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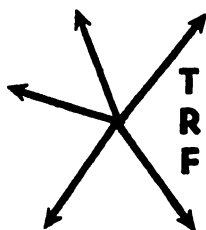
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TRANSPORTATION RESEARCH FORUM

Intermodal Transport, A Canadian Experience

by Dr. R. A. Bandeen*

CONTAINERIZATION HAS BEEN GAINING a momentum in the transportation industry unequalled, perhaps, by any other industrial innovation. The ramifications of this surge are being felt by all carriers in all modes.

Despite its phenomenal growth containerization has yet to make a real impact on Canada's economy. There can be no dispute that its long-range future promises abundant rewards. To date it has introduced review and rationalization of Canadian intermodal services.

For this paper intermodal transportation is defined as the movement of objects, consolidated physically to facilitate handling, through two or more different transportation modes, which utilize specialized equipment to interface the means of carriage.

Before examining the emerging role of intermodal transportation in a rapidly evolving transportation scene, it is best to describe CN's involvement to date in the intermodal transport field. CN is a diversified transportation enterprise which operates a multi modal transportation system which has been playing an increasingly active role in the development of intermodal services since the early fifties.

Piggyback Service

Piggyback service in CN dates from 1952, and moves under several plans which vary according to the participation of motor carriers, railways and shippers. In 1969 operating revenue from piggyback service amounted to \$28 million dollars; 87,000 trailer movements handled approximately 1.4 million tons of freight.

Capital Equipment consists of 80 piggyback terminals of which 10 are classified as major; 1,050 piggyback flat cars; and 500 trailers either owned or operated by CN.

Cargo-Flo

Cargo-Flo is the trade name for a method of bulk transportation offered by CN. This service introduced in 1968 moves bulk commodities such as cement, chemicals, plastics, flours and petroleum products. It melds low cost long haul by rail combined with flexible delivery by road transport.

The focal point of the system is a bulk terminal which serves as a receiving and distributing centre. The commodities are shipped to it in tank cars or pressure hopper cars. Liquid pumps or air pressure transfer devices reload the contents into highway carriers.

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A Cargo-Flo terminal was opened in Toronto last year. Another is being planned in Montreal, and the system will soon be introduced in Western Canada.

Containerization

CN initiated container service in 1958 when containers loaded with domestic traffic were carried to Newfoundland from Nova Scotia.

Today CN is the Canadian distribution agent for several shipping lines including Manchester Liners of Britain through Montreal and Dart Container Line through Halifax.

CN now handles more than 3,000 containers per month, with its fleet of 650 container cars. As well as handling this international intermodal traffic, CN Express has approximately 1,000 of its own containers in domestic service.

Intermodal traffic logically divides itself into two areas, the first concerned with bulk flows and the second, the subject of this paper, with integral-carrying units.

Montreal is the focal point of present CN international container-rail activities. Services provided are designed to expedite loading and movement of the containers, and as such include unpacking the container contents for customs inspection; pick-up and delivery of loaded and empty containers; packing and unpacking, and sorting the contents; storing loaded and empty containers; storing container contents in a bonded shed; pick-up and delivery of container contents; mounting and de-mounting containers to and from rail and road equipment; placing containers on legs at the receiver's dock; servicing heated and refrigerated containers; and doing minor repairs.

Container trains depart for Toronto which serves as the major distribution centre. Container transfer, packing or unpacking occurs at a \$10 million dollar facility capable of handling 15 million pieces of express a day as well as processing 600 import-export containers a week.

Distribution is performed by CN highway subsidiaries as well as other common carriers.

Domestic container services are for the most part confined to the Montreal-Toronto Corridor. One of the important questions which has developed is the relationship between domestic container service, highway common carrier, piggyback and freight forwarder service in this Corridor.

The optimum mix of transportation services has proven to be a complex question involving a large number of variables.

Rationalization has been attempted by the CN and its customers. Shipping frequencies have been altered where needed to permit more efficient container stuffing. Container pick-up and delivery has been altered to service more customers less expensively and rationalization of shipping packages has permitted more extensive use of container packages.

GOVERNMENT POLICY ON THE DEVELOPMENT OF INTERMODAL TRANSPORT

In an attempt to define and implement a national transportation policy—the Canadian Government by enacting the National Transportation Act declared in February 1967 that the economic well-being and growth of Canada are “most likely to be achieved when all modes of transport are able to compete freely”. Recent pronouncements by government officials indicate that the government intends to pursue its policy using a minimum of regulation relying instead on the market system.

The government created the Canadian Transport Commission to oversee the implementation of its transport policy. The Commission is charged with responsibility for implementing and interpreting previous transport legislation in addition to the duties assigned under the most recent legislation. The responsibility of the Commission is that “of co-ordinating and harmonizing the operations of all carriers engaged in transport by railways, water, aircraft, extra-provincial motor vehicle transport and commodity pipelines”.

One of the functions of the Commission is to “undertake studies and research into the economic aspects of all modes of transport within, into or from Canada”. In this regard the Commission has recently initiated a study of containerization, the object being to provide a base from which the Government can develop a National container policy for Canada. The proposed study will attempt to identify and project present trends toward containerization in world trade with particular reference to the North American Continent. It will examine Canadian internal and external traffic flows, and consider what measures, if any, the Government can take to assist in the sound and orderly development of container facilities at strategic points throughout the country. It is expected that the results of this study will be made available to all interest parties.

The result of this Government attitude is to create an environment where free competition is encouraged thus allowing supply and demand to optimize the transportation system.

Within this system CN has taken full advantage of the opportunities available for the application of entrepreneurial skills. As a result CN has become deeply involved in managing a multimodal transportation system.

Management of CN's intermodal transportation holdings has become a complex problem requiring the development and application of new managerial skills. Questions which must be faced relate to the most economic methods of transport, the relationship between piggyback services, freight forwarders and highway carriers, international container operation control, how to ship, when to ship and contingency planning.

FUTURE DEMAND FOR INTERMODAL SERVICES

CN has recently completed a series of long range planning studies on the capabilities of the different transportation methods and their application to the forecasted market demands of 1985. The projected allocation of traffic, between competing methods of transport, indicates a substantially increased share of a much larger market could be best handled by an intermodal system.

The prospects are therefore for not only a growing market but also a potential for increased penetration of this market with a system of intermodal service.

However, taking into account changing technology as it applies to the traditional unimodal systems indicates that these systems still have a vital role and in absolute terms an increasing role to play in the total transportation spectrum.

It is therefore essential to ensure the allocation of resources which reflects the relative importance of the competing system. The growing complexity of the range of transportation services suggests the need of closer cooperation between the transportation agency and the shipper in identifying the mix of transportation services to be provided.

ISSUES AND PROBLEMS

Total Transportation

Price and quality of service will become in this decade the two most important questions facing transportation companies. It is apparent that the systems approach to transportation is now in use. Attention must now be focused on the refinement of these systems.

Container Flow and Control

Import Container flow can be regarded as a sequence of approximately 25 steps, which may be classified as either being of a stationary nature, an on-the-spot movement or a distant movement. Fig. 1 extracted from the 2nd edition of "Container Services of the Atlantic" illustrates these transportation phases.

Interfacing these sequences has become a complex coordination problem. Aside from more complex labour contracts which must be negotiated, standardization of equipment must be achieved for unrestricted interchange and control must be maintained.

What agency should be used to control container flow and documentation? Who should be responsible? These are questions which must be answered.

There are a number of possible alternatives:

1) Independent control exercised by all owners of container equipment. This alternative is obviously not viable.

2) Control exercised by container leasing organizations. This may be an acceptable alternative if all containers are leased and there is close co-operation between the leasing agencies.

3) Control exercised by a super agency representing all owners and users of container equipment. This type of organization requiring the grouping of a large number of bodies with divergent interests would probably require some form of government support and could conceivably become a para government agency.

4) Large multimodal transportation systems are prime candidates to perform this control function as well. This is practically true of transport group-

PHYSICAL SEQUENCE FOR CONTAINER MOVEMENT

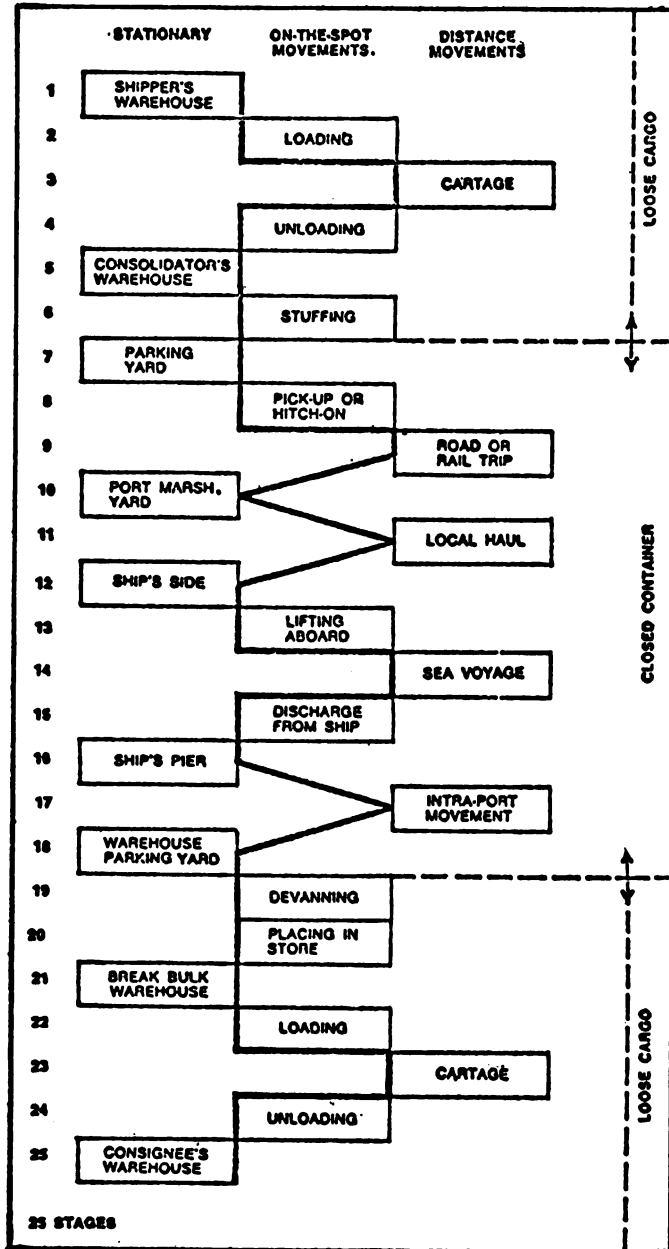


FIGURE 1

ings built around railways as is the case in Canada because the railroads have the largest capital investment in the container pipeline and because railway control systems are reaching a high degree of sophistication, it would suggest that the marginal cost of expanding present systems may be significantly lower than the cost of setting up a new system.

One of the problems with this proposal however stems from the fact that present rail systems, such as ACI (Automatic Car Identification) and CN's TRACS (Traffic Reporting and Control Systems) are geared to on-line equipment, with no provision for control or checking of off-track movements.

Ownership of all the modes is not necessarily a prerequisite for optimal control. Because schedules may have to be redefined or terminals relocated, some degree of individuality and autonomy will be lost by participants in the integrated system, however, corresponding increases in equipment utilization and profitability will no doubt help to overcome potential opposition.

Would the marginal cost of these proposed systems exceed the marginal benefit? If we assume the study by the Association of American Railroads regarding equipment utilization holds true; that a one per cent improvement in utilization through the usage of a real time system could save the railway owners hundreds of thousands annually, similar improvements in data availability regarding container traffic could result in similar savings and hence the answer is unquestionably, no.

Facility Utilization

Rationalization of mode usage has become paramount. Because container handling inherently demands large capital expenditure, it is of interest whether the terminals which are being presently contemplated and accompanying rail facilities are the result of increased demand, or whether usage of containers will increase because the large capital outlays demand increases in through traffic whether economical or not. This chicken-before-the-egg paradox is not unique to sea-rail intermodal system but is in fact characteristic of any capital injection which disturbs the established equilibrium.

Significant improvements in facility utilization could result through increased usage of domestic containers. Although questions relating to the effects on present car loadings, profitability and sub-optimization would have to be dealt with, such domestic traffic could provide the "topping-up" and mean the difference between under-utilization and optimum utilization.

Overview of the Control Flow and Utilization Dilemma

The global problem of traffic flow, utilization economics and line haul economics is probably the most significant challenge.

The transportation problem can be visualized as a matrix with major European and North American shipping points on each side, one side representing origin, the other destination.

Total costs of transportation form the elements of the matrix. Each shipping point may be regarded as the focal point of a rail-highway, barge system. European shippers attempting to reach North American points scan the transportation matrix and attempt to minimize their distribution costs through

a particular port facility and its accompanying supporting transportation network.

A palletized shipment leaving Rotterdam for Windsor Ontario is faced with the choice process illustrated in Figure 2.

Simple calculation suggests that for this flow of material (one way) the shipper is faced with 20 alternatives for completing delivery. The return trip, if we assume the reverse process, presents the same choice and hence, there are a total of 40 possibilities for the round trip. The individual shippers is not equipped in most cases to cope with this question and in fact may not even realize this number of alternatives is available.

Who should counsel the shipper? Ideally it should be an unbiased third party with no vested interest in a particular transportation mode. However, such a third party is not required because of the inherent competitiveness of transportation services. Eventually, the shipper will tend to gravitate toward the lowest cost modal combination in terms of total distribution.

Looking at this large number of choices from the mode viewpoint, such a large number of trip possibilities will present operational problems for the major ports in the matrix, because of the large traffic volumes required to justify and maintain container facilities. Ports are in fact competing vigorously for container traffic and this suggests that a container port consolidation program should be contemplated whose objectives would be to reduce the number of ports—so that the resultant throughout volume could support the new superports.

The justification of port facilities is essentially an illustration of the rationalization which must occur in all aspects of today's transport methodologies.

Economic & Market Consolidation

It has been stated that practically everything is containerizable. But it has yet to be established that a system developed originally to decrease the turnaround time of a ship in port lends itself to optimization of the total transportation network.

Comprehensive analysis should be undertaken to ascertain the total impact of containers on rail. If economic and profitable, container usage should be encouraged, if not, excess costs must be passed back to shippers so that they can rationalize their ocean freight methods. In this fashion, transportation systems will reach a state of dynamic equilibrium.

With economic consolidation a necessity the next logical step will be market consolidation. No longer can the shipping companies be considered "entities unto themselves" they are in fact only one segment of the marketing program for a commodity. The consumers, be they industrial plants, wholesalers or other transportation modes will require shipments modified both physically and in timing to correspond to ultimate consumer demands. This market orientation has changed the operating philosophies of many manufacturing concerns and perhaps this will be similar changes in traffic as transportation companies become progressively more market oriented.

TRANSPORTATION ALTERNATIVES

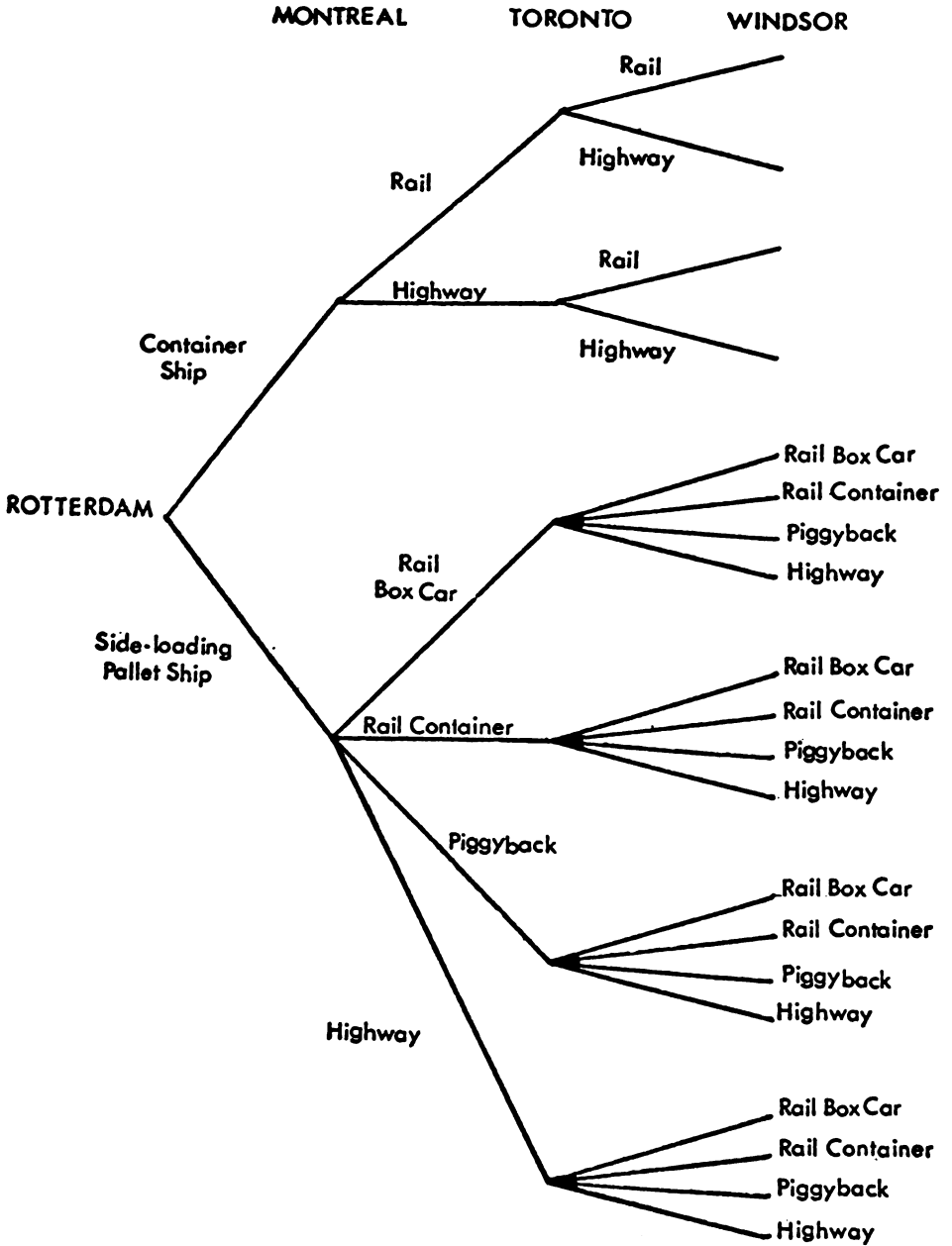


FIGURE 2

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The future will see rationalization of intermodal transportation facilities and services. Unprofitable areas will be phased out and profitable services will expand.

One of the basic tenets governing the marketing system is that any function which increases the value of a product should be rewarded in monetary terms.

The international freight forwarder in the past has survived and proposed largely because of the degree of chaos that existed in the transfer and paperwork chain needed to get exports to the docks.

With the advent of the container, intermodal transport and new control systems, freight forwarders could be faced with a changing requirement for their services if carriers begin to assume their expediting function.

Container systems because of their inherent capital intensive nature, require a substantial decrease in the number of man hours required to expedite movement. Because of present labour agreements and other vested interests it is probable a significant gestation period will be necessary before the container system reaps all the benefits.

Container Nationalism

The price for the rapid growth of the container trades will be the growth of shipping nationalism, perhaps to the detriment of overall transportation efficiency. Because of large capital investment in equipment and facilities ship owners may seek protection of their interests and restriction of free entry to insure sufficient volume. This could lead to bilateral agreements between nations and perhaps eventually involve government regulation. The parallel might be drawn in fact between the air transport agreements of today and the eventualities facing the container trades.

CONCLUSION

The successful use of intermodal transport as a tool to control the cost and improve the efficiency of the distribution system is dependent upon the development of an integrated transportation system to serve both international and domestic traffic. A prerequisite for such a system is an acceptable method of integrated control of the physical plant. To ensure the efficiency of the present intermodal facilities a process of rationalization must be undertaken. In view of the present traffic levels such a process could lead to a program of port consolidation to best serve the requirements of the early 70's.
