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CANADIAN RAILWAYS IN WARTIME

OUTBREAK OF WAR

The importance of transportation in the war of supply does not begin only with the loading of the goods of war into a merchant ship at the dockside of an ocean port.

It begins long before that. The task of delivering the all-important heavy ammunition to artillery units fighting their way toward Berlin may have begun when zinc was brought from a mine at Kimberley, British Columbia, to a smelter at Trail, B.C. After smelting, the metal was taken east, across the Rockies and the Prairies, to a brass mill at Toronto, Ontario.

Meanwhile, copper, the other metal used in making brass, has been mined and smelted at Coppercliff, Ontario, and the refined copper has been shipped to the same brass mill at Toronto. From here, the brass is shipped to various plants around Toronto where it is made into components of a finished round of ammunition.

The parts are then shipped to a shell filling plant at Cherrier, Quebec, and the finished round of ammunition is shipped from Cherrier to a port -- perhaps Montreal or Halifax.

In all of these movements, and many other similar movements, the railways of Canada are doing one of the most vital of war jobs -- a war job which is absolutely indispensable -- and they are doing it despite strongly felt shortages of men, equipment and material.

BACKGROUND TO CANADIAN RAILWAYS

The outbreak of the present war found Canada ranking third in the world in total railway mileage with 42,346 miles of single track. (see appendix A for mileage table of Canadian railways in 1943) Of this, 51% was operated by the Canadian National Railways, 40% by the Canadian Pacific Railway, and 9% by other roads. The United States and Soviet Russia are the only countries in the world with a greater mileage. In miles per capita, Canada has one mile of line for each 281 persons, exclusive of Canadian railways that cross over United States territory. This figure is twice the average for the United States and is second only to Australia in miles per capita. Canada's extensive transportation system was in peacetime capable of handling a much greater volume of traffic than economic conditions required.

It has been estimated that before the war the debt incurred in respect of Canadian railways, including some construction grants made to the Canadian Pacific Railway, accounted for more than a quarter of the public debt of Canada. The Canadian National Railways cost the country in net income deficits an average of \$50,000,000 a year from 1930 to 1939. Every effort was made to maintain track motive power and rolling stock in good condition, but because of loss of traffic many economies had to be made, and when war broke out Canadian railways were by no means in an ideal condition to meet the demands made on them. Hence their wartime achievement is even more remarkable.

Thousands of trainloads of construction materials, machinery and equipment have been moved, raw materials and war materials transported to ocean ports, troops carried across the country, army camps and air training depots supplied, loaded cars hauled from industrial yards, trains kept moving at high efficiency. As traffic increased, unit costs went down, and thus it was proved that, given the traffic to carry, Canadian railways would pay their way. After two years of war, the Canadian National Railways were able to pay interest in full on outstanding obligations to the public and to the government, and after meeting all tax requirements, showed a surplus for the first time in 13 years. Canada's railway "problem" became one of its greatest war assets. Canada is now the second greatest exporter among all the United Nations. It is difficult to see how Canadian industrial production, so greatly expanded to meet the demands of war, could have been serviced by a transportation system which was adequate to handle only the needs of its peacetime economy. It is difficult to build railways in wartime. It might well be argued that Canada's maintenance of excess transportation capacity during peacetime was one of its wisest defence measures.

TRANSPORT CONTROL

During the last war Canadian railways encountered serious difficulties because of congestion at seaports and railway terminals caused by shippers loading and billing shipments before space was available. This time both the government and the railways profited by past mistakes. Immediate steps were taken to insure that vital transportation requirements would be met. In November, 1939, the office of the transport controller under the Department of Transport was established to facilitate the orderly transit of war materials, and troops and to prevent congestion at terminals. The controller regulates the movement of all goods between points in Canada and supervises the movement of civilian passengers and military, naval and air force personnel.

Under transport control, freight cannot be shipped unless provision has been made for its prompt unloading. Before export freight is accepted, all contractors or shippers must obtain an export permit, and the export permit is not issued until it is known that space on a ship has been allocated for the freight. The export permit shows the date on which shipments will be accepted. Confidential information is furnished as to dates when vessels are available to accept cargo at the seaboard, and a schedule of running time allowances is set up for the number of days required to move freight from point of origin to the seaboard. The permit system is now considered a vital feature in the handling of export freight traffic.

Since materials can be transported overseas only as convoys sail and as permits are granted, they must be stored in the meantime where they will not interfere with the flow of traffic. To speed the movement of freight in the industrial yards of the numerous new war production plants, additional trackage was laid out. These industrial yards had to be kept clear of war materials awaiting overseas shipment, and freight cars also had to be released for immediate service. Hence it was necessary that storage yards or supply dumps be established where all such materials could be held while awaiting shipment. In these storage yards vast quantities of war supplies are kept under constant guard until shipping instructions and permits are received. This clears factory space of all but the materials required for production. Bottlenecks and congestion experienced in the last war have thus been eliminated, and the flow of munitions overseas has been vastly speeded up.

In 1941 the controller set up a carloading division to facilitate the loading of raw materials and war supplies. Carloadings of the Canadian railways have at times reached 75,000 a week, a sharp increase over immediate pre-war peaks.

In an effort to save rail and ocean space, packaging sizes were cut down. Orders were also issued to compel the carrying of greater loads of fruits, vegetables and other produce in refrigerator cars, and penalties for holding such cars longer than necessary were increased. In 1943 a maximum carloading order was issued which provided that every freight car must be loaded to capacity on every trip. This saving in space added several thousand cars a week to available carrying capacity.

The increased use of tranship stations has helped to conserve much-needed space, equipment, fuel and motive power. At certain selected points shipments are transferred and consolidated into cars headed for common destinations. This offsets the cost of handling incomplete loads and reduces switching operations to a minimum.

Cars which carry parcel freight on shipment to several consignees must be so loaded and unloaded as to produce no delays to other cars en route and to avoid duplicate handling. Each class of goods and each size of freight car has its maximum loading specified. These regulations of course increase the work of supervising the loading of freight trains considerably, but as a result the average loading per car has increased 35% from the years 1939 to 1944. The following table shows the average carload for the month of April for the last five years:

April, 1939	24.16 tons
" 1940	27.65 "
" 1941	28.84 "
" 1942	30.89 "
" 1943	32.83 "
" 1944	32.50 "

The office of the transport controller also arranges for the orderly movement of the armed forces to various training camps, to the United Kingdom, to Newfoundland, Labrador, etc. Special train services are organized to handle the traffic to and from the hundreds of camps scattered throughout Canada.

The transport controller has curtailed civilian passenger traffic by the abolition of cheap fares for excursions, holidays, week ends and large parties. Efforts have been made to induce employers to arrange staff vacations in mid-week so that the stress of this travel is more evenly distributed. On certain routes chair cars, dining cars and sleeping cars have been removed or limited. Chair cars have been removed on the heavily travelled routes between Toronto and Ottawa, Toronto and Montreal and Montreal and Ottawa.

FREIGHT

In the pre-war period Canadian railways suffered severely from the loss of freight earnings. Depressed economic conditions were accentuated by the diversion of short-haul traffic to the highway public carrier, plus a widening use of the private automobile. The outbreak of war brought an enormous increase in freight traffic. Expanding Canadian industry required adequate transportation by rail of both raw materials and manufactured products. The war at sea diverted to railways thousands of tons of traffic formerly moved by water. Lumber which had moved to the United Kingdom by way of the Panama Canal now went across the continent by rail. Newsprint from Quebec which once moved by water to the United States changed to rail. Bauxite, formerly brought from British Guiana to Arvida by boat, now came by rail from Arkansas. Munitions of war had to be transported long additional distances by rail to shorten the ocean haul, instead of moving to the nearest seaport as in peacetime. Coastal shipping was also subject to severe restrictions, and the number of vessels on inland lakes and rivers was greatly reduced. Gasoline rationing, scarcity of rubber and the resulting regulations limiting truck operations diverted to the railways much of the traffic which in recent years moved by highway. This necessitated the restoration of many abandoned local railway services and facilities, as it was largely short haul

traffic.

The tremendous task thrust on the Canadian railways by these developments can best be judged by the average number of miles a ton of revenue freight is carried. Movement of traffic is compiled on a ton mile basis: The movement of one ton of freight a distance of one mile.

On this basis, traffic moved on Canadian railways during 1944 reached an all-time high record of 66,000,000,000 ton miles compared with 31,000,000,000 in 1939.

The 1943 record was three times the movement reported in 1933. It was more than double the traffic handled at the peak of the last war, and 50% higher than the boom year 1928. Movement of this tremendously increased traffic was accomplished by prompt loading of cars and improvement in railway operation. In 1917 a ton of freight moved on an average approximately 30 miles a day, while in April of 1943, the average was 50 miles -- an increase of more than 65%.

Extent of the increase in traffic carried by Canadian railways during the war years is indicated by the following table, which shows the number of tons of revenue freight carried one mile in various years:

Year	Freight Carried One Mile (tons)
1944	66,000,000,000 (estimated)
1943	63,915,073,921
1942	56,153,953,000
1938	26,834,696,000
1933	21,092,594,000
1928	41,610,660,776

Revenue freight loaded at stations in Canada during 1944 was the heaviest in the history of the railways -- 100,316,787 tons -- estimated at 106,000,000 tons far greater than the 91,864,795 tons loaded in 1942 and the 84,036,011 tons in the prosperity year of 1928. There was also an upward jump in the amount of freight imported -- from 19,610,245 tons in 1942 to 22,824,032 tons in 1943.

The upward trend was even stronger in freight received from foreign connections for foreign points -- from 22,643,949 tons in 1942 to 29,808,277 tons in 1943: movement of crude petroleum, gasoline and other petroleum oils and products accounted for 80% of this increase.

The great effort made by Canada in the field of food production was reflected in the increase of grain loadings in 1943. Loading of wheat was heavier than in 1942 by 1,525,369 tons or 13.6%; oats, barley and rye more than doubled.

PASSENGER TRAFFIC

The upsurge of passenger traffic during the war years has been even more phenomenal than the growth of freight traffic. Since 1919 passenger traffic on railways had been declining consistently. By 1939 it was only half the figure of 10 years earlier. However, with the extensive movement of the armed forces, the migration of war workers to industrial centres, the increased tempo of business and the shortage of gasoline and tires, passenger traffic in the war years 1939 to 1943 increased by about 200%.

Following is a table comparing the war years with the boom year 1928 and the depression years.

Year	<u>Passengers carried</u>		
	All Canadian Railways	Canadian National	Canadian Pacific
1943	57,175,840	34,501,000	17,597,000

Year	All Canadian Railways	Canadian National	Canadian Pacific
1942	47,596,602	30,363,000	13,457,000
1938	20,911,196	10,289,000	7,454,000
1933	19,172,193	9,435,000	7,174,000
1928	40,592,792	19,697,000	14,751,000

EQUIPMENT

If the Canadian railways had been faced with these traffic increases in peacetime, they would have built locomotives and cars in large quantities. In wartime the scarcity of labour and materials, as well as conversion to war production of factories which manufactured railway rolling stock, made this impossible. Moreover, reduced business in the proceeding decade had forced the railways to restrict the building of new locomotives and cars. Much of their equipment was older than if traffic had been normal. For these reasons, the accomplishment of the railways in handling the wartime increases in freight and passenger traffic is even more remarkable.

Between 1929 and 1942 the number of locomotives in use on the Canadian National declined 19% and on the Canadian Pacific 22%. Together, the two lines had 4,170 locomotives in 1942 compared with 5,239 in 1929.

Although the 1928 volume of traffic was 44% less than in 1942, the 1942 traffic was handled with 8.6% less staff, 25.9% freight cars, 14.2% fewer passenger cars and 6.0% fewer locomotives. The Canadian Pacific in 1941 handled double the traffic of 1918 with 587 fewer locomotives and 13,464 fewer freight cars. The annual report of the Canadian National for 1943 remarks that "it is interesting to note that the vastly increased war traffic in 1943 was handled with 16.6% fewer locomotives, 15.4% fewer freight cars and 5.1% more passenger cars than was the traffic of 1917, the fourth year of the last World War". Although it is true that locomotives and cars owned by Canadian railways in 1942 were fewer than the number owned in the last war, a direct comparison of the two war periods is misleading, since locomotives today are much larger and more efficient and the capacity of cars much greater.

The action of the transport controller in insisting on full loading of freight cars has resulted in much more freight being carried more efficiently than under the unregulated system followed during the last war. Besides taking greater advantage of the carrying capacity of the cars, the cars in use in this war are also able to carry more. Between 1920 and 1942 the average capacity of a box car increased from 34,779 tons to 42,111 tons; a flat car from 33,459 to 42,594 tons; a coal car from 43,404 to 54,961 tons. On the average, the capacity of all freight cars during these 22 years increased from 35,141 tons to 43,175 tons.

Besides the increase in car capacity, loading methods have been improved and made more scientific, so that twice as many units can be packed in a car as in 1914.

Naturally the power of locomotives had to be increased to haul the greater weights carried in the new cars; the average tractive power of locomotives used on Canadian roads increased by 32% between 1920 and 1942.

The combined effect of these factors has been to increase by 70% the utilization of freight cars.

Speed also increased. Freight train speed between terminals, including all delays, was almost 17 miles an hour in 1942, an increase of 60% over 1917.

Since it has been impossible to build enough new motive power and rolling stock, to handle increased wartime traffic other measures had to be taken. Equipment, instead of being replaced, has been rebuilt or refitted. Old locomotives were reconditioned for service. Operating methods were reorganized. Day and night shifts of servicing staffs were instituted.

Canada-U.S. Car Pooling

In order that it will be unnecessary for good to be loaded and unloaded at the borders, freight cars in Canada have always been pooled with those in the United States. However, during wartime there has been increased emphasis on Canada U.S. car pooling. United States freight cars which move to the west coast ports do not return east empty. Instead, they are sent north to Vancouver, loaded with lumber and sent across Canada to the Atlantic coast. Canadian cars which would ordinarily move westward empty are now made available to United States lines.

TRANSPORTING TROOPS

Great problems have arisen with the necessity of finding equipment to transport thousands of troops to and from camps, homes and embarkation points. Passenger cars, coaches and pullmans were rearranged to furnish self-contained living quarters for soldiers.

The problem of feeding troops en route was met by the building of commissary kitchen cars to provide meals with speed and efficiency. On these cars mess orderlies line up to draw rations to serve their comrades in the coaches. A "long table" diner for troops has also been designed, with two tables running the length of the dining-room, thus permitting waiters to serve from the centre of the car. These tables seat 54 men instead of the regular diner capacity of 30 to 36.

A cafe car has also been built, with kitchen in the centre and "plate" meals served to passengers on settees at the sides of the car. It accommodates 40 persons.

Special hospital cars have been built for the carrying of casualties. Incorporating all of the latest advances in comfortable accommodation, they were designed to be operated in both Canada and the United States.

A new type of coach has been designed by the Canadian National for industrial trains to seat 122 passengers, instead of the usual coach average of 72. The C.N.R. reports that with fewer cars available than in pre-war years, six times as many meals were served on diners in 1944.

In addition to the special war service cars mentioned, the Canadian National is about to start work on conversion of 50 colonist cars to army sleeping cars.

One of the most useful types of freight car is the flat car with a depressed centre which is used to move any odd-sized or unwieldy freight. These specially built cars are the largest in Canada. They have carried corvette boilers, a large steel-welded boat, steel towers, war plant transformers and invasion barges which, in addition to being high, protruded over the sides of the cars. Because of this a special movement technique had to be developed in which loads were jacked up or lowered as circumstances demanded to get them by half-deck girder spans on bridges.

PERSONNEL

Just as serious as the equipment shortage to the Canadian railways has been the manpower shortage. The number of employees (average of counts made each month) for the railways in 1943 was 169,663, compared with 127,747 employees in 1938. This increase of 33% was disproportionate to the enormous traffic

increase of 138% in freight ton miles and 266% in passenger miles for the same period (1938-43).

As with equipment, the number of employees of the railways had been greatly reduced during the years of the depression. For example, the staff required to patrol the right-of-way along the tracks had been reduced to a minimum for safety and speed; but with the tremendous increase in traffic after the outbreak of war, a very much greater number of maintenance of way men was required. Similarly, in the round houses and shops, staffs had been severely reduced and were completely inadequate to handle the sudden emergency.

All railway companies, reporting on their war activities, make mention of the co-operation received from their personnel. Employees who would ordinarily have retired have been retained in service; others who had already retired have been called back to work. In certain fields much more than the usual proportion of unskilled labour has been employed under the supervision of experienced men.

The part taken by women in replacing men has been important. Car cleaning draws most female labour, but in addition women have been engaged in engine wiping, station snow clearance, track work, coach cleaning, yard checking and telegraph messenger work. They have also been hired as baggage porters, janitors, gardeners, pumpmen, crew clerks, ticket clerks, telegraph operators and assistant agents. By October, 1943, women replacing men in Canadian railways numbered 1,400.

Both the Canadian National Railways and the Canadian Pacific Railway report larger staffs in the war period, but the increases were very inadequate compared with large increases in freight and passenger traffic. The following table shows the number of employees in various representative years for all Canadian railways and for both the main systems. The average number of employees for the Canadian Pacific in the war years has not yet reached the average for any year from 1926 to 1930. The average number of employees for the Canadian National in 1943 reached the average for the year 1930, but is less than all preceding years from 1923 to 1929, with the exception of the year 1925, when the average number was 98,382.

Employees on Canadian Railways

Year	All Canadian Railways	Canadian National	Canadian Pacific
1943	169,663	101,126	64,387
1942	157,740	94,592	59,947
1938	127,747	74,953	50,155
1933	121,923	70,625	49,412
1929	187,846	109,096	74,274

Enlistments in Armed Services

To December 31, 1944, the Canadian Pacific Railway reported that 20,716 employees had enlisted with the armed services, while the Canadian National Railways at December 1944 reported 20,000 employees in the armed services. Overseas it was reported that the First Canadian Army Railway Operating Group consists almost entirely of Canadian ex-railroaders who are using their expert knowledge to operate French and German locomotives. Technical men, experts in various fields, and administrators have also been taken from the railways in large numbers by the government to assist in the prosecution of the war. For example, Canadian railway officials were summoned to Ottawa to assist with the formation of the Defence Purchasing Board, which was the forerunner of the Department of Munitions and Supply.

To help compensate for the shortage of technicians, Canadian railways inaugurated travelling schools. Railway cars were fitted as "classrooms on

wheels" for training firemen studying to become engineers. These cars will accommodate 70 pupils at one sitting, and classes are held in various parts of the country. The students study air brakes, boilers, lubricators, steam heat, air conditioning, lighting and other subjects.

Earnings

At the end of 1939, after less than four months of war, Canadian railways showed a substantial improvement in earnings. As the war continued, the improvement continued, and in 1943 revenues earned by railways rose to a new high record of \$778,914,565, compared with \$663,610,570 in 1942 and \$336,833,400 in 1938.

Operating expenses also increased in 1943 to a new high of \$560,597,204 compared with \$485,783,584 for 1942 and \$304,373,285 for 1939.

The following table shows earnings and operating expenses for various years. The year 1928 had shown an all-time high record in revenue until the war period:

Earnings and Operating Expenses of Canadian Railways

Year	Total Operating Revenues	Operating Expenses
1943	\$778,914,565	\$560,597,204
1942	663,610,570	485,783,584
1938	336,833,400	295,705,638
1933	270,278,276	233,133,108
1928	563,732,260	442,701,270

Freight revenue increased by 12.9% in 1943 over 1942, and passenger revenue by 35.3%. Other services also showed substantial increases. The total increase over 1942, which had shown a previous all-time high record, was \$115,303,995 or 17.4%. In comparison with 1939, freight revenue increased 98.6%, passenger revenues 242%, and total revenues of 112%.

The effect of the war on the Canadian National Railways was marked. In 1939 the company's net income deficit, which had averaged \$50,000,000 for the last 10 years, dropped to \$38,000,000. The year 1940 saw the reduction of the Canadian National deficit to \$15,000,000, and finally, in 1942, to the great satisfaction of the Canadian taxpayers, the Canadian National Railways showed a net income credit, for the first time since 1928, of \$4,000,000. Operating net revenue and cash surplus bettered all previous records by substantial margins. In 1943 operating net revenues were \$116,140,000 compared with \$86,656,000 in 1942, an increase of 34%. When allowances were made for the payment of taxes and all fixed charges, including interest on government loans as well as accelerated depreciation on equipment, adjustment of inventory reserves, amortization of war projects, etc., there was a cash surplus of \$35,639,000 compared with \$25,063,200 in 1942. This cash surplus represents money returnable to the people of Canada by the Canadian National Railways through the federal government.

It is estimated that gross revenues of the Canadian National for 1944 will be on a level with 1943. Operating revenues have been estimated at \$440,000,000, with operating expenses \$352,000,000 and a net operating revenue of \$78,000,000. Because of increased expenses as a result of wage increases and a rise in the cost of materials, net revenue for 1944 will not be as great as it was in 1943. However, a cash surplus will again be turned over to the federal treasury after payment of interest due to the public and the government.

The Canadian Pacific Railway shows a similar picture of sharply increasing revenues during the war period, with gross earnings in 1944 at \$318,870,000 or 7.3% greater than in 1943, a year in which earnings had reached their highest previous level. This was the first time that gross traffic revenues exceeded the \$300,000,000 level. They almost tripled the gross earnings of the depression low year of 1933. During the depression years reduced C.P.R. earnings resulted in discontinuing the payment of preferred dividends from 1933 to 1936, and of ordinary dividends from 1932 to 1942.

In 1942 operating revenues reached \$272,268,643, an all-time high up to that time. In 1943 there was a further increase in operating revenues at \$314,331,984. Increases were also recorded for all varieties of traffic, and freight earnings increased by \$22,045,259 or 11.3%. Earnings from grain and grain products increased by 37% in 1943 over 1942.

The annual report of the Canadian Pacific Railway for 1943 said this increase was "almost entirely the result of the conversion of the national economy to a wartime basis." Passenger earnings increased by 30.1%. Express revenues were the largest since 1921.

In 1943 dividends amounting to \$5,042,782 at the rate of 4% were paid on the non-cumulative preference stock, and at the end of the year, for the first time since 1931, a dividend of 2% on the ordinary stock, at the rate of 50 cents a share, was declared; this dividend was again paid in 1944. Net profits of \$42,982,718 were reported for 1943, compared with \$34,361,432 in 1941, \$1,262,382 in 1938, and a deficit of \$424,115 in 1932.

Accidents

With the exception of the year 1942, when 43 passengers were killed, the war years have shown no noticeable rise in the number of railway passengers killed. (The Almonte train wreck which resulted in the death of 36 passengers occurred in 1942). As a matter of fact, passenger deaths decreased considerably from the years 1926-30, which averaged 17 passengers killed a year. In 1943 the 1942 figure of 43 passengers was reduced to nine passengers killed, compared with 20 passengers killed in 1929, eight in 1933 and 10 in 1941.

The year 1939 had the very low figure of one passenger killed. Even including the high figure for 1942, the average for the war years 1939-43 of 13.6 passengers killed is still below the average for the previous boom years.

Considering the enormous increase in wartime traffic, this low record shows the extreme care taken by railway officials and employees for the safety of their passengers.

The number of passengers injured in train accidents (including all injuries, no matter how slight) has also shown no appreciable rise during the war years. The figure of 417 passengers injured in train accidents in 1943 compared with 639 injured in 1942, 485 in 1941 and 432 in 1935. The average number of passengers injured in the period 1926-1930 was 500 a year - 406.6 in train accidents, 94.0 in non-train accidents.

However, the number of employees killed in train accidents has shown a steady increase during the war years, and this increase has been at a greater rate than the increase in the number of persons employed. During 1943, 112 employees were killed, compared with 103 killed in 1942, 88 in 1941 and 43 in 1939. The average for the four years 1940-43 was 88 employees killed, compared with the average for 1935-39 of 55 killed.

Total number of deaths from train accidents, including deaths to trespassers and motorists, was 318 in 1943, compared with 411 in 1942 and 275 in 1940. Average total number of deaths for the years 1926-1930 was 422 a year. The average figure for the four years 1940-43 was 345 persons killed and 3,050 injured, compared with the 1935-39 average of 316 killed and 2,047 injured.

Trainmen are subjected to greater hazards in train accidents than other employees, and the number killed and injured from accidents connected with the movement of trains, locomotive or cars has shown a continuous increase for each of the war years. The average number of trainmen killed for the five years 1935-39 was 30.2 and injured 887. In 1940-43 the averages increased to 53 and 1,744 respectively. The highest record was in 1943, with 78 killed and 2,649 injured. More trainmen were employed and were working a greater number of hours than in the pre-war years; but even on a man hour basis the 1940-43 records show an increase over 1935-39 of 23% killed and 38% injured. For 1943

the increases are 51.7% and 75.6% respectively.

On the basis of total employees, regardless of the average time worked, the increases were larger. For 1940-43 the increases were 35.4% for killed and 52% for injured. For 1943 the increases were 75.7% and 103.6% respectively.

Engineering Problems

Extremely difficult problems have been faced by the engineering departments of both railways. In the first days of the war, industries were springing up all over the country, these had to be served with industrial spurs and other trackage and facilities as quickly as possible. Hundreds of camp sites and air fields had to be given transportation facilities. Marshalling and storage yards had to be built, and lines had to be strengthened to meet the sudden heavy war traffic. Some highly intricate problems arose in transporting equipment. To move landing barges, it was necessary for the railway tracks to be depressed to permit the load to pass under bridges, and in certain sections signal towers had to be stripped and switch stands removed. Giant boilers offered serious problems, because they were often so big that they had to be loaded on two flat cars. The load being too wide for clearance, it was necessary that single track branch lines be used as much as possible. When the load did come onto a double track main line, no train could pass on the other track during the run, which meant train schedules had to be very carefully arranged.

One of the most important shipments ever made on Canadian railways was the moving of a steel tower from Lachine, Quebec, to the government-owned Polymer synthetic rubber plant at Sarnia, Ontario. The steel tower measured 165 feet in height and $12\frac{1}{2}$ feet in diameter and weighed 150 tons. It had to be specially built, loaded on three flat cars and hauled by a special train. The train consisted of an engine, a rusted rock car used as a "floater" between the load and the engine, the three flat cars bearing the tower, and two cabooses for the crew. Since it could be moved only in daylight at 15 miles an hour, it took five days for the 500-mile trip. Everywhere the special train was given the right of way. The slow speed was an extra precaution for safety, and track men rode with the train to inspect the rails and bridges before the load went across. This steel tower comprised the largest unit shipment ever made in Canada.

Munitions

Not only are the railways handling the largest volume of traffic known in their history, but they are also engaging in various other wartime activities. For example, in their own shops and in munitions plants operated by them have been produced tanks, naval guns, cargo ships, mine sweepers, marine engines and guns of heavy calibres, as well as secret devices.

The Canadian Pacific's shops at Montreal, the Angus shops, were converted to the production of Valentine tanks for the use of Soviet armies. It was stated by the chairman of the Soviet Government Purchasing Commission in the United States that these tanks were the best of all imported tanks. When the Soviet contract was completed, Angus shops then turned to the manufacture of huge main marine engines and condensers for the Royal Canadian Navy escort vessels. While on the tank contract, company engineers devised a plan of using one-piece cast turrets and cast noses for tanks in place of the previously used built-up parts. This method added to the fighting effectiveness of the tanks and at the same time simplified construction. It was widely applied thereafter in tank construction in Canada and elsewhere.

The Canadian Pacific's Ogden Shops in Calgary also produce naval guns, anti-aircraft gun mounts, gun barrels and sights and breech housing mechanism

on contract to the Royal Canadian Navy, the Royal Navy and the United States Navy. The Canadian Pacific shops collect approximately 75,000 tons of scrap metal annually, with a net reclamation value of \$500,000. Some of this scrap is sold and some is reclaimed. At Angus shops cast-iron wheels are made, 70% of the content of which is scrap.

A recent report from the Canadian National Railways revealed that from the start of the war to the end of 1944 a total of 1,145,117 tons of scrap materials was salvaged and reclaimed by the C.N.R.

The Canadian National is also engaged in the manufacture of munitions, including guns and gun carriages. The National Railways Munitions Limited at Point St. Charles, Montreal, one of the important war industries in eastern Canada, makes naval guns and field artillery gun-carriages. Here, with a staff of some 1,200 men and women, 500 12-pounder naval guns and mountings, effective in anti-submarine warfare, have been built and delivered. The company also has orders for 1,000 four-inch naval guns and for several gun howitzer carriages. This particular gun is considered one of the most efficient pieces of artillery designed during the war. In the post-war period it is expected the shop will become, without alterations, the car repair shop for the Canadian National and will replace the only remaining section of the group of buildings which form the general repair shops of the Canadian National Railways at Montreal. Munitions are also being manufactured in three other Canadian National shops.

The Canadian National is the only railway in North America which operates a shipbuilding yard. The yard is located on the Pacific coast and builds minesweepers and cargo ships. The company's Prince Rupert dry dock is one of seven major yards now building Canadian 10,000-ton cargo vessels. Prior to engaging in the construction of freighters, the yard turned out four minesweepers of the Bangor class for the Royal Canadian Navy. After delivering six 10,000-ton cargo ships of the North Sands type, it is now building Victory ships. About 1,500 men are employed in this shipyard, which has also been engaged in naval ship and cargo repair.

Centralized Traffic Control System at Monoton

Of the utmost importance in the transportation situation is the 125 Canadian National line between Monoton, New Brunswick, and Truro, Nova Scotia. Four-fifths of this line is single track, and over it must pass all the railway traffic of Canada on its way to Halifax. Monoton constitutes a converging point for all the rail traffic from all parts of Canada and points in the United States to the ports of Halifax and Sydney, Nova Scotia. Truro acts as a converging point for westward rail traffic from industrial centres and seaports in Nova Scotia. In addition, there is the Tormentine sub-division that provides the only rail connection between Prince Edward Island and the mainland.

The war increased the freight and troop traffic on these lines to a point which taxed their capacity to the limit. Overseas traffic from the port of Halifax was greatly war-expanded. It soon became apparent that something would have to be done to increase the capacity of the line and expedite the movement of trains. Train movements at this time were directed by the manual block system which caused repeated delays, particularly in winter.

It was decided not to build an additional low grade line, since the cost would be 9,000,000 and it was not expected that second track would be needed after the war. Instead of double tracking, a centralized traffic control system was set up between Pacific Junction and Truro in 1941 which was capable of handling wartime traffic. It will also expedite the handling of traffic after the war. The centralized traffic control is a system by which trains operate without using train orders or time table authority. Instead, they obey only signal indications, which are under the supervisory control of the man on the control machines located at Monoton. The system is basically a series of controlled locations, equivalent to interlocking plants, connected with automatic signalling. Each controlled point consists of a single switch or crossover, or various combinations of single

switches and crossovers with associated signals.

The centralized traffic control saves a great deal of labour and time and increases the capacity of the line in trains per day, between 50% and 70%. Average running time on freight trains of two hours is saved, which means the locomotives are available for service elsewhere since they are on the road a shorter length of time. The result is that operating expenses have decreased while the safety of operation has increased. Broken rails are detected more frequently on the control board, and the greater number of conveniently located telephones makes it possible for employees to inform the controller of unsafe conditions in the roadways. Trains can be stopped more quickly than by the train order method since there is direct control of a large number of signals. In contrast with the last war, when the railway between Moncton and Truro was a bottleneck handling only 400 cars a day, in this war 1,000 cars a day can be handled with ease.

An example of the efficiency of the system can be seen in the movement of troops to Halifax for overseas. There have been times when it has been necessary to transport as many as 10,000 troops over the Halifax line in 24 hours. Some dislocation of normal train schedules has been experienced, but in all cases the job has been finished on time. In some cases ticketing staffs have worked 36 hours without sleep. On many occasions for days at a time as many as 100 trains a day have been operated in and out of Halifax. This works out at about one train every 15 minutes.

Other improvements in the Atlantic Region which are assisting in the prompt movement of wartime traffic include large yard extensions at Moncton, Truro and Bedford Basin, Nova Scotia. A new engine terminal at Fairview, Nova Scotia with a coaling plant of 250 tons capacity and also a 150 tons coaling plant was built at Napadogan, New Brunswick. Lighterage docks and lighters have been built at Halifax.

Northern Alberta Railways

The Northern Alberta Railways, jointly owned by the Canadian National and Canadian Pacific Railways, and operated by the Northern Alberta Railways Company, has about a thousand miles of track that links the pioneer towns and settlements north of Edmonton where there are few highways. One line runs northwest from Edmonton to Dawson Creek in British Columbia, the southern end of the Alaska Highway, with a branch line terminating at Hines Creek in Alberta. The other line goes to Waterways, 283 miles northwest of Edmonton, to which it was extended in 1923. Begun in 1914, it was originally built as a colonizing railroad. Before the war its 16 locomotives and 600 employees plus a score of passenger cars and less than a hundred freight cars were more than sufficient for the work.

With the building of the Alaska Highway, the oil pipe line at Fort Norman and the development of northern navigation, however, Northern Alberta Railways became, in the words of a United States army officer, "one of the most strategic railways in the world". It is estimated that without the existence of this railway to carry men and materials, developments in the Canadian northwest, would have been delayed for months and even years. In February, 1942, with the beginning of the Alaska military road, trains began to move with ever increasing loads of building equipment, gasoline and oil. The number of locomotives on the line was tripled, and the staff more than doubled. New tracks had to be laid in below zero weather, and freight sheds constructed. Between March 7 and December 28, 1942, more than 7,500 carloads of freight were shipped to Dawson Creek, and in addition 2,000 or more carloads to Waterways, an amazing amount for a small, poorly equipped railroad.

Post-War Plans

Both the Canadian National and the Canadian Pacific Railways gave evidence

before the parliamentary committee on reconstruction in 1943 on their post-war plans, particularly the provision of employment opportunities. Since the two companies together make up the largest single industry in Canada, the largest employer of labour and the largest user of materials, their employment plans are extremely important to the Canadian economy.

Both companies will have a "backlog of deferred maintenance" which will arise from three sources. Some of it will be work which would have been done during the depression years had the railways not been obliged to curtail expenditures; some of it will be work which could not be undertaken during the war because of shortages of men and materials, and some of it will arise from the necessity of correcting the effects produced by the severe strain of wartime traffic. Included in this backlog will be drainage work, ballasting and relaying of steel rails, replacements of motive power and rolling stock. To the end of July, 1944, railways had accumulated more than \$50,000,000 for deferred maintenance work, representing between 25,000 and 30,000 man-years of work, in addition to ordinary maintenance work.

The problem of providing work for returned men was discussed fully in the brief presented to the committee. The railways have lost about 20% of their personnel to the armed forces and expect these men to come back to their old positions or to better ones, with seniority preserved for them. This will be possible, say the railways, because many thousands of employees now working for the railways are persons who would not normally be employed -- married women, women doing men's work, juveniles and pensioners. As for new employees, the Canadian National points out that since they have no seniority, they must undergo a period of apprenticeship or part-time work, during which they would have less than full employment. Such temporary positions are mostly of a seasonal nature and would call for unskilled or semi-skilled labour on construction or maintenance work in the summer and snow removal in the winter. This work would add to the general pool of employment, but would not lead to permanent employment.

Canadian National officials divide possible work projects into four classes: Capital works to expand the company's field of operations; projects which can pay for themselves; desirable but economically marginal projects, and projects desirable but not productive of net revenue to the railways. Self-liquidating projects are the only ones which the railway would undertake at its own expense. All others would require some form of government assistance. The four classes of projects would provide an estimated 95,000,000 man-days of work at a total cost of \$640,000,000. The Canadian National Railways state that, assuming there is a post-war national income of approximately \$8,000,000,000, the annual operation and capital expenditures of the C.N.R. would be in the neighborhood of \$317,000,000 and the system would provide direct and indirect employment totalling 47,000,000 man-days a year. Each 1% increase in national income would increase employment by .7%, and each decrease of 1% in income would decrease employment by .75%.

The Canadian Pacific Railway states that the volume of its business is an index of the total income, in the form of goods and services of the people of Canada. The economic objective of the company must be to conduct its affairs to contribute as much as possible to raising the income of the citizens of Canada to the attainable maximum. Wartime experience, says the C.P.R. brief, suggests that depressed economic conditions may be unnecessary and that it should be possible under correct national policies for private enterprise to provide employment and a fair standard of living. The submission stresses that its forecasts are predicated on several assumptions: Victory which will bring free development of international commerce, a continuing free democracy in Canada, private enterprise as the basic source of economic activity, and legitimate types of collective bargaining.

The Canadian Pacific also points out that the tremendous growth in highway transport in the last 25 years has provided an important new facility in the field of land transportation. The resulting destructive competition, lack of an adequate national policy of regulation, and the policy of the provincial governments in permitting the use of highways without ensuring that commercial services are charged their fair share of the cost of construction and maintenance of highways, are criticised. Since it is expected that after the war highway transportation will regain a considerable volume of its lost traffic, more regulation by the government in this field is recommended. However, the Canadian National points out that although highway transport has caused problems for the railway, it has, by the opening of new districts, resulted in demands for goods and services which the railway had to supply.

From the experience during the war, it can be seen that given the traffic to carry, railways in Canada can pay their way. The future of railways is largely a matter of traffic volume which is not under their control. The prosperity of the railway hinges directly on the prosperity of the nation as a whole.

History

It would be difficult to over-estimate the importance of the railways in the building of Canada. With a narrow band of population stretched across a continent along the northern border of the United States, Canada needs a large and costly transportation system if the country is to operate as an economic and political unit.

In the early history of Canada there was not a band of population, but isolated pockets along the northern border of the United States. These isolated groups of people were all members of the British Empire, but they were not joined together as one nation. A basic essential of nationhood -- easy communication between one part of the country and another -- could scarcely be achieved without a transcontinental railroad, and it was when the men in the east decided to push a railway across the prairies and over the Rocky Mountains that the idea of a united Canada first became a concrete possibility.

Among the first great economic undertakings to engage the attention of the Dominion of Canada after Confederation in 1867 was the building of a transcontinental railway to link east and west. Building of this railway -- the Canadian Pacific -- was one of the terms on which British Columbia entered Confederation in 1871. During the ten years 1871-1881 the government built 713 miles of track. In 1881 the project was turned over to a group of business men who undertook to build an all-Canadian railway to the Pacific ocean as a private enterprise. At its formation in 1881 the Canadian Pacific Railway Company received a substantial cash subsidy and grants of western lands from the government. Surmounting tremendous difficulties, the railway was completed in 1885, and the vast hinterland of the Canadian west was opened for settlement.

The wheat boom in the Canadian Northwest during the period 1900-1913 brought prosperity and rapid economic expansion and precipitated another era of railway development. With the mounting volume of grain moving to the coast for export and the increasing quantities of manufactured goods and equipment moving into the prairies, the capacity of existing railways was taxed to the utmost. The Canadian government in an effort to keep the flow of western traffic within Canadian rather than United States channels, gave every assistance to railways. Canadian national policy was to keep an east-west flow of traffic, and east-west economic integration, an east-west interdependence, by means of an all-Canadian transportation system and by protective tariffs.

Besides the Canadian Pacific Railway, two other transcontinental systems were built. In 1902 both the Canadian Northern and the Grand Trunk asked for and were granted authority to build transcontinental railways. The Canadian Northern was completed just before World War I, and the Grand Trunk Pacific (with the government-built National Transcontinental) was finished in 1915. These enterprises seemed justified at the time by the rapid development of the west and increasing general prosperity. Total Canadian railway mileage increased from 18,140 miles in 1901 to 30,795 in 1914.

The expansive railway policy of Canada made direct economic intercourse between its separate regions possible. Not only was the settlement of

the west promoted, but economic activity in the east was stimulated. A direct railway connection with the prairies gave a tremendous impetus to the industrialization of Ontario and Quebec, to the coal and steel industries of Nova Scotia and to the lumber industry of British Columbia. Railways reduced the vast size of the country to manageable proportions. In the words of the Sirois Report: "An economically loose transcontinental area was transformed into a highly integrated national economy."

Unfortunately the assistance given the railways during the period between the end of the 19th century and the start of World War I was not necessarily in accordance with the conditions of economical and efficient transportation. Although some attempt was made to avoid duplication in the building of additional transcontinental railways, prevailing optimism was so great that eventually the government had given assistance to three different lines, and far more railways were built than were economically justified. The result was costly duplication extending across long stretches of unproductive territory, and the transportation overhead on the Canadian economy has increased with each passing year. A great deal of this heavy cost would have been avoided if the connections between different regions had been made by way of the existing route through the United States. On the other hand, without a railway backbone, it is doubtful if the Canadian economy would have survived: Canada's railway burden was the price of economic and political unity.

With the extraordinary demands of World War I, a tremendous strain was placed on Canadian railroad facilities. In the face of a record volume of business, the number of railroad cars proved inadequate, (largely because they were used to store freight instead of to convey it) costly delays resulted, and several lines collapsed. To avert financial disaster on a national scale, many lines had to be taken over by the government. Between 1917 and 1921, the Canadian Northern, the Grand Trunk (and its subsidiary, the Grand Trunk Pacific) and several smaller lines were taken over by the government. In 1923 these lines, along with the Intercolonial, which has always been a government railway, were brought together under the title of Canadian National Railways.

During the 1920's, the financial condition of Canadian railways improved considerably with general world prosperity. The Canadian National, however, was never able to free itself from the burden of inherited debt. Although the system showed a substantial net revenue in 1923, it was not until the year 1926 that net returns were enough to pay all fixed charges due the Canadian public. The Canadian Pacific during this period paid its shareholders substantial dividends. In the decade 1920-30 the motor vehicle began to prove itself a serious competitor to the railways, and the lack of governmental regulation in this field is blamed by the railways for loss of revenue.

The depression years of the 1930's saw railway freight and passenger traffic decline to new low levels, and hard hit by the long continued drought in the west and increasing highway competition. Revenues consequently decreased while capital expenditures and fixed charges increased. In 1931 the Canadian Pacific Railway reduced its dividend payment from 10% to 5%, and in 1932 discontinued dividends entirely. The C.N.R.'s deficit reached a high of \$60,968,438 in 1931 and for the next 8 years averaged \$50,000,000 a year.

In 1932 a Royal Commission was appointed to study the railway situation. The report of the commission condemned the competition of the Canadian National and the Canadian Pacific Railways. It stated that in order to reduce the burden of C.N.R. deficits on the federal treasury and to improve the financial position of the privately-owned Canadian Pacific, immediate steps should be taken to reduce unnecessary competition and duplication of service. However, each railway should retain its separate identity, the commission recommended.

As a result of the recommendations, the Canadian Pacific-Canadian National Act was passed in 1933. This act provided for the reorganization of the Canadian National Railways, and both railways were directed to co-operate in several

important measures. In the event of disagreement, provision was made for an arbitral tribunal under the chairmanship of the chief commissioner of the Board of Transport Commissioners. The act also provided that the Canadian National system was to go to Parliament for funds to meet its deficits instead of following its usual practice of issuing new bonds.

Board of Transport Commissioners

Since transportation services can be more efficiently and economically provided by one or a few concerns, the tendency in Canada as in other countries has been towards amalgamation and consolidation -- for example, the Canadian Pacific Railway and the Canadian National Railways. Since this tendency towards monopoly may result in abuses, the government set up authorities to control rates and certain other conditions on which services are rendered to the public. For the railways, this control was placed in the hands of the Board of Transport Commissioners. This board is responsible to Parliament through the minister of transport. Its powers cover matters relating to the location, construction and operation of railways. The Canadian Pacific Railway, although still privately owned, is under the same of control by the Board as is the C.N.R. All Canadian transportation agencies -- railways, canals, harbors, civil aviation, radio, etc., -- come under the supervision of the Department of Transport, which was organized in 1936. This department combined the former Department of Railways and Canals (which had been formed in 1879 as an off-shoot of the Department of Public Works) with the Department of Marine.

Miles of Road Operated by Canadian Steam Railways during 1943 (Average)

<u>No.</u>	<u>Name of Railway</u>	<u>Miles of Road Operated</u>
1.	Algoma Central and Hudson Bay	321.8
2.	Alma and Jonquiere	10.6
3.	British Yukon	90.3
4.	Canada and Gulf Terminal	381.1
5.	Canada Southern (Lessee N.Y.C.)	370.0
6.	Canadian National	21,771.6
7.	Canadian Pacific	17,037.9
8.	Central Vermont	25.3
9.	Cumberland	31.3
10.	Essex Terminal	21.3
11.	Greater Winnipeg Water District	92.0
12.	Hudson Bay	510.1
12a.	International Bridge and Terminal Co.	1.1
13.	Maine Central	5.1
14.	Maritime Coal, Railway and Power Co.	12.2
15.	Midland Railway of Manitoba	75.5
16.	Morrissey, Fernie and Michel	5.0
17.	Napierville Junction	41.7
18.	Nelson and Fort Sheppard	60.9
19.	Northern Alberta	927.6
20.	Ottawa and New York	58.0
21.	Pacific Great Eastern	347.8
22.	Pere Marquette	319.0
23.	Quebec Railway, Light and Power Co.	25.4
24.	Roberval and Saguenay	29.0
25.-	St. Lawrence and Adirondack	60.9
26.	Sydney and Louisburg	70.3
27.	Temiscouata	112.2
28.	Temiskaming and Northern Ontario	574.0
29.	Thousand Islands	4.5
30.	Toronto, Hamilton and Buffalo	111.0
31.	Toronto Terminals	3.2
31a.	Van Buren Bridge	0.3
32.	Vancouver, Victoria and Eastern	86.8
33.	Wabash (in Canada)	245.4
34.	Total 1943	42,346.3
35.	Total 1942	42,338.6
36.	Canadian National (Canada and U.S.)	23,562.4