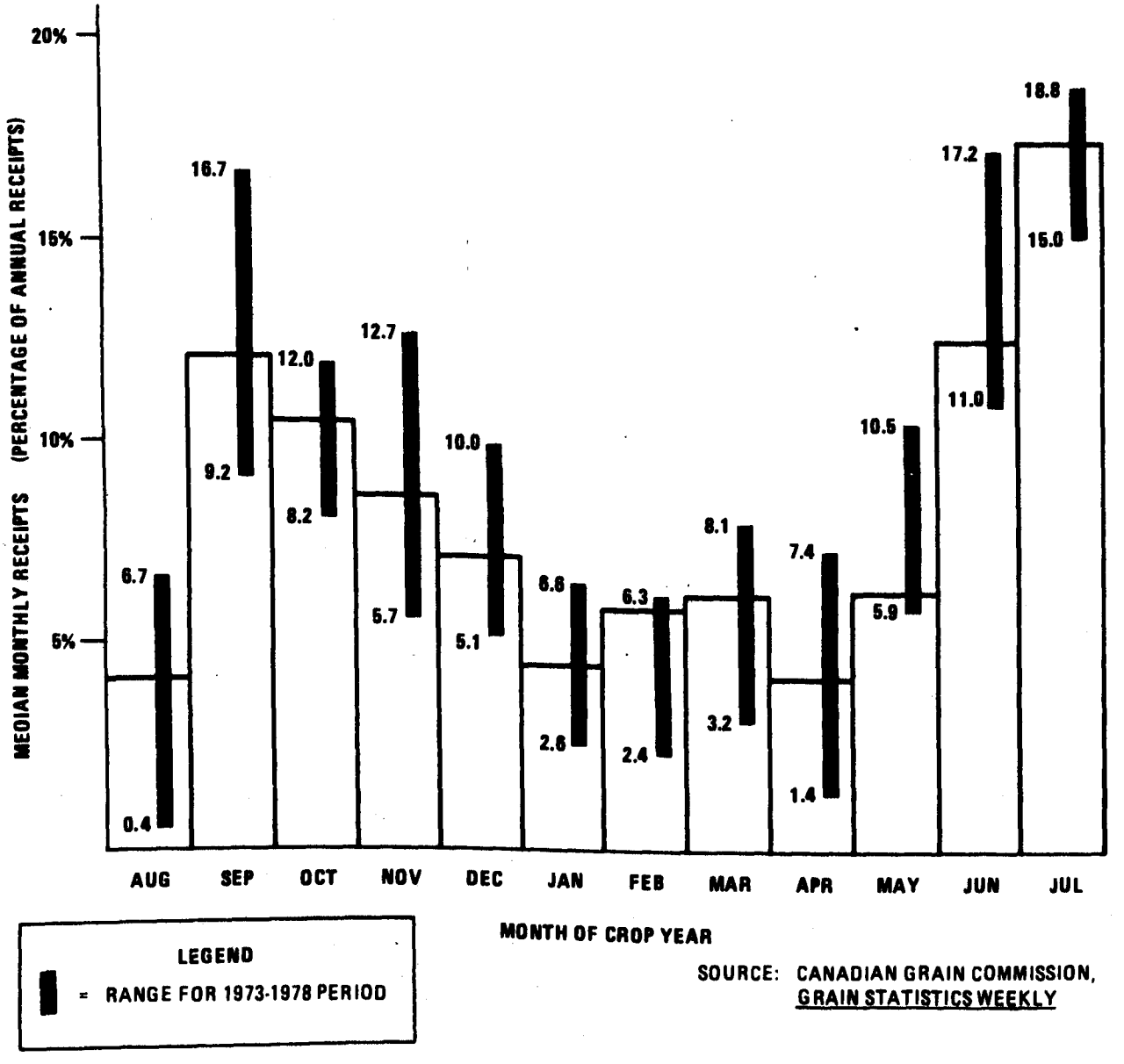
- Farm storage, delivery quotas and producer cars
- Consolidation of the primary elevator system
- Primary elevator operations
- The interface between primary elevator operations and the railway system
- The impact of rail line abandonment.

1. PRODUCER DECISIONS AFFECT SYSTEM PERFORMANCE

The producer and the facilities he maintains are a key element in the whole system. On-farm carry-over from one crop-year to another can approach annual production levels. Also, since the harvest is generally moved directly into on-farm storage, at least one year's storage must be provided on-farm. This represents the intitial surge capacity for the system.

Increased on-farm drying would also be beneficial in a year with wet harvest conditions. This would require proper incentives for the producer to purchase the necessary equipment.

EXHIBIT 6
Monthly Distribution of
Primary Elevator Receipts



SOURCE: CANADIAN GRAIN COMMISSION,
GRAIN STATISTICS WEEKLY

The monthly distribution of primary elevator receipts over the past five crop years is shown graphically in Exhibit 6 and indicates that there may be some potential for improved capacity utilization through more uniform deliveries. While this might be achieved, in part, by greater enforcement of terminating quotas and, possibly, price incentives, the potential impact on delivery peaking and system operating efficiency would be limited by other factors such as seeding and harvesting requirements and the difficulty of making deliveries during the winter months.

It has been noted that the number of producer cars has been increasing rapidly during the past two or three years, from a level of about 200 cars per year to over 3,000 in the 1978/79 crop year. This increase has been a matter of concern to the railways in terms of its detrimental effects on efficiency of rail operations. The reintroduction of quotas on Non-Board feed grains, which were scheduled for the beginning of the 1979/80 crop year, can be expected to restrict greatly the use of producer cars because the acreage of land planted to a particular crop would have to be quite large for one producer to accumulate enough quota to load a car, particularly a hopper car. It is thus expected that if these regulations come into effect the number of producer cars will decline again during the coming year.

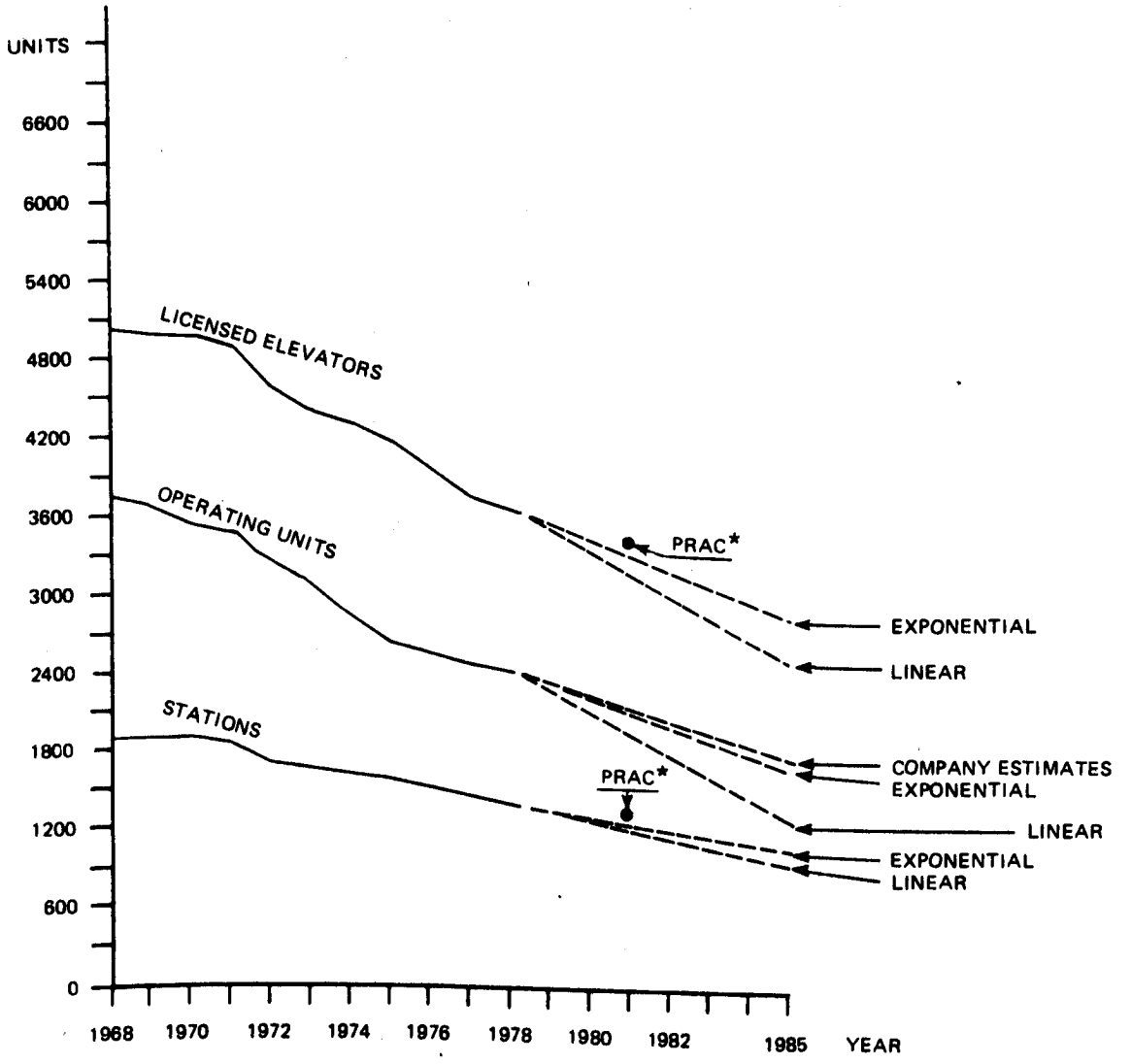
The quota system, which regulates the entry of grain into the system, was analyzed. It is possible to improve this system; however, continuing data on on-farm inventories and their condition would also be required.

2. ELEVATOR CONSOLIDATION TRENDS WERE STUDIED

Trends in the number of country elevators, operating units and stations over the past decade were analyzed and projected into the future. These projections were compared with future expectations of the grain companies. The results are summarized graphically in Exhibit 7. They show that the number of elevators dropped from about 4,800 in 1971 to about 3,700 in 1978 and is expected to continue to drop to about 2,600 in 1985. Similarly, the number of stations dropped from about 1,800 in 1971 to about 1,400 in 1978 and is expected to drop to about 1,000 in 1985.

Consolidation has resulted from a number of factors, including the impact of improvements to the rural road network, the introduction of high throughput elevator designs, improved safety and health standards which are costly to

EXHIBIT 7
Projections of Primary Elevator System



*Estimates of reduction in the number of elevators and stations through line abandonment made by the Prairie Rail Action Committee (PRAC) in its report of January 1979.

implement in older facilities, rail line abandonments, increased elevator labour costs and related factors. All of these are expected to continue bearing on future operations.

They will be reinforced by other factors such as potential impact of the hours of work legislation that has been scheduled for application to primary elevators and the effect of the Hall Commission and Prairie Rail Action Committee (PRAC) recommendations on the pace of branchline abandonment. These will tend to accelerate the trend to fewer elevators and fewer stations. This, in turn, can be expected to improve the efficiency of prairie rail and elevator operations while requiring somewhat longer truck hauls by producers to primary elevators.

An analysis was made of a recent survey of producer attitudes which was carried out by the Department of Agricultural Economics of the University of Saskatchewan. This indicated that the producers surveyed placed a great deal of importance on the value of competition and would generally be willing to truck their grain several miles further in return for improvements in the level of service provided. This would seem to support the continuation of elevator consolidation as noted above.

One way by which reinvestment in modern primary elevator facilities can be encouraged is the development of a variable pricing structure for primary elevators.

3. PRIMARY ELEVATORS SHOULD PRESENT NO MAJOR OVERALL CAPACITY CONSTRAINT

A sample assessment was made of the number of grades of grain handled by various country elevators and terminal elevators and the possible impact on distribution efficiency of reducing the number of grades handled and marketed. While grain marketing was beyond the scope of this operations analysis, it was concluded that a large reduction in the number of grades would have a significant impact on system efficiency although it is uncertain whether Canada's ability to market grain would be maintained if a large cut in grades were made.

Perhaps of more significance is the requirement of a number of important customers (e.g. Japan) for high protein wheat. A preliminary assessment of the problems associated with identifying wheat protein levels was made. Substantial inefficiencies are introduced because of inadequate knowledge

of protein levels of wheat on hand in the country. For example, 100 cars of wheat are routinely called forward from those blocks which normally have high protein levels in order to obtain approximately 60 cars of the required protein level; the excess 40 cars become a source of congestion and inefficiency in the system. A subcommittee of the CWB is studying the feasibility of a means of measuring protein content and providing up-to-date inventory information on this factor at the country elevators, and a decision on the two approaches being studied should be forcoming in the near future.

Misshipments or shipments of the wrong grades of grain also introduce inefficiencies into the system. A comparative analysis was made of the types and grades of grain authorized to be loaded at primary elevators with those unloaded at the terminals, for a sample 12-week period in 1978 in an effort to identify and measure the effect of misshipments on throughput and efficiencies of the grain logistics system. The results of this analysis indicate that approximately 79 percent of the authorized shipments were filled exactly as specified. Seventeen percent of the shipments were unloaded and graded by Canada Grain Inspectors with a single grade difference from that authorized and 3 percent had a difference of two or more grades. Only 1 percent of the shipments were of a different type of grain from that originally authorized. The implications of these misshipments and misgradings should prompt the establishment of management incentives and controls which could improve performance, as discussed later in this report.

While single grade differences may be difficult to identify in the field using current grade methods, they result in system inefficiencies. Also very significant are the errors of more than one grade, or errors in type, which not only reduce the efficiency of the logistics system but also may represent a deliberate frustrating of the system in order to relieve local problems in the primary elevators.

4. RAILWAY OPERATIONS INTERFACING WITH COUNTRY ELEVATORS WERE ALSO ANALYZED

A number of analyses were carried out on the interface between primary elevator and railway operations to identify improvement opportunities, including schedule reliability of rail operation, days of the week of rail service and primary elevator operations, car spotting capacity, shortfalls,

destination tagging, and producer cars. While the country operations were found, in total, to be quite effective, it was noted that improvements are possible and desirable by using more layover turns and improving communications from the railways to the primary elevator managers; this, in turn, would make it feasible for country elevator managers to match their operations to rail service and thereby improve car utilization by about one day per cycle.

Car spotting capacity is a problem at some elvators, and this requires joint activity by the grain companies and railways. Car shortfalls are a significant problem in the planning and control of the system, since they introduce an element of discretion on the part of both railways and country managers as to which car orders will actually be filled. It was found that about 3 percent of rail cars arrive at the ports without legible destination tags, a source of inefficiency during terminal switching operations.

5. THE IMPACTS OF BRANCH LINE ABANDONMENTS WERE ASSESSED

Approximately 3,450 miles of Prairie rail network have been recommended for abandonment by either the Hall Commission or the Prairie Rail Action Committee (PRAC). To date the Canadian Transport Commission has approved abandonment of approximately 1,401 miles and is presently reviewing the remaining 2,049 miles. These proposed abandonments may contribute to reduced railway operating costs if carefully managed. Line maintenance and rehabilitation cost savings would also be realized. Although the same number of cars must be loaded as before (but at different points), the railways can reduce the number of train runs on these low density lines, probably reducing crew and power requirements and possibly reducing car requirements.

To measure the effect of line abandonments, an analysis was performed for thirteen subdivisions recommended for abandonment by PRAC. Although this sample is not necessarily representative of all proposed abandonments, it does illustrate the nature of the abandonment effect on the railways. Two types of subdivisions were analyzed: those recommended for full abandonment and those recommended for partial abandonment. The analysis was performed by estimating the transfer of car loads from the lines to be abandoned to adjacent lines not scheduled for abandonment.

The overall findings from this analysis were as follows:

- Service frequency increases on lines adjacent to abandoned lines should be minimal and some railway cost savings will occur due to reductions in trips. These will be primarily savings in engine and crew hours rather than savings in the numbers of crews required.
- Complete subdivision abandonments will probably result in greater relative savings for the railways than partial abandonments.
- PRAC and Hall recommended abandonments will probably only improve car cycle times to a minor extent
- Savings of 65 to 75 crew and locomotive days per week can be anticipated, in total, from subdivisions recommended for full abandonment, consequently offering opportunities for more effective redeployment of manpower resources.

6. THE PRAIRIE SYSTEM WILL BE ABLE TO HANDLE INCREASED FLOWS

Although there are many improvements which can be made to the grain logistics system on the Prairies, the basic system as it is evolving can handle the increases in grain volumes expected. The improvements outlined in this chapter are mainly concerned with management, information flow and system control, rather than requiring large investments of public money for capital facilities.

VII. PORT OPERATIONS

Grain is shipped to market through eastern terminals at Thunder Bay and Churchill and western terminals at Vancouver and Prince Rupert. These terminals are, on occasion experiencing difficulties in handling the present volumes of grain. Some of these difficulties are caused by interactions with other parts of the system, such as grain received of a type not immediately required, or a shortage of rail car arrivals in comparison with immediate needs. However, given the significantly higher volumes of grain that may be anticipated in the years to 1985, questions are raised as to the ability of the terminals themselves to handle the necessary volume assuming that the supply of rail cars and locomotives and the capacity of the main line and yards evolve to provide the additional capacity needed.

1. TERMINAL OPERATIONS WERE OBSERVED AND ANALYZED

Field visits were made to the ports and most of the terminals to observe handling methods. Interviews were held with operating personnel and data collected regarding rated and practical throughput capacities. Shifts worked, interface matching between railways and the terminals, switching and interchange operations, cars arriving at the wrong destination, and a variety of other factors were considered.

Analyses were carried out for the four ports considering the following important issues:

- How terminal throughput capacity, in the east and in the west, compares with the demand that may be anticipated through those ports in the near future
- Additional increases that may be indicated in unloading, cleaning, offloading, drying and storing capability
- Whether new capacity if needed should be added at Thunder Bay and Vancouver or whether greater use should be made of Churchill and Prince Rupert
- Whether further pooling, switching, interchanging or terminal elevator specialization should be considered.

Primary attention was focused on Vancouver, owing to the higher projected growth rate and capacity pressures already being experienced at that port. The problems in the west and in the east are quite different; accordingly, results are summarized below first for west coast ports and then for the east coast ports.

2. WEST COAST PORTS ARE EXPERIENCING THROUGHPUT LIMITATIONS

The analysis indicates that terminal throughput capacity in the west coast is primarily constrained by the ability of the elevators to clean grain, although as presently operated with unloading on two shifts and cleaning on three shifts, unloading appears to be the limiting factor in some cases. The analysis indicates that offloading to ships is not a limiting factor once the grain is at the terminal and the ship is at the dock.

(1) Committed Vancouver Terminal Expansions Will Increase Throughput Capacity

The estimated practical throughput capacity of the five west coast terminals as they operated in 1978 was 995,000 tonnes a month. Given the seasonal nature of demand, the yearly performance was equivalent to that of about 8.5 peak months, at 995,000 tonnes, or about 8,500,000 tonnes a year. This will be raised to an estimated capacity of 10,800,000 tonnes a year in the 1979/80 crop year, after the new Pioneer terminal is put into service and minor modifications have been completed at other elevators.

(2) Effective Storage Capacity Has Decreased Relative to Nominal Capacity Owing to More Grades

Based on year-round operation, the west coast terminal elevators typically achieve an average of about 11 storage turns per year, or one turn every 27 working days. Not all of the nominal storage can be used, because of bin requirements to handle the many grades and types of grain. The increase in numbers of grades has been such that the effective storage capacity has dropped from about 80 percent 10 years ago to about 60 to 70 percent currently.

With the high volumes moving through the west coast terminals there is little storage capacity available on the west coast for buffer stocks, to allow for any mismatch between the grades required by the vessels and those supplied by the cars, and little capacity to tolerate interruptions in supply due to plant breakdowns such as derailments, or exceptional peaks in demand. In such a situation, the inventory planning and control process must be very effective, coupled with good information on ship arrivals and their anticipated loading, if ship delays and queues are to be avoided. Errors in the planning and control system, as documented in Chapters IV and IX of the Technical Report, are such that these problems do, in fact, occur regularly.

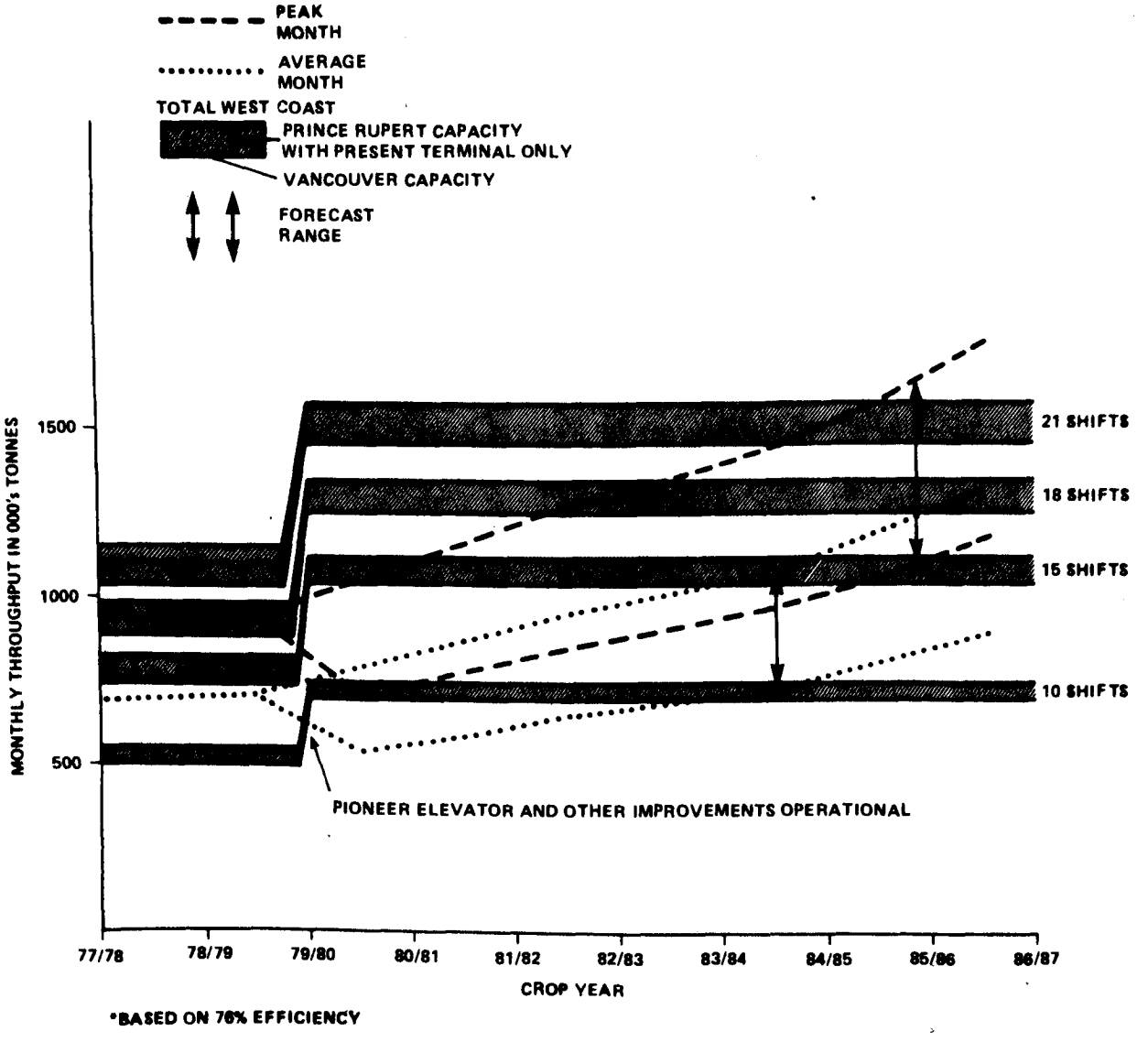
(3) More Terminal Shifts Would Increase System Throughput

Throughput of the terminal elevators can be increased by more unloading shifts per week or by cleaning for more shifts. Exhibit 8 shows the capacity that may be achieved in this way, based on a detailed analysis presented in the Technical Report, Chapter VII. At the top range of the high forecast of grain movement, with terminals operating 15 shifts per week, throughput capability will be exceeded in the peak month of a high volume year by 1980/81. In these calculations the practical throughput rate has been set at 76 percent of nominal throughput rate based on an analysis of Vancouver operations.

(4) Drying Can Be a Bottleneck in Some Years

Drying may be a bottleneck in some years when a wet crop is harvested. However, it is never envisaged that more than 25 percent of the volume will require drying, and in most years, the amount of moisture in the grain is such that less than 10 percent has to be artifically dryed. Drying needs are in this sense different from unloading, cleaning, and offloading, which are operations which have to be performed on all of the grain. Therefore, drying is considered separately and is not taken as an absolute throughput capacity constraint on the system as a whole.

EXHIBIT 8
Demand and Throughput Projections
- West Coast Terminals



*BASED ON 76% EFFICIENCY

(5) More Drying Capacity is Planned

West coast drying capacity is such that the dryers are presently capable of handling about 10 percent of the crop, or about 8 percent of the shipments in the peak month of a peak year. Some addition to drying capacity is anticipated due to the new Pioneer terminal and a new dryer going into operation at Prince Rupert, but by 1985/86 the capability with a full 21 shift per week operation will be down to be drying a maximum of 9 percent of the projected crop on a year-round basis and 7 percent of the shipments in a peak month. In recent years the proportions requiring drying have ranged from less than 1 percent to 22 percent. If it is desired to maintain protection against wet years, it will be necessary to add further drying at terminal elevators or be prepared in a wet year to dry on the Prairies, (either on the farms or in the inland terminals) to a much greater extent than is being done now.

(6) Pooling, Switching, Interchanging, Specialization Were Also Assessed

Pooling grains, switching between elevators, interchanging cars between railways or specialization of certain grains in certain terminal elevators have been suggested as methods of increasing port throughput capacity. Unfortunately, nearly all such changes increase the capacity of one part of the system at the expense of a loss of capacity in another. For example, if each railway delivers its cars to the most convenient elevators which can receive them, car cycle times are kept low; however, storage and elevator facilities may not be used to the maximum and there may be more vessel movements required to accumulate a load. On the other hand if the elevators specialize in the products which they can handle best and if low volume stocks are accumulated in one or two elevators only, elevator and storage capacity may be used most efficiently but rail car movements and interchanges may be increased and car cycles lengthened.

At the present time there is some elevator specialization. Durum is stored only in Saskatchewan Wheat Pool and winter wheat only in Alberta Wheat Pool. Rye is usually assigned to Saskatchewan Wheat Pool and Pacific Elevators. Flax is usually handled by Alberta Wheat Pool and United Grain Growers.

Analyses of the trade-offs involved indicate that the present level of specialization is not unduly detrimental to overall port throughput, but further specialization may not be desirable. Similarly, existing pooling, switching and interchange arrangements appear to work reasonably well, although some additional agreements will be required to allow CP cars to serve the new terminal planned for Prince Rupert. A draft agreement has been worked out by the railways.

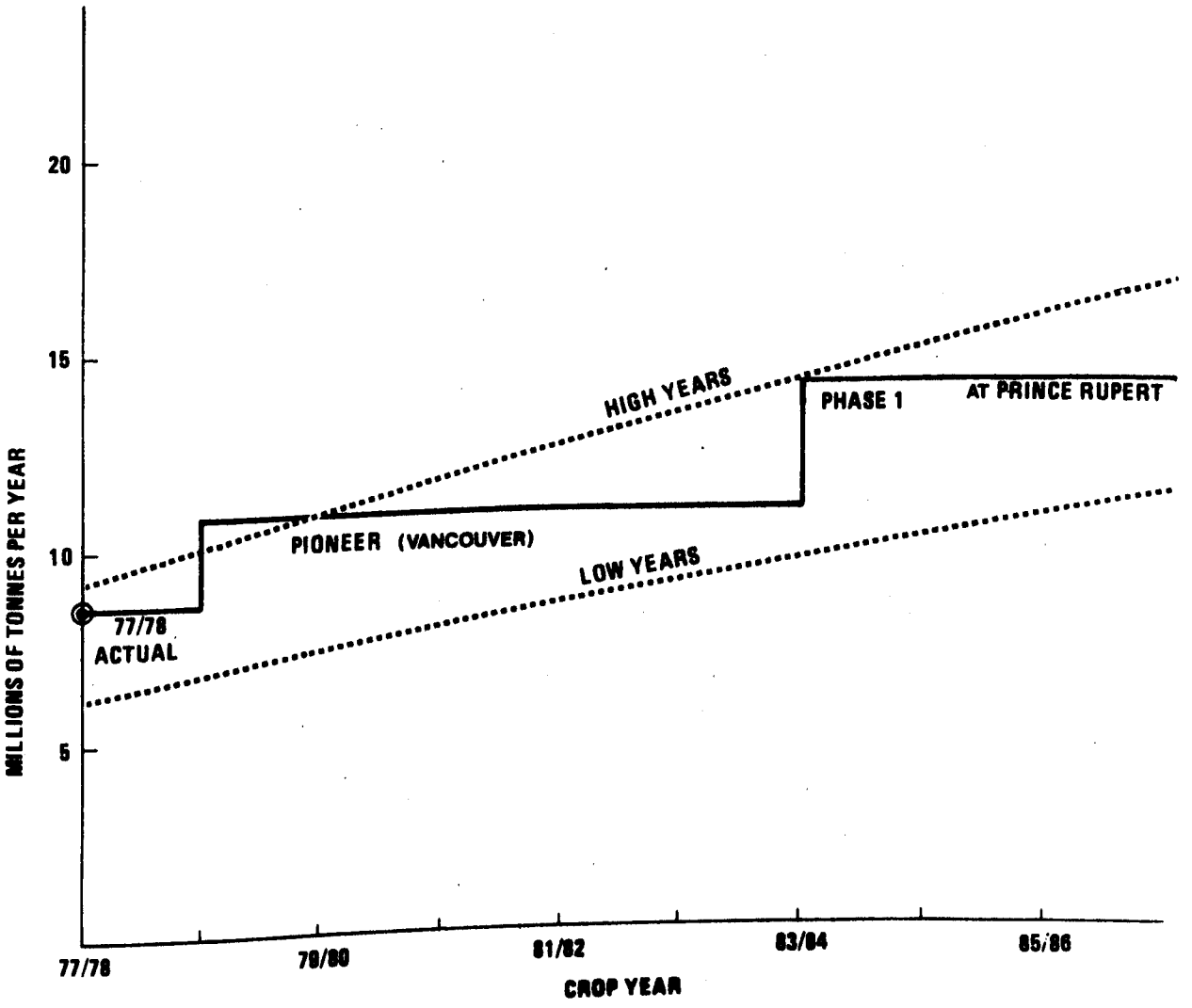
An assessment of the pooling of Non-Board grains was made. The desirability of car pooling for these grains was not established but it is suggested that "paper pooling" of oil seeds would be desirable, so that when there are adequate stocks in the ports, ships may be loaded even when the particular seller does not have his stocks on hand at the time. An industry committee is currently studying this possibility.

(7) New West Coast Terminal Capacity Will be Required

As shown in Exhibit 8, the throughput capacity of west coast terminals, not including a new terminal at Prince Rupert, is expected to be adequate to handle the high demand forecast to about 1982/83 if the present 10 shifts per week were increased to 18 shifts per week. Other operational changes, such as achieving a more uniform pattern of ship arrivals and cleaning some grain on the Prairies and shipping it over the elevators or bulk loading terminals, if such were available for drying, could be expected to extend this capacity for more years, although the extent to which vessel arrival smoothing might be achieved is questionable and beyond the scope of this analysis. Assuming the anticipated high growth rate, it would therefore appear necessary to build new terminal facilities on the west coast, as noted earlier in Chapter IV.

Exhibit 9 compares the annual demand (for the top and bottom of the range for the high growth scenario) with the annual capacity of the existing facilities as presently used. In this comparison, therefore, the same annual pattern of sales demand is assumed and the same number of working shifts is taken as currently exist. Also shown on this exhibit is the expansion of Pioneer and a further supplement in the 1983/84 crop year of 1.5 million tonnes in annual throughput facilities proposed for Prince Rupert.

EXHIBIT 9
Capability and Throughput Projections
- West Coast Terminals



The supplement is based on increments of cleaning which would be appropriate for a 10 million bushel elevator turning 11 times per year. The proposal for a new Prince Rupert facility which has recently been announced, is estimated to cost about $100 million.

It can be seen from the exhibit that such a facility would increase the capacity of the system as presently operated approximately in accordance with high demand estimates. In years of top demand, the shortfall could be met by additional shifts or supplements of clean grain as necessary.

(8) Railway Limitations Will Limit Expansion at Vancouver

While theoretically the throughput capacity of Vancouver terminals might be sufficient to handle high forecast volumes through the mid-1980's, it is by no means certain that the system could be supplied through the mountains and the Fraser Canyon, given rail capacity limitations and the anticipated growth of other commodity traffic.

The construction of Prince Rupert facilities, on the other hand, would be less vulnerable to railway capacity limitations, since lengthening of existing sidings and the addition of new sidings on the Prince Rupert line can keep up with the traffic growth, although CN main line improvements east of Red Pass Junction will probably also be required. New terminal facilities at Prince Rupert would also add storage, which offers greater market opportunities for spot sales, etc., and would add drying capacity for which there is not sufficient provision in the present system when there is a wet but high yield year. It is therefore concluded that an additional terminal of about 10 million bushel storage capacity will be needed at Prince Rupert before 1985 if sales in bumper years are not to be foregone.

3. EASTERN PORT CAPACITY IS NOT SO CRITICAL

The eastern terminals located at Thunder Bay generally serve Atlantic and Mediterranean export destinations. While 10 percent of the export volumes through Thunder Bay are picked up directly by ocean ships, most grain is taken from Thunder Bay by lakers to St. Lawrence River transfer elevators where additional storage provides further buffers between the export demand and the prairie handling system.

In addition, there are substantial volumes moving through Thunder Bay for domestic consumption.

Besides having adequate surge capacity, Thunder Bay is expected to experience a lower rate of traffic growth than Vancouver to 1985/86.

(1) Terminal Capacity at Thunder Bay is Adequate

Given the seasonal nature of the Thunder Bay shipping season, covering about 260 days per year, it is not necessary to be able to clean at a rate equal to the shipping demand in a peak month. With an 8½ month shipping season, it is possible to fill the storage with cleaned grain at the start of the season and gradually deplete it through the season to supplement the ongoing operation. On this basis, cleaning proceeds for 10 months a year.

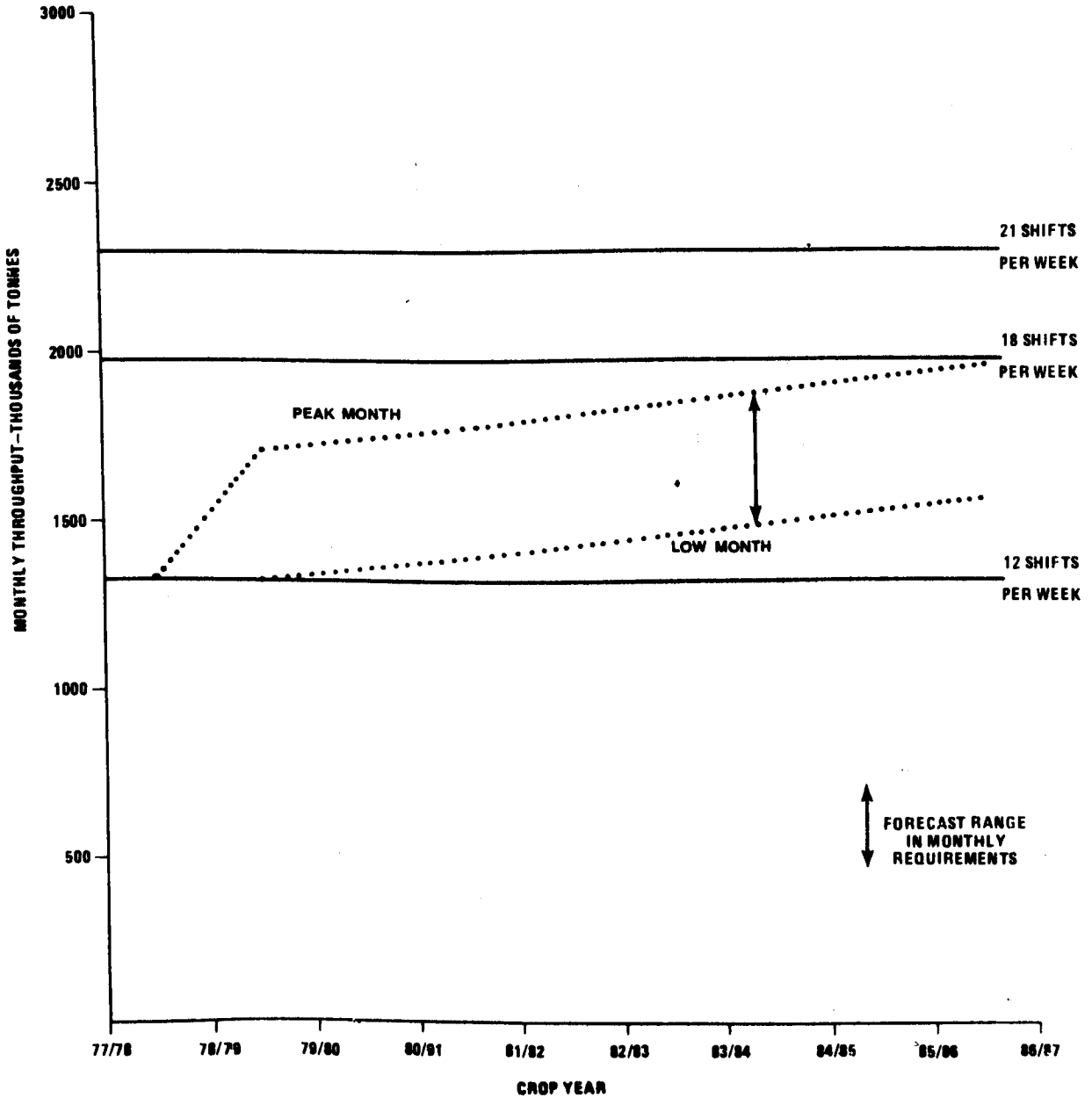
Exhibit 10 compares terminal capacity at Thunder Bay with the average demand over a 10 month year, based on 12 shifts per week (as operated during 1977/78), 18 shifts per week and 21 shifts per week of terminal operations. It can be seen that there is adequate capacity to 1985/86 under the high forecast, if the number of shifts per week rises to 18 as necessary, during peak periods.

A simulation of the storage system was carried out, starting the season with initial stocks, gradually depleting them and refilling the elevators after the close of the shipping season. This analysis confirmed that the Thunder Bay terminal storage should be adequate for the high projections through the 1985/86 planning period.

(2) Expansion of Churchill's Role Depends on Other Factors

The facilities at Churchill are operated effectively and efficiently. However, before significantly larger volumes can be exported through the port of Churchill several problems will have to be overcome. These include the completion of research on the stabilization of the roadbed of the rail line to Churchill which passes

EXHIBIT 10
Capability and Throughput
Projections - Thunder Bay



through a unique zone of discontinuous permafrost. Until an improved technology for dealing with such conditions is developed, and can be applied in the rehabilitation program committed to this line, the line will probably be restricted to box car traffic. Other considerations which limit the use of Churchill include the constraints of a limited season, marketing opportunities, marine technology and marine insurance.

Given these problems and since the most significan growth is anticipated through the West Coast ports, no expansion of grain capacity at Churchill is recommended. Thunder Bay is capable of handling the forecasted increase in volume to the east without major new facilities.

4. PORT INVESTMENTS ARE MOSTLY NEEDED ON WEST COAST

Given the frequency of problems today at Vancouver, and the significant growth projections for west coast ports in grain and other products, capacity constraints are expected to be more acute in the west. Therefore, additional facilities will be required on the west coast, preferably at Prince Rupert. With the operation of additional shifts, Thunder Bay facilities should not constrain movements.

VIII. RAIL OPERATIONS AND REQUIREMENTS

The ability of the railroads to move the grain in the quantities desired between the Prairies and the Ports will depend on having adequate numbers of cars and locomotives as well as sufficient line capacity to handle not only grain, but other more profitable and perhaps higher priority products as well.

1. CAR SUPPLY REQUIREMENTS WERE ESTIMATED

An estimate of current and 1985 grain car requirements was developed and compared with existing car supply trends. The estimate is based on 1978 car cycle turnaround times with and without targeted improvements in car cycle times between now and 1985. The two major factors that could affect improvements in car cycle times and consequent reduction of fleet size requirements are the existing trends in the substitution of higher capacity covered hoppers for boxes and the potential changes in operating plans and procedures, as discussed in more detail in the Technical Report.

An inventory of the Canadian grain car fleet indicates that the number of serviceable cars regularly in grain service at the end of 1978 was about 22,000 units. The fleet currently consists of about 2/3 railway-owned boxcars and 1/3 government-owned hopper cars. The boxcar fleets are old, with an average age of 29 years for CP and 33 years for CN. As a result, the anticipated attrition rates for boxcars are high. Projections to 1985, based on railway company attrition estimates, indicate that the total quantity of cars in grain service will decline to 13,200, or less than 60 percent of the 1978 inventory.

In addition to these surviving cars, there will be in service the 2,000 covered hopper cars which have been ordered by the Canadian Wheat Board for delivery in 1979/80.

If the resulting net new car requirements were met with steel hopper cars carrying an average 80 tonnes with a 3 percent bad order ratio, the following new cars would be required in addition to the 2,000 hopper cars already on

order by the CWB in order to meet the top demand volumes of the high forecast:

- If no improvement in car cycles
  - In the 1979/80 crop year, 1,900 new cars
  - Each subsequent year to 1985/86, 1,900 new cars
  - By 1985/86 a cumulative total of 13,300 new cars
  - The cost of this cumulative total of new cars, at current prices of about $43,000 per hopper car would be about $572 million in 1979 dollars.
- If car cycles improved by 15 percent
  - In the 1980/81 crop year, 800 new cars
  - In each subsequent crop year to 1985/86, 1,700 new cars
  - A cumulative total of 9,300 new cars by 1985/86
  - The cumulative car total would cost about $400 million based on a price of $43,000 per hopper car at 1979 prices.

The above car requirements are based upon the top demand volumes of the high forecast, a situation which would occur if good crops were obtained each year and world demand were sufficient to absorb them. If mean demand levels of the high forecast were experienced, the number of new cars required to 1985/86 if no car cycle improvements were achieved would be 9,400 (at a cost of $409 million in 1979 dollars) while 6,000 cars (at a cost of $258 million in 1979 dollars) would be needed to 1985/86 if a 15 percent reduction in car cycles were achieved.

It will be noted that the number of new cars required to meet top demand volumes with a 15 percent reduction in car cycles is approximately the same as the number required to meet mean demand volumes with no reduction in car cycles. It is therefore recommended that this number be used as the basis for car purchases during the next five years in a program as shown on the following page.

Year	No. Cars	Cum. Total
1980/81	1,900	1,900
1981/82	1,900	3,800
1982/83	1,900	5,700
1983/84	1,900	7,600
1984/85	1,700	9,300

Purchases beyond 1984/85 would depend on the degree of car cycle time improvements and then current volume projections.

These purchases would be in addition to the 2,000 cars now on order by the CWB.

Assuming 9,300 cars are acquired in the next five years coupled with the addition of the Prince Rupert facility referred to elsewhere, the top range of the high forecast can probably be met, such that sales would not likely be lost in those years if bumper conditions were experienced and car cycle improvements can be achieved. On the other hand, if only the mean demand levels of the high forecast were experienced, close to this number of cars would still be required if the car cycle improvements are not achieved. In view of the uncertainties regarding the extent and timing of car cycle improvements, it would appear to be prudent to acquire cars at the rate of 1,900 per year at least for the next few years.

If 9,300 new cars are purchased, the total cost would be about $400 million at 1979 prices. The return on this investment appears to be very high, since potential lost grain sales in any one year if the investment were not made (and the top forecast range of demand were experienced) would be well in excess of $500 million. The "downside risk" of the investment is therefore small, given that the cars will be required for replacement eventually, and future purchase prices probably will be substantially higher because of inflation. Additionally, a "bumper" year or two, which can occur at any time, might well be sufficient to recoup the investment cost in new cars through increased sales made possible by the additional car capacity.

2. LOCOMOTIVE REQUIREMENTS WERE ESTIMATED

Analyses were carried out of existing and future mainline and branchline grain movement locomotive requirements for both CN and CP as well as replacement requirements due to retirement of older units.

The number of locomotives required in 1978/79 and 1985/86 are as follows:

	Number of Locomotive Units Required		
	1979/80	1985/86	Additions to Serve Growth
CP - collection network	100	134	34
- main line	102	132	30
Total	202	266	64
CN - collection network	102	137	35
- main line	75	101	26
Total	177	238	61
TOTAL BOTH RAILWAYS	379	504	125

The capital cost of the 125 additional locomotive units to serve growth projections is about $106 million in 1979 dollars.

In addition the fleets of locomotive units used for grain are aging. Most modern units being built cannot be accommodated on large parts of the branchline network because of weight restrictions. Grain service requirements on these lines can only be met by acquiring new lightweight locomotives or by moving most of the older units in the fleets of the two railways to the Prairies. If only 20% of the total grain locomotive fleets are retired an additional 76 units could be required with an additional capital investment of $65 million. Therefore the total additional investment to meet growth and replacement requirements for grain movements would be $171 million in 1979 dollars.

3. LINE CAPACITIES WERE ANALYZED

Another major concern is the capacity of the mainlines of CP and CN through the mountains and the Fraser River Canyon. "Stringline" capacity analyses were carried out for this reason on the CN and CP mainlines westward from Edmonton and Calgary, based on a calculated requirement of 39.5 westbound trains per day for all traffic, to handle the 1985 projected top volume over the combined routes to the Pacific Coast on a design day basis (1/300th of the annual volume). This breaks down to 19 trains per day via CP to Vancouver (versus 15 trains per day at present), 16 trains per day via CN to Vancouver (versus 13 at present) and 4.5 trains per day via CN to Prince Rupert (versus 2.5 at present).

The analyses of the line capacities on both CP and CN lines to Vancouver indicated that they could theoretically handle the expected 1985 volumes as projected with present facilities, if the peak traffic period did not coincide with the peak maintenance season. However, both lines would be extremely close to their realistic line capacities, particularly when the heavy maintenance needs required for such high densities of traffic are taken into account. Any breakdown or additional traffic beyond that projected could cause lengthy delays and jeopardize the total efficiency of either line. The Prince Rupert line should be able to handle the projected 1985 traffic volumes with some investment to increase the length of certain short sidings on that line and double tracking near Red Pass Junction.

Both CN and CP Rail have been increasing the capacity of their lines to Vancouver for a number of years in response to traffic growth. While the capacity of both lines can be further increased, the less expensive capacity-increasing projects have already been carried out. Each increment of capacity required in the future will become much more costly. Significantly, a portion of the capacity of both Vancouver lines is utilized by a daily passenger train each way on each line, and resulting differential train speeds and priorities consume a great deal of line capacity. CN capacity improvements west of Edmonton would cost a total of $160 million. CP Rail is in the process of completing three major improvements on their Calgary-Vancouver line. A fourth major improvement involving a new low grade route and tunnel under Rogers Pass is under consideration. It would cost approximately $100 million. A proposal for joint track usage in the Fraser River Canyon section between Kamloops and Vancouver was estimated some years ago to provide sufficent capacity to both railways in this area at a cost of $148 million.

Even these projects, if completed, may not provide adequate capacity for grain to Vancouver. Therefore, a shift of grain movements to Prince Rupert can be justified in terms of providing throughput capacity.

It was indicated by both the CN and CP that their eastbound mainlines between Winnipeg and Thunder Bay would be adequate to carry projected volumes to Thunder Bay through 1985/86 with existing facilities. CP is considering signalling its double track line to facilitate maintenance and overtaking by trains of different speeds.

4. MAJOR INVESTMENTS WILL BE REQUIRED TO PROVIDE CARS, LOCOMOTIVES AND TRACK CAPACITY NEEDED

The investment in railway rolling stock and plant necessary to provide the capacity to move the grain from the country to export positions will be significant. The railways' policy of not investing without adequate return, and the losses the railways incur in handling grain, are expected to preclude their making the investments necessary to move grain. In addition to acquiring and repairing cars, investment in locomotives and line capacity may be required of the government or the CWB unless the rate levels are made compensatory, or grain sales are to be lost.

IX. INFORMATION, PLANNING AND CONTROL SYSTEMS

Detailed observations and analyses were carried out of the inventory planning and control systems employed by the CWB and grain companies to determine how these activities might be improved and the effect of such improvements on the throughput and efficiency of the grain logistics system. The types of information and feedback which are available for inventory planning and control, and the process by which the CWB, railways and grain companies carry out the weekly car allocation, including scheduling of car orders and train runs, under the block shipping system were reviewed. During the course of this work, members of the consultant team attended weekly planning and negotiating meetings and spent several weeks observing the activities of the CWB transportation staff in its role as managers of the block shipping system and car allocation process. A more detailed description of these analyses, the existing information/planning/control processes, and problems identified, is presented in Chapter IX of the Technical Report. The major findings are summarized below.

1. MORE COMPLETE, ACCURATE AND TIMELY INFORMATION IS NEEDED

Insufficient information is available on country stocks of grain, and feedback on car orders filled at country elevators is unduly slow. The lack of information on country stocks includes uncertainty regarding the condition (straight, tough, damp) of grain in some blocks, which can mean that additional drying times at the terminals may not be anticipated properly. Of increasing importance, measurement of protein levels is fragmentary, and an information system to provide these data on a timely basis is not in place. This leads to system inefficiencies such as calling forward 100 cars of grain from "high protein" blocks in order to obtain 60 cars in the port of the required protein level.

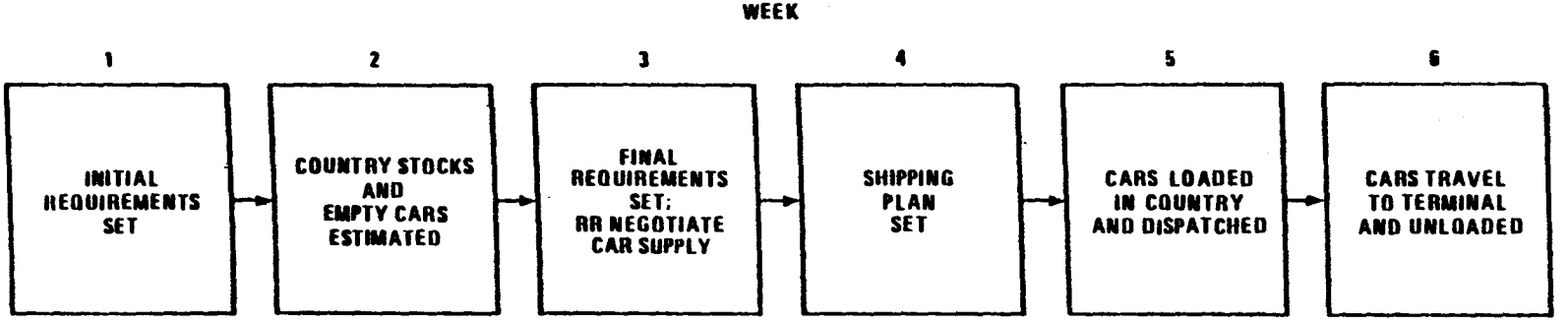
2. FAILURE TO REVISE WEEKLY PLANS TO ACCOUNT FOR CAR SHORTFALLS CAUSES LOSS OF CONTROL

A failure to account for rail car shortfalls in the planning process causes substantial lack of control in implementing the plan. Generally, the CWB produces a weekly car allocation and car order plan which is based upon more cars than the railways are able to provide. It is not clear why this "ritual" persists, but all parties must be comfortable with it since it does persist. The resulting car "shortfall" tends to become cumulatively larger from week to week. When a shortfall exists, the railways have discretion regarding the elevators at which they will spot cars and the elevator managers have discretion regarding which car orders they will fill, using the cars which are spotted. This discretionary element in plan implementation, which grows from week to week as car shortfalls accumulate, means that the CWB cannot be sure which elements of its weekly plan will in fact be acted upon. The situation is compounded by the fact that information on which car orders are actually filled at country elevators takes approximately one week to find its way back to the CWB in Winnipeg, via the grain company head offices.

3. TRANSIT TIMES ARE NOT DEALT WITH EXPLICITLY ENOUGH IN WEEKLY DELIVERY PLANS

The grain transportation planning process uses a six-week cycle as illustrated in Exhibit 11. This does not provide an adequate look ahead under present conditions in terms of transit times of loaded rail cars from the country elevators to the terminals. As shown in Exhibit 11, the cars are loaded during the 5th week and are expected to arrive at the terminal by the end of the 6th week, with a transit time of one to two weeks. In fact, the transit time from many blocks to relevant ports varies and can be substantially more than two weeks. This is not explicitly taken into account in the planning process. A planning process which deals more explicitly with the actual loaded car transit time from each block to each port would be substantially more effective as a basis for achieving grain unloads of the desired types and grades at specific terminals to meet specific vessels.

EXHIBIT 11
The Six-Week Planning Cycle for
Railway Car Orders and Deliveries



4. PLANNING AND CONTROL SHORTCOMINGS LEAD TO SLUGGISH RESPONSE

The combined effects of an unrealistic plan and discretionary response to the plan lead to an extremely sluggish response. As illustrated in Exhibit 12, only 38 percent of the orders placed for loaded cars in week 5 and scheduled for arrival by the end of week 6 actually arrive by that time, based on a sample of the first 20 weeks of the 1978/79 crop year. The remaining 62 percent straggle in during the following five or six weeks, and some 7 percent have not yet arrived after the 10th week. This sluggish response may cause little problem if no change is required in grain types or grades at the various ports. If however, it is desired to rapidly increase shipments of, for example, No. 1 CWRS to Vancouver in order to meet a surge of Japanese vessels, the ability of the system to plan for and implement this change is severely limited, as illustrated by the System Dynamics case study outlined earlier. The failure contributes strongly to ship delays and demurrage payments and to congestion of terminal elevators with the wrong types of grain relative to vessel demands.

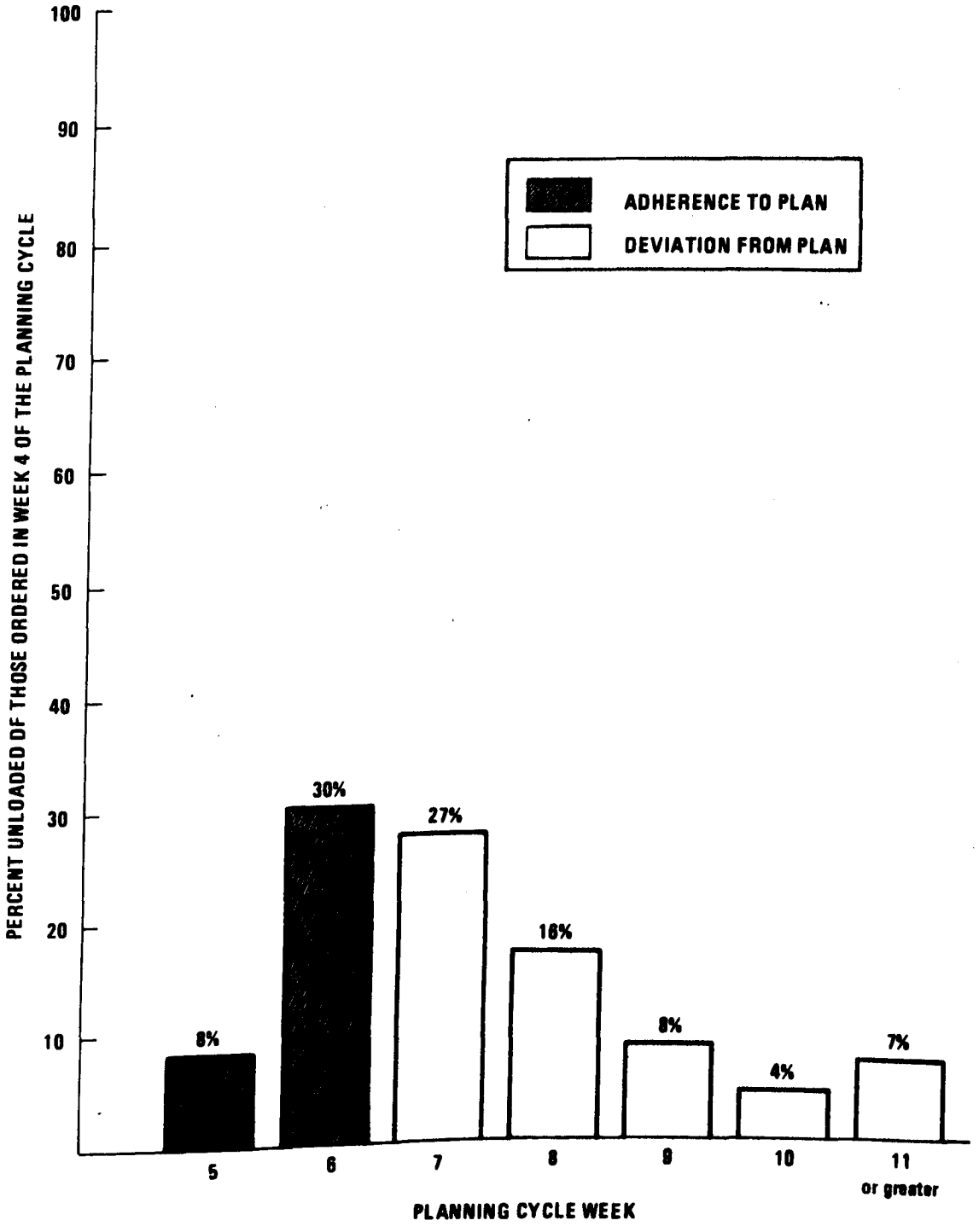
5. GREATER USE OF COMPUTER ASSISTANCE FOR INVENTORY MANAGEMENT AND DISTRIBUTION DECISIONS IS DESIRABLE

The consulting team concluded also that the information. planning and control problems referred to above could be reduced if greater use were made of computerized information handling and display systems and computerized models to assist staff members in inventory and car management decisions. More details on the types of aids referred to are provided in Chapter IX of the Technical Report. The leverage resulting from improved management information systems and inventory management decision aids suggests that substantial returns could be achieved by improvements in these areas.

6. MORE SYSTEMATIC FORWARD PLANNING WOULD IMPROVE THE DISTRIBUTION PROCESS

Another important finding is that there is insufficient planning beyond the normal six-week planning horizon. The existing procedures do not systematically forecast or anticipate demands on terminal elevators, rail car supply, inventory and movement situations for more than one week at a time working within the six-week planning horizon. This means that analysis of future trends and development of a long-term congestion or shortfall strategy are not systematically carried out, and there is little or no strategic planning for the long-term use or improvement of facilities.

EXHIBIT 12
Percent of Cars Unloaded
of Those Ordered
(Average of All Ports)*



* Source: Canadian Wheat Board Block Audit File, 3-month sample, 1978.

A monthly meeting to look beyond the six-week horizon is suggested, as summarized in Chapter XI.

X. INSTITUTIONAL RELATIONSHIPS AND INCENTIVES

The institutional relationships which exist in the Canadian Grain Industry reflect its unique features: the statutory rates, and centralized export marketing of wheat, oats, and barley by the Canadian Wheat Board. These features have in turn led to complex organizational interfaces to make up for the lack of normal commercial incentives. These complex relationships account for many of the problems experienced in transporting grain and make it difficult to pinpoint responsibility and make changes. Looking ahead, the issue in Canada is one of investing to provide the transport and handling system capacity needed in the foreseeable future or running the risk of lost grain sales. The stakes are high and adaptation through evolution will probably take too long to take advantage of the opportunities.

1. RISK OF LOST GRAIN SALES JUSTIFIES CREATION OF A TASK FORCE TO ACCELERATE CHANGE

While the investments to provide transport capacity needed to realize the potential to increase exports by 50 percent are substantial, the economic justification of such investments is exceedingly strong. Additional export sales from only one "bumper" year between now and 1985/86 could well earn enough additional foreign exchange revenue to cover a third of the entire capital investment for the period, as discussed further in Chapter XI.

(1) The Specific Interests of Principal Parties Are not Mutually Compatible

The parties' perceptions of their best interests sometimes conflict with the overall national interest. Therefore, the enthusiasm of the various parties to implement specific changes will be dependent on their perceptions of the effect. Two examples will illustrate this concern.

Even if the Federal Government or the Wheat Board makes all the investments necessary to purchase cars and locomotives, at statutory rate levels, the railways suffer significant out-of-pocket losses that increase with volume and further use of limited available capacity which they could otherwise utilize to move profitable traffic.

Likewise, a proposal to clean grain on the Prairies, rather than in terminal elevators, would:

- Reduce throughput constraints in the terminal elevators
- Possibly reduce feed prices in the Prairies
- Save some of the cost (in car capacity and rates) of shipping the screenings mixed with the grain to the ports.

On the other hand, the grain companies might suffer lost profits on the screenings, and higher cleaning costs at low volume country elevators would result from such a plan.

Given the incompatible interests of the parties in the short run, and their differing perceptions of the benefits (or disbenefits) of proposals in the long run, it appears that a neutral, catalytic force will be required to bring about changes.

(2) A Dedicated Neutral Task Force With a Strong Managing Director is Required to Provide Leadership for the Implementation of Improvements

It is recommended that a Grain Transportation Improvement Task Force should be empowered by the Federal Government to develop and implement specific improvement plans. The Task Force would work in close cooperation with the producers, the Canadian Wheat Board, the Canadian Grain Commission, railways and the grain trade. Ideally, the Task Force should:

- Have a strong, highly-respected and knowledgeable Managing Director appointed by the Minister Responsible for the Canadian Wheat Board on the advice of the industry. The Managing Director should be a person of stature in the grain industry who would hire or retain the other full-time members of the Task Force
- Report to an Executive Committee chaired by the Minister and made up of the Chief Commissioners of the CWB and Canadian Grains Commission, Presidents of one cooperative and one

private grain company, and the Chief Executive Officers of the CN and CP.

- Have about ten senior staff members drawn from the grain industry and railways, experienced in the complexities and requirements of grain transportation, marketing, and car management systems. These individuals should either be seconded from their current occupations or retained on a contract basis, such that they will be available full time for the lifetime of the Task Force

- Have a limited and clearly defined lifetime, in the range of up to four years, and a schedule of activities emphasizing its action orientation

- Report to the Executive Committee with a proposed action program, implementation schedule and funding requirements within 90 days of its creation. The Executive Committee and Task Force would, working with relevant industry participants, act to implement the approved recommendations

- Be charged with overseeing and coordinating implementation of the program and reporting quarterly to the Executive Committee and Minister on progress and implementation. This process would continue for a period of up to four years, following which the Task Force would disband or be replaced

- Make recommendations to the Executive Committee and Minister regarding future changes and implementation requirements to improve the grain distribution system, and regarding the possible formation of a body to continue the process of change and its monitoring, either within one of the existing participating bodies in the grain industry or as a new group.

In selecting the Managing Director and the senior staff members of the Task Force, care should be taken to minimize past, present or future conflicts of interest; however, since highly competent and experienced people are needed, real, rather than indirect perceived conflicts should be the main concern. The Managing Director

and senior staff members should be prohibited or at least discouraged, from succeeding themselves in any organizations or functions growing out of the work of the Task Force in order to ensure that any recommendations do not appear self-serving

It is recommended that a Task Force be established, with strong leadership and an effective mandate along the lines outlined above, to implement needed changes in the grain transportation system.

2. THE STATUTORY RATE IS THE PRIMARY SOURCE OF MANY GRAIN TRANSPORTATION PROBLEMS

Given the losses the railways are already sustaining on grain, as reflected in the findings of the Snavely Commission,* it is not surprising that for several years they have not invested in plant improvements, locomotives and freight cars for the purpose of moving grain:

(1) Growth of Profitable Traffic Puts Pressure on Grain Movements

The rapid growth in other commodity movements by rail, such as coal, sulfur, and potash is both a blessing and a curse for grain movement. While this traffic growth may have helped to offset the railways' losses on grain and possibly deferred a crisis, this same growth now puts increasing stress on existing facility capacity and motive power.

(2) Railways Handle Grain Well Considering Economic Disincentives

The Canadian railways' handling of grain has improved significantly in recent years and present performance is quite good by North American railroad standards. This relatively good performance evidently results from social or political pressures; it is clearly not done for direct economic gain.

The statutory rate on grain removes the normal economic incentives which lead to efficient use of resources in a free economy. The other principal players also have little direct incentive to use facilities and equipment efficiently—as long as sales are not lost.

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* Snavely, King and Associates, "1977 Costs and Revenues Incurred by the Railways in Transportation of Grain Under the Statutory Rates" September 1978

In spite of the lack of incentives, the system has been working relatively well with each party recognizing its social responsibilities even though monetary incentives are largely missing. Upon close examination, even the process for fixing blame for failures, with each participant pointing at another, appears to reflect a social accommodation which confounds the public, but insulates the players under a cloud of confusion and results in a stalemate. In the future, the already visible strains in the system will require concrete actions.

(3) While "Crow Rate" is Outside the Scope of this Analysis—Its Effect Is Pervasive

The scope of this operations analysis specifically excludes changes in the present statutory rate (the "Crow Rate"); however, it is so pervasive in the structure and operation of the grain logistics system that it cannot be ignored.

It must be emphasized that the institutional, operational and capital improvements recommended in this report, while essential to the realization of Canada's grain export potential, should not be seen as a substitute to resolution of the Crow Rate issue. The railways no longer have the economic or physical capacity to underwrite the grain drain. If the Crow issue is not resolved, the problems outlined in this report will not be completely overcome and grain will suffer due to its low priority. If it is resolved in a reasonable manner, the probability of success in implementing the recommendations presented in this report will be greatly enhanced.

3. CANADIAN WHEAT BOARD CONTROL OF BLOCK SHIPPING STAFF CAUSES TENSION—ESPECIALLY WITH RESPECT TO NON-BOARD GRAINS

One of the major institutional issues underlying the tensions between the participants is the role of the Canadian Wheat Board in managing the transport functions and thereby controlling the movement of not only Board grains but Non-Board grains as well. The conflicts of interest inherent in this role of the CWB seem to be more of a threat than a reality.

(1) Reassigning the "Block Shipping Staff" from the CWB to the Task Force Offers Several Advantages

The transportation staff group within the CWB (detailed in Appendix Q) who now carry out the weekly application of the block shipping system is referred to here as the "Block Shipping Staff." Three possible locations for the Block Shipping Staff were considered:

- Remain in their present location as part of the Canadian Wheat Board
- Relocate and report to the Chief Commissioner of the Canadian Grain Commission
- Relocate and report to the Task Force during the implementation period.

The possible advantages and disadvantages of moving this activity are outlined in Exhibit 13.

On balance, relocation of the Block Shipping Staff reporting to the Managing Director of the Task Force offers the most opportunity to effect change. An early decision on this matter by the Minister Responsible for the Wheat Board would settle this question in principle, and the Task Force could then focus on the timing and mechanics of the move (if this were the decision) as part of its detailing of the implementation program during the first 90 days of its existence.

(2) Alternatives for the Quota Delivery System Should Be Considered in an Effort to Gain Better Control Over Grain Flows

Consideration should be given to a system under which the CWB would buy all Board grain stored on-farm, and the Task Force would call forward farm-stored grains to primary elevators as required to meet sales commitments some weeks later at the ports. This would give the "Block Shipping Staff" far greater control of the logistics system and would facilitate drawing down all elevators on a given set of rail lines each week in a manner designed to increase rail operating efficiency.

EXHIBIT 13
Issues Related to Relocation of the Block Shipping Staff

POSSIBLE LOCATION OF BLOCK SHIPPING STAFF

A. PRESENT LOCATION AS PART OF CANADIAN WHEAT BOARD (CWB)

ADVANTAGES

1. Retention of nominal CWB control over grain deliveries to meet its marketing commitments.
2. Simplifies coordination of the Quota Delivery System with the Block Shipping System.
3. Avoids the disruption of a move or forming a new body.

DISADVANTAGES

1. Delivery control is inadequate, in part because of lack of cooperation from other participants due to operating "style" of CWB staff.
2. Retains potential conflict of interest re Board/Non-Board car allocation owing to CWB's interest in marketing Board grains.
3. Detracts from CWB marketing effectiveness owing to concerns regarding responsibility for poor performance on delivery of sales commitments.

B. RELOCATE TO THE CANADIAN GRAIN COMMISSION (CGC)

ADVANTAGES

1. CGC is more neutral re car allocation between Board and Non-Board grains.
2. Block shipping staff reporting to CGC would be more likely to receive cooperation from other participants simply because "under new management" without disadvantages A.1 and A.2 above.
3. CGC enabling legislation appears to allow it to reassume this function which was transferred to CWB by Order-in-Council and could probably be similarly transferred back without new legislation.

DISADVANTAGES

1. Possible lack of cooperation due to bureaucratic rivalry between CWB and CGC.
2. Requires careful consideration of who should administer the Quota System and coordination between Quotas and Block Deliveries.
3. Requires consideration of potential conflict of interest between Block Shipping control and Elevator Licensing authority or other CGC regulatory powers.
4. Disruption of a move, but does not need formation of new body.

C. RELOCATE TO A NEW BODY: THE GRAIN TRANSPORTATION IMPROVEMENT TASK FORCE

ADVANTAGES

1. Advantages B.1. and B.2. as above, enhanced by added neutrality of a new body.
2. Does not suffer from disadvantages B.1. and B.3. above.
3. Relocation to a new body dedicated to improved grain distribution system with reliable forward planning and control, would allow CWB and grain companies to concentrate more effectively on marketing grain available for export and deliverable.

DISADVANTAGES

1. Same problem as B.2. above.
2. Same problem as B.4. above plus need to form a new body.
3. If transferred to report to Task Force might detract Task Force's implementation and monitoring role, but would give it added clout to initiate changes.

This highly-centralized system has a number of important implications which would require detailed assessment. These implications include:

- Extent to which system would become more responsive.
- Manner in which Non-Board grains would be treated
- Impacts on the role of the grain companies
- Implications for cash flow from the CWB to producers.

The Task Force should assess such a change in the quota delivery system, in the light of these and related implications.

4. CHANGES SHOULD BE MADE IN THE PROCESSES TO PINPOINT RESPONSIBILITY

Notwithstanding decisions made on the assignment of the Block Shipping Staff, improvements should be made in their processes.

(1) The Weekly Planning Process Should be Formalized

The railways, CWB marketing staff and grain companies' marketing and distribution staff should meet each week with the Block Shipping Staff to establish the car allocation plan. The goal would be to develop a set of documented relationships based on an "announced" plan clearly showing the responsibilities of each participant and providing a documented basis against which to measure and record subsequent performance in meeting the grain delivery plan.

(2) Penalties and Bonuses Should Be Clearly Established

Consideration should be given to a system of penalties and bonuses (financial, car, or both) developed through discussions with the participants in the agreements. For example:

- Penalties to a company if it did not meet its commitments
- Bonuses to a company if it achieved specific target performance levels in delivering Board grains

- A financial bonus system as an incentive for railway performance according to plan. (Such bonuses should not be construed as a substitute for changing the "Crow Rate," but rather as an incentive to improve railway performance where none exists today.)

- The application of retroactive penalties should be eliminated unless clearly specified in the documented relationship. Arbitrary penalties also should be eliminated

- The CWB might be subject to a "penalty" if it were not able to arrange the expected shipping to move the grain out of the company's terminal within the agreed period. This could take the form of extra cars to the company which could be used to move Non-Board grain or to offset other car penalties levied on it

- The rules would include a clear understanding of the timing and nature of information to be communicated between the parties, with the intent that the car allocation and shipping process would be made as open as possible

- The administration of the block shipping system and documented relationships would be clearly logged and an audit trail established as a basis for subsequent review of operations, activities and penalties.

Financial or car penalties/bonuses need further consideration. The changes noted above to achieve a more open, auditable and predictable car penalty system under the present framework should be given top priority and the possibility of further changes in penalties or bonuses considered subsequently based on results.

(3) Consideration Should be Given to Permitting Grain Companies More Latitude in Car Allocation

Allocating cars first to companies, who would subsequently allocate the cars to both blocks and elevators, would give the companies more control to meet delivery requirements for both Board and Non-Board grains while permitting more flexibility to

employ their assets. With the growing proportion of Non-Board grains, it becomes more important that the planning and control of delivery from each block be closely integrated for both Board and Non-Board grain and the increasing company participation may help to accomplish this.

Another approach could be to allocate total cars each week between Board and Non-Board grains, and then have the Block Shipping Staff allocate cars for Non-Board grains among the companies, with the Block Shipping Staff continuing to allocate cars for Board grains to specific blocks.

These alternatives should be reviewed by the Task Force in light of inventory control system development and possible changes in the Quota System previously suggested for consideration.

(4) Forward Planning Should Extend Beyond The Six-Week Horizon

The car allocation process and negotiation should be modified such that the Block Shipping Staff, the CWB, the grain companies and the railway representatives meet on a monthly basis in addition to the regular weekly meetings. The participants would examine overall rail car supply for the upcoming three to six months, examine market conditions for both Board and and Non-Board grain over the same period, and agree on the total number of rail cars likely to be required and available each week during the coming month and an appropriate allocation of rail car supply between Board and Non-Board grains. Confidential sales details which the CWB and grain companies would not want divulged to their competitors, would be communicated individually to the Block Shipping Staff who would treat it as priveleged information.

Under this arrangement, a grain company would be able to make commitments for both Board and Non-Board grains within the context of the overall allocation of cars and expected market and car supply conditions.

An important result of these modifications to the existing system would be to place added responsibility for the actual performance of inventory management on the participants.

* * * * *

The primary advantage of the proposed changes would be the provision of a more businesslike and impartial context within which the CWB, grain companies and railways would be able to carry out forward planning and inventory management. Conflicts between Board and Non-Board grain, and related conflicts between the participants could be reduced. In addition, advanced planning and timely achievement of delivery plans would increase efficiency of daily operations and substantially improve the ability to deliver the right type of grain to the right place at the right time.

XI. IMPLEMENTATION OF RECOMMENDATIONS

If the potential sales projections developed by the CWB and used in this report prove realistic, the return on investment in providing the transportation capacity necessary to move the grain is very high and would easily justifv the substantial public investments required in anticipation of demand. Only a few bumper crops in the next six years would justify the investment in those years alone. The benefits of the investments would be available for generations to come.

The lead times on the necessary investments generally run from two to five years so that some risks must be anticipated, but the leverage inherent in this situation favors making the investments, rather than risking lost sales.

As soon as the Task Force is organized and the Managing Director and senior staff members have been appointed, they should develop an implementation agenda. This implementation agenda should include recommendations to be implemented in the near term, recommendations to be implemented over time and those to be restudied before an implementation decision is made.

Additionally, they should develop a schedule, organization plan and budget for the implementation program. Recommendations for near-term capital expenditures and commitments by the government should also be presented for early consideration.

The implementation agenda, as well as recommendations for capital commitments and funding requirements, should be submitted to the Executive Committee for review and amendments. Upon obtaining concurrence or approval as necessary from the Ministerial level, the Task Force should then be directed to manage the final implementation program.

While it is suggested that the Task Force develop its own agenda, the recommendations contained in this report are offered as a starting point for an implementation program. The recommendations are presented in agenda form in the following general categories.

- Major capital expenditures in providing capacity to move projected grain flows:

  - Grain cars
  - Locomotives
  - Terminal elevator capacity
  - Branch line rehabilitation
  - Main line capacity

- Operating changes to improve delivery performance at ports and to reduce investment requirements

  - Information planning and control systems
  - Country operations
  - Port operation
  - Grain car cycles
  - Institutional changes.

1. TASK FORCE SHOULD DEVELOP DETAILED CAPITAL EXPENDITURE RECOMMENDATIONS

Major capital expenditures will be necessary to provide the capacity to move projected grain flows in a timely manner. The exact magnitude of the investments required will depend on actual growth in grain and other traffic by ports, improvements in the efficiency of calling up grain for transport, improvements in loaded and empty car cycles, and the rate of retirement of locomotives and cars. Equally important is the question of who should make the investments. All of these factors should be considered by the Task Force in developing its detailed capital expenditure recommendations.

The table below illustrates the magnitude of additional investments (in 1979 dollars) that may be necessary to provide the rail and terminal elevator capacity necessary to meet the top range of high projections of grain movements for 1985/86. (Not all of these investments are solely for the benefit of grain movements. The Task Force should recommend the share of these investments to be borne by grain).

POTENTIAL MAJOR CAPITAL INVESTMENTS
1979/80 to 1985/86

	(Million $) Low Estimate	High Estimate
Grain Cars	$ 400	$ 572
Locomotives	106	171
Prince Rupert Terminal Elevator	100	100
Branchline Rehabilitation*	700	700
CN Main Line Capacity**	-	160
CP Main Line Capacity**	-	100
Joint Fraser Canyon Operations	-	148
	$1,306	$1,951

Expenditures ranging from $1.3 billion to $2.0 billion may be required between now and 1985/86.

- Grain Cars

  The low estimate assumes that the target 15% improvement in the utilization of grain cars has been achieved, reducing the investment otherwise required in grain cars by $172 million.

- Locomotives

  The railways have indicated they will make no significant investments to support grain movements including locomotive purchases required to handle added grain traffic in the absence of compensatory rates.

- Prince Rupert Terminal Elevator

  The new Prince Rupert Terminal Elevator is estimated to cost $100 million and be funded largely by the grain trade.

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* Some of this amount already expended

** Not all attributable to grain

- Grain Branchlines

  Branchline rehabilitation funds of $700 million are assumed to come from the Federal Government

- Line Capacity

  While the reviews of line capacity carried out in this operations analysis indicated that line capacity may be a constraint on flows through the port of Vancouver, detailed computer simulations are needed to determine precisely how to best provide added capacity and what role, if any, the government should play in financing such projects to improve grain flow. The CN and CP line capacity improvement projects may well be carried out to better serve profitable movements; however, if grain does not pay its fair share, some of these investments may not be made and grain, with a low movement priority, would be delayed.

An early function of the Task Force should be to identify which commitments should be made in the near term and which need to be studied further. The Task Force should then analyze those commitments which need additional study to determine specific requirements by years for the programs and opportunities to reduce future investment commitments, such as improving car utilization. The financial and managerial role of the government in general and the Task Force specifically should be determined in each case.

2. A MINIMUM LEVEL OF INVESTMENT IN EQUIPMENT AND FACILITIES SHOULD BE COMMITTED

Following the findings and conclusions summarized earlier in Chapters VII and VIII it is recommended that the low estimate of capital investment listed on page XI-3 should be made as a minimum between now and 1985/86 as shown on the next page.

MINIMUM RECOMMENDED LEVEL OF CAPITAL INVESTMENT

Equipment/Facility	Investment ($ millions--1979 dollars)	
9,300 hopper cars	$ 400	
125 grain locomotives	106	(for growth only, not replacement)
Prince Rupert Terminal	100	
Branchline Rehabilitation	700	
TOTAL	$1,306	

The sources of funding for these investments will require study and negotiation by the Task Force. The Prince Rupert terminal is expected to be funded largely by the grain industry; the branchline rehabilitation and probably the grain car funds are expected to come from the federal government, although the latter might come from the CWB; if compensatory grain rates are introduced, funding for the locomotives should be forthcoming from the railways; failing this, the federal government will probably have to make the investment.

As noted above, additional investments might be necessary and this could be the subject of review/recommendation by the Task Force.

3. TASK FORCE SHOULD DEVELOP DETAILED IMPLEMENTATION PROGRAM FOR IMPROVING OPERATIONS

The recommendations to improve operations contained in earlier chapters of this report are summarized here as part of the agenda to be reviewed by the Task Force in developing its implementation program. Generally, the recommendations focus both on improving delivery reliability in the port and expediting car cycles to reduce car investment requirements.

(1) Improved Information Planning and Control Systems Should Improve Delivery Performance and Reduce Car Requirements

Improvements to the forward planning and monitoring of the block shipping process can be made in the short term and longer term.

1. The Following Improvements Can Begin Now

- Monitor cars in transit (empty and loaded) to and from ports on a daily basis to determine more accurately the execution of the plan.
- Extend anticipated port inventory requirements over a number of weeks beyond the current planning horizon based upon block origin/port destination cycles.
- Eliminate cumulative carryover of shortfalls.
- Telex the weekly elevator report directly to the Block Shipping Staff who could then provide the companies with the same information in processed form.
- Incorporate more reliable and timely transfer of vessel information in the demand formulation process.
- Eliminate redundancies in communication and information (i.e., reporting of orders to elevators by the grain companies and railways).

2. Create an Information System for Longer Term Improvements

- Reduce communication and control delays by increased use of the telephone and telex for transmission of type and grade of grain in terms of shippable stocks, elevator congestion, outstanding orders, orders filled, etc.

- Increase the frequencies of information flow among the major participants in the block shipping system; this would enhance the participants' forward planning capabilities, allow them to monitor their own activities more effectively, and allow each participant to monitor the performance of the others.

- Integrate major computer systems to establish a daily information exchange (including a car control mechanism) between the CGC, railways, CWB and companies, on a staged basis in accordance with the capabilities of the individual computer systems.

- Introduce daily inventory recording from key country points, possibly through polled minicomputers or telephone, including provision for the collection of conditions, grade and protein level information. A central facility for receiving the data and entering it into an overall data system should also be set up.

- Provide more comprehensive and reliable information on the conditions, grades and quantities of grain by type stored on farms.

- Ensure that all parties to the movement of grain, allocation of cars, etc. have inquiry facilities so they can assess the supply situation as represented by inventories on the farm and in country elevators. This would require access to the central computer to summarize totals of the day before and to record current transactions.

Consideration should be given to integrating these monitoring and control elements into a Car Management System.

3. Provide for Protein Identification and Grading in the Information System

The major requirements for a data system which would support identification and segregation of protein graded wheat are:

- A sampling system
- The recording of protein levels, grades, and quantities on the farm, at country elevators, in rail cars and at terminal elevators
- Input of this information to the data system from all levels
- Programs to summarize the data
- Inquiry facilities
- Programs to calculate strategy to meet export needs on a week-to-week and day-to-day basis.

Work is currently underway by the Protein Subcommittee of the Wheat Board Technical Group to develop an approach to implement a protein identification and pricing mechanism. A test implementation of one of the Subcommittee proposals should be undertaken in order to begin testing the recommendations presented above. The Canadian Grain Commission is also doing research along these lines which should be considered.

4. Introduce Use of Computer Simulation Models

To assist in inventory management and related system management decisions, it is desirable to use computer models to "test" operating decisions to meet alternative conditions or objectives; for example:

- A "catch-up" mode, aimed at quickly replenishing stocks in a port with a particular grade/type of grain
- An "equity" mode, aimed at drawing grain from blocks and elevators which had not yet received a fair share of the demand to date

- A "Thunder Bay priority" mode, aimed at pushing certain types/grades of grain to Thunder Bay as quickly as possible

- A "Vancouver priority" mode, a "Prince Rupert priority" mode and a "Churchill priority" mode, with similar purposes

- An "all ports priority" mode, aimed at moving as much grain of certain grade/type to all ports as quickly as possible

- A "snow line priority" mode, aimed at moving grain out of subdivisions before they experience line closings

- A "routine" mode, aimed at normal deliveries.

Computer models would also be highly useful in helping to determine the most appropriate destination-distribution of empty rail cars as they are returned each day from the ports. Computerized car management techniques could contribute strongly to achieving reductions in car cycles, with important savings in car supply. Models are available which could be put in place fairly quickly.

(2) Country Operation Improvements Can Enhance System Throughput

Improvements relative to producers, primary elevators and railways would enhance the throughput of the system.

1. Producers' Actions Need to be Integrated into the Overall Logistics System

- On-farm storage for over a year's harvest must be provided. There are proposals to stockpile large quantities of grain to act as a cushion in case of poor harvests and to assist in the stabilization of international grain prices. If large additional stocks are required to meet international commitments, it would be appropriate to consider revised payments or incentives for on-farm storage.

- Farm storage represents an initial surge capacity to the logistics system and therefore must be considered a system asset.

- On-farm drying should be encouraged to increase system throughput. In years when weather conditions cause a wet harvest, the amount of drying required in port can be a constraining feature on system throughput. Under these conditions, more drying on the farm would reduce this constraint. Producers need to be encouraged by price incentives to dry grain on the farm at those times.

- It would be advantageous for grain to be delivered to the primary elevators in a more uniform manner. The concentration of movements can be adjusted by changes in the incentives to deliver as seen by the producer. Efforts should be made to smooth this flow, including greater use and enforcement of terminating quotas.

- The quota system can be modified to improve overall operations related to producers.

  - More knowledge of the actual size, grade, and condition of on-farm inventory would allow quotas to be set more precisely.

  - Terminating quotas should be used to equalize the deliveries to primary elevators over the year.

  - The quota system could be used to encourage the delivery of dry grain when more of this is required to maximize throughput in the ports and could be used to ensure the delivery of tough and damp grain when dryer capacity is available through differential quotas.

  - The use of financial incentives for more timely deliveries should be explored; for example, premiums for timely delivery might be provided.

- The implications of a thorough "on-farm" testing and sampling system to determine accurately the status of on-farm inventories should be investigated before major changes to the quota system can be considered.

2. Primary Elevators Can Contribute to Improved System Performance

- Variable tariffs would accelerate elevator investment and improvements. There are, in practice, few differences in tariffs at present and little incentive is provided to the producer to haul his grain to a more efficient elevator. This lessens benefits to a company for construction of more efficient elevators and tends to burden the entire grain industry with reduced efficiency.

- Increasing the number of grades should be carefully evaluated because of the impacts on efficiency. When more grades are handled in a particular elevator, more subdivisions of storage are required and the effective storage capacity is reduced. A reduction in the number of grades would have benefits by increasing primary elevator operational efficiency and effective port terminal capacity, as well as simplifying the inventory control system. The cost of maintenance of a large number of grades should be very carefully assessed against the marketing advantages.

- Misshipments of grain should be reduced. Primary elevator agents ship grades or types of grain other than those required (and ordered) to the ports for about 21 per cent of the shipments. While many of these differences are handled by blending, or by flexibility in the sales contracts, efforts should be undertaken to monitor failures, improve training of elevator managers and, when necessary, levy penalties.

3. Railway Related Changes Have an Impact on Overall Operation

- Railway services to primary elevators should be on a scheduled basis. Although shortfalls will occur and some schedule changes may be made at the last minute, scheduling should help the primary elevators in their operations planning.

- An overall saving of 1.0 days in car cycle times may be achieved by realigning railway pickup and delivery service to the form of "Dayover Turns" which provide placement on the outbound trip, rest for the crew and the lifting of loaded cars on the return trip. While several train runs are scheduled on this basis now, more widespread use of "layover turns" would improve car utilization. Locomotive utilization and adequate facilities for resting the crew are significant considerations in establishing this type of service.

- Car spotting limitations should be addressed. Specific joint railway/industry committees should be set up by the Task Force to address this problem, particularly when adjacent lines are to be subject to abandonments or adjacent stations to consolidation, and average loadings at remaining points will be increased.

- Branchline abandonments will have a positive impact on railway operations. The recommendations of the Hall Report and PRAC suggest that a number of railway subdivisions would be abandoned, either completely or partially. These proposed abandonments, especially if the complete line is involved, will eliminate railway costs in maintaining and operating these lines and should, therefore, reduce the branch line subsidies. In addition, the abandonment of many lines means that they will not require government capital expenditures or rehabilitation. The removal of lines from the network will free up equipment and other resources to rehabilitate and maintain the remaining lines.

(3) Grain Car Cycle Can Reduce Car Requirements and Increase Throughput

Improvements in car cycles can be achieved in the near term and long term.

1. Near Term Recommended Improvements

- Realign railway delivery and pickup service in the country, as discussed in the preceding section on Country Rail Operations improvements, thereby achieving a targetted reduction of one day in average car cycle time.

- Realignment of the work week in terms of weekends and shifts per day work, particularly in the terminal elevators and in certain circumstances in the primary elevators.

- Refine the block allocation system to apply the subdivision train run minimum requirements to the planning for car allocations to blocks, so that the total cars out of a gathering point to a specific destination would, whenever feasible, be the number of cars required to satisfy the minimums for a main line train run.

- Assign top priority to branch line rehabilitation and maintenance on weight restricted lines which now severely affect car movements.

- Consider the effect of the influx of producer cars with extra switching delays in the country and in the ports.

- Place car orders for one port for a given block and train run to reduce switching and train make-up delays.

- Ensure that crosshauls for grain types that have an abundant geographical spread are not occurring unless market strategy absolutely warrants.

- Put into place an improved system to direct, monitor and control the movement of empty cars from the ports to the areas in the country where they are required.

- Increase the reliability of estimated ship arrival times along with provision of additional buffer storage capacity.

2. Long Term Recommended Improvements

- Establish close communications and cooperation between the railways and the Block Shipping Staff to ensure that the right cars are being given priority for movement before needed cars are "buried" in a holding yard such as Keith.

- Introduce reporting on more events in the car cycle, such as delay time at locations en route within the current car cycle data bases and develop the railways' car cycle reporting systems on a more uniform basis.

- Develop a test program to measure the performance of the elevators in terms of acceptance and the delivery performance of the railways in the ports.

(4) Port Area Improvements Can Increase Throughput

Improvements in port elevator throughput can be achieved.

- Operating more shifts per week will increase throughput. The elevators are presently reluctant to work more shifts per week because they fear they will run out of rail car supply. If they were assured of supply, then 20 shifts per week could be operated with four crews working five shifts per week. The twenty-first shift could be used for maintenance. This would theoretically permit the elevators to handle one-third more than at present. Such an increase would handle forecast volumes to 1985. However,

one full shift for maintenance may not be adequate to provide as high a level of service as at present. Therefore, 1983 might be a more realistic estimate of the last year to which the present elevators could handle the high-year forecast tonnages through increased shifts.

- Supplementing port supplies with cleaned grain should be attempted. Clean grain can be passed over the elevators up to the limit of the unload capacity, or it may be handled by the bulk loading terminals. The latter may present capacity and environmental difficulties, however. The limit to such an approach is the amount of grain which can be cleaned and stored in the Prairies. This is presently restricted because of the desire to generate the screenings on the coast to serve the higher-priced export market.

  It would seem desirable to plan for the use of some cleaned grain from the Prairies when the terminal cleaning system could not otherwise handle the volume. This could extend the capacity of the system to 1983. The inland terminal elevators could serve to store cleaned grain for such occasions.

- Grain companies should continue in their attempts to reach agreement on the "paper pooling" of Non-Board grains, particularly oilseeds, in order to allow more efficient use of terminal capacity for these products.

- Additional railway interchange will be required in the future, particularly on the West Coast to allow CP cars access to Prince Rupert. Remaining details of negotiations between CN and CP should be concluded as quickly as possible regarding equitable arrangements for interchanging.

More uniform and predictable ship arrivals are desirable to smooth peaks, allow better matching of grain deliveries to vessel requirements and make better use of transportation and handling capacities. While it was beyond

the scope of this operations analysis to estimate the extent to which more uniform vessel arrivals could be negotiated with Canada's grain customers, there are indications that some improvement could be achieved, at least on long-term contracts, and it is recommended that the CWB make this attempt. Efforts should also be made by the CWB and grain companies to provide greater lead time and accuracy in estimating time of arrival of vessels, so that the delivery system will have a greater chance of matching the demand requirements of specific vessels.

(5) Institutional Changes Are Necessary to Improve The Effectiveness of Operational Improvements

- Reassigning the Block Shipping Staff from the CWB to the Task Force offers more opportunity to effect change. This is a complex issue which requires further planning by the parties involved and by the Task Force. An early decision on this matter by the Minister would settle this question in principle and expedite its implementation.

- Consideration should be given to replacing the Quota System with a system under which the CWB would buy all Board grain stored on-farm following on-farm inspections and grading. The Task Force would then call forward farm-stored grains to primary elevators as required to meet sales commitments some weeks later at the ports. This could facilitate drawing down all elevators on a given set of rail lines each week in a manner designed to increase rail operating efficiency as well as improving the responsiveness of the system and maintaining an eventual basis of equity to the system.

- The weekly planning process should be formalized. The railways, CWB marketing staff and grain companies' marketing and distribution staff should meet each week with the Block Shipping Staff to establish the car allocation plan and agree on a documented grain delivery plan.

- Penalties and bonuses should be clearly established. The changes made in the administration of the block shipping system would require development of a clear-cut set of rules guiding the administration of the company-CWB-railway plans.

- Alternative penalties/bonus systems should be considered. Financial or car penalties/bonuses need further consideration. The rules for the existing car penalty system should be drawn up, promulgated and applied in a non-retroactive, non-arbitrary, auditable manner. Reliance should be placed on a greater degree of voluntary cooperation among the participants, based upon consultation, definition of responsibilities and the documenting of weekly plans and performance levels by each participant. Revised penalty/bonus practices should be considered after the above changes are made and the effects assessed.

- Consideration should be given to permitting grain companies more latitude in car allocation by having the Block Shipping Staff allocate cars first to companies, who would then allocate the cars to both blocks and elevators. Alternatives should be reviewed by the Task Force in light of inventory control and car management system development and possible changes in the Quota System previously suggested for consideration.

- Forward planning should extend beyond the six-week horizon. The car allocation process and negotiation should be modified such that the Block Shipping Staff, the CWB, the grain

companies and the railway representatives meet on a monthly basis in addition to the weekly meetings described earlier. The participants would examine overall rail car supply for the upcoming three to six months, examine market conditions for both Board and Non-Board grain over the same period, and agree on the total number of rail cars likely to be required and available each week during the coming months. An appropriate allocation of rail car supply between Board and Non-Board grains would be made. Confidential sales details which the CWB and grain companies would not want divulged to their competitors, would be communicated as privileged information to the Block Shipping Staff.

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It is hoped that the wide range of recommendations contained in this report and summarized in this chapter will serve as a starting point for the planning of the implementation program of the Task Force. With billions of dollars at stake and the long lead times necessary to implement some (but not all) of the recommendations, time is of the essence. The leverage favors early investment, but the issues involved, such as who should provide the funding, are complex. The key will be the appointment of a strong, action-oriented Managing Director and Task Force to deal with the issues in a timely manner.