newsletter

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Upper Canada Railway Society

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RAILWAY NEWS AND COMMENT

RAILWAY AND ROAD PROGRAM ANNOUNCED FOR BRITISH COLUMBIA, THE YUKON AND THE NORTHWEST TERRITORIES

Transport Minister Don Jamieson has announced a multi-million dollar railway and highway program to open up northern British Columbia, the Yukon and the Northwest Territories. Cost of the program is to be shared with the British Columbia government and is still subject to final agreement. It will extend over a period of ten years.

The program provides for the construction of about 1000 miles of railway, some of which is now being built by the British Columbia Railway. The program will cost several hundred millions of dollars and its completion could see a railway built by the Federal Government as far north as Dawson City in the Yukon. Federal Cabinet approval has been given to Canadian National to enter negotiations with BCR on final details of construction and operation of the rail lines.

The program would create some 20,000 new jobs and open up 600,000 sq. mi. of resource-rich area and provide access from British Columbia to the Yukon and the Mackenzie Valley in a rail and paved highway loop. The announcement was a firm commitment that the Federal Government was read to proceed with the project.

Talks have been underway between the Federal Government and the British Columbia Government for two years on ways to make optimum use of both CN and BCR lines in the northern part of the province and on building of new lines to the greatest advantage of the region's development. The Federal Government will pursue on its own the eventual extension of railway lines into the Yukon, and the timing of this will depend on developments in the Yukon.

The railway lines proposed by the program include the following:

* A 115-mile rail line from CN's Prince Rupert-Prince George line to the new BCR Dease Lake-Prince George extension which is due to be completed in 1974.
* An extension of the Dease Lake line into the Yukon at Watson Lake.

It is thought that the Federal Government will pay 25% of the cost of the Dease Lake extension from Fort St. James, northwest of Prince George, to the point where it will connect with the 115-mile Prince Rupert link. The line from this still undetermined point to Dease Lake in the northwestern part of British Columbia and then up to Watson Lake in the Yukon will be shared on a 50-50 basis. CN will build three branch lines of about 100 miles total mileage from its Prince Rupert-Prince George line to serve forest industries in the area. CN and BCR will have running rights in perpetuity over the Dease Lake line into the Yukon and BCR will have running rights over CN into Prince Rupert.

The exact location of the 115-mile extension from the Prince Rupert Line has not been decided but it will run generally in a northeasterly direction from the Hazelton-Terrace area to a junction point south of Dease Lake and will be a joint undertaking of CN and BCR. BCR is known to favour a Hazelton terminus for the connecting line. Detailed operating and traffic agreements for the new rail network are to be worked out by CN and BCR. Final route selection and time of construction remain to be agreed upon.

The Federal Government and CN will consider plans for the next phase of the extensions into the Yukon, with an eventual terminus as far north as Dawson City.

The three CN branch lines will serve the forest region at Ootsa Lake, Babine Lake, and the Nass River, increasing its supply of lumber and providing wood chips at low cost to serve pulp mills at Kitimat and Prince Rupert.

Under the highway program, the B.C. government will build a highway from Fort Nelson to the border of the Northwest Territories. The Federal Government will extend this highway to Fort Simpson in the Mackenzie Valley to link up with the new Arctic highway recently announced. British Columbia will be asked to assume responsibility for the B.C. portion of the Alaska Highway, once paving of it between Fort. St. John and Fort Nelson is completed. The Stewart-Cassiar highway will be finished this autumn and two additional subsidiary roads will be built to provide a shorter route from Alaska and the Yukon to the south. A highway will be built from Carcross, Yukon to Skagway, Alaska to give Whitehorse and the southwest corner of the Yukon access to the sea.

Studies have indicated a key need for new rail transportation from the Yukon to the Prince Rupert area. The decision announced earlier this year declaring Prince Rupert a national port has made recognition of this growth as well as providing additional port outlets for all the western provinces. The new proposals are designed to improve the economies of the western provinces, speed up grain shipments, upgrade the resource development in the forest and mineral regions of the Yukon and to take advantage of the port of Prince Rupert for increasing export trade with Pacific rim countries. "The Federal Government must assume a substantial role in insuring that the upgrading and rationalization of the northwestern systems occurs in time to meet these unforseen demands and needs," Mr. Jamieson said.

Salute to MLW 1902 1972

To the locomotive enthusiast, the initials MLW on an engine's builder's plate mean only one thing--that the locomotive bearing those initials was built by the Montreal Locomotive Works. The company bearing these initials has been in the locomotive building business in the east end of Montreal for the past seventy years. In those years, MLW has produced steam and diesel locomotives for nearly every railway in Canada. Abroad, engines bearing MLW builder's plates are to be found on every major continent.

The MLW story begins in 1902. A group of businessmen founded a engine-building company known as the Locomotive and Machine Works of Montreal. The early years of the Twentieth Century were years of railway expansion in Canada (the dozen years after 1902 would see the completion of two additional Canadian transcontinental railways), and the market for railway equipment and locomotives would be brisk. In 1904 the company was acquired by the American Locomotive Company and the name changed to Montreal Locomotive Works Limited. Thus began the long association with Alco which was to continue up to the dissolution of the Alco name and business in 1969.

In 1946, some 100,000 shares of MLW stock were put up for sale by Alco. These shares were bought up by Canadians. In 1955 additional shares were put on the block, so that by 1958 MLW was 80% Canadian owned.

Over the years, things changed for MLW's American affiliate. In 1964, Alco Products, Inc., as the locomotive building firm of Schenectady was now known, was absorbed by the Worthington Corporation as a wholly owned subsidiary. At the same time, Worthington acquired MLW stock, and by 1967 had acquired 52% of the MLW stock (and thus controlling interest). At the same time Worthington merged with auto-builder Studebaker--the new name being Studebaker-Worthington Corp.

To complete the corporate study, the Worthington business in Canada was merged with MLW in 1966 as a subsidiary. In 1968 another name change to the name MLW is known as today was done--MLW-Worthington Limited. MLW Industries is the locomotive building division of MLW-Worthington Limited.

The affiliation with Alco enabled MLW to gain access to Alco's engineering expertise. Nevertheless, steam power built by MLW was distinctive, and many, many famous engines emerged from MLW's erecting halls. The list is too long to be reproduced here. As the diesel electric locomotive displaced steam all over North America, MLW began producing diesel locomotives of Alco design. Initial diesel locomotive production began in 1948 (switcher designs), and in 1950 the first Canadian-built streamlined cab diesel units were turned out for Canadian National (MLW built a new plant to specifically fabricate diesels). Electrical gear for MLW-built diesels is produced by Canadian General Electric--an association which started in 1948.

In 1970, the business of Alco Products Inc. was wound up by Studebaker-Worthington. Having shared Alco's steam and diesel designs over the years, MLW was in the position to purchase Alco's engineering expertise, and did so, also acquiring all of Alco's worldwide licensing agreements. The long years of affiliation were terminated to MLW's advantage.

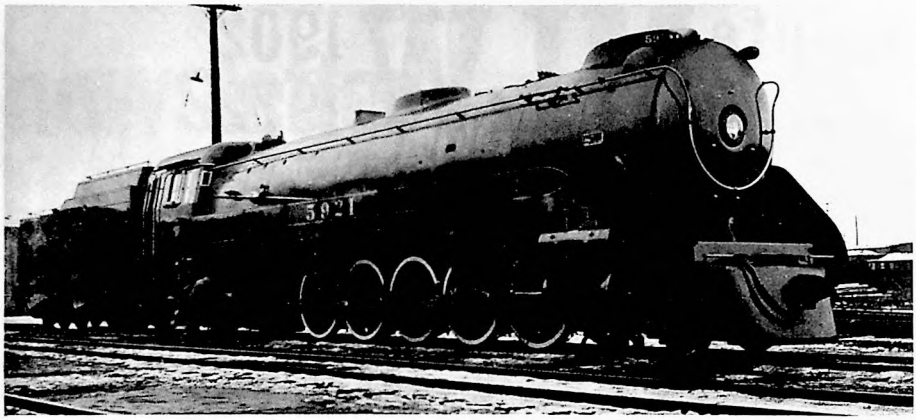
MLW Industries is now Canada's only integrated locomotive builder. MLW's engineering staff has increased by 40% since 1969, and in these years a distinctive locomotive line has been evolved--the M-line of diesels. This line now has four models--the 3000 hp. M630, the 3600 hp. M636, and the 4000 hp. M640 (only one experimental model produced to date--CP Rail 4744), and the brand-new M420 with 2000 hp. MLW currently has orders for 36 M420 units from two railways--British Columbia Railway and Canadian National. Two slightly different M420TR units were delivered last spring to the Roberval & Saguenay.

As the domestic M-line of diesel units was evolved, an export line of MX units was evolved. This line of export units has proved of prime importance to MLW. Of 72 units delivered during 1971, 41 were export (source: Extra 2200 South). MLW has shipped or will ship MX-series units to some of the following countries: East Africa, Yugoslavia, Nigeria, Tunisia, Malawi, Jamaica.

The erecting halls of MLW's Montreal plant have seen things other than locomotives. In 1962, MLW delivered 36 subway cars to the Toronto Transit Commission. These M-1 cars were the first Canadian designed and built rapid transit cars. In 1967 MLW constructed the five Turbotrain sets for United Aircraft of Canada which subsequently entered service on Canadian National between Montreal and Toronto. Currently MLW is engaged in another passenger train project--the development of the LRC train in partnership with Alcan Canada Products, and Dominion Foundries & Steel Ltd. [See Meet LRC, page 133 of this issue.]

This article is but a brief glimpse at MLW's seventy years of locomotive building in Canada. The future is impossible to foretell, but it is safe to say that MLW-built diesel locomotives will be forthcoming for many years to come. In the meantime we wish MLW "Happy Birthday!"

Duluth, Winnipeg & Pacific 2-8-0 2504, shown at Virginia, Minnesota in 1953, was built by MLW in 1918 (builder's number 59451) for the Canadian Northern Railway as CNoR 2504. (Edward Emery)



Canadian Pacific T-1-e Selkirk 5921 stands freshly delivered at Outremont Yard in Montreal, outshopped from the MLW plant under builder's number 69111. Very soon she will be shoving trains over the Selkirks. The date: November 26, 1938. (Robert McMann Collection)

Canadian National FA1 cab unit 9407 (shown standing at Mimico Yard, brand-new) is a member of the first group of Canadian-built streamlined cab diesel locomotives built by MLW in 1950, and delivered to CN. (Robert McMann Collection)

CP Rail M640 4744 is rated at 4000 hp. and was built by MLW in 1971. This unit currently holds the title as the most powerful single-engine production model diesel-electric in North America. (J. Bryce Lee)

meet LRC

BY ROBERT D. MCMANN.

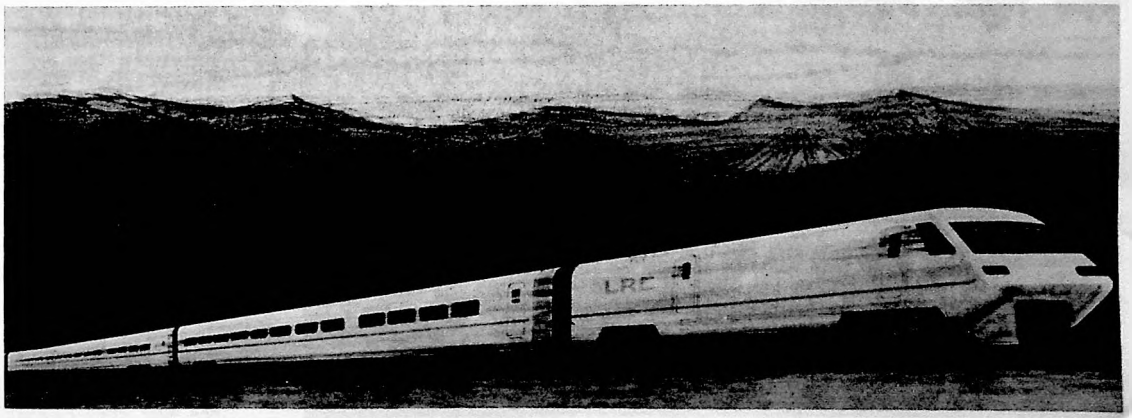
R.....C....L....R....C....L...R...C..L..R..C..L.R.C.LRC LRCLRC...LRC...LRC...LRC...what do these initials mean? They signify a train, a special kind of train. The LRC train is a new type of passenger train that is being designed and built in Canada, and a train about which you will be reading and hearing more in the months to come. The initials LRC signify a concept that this train is being designed to fulfill....L standing for LIGHT, R standing for RAPID, and C for COMFORTABLE (in French: Leger, Rapide et Confortable).

The LRC is the product of the talents of three Canadian companies--Alcan Canada Products Ltd., Dominion Foundries & Steel Ltd., and MLW Industries. The LRC train may be termed a "next-generation" high-performance passenger system. It is intended to make substantial reductions to intercity schedule times while operating within the environmental limitations of present-day railway technology and plant. It does not demand any special considerations for track or signals, but has the potential to take advantage of track structure and signalling improvements likely to occur in the next ten to fifteen years. The LRC system (the train package is a system concept) is a train designed to be the contemporary of the large-body jetliners now in use with major airlines. It will offer high point-to-point average speeds and comfort---all within the framework of present maintenance and track facilities. It makes use of the "state of the art" railway technology in all areas to achieve this. It offers the traveller the potential of high-speed comfortable railway transportation between two points of intermediate distance.

Most people who read the NEWSLETTER will be familiar with the decline and fall of the railway passenger train in North America (see the December 1971 UCRS NEWSLETTER, Decline of the Canadian Passenger Train). Since World War II, the intercity passenger train has just about gone the way of the dodo. The traffic the passenger train once carried has evaporated away---to private automobiles, to buses, and, over longer distances, to airlines, so that now the railway passenger train is regarded by some as an anachronism. The decline is now so complete that in the United States, a country which once had the finest railway passenger services of any country in the world, most surviving railway passenger services have been taken over by the National Railroad Passenger Corporation (AMTRAK), and given federal assistance. In Canada, the situation is not as bleak, and it is now recognized by the Canadian Government that in order for railway passenger services to survive, some government assistance must be given. The National Transportation Act stipulates that railway passenger services may be eligible for federal subsidies of up to 80% of annual losses, if the services are judged to be uneconomic by the Canadian Transport Commission. For this to happen, the railways must file application of abandonment for the particular service in question with the CTC, and that body then must determine whether the service is losing money and should be maintained in the public interest before subsidies can be recommended. At the present time, both major Canadian railways have abandonment applications before the CTC for all remaining intercity passenger services in the country.

It is now generally realized that urban ground transport systems can only be improved if there is more basic research into land transportation and general acceptance that society is the only agency capable of shouldering the inevitable costs. Intercity railway passenger trains offer some solutions to the problem of improving ground transportation systems. Passenger trains are still an economically sound way of moving large volumes of people. On a cost basis, they are a more economic form of passenger transport than the non-commercial combination of private auto and public road. Until such time that different forms of ground transport can be perfected, using trains which float, glide or fly above rights-of-way, lighter railway trains with improved suspension systems will offer the most likely immediate answer to the need for faster intercity land transport.

Enter LRC. LRC is a systems approach, offering such a lightweight train as an intermediate answer to the need for faster intercity ground transport. The train has been designed to serve a new and specific purpose, using established methods of propulsion and fabrication and materials whose properties have been use-tested. The train will operate economically as a push-pull unit with a locomotive at each end and ten coaches in between. Lightness, low centre of gravity and a suspension system that uses electronic sensors and hydraulic cylinders to bank the coaches on curves for maximum passenger comfort are the basics of the new design.



The LRC train project is a joint venture of three companies--Alcan Canada Products Ltd., Dominion Foundries & Steel Ltd., and MLW Industries, co-financed by the federal Department of Industry, Trade and Commerce, through its Program for the Advancement of Industrial Technology. The LRC project is primarily the brainchild of William Bailey, an engineer with Alcan who originated the project in 1967. The design was worked up in association with R. N. Dobson of Dofasco and John Byrne of MLW Industries, and the project became a joint venture, with financing assistance in the form of a grant from the PAIT program for half of the development cost ($2.5-million in total).

The prototype LRC coach is the first piece of railway equipment to be constructed for the project. The coach was built by MLW at its East Montreal plant and was outshopped in July of last year. On October 5, 1971, the coach was demonstrated and officially unveiled to officials of the Federal Government and the Canadian Transport Commission. Work is currently underway on the construction of a prototype locomotive at MLW, and this unit should be completed shortly.

How does the LRC train achieve its high performance--the improved suspension, high operating speeds--without any improvements to existing railroad plant? This question is best answered by examining the features of the LRC train technology.

The prototype LRC coach employs materials and methods of fabrication that make it completely different when compared with conventional railway passenger equipment. The coach is distinguished in appearance by its large windows, its generally streamlined, flush-surface, all welded look and its low silhouette (nearly two feet below the roof level of conventional passenger equipment) The car body structure is a stressed skin design in which Alcan aluminum alloy sheet and extrusions have been combined to provide an efficient lightweight car. The structural strength meets all the requirements as set out in Section "C" of the Association of American Railroads Manual of Standards and Recommended Practice ---specifications for trains weighing more than 600,000 lb.

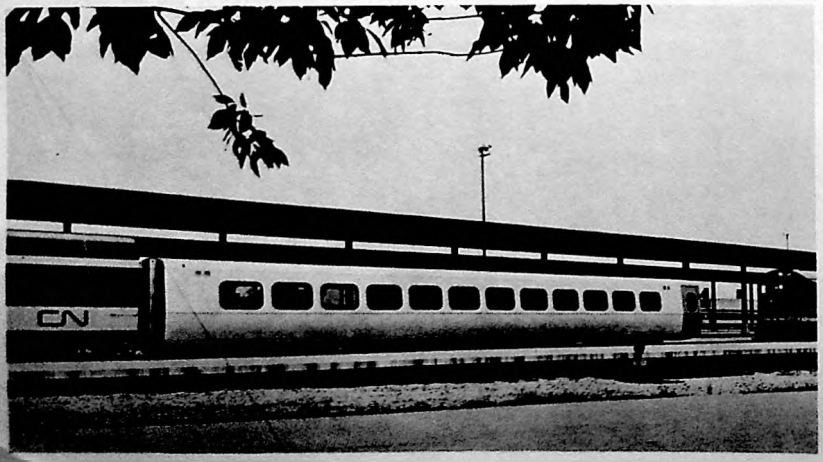
Length of the coach is 84 feet. The height from top of rail to roof is 11' 9". Maximum width is 10' 5".

The body of the coach is designed to achieve strength and stiffness without excessive weight. The centre sill, characteristic of traditional railway passenger equipment, is eliminated in the LRC coach, with horizontal loads being carried by large tubular side sills. This arrangement greatly increases the flexural strength and stiffness of the body shell, and, by providing a heavy perimeter frame at floor level,gives added resistance to side invasion of the passenger compartment. Buffing and draft loads are transferred to the side sills by horizontal shear structures fabricated from plate and extrusions which join the side sills and extend from the truck well to the end of the car.

The directors of the LRC project examine a blueprint while standing in the shell of the prototype coach at the MLW Industries plant. From left to right: John Byrne, Vice-President of MLW-Worthington Ltd. and head of the Transportation Group of the company's MLW Industries division; N. R. Dobson, Director, Product Development, Dominion Foundries & Steel Ltd.; and W. D. Bailey, Engineered Applications Manager of Alcan Canada Products. (Alcan Canada Products)

The side frame consists of the outside skin, side sill, waist rail, top of window stringer, side plate and side posts. The main longitudinal framing members are continuous extruded shapes, incorporating a torsionally stiff tubular section which lends added resistance to distortion. The waist rails are modified T-section shapes. Most of the waist rail area is concentrated in a heavy flange which forms a continuous external belt on the side of the car. The side plates consist of two continuous sections, one a modified channel shape and the other a modified Z-section, which are joined together. The side posts are extruded channel shapes, which, when welded to the car skin, form box section members spanning the area between the side sills and side plates. The roof is supported on extruded hat section roof bows, which span between the side plates, stiffened by extruded Z-section intercostals (discontinuous stringers) placed between the roof bows.

On each side of the coach's single vestibule is a sliding plug door which has the same contour as the car when it is closed. A key-energized master door control panel is located on each side of the vestibule to permit operating the single adjacent door or combinations of doors throughout the train. Retractable steps, allowing access to the coach from ground level, are operated in conjunction with the side door mechanism and present a surface that is flush with the car body when they are retracted.



This broadside view of the LRC coach shows its low-slung design when compared with conventional railway equipment. Photograph taken at Ottawa Union Station. (Alcan Canada Products)

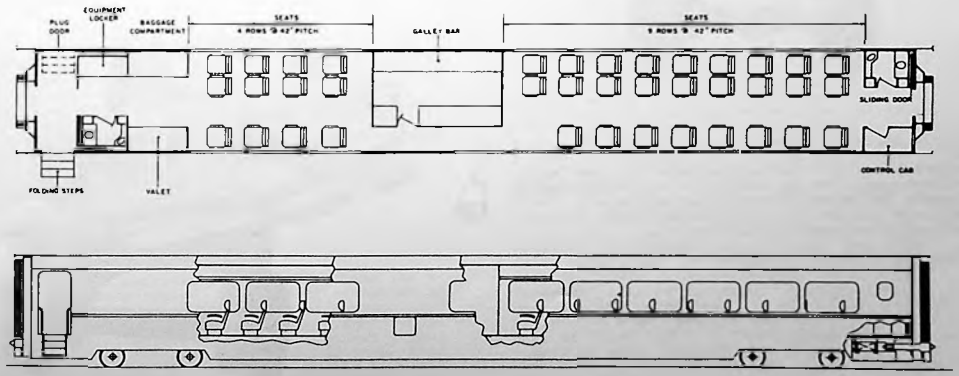
The LRC coach's radical powered banking system is demonstrated for guests who were invited to view the coach in Ottawa Union Station, October 5, 1971.
(Alcan Canada Products)

Prominent government and company officials sample the ride offered by the LRC coach on the demonstration run from Montreal to Ottawa on October 5, 1971. From left to right: J. W. Pickersgill, President of the Canadian Transport Commission; R. L. Grassby, President and General Manager, MLW Industries; R. N. Dobson, Director, Product Development, Dofasco; Harold Corrigan, President, Alcan Canada Products. (Alcan Canada Products)

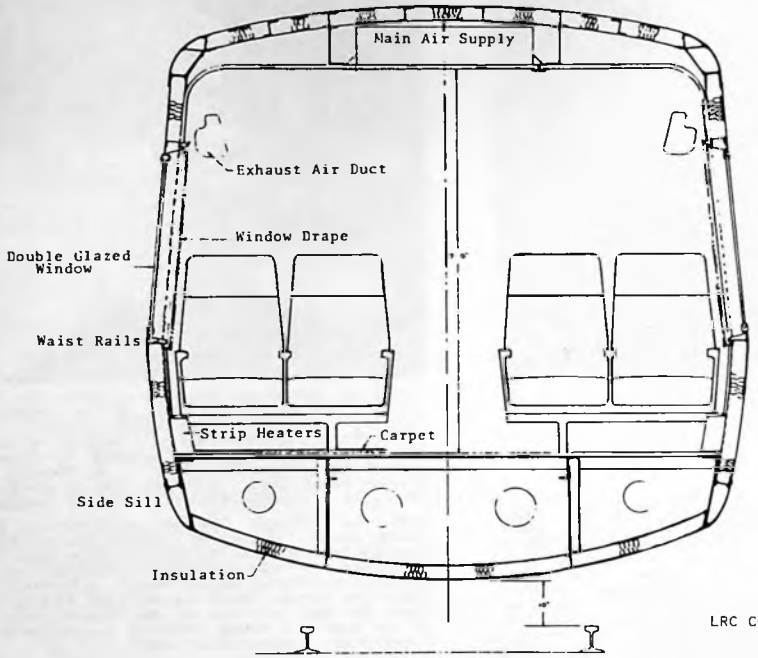
The floor of the coach is of aluminum faced plywood sheet covered with underpadding and carpet and forms a single unbroken unit from end to end of the coach. Without stepped sections or openings the LRC offers an unimpeded choice of seat locations. The sealed floor provides additional insulation against road noises, supplementing the three inches of fibreglass insulation on the interior of the coach's undershell. Floor panels are flexibly mounted on neoprene support pads. Over truck wells and other mechanical sources of noise, extra accoustic damping is provided by a lead sheet liner bonded to the underside of the floor and by sections of corrugated aluminum and fibreglass installed in the same areas.

The coach's design has been developed to contribute to passenger comfort. The basic comforts afforded by power banking, the primary LRC innovation, are complimented by the installation of advanced and especially researchedaccoustic and thermal insulation throughout the coach shell, as well as air conditioning, heating and ventilation designed to function in a wide range of climatic conditions. The air conditioning system is capable of handling 30 cfm of air per passenger (in a coach equipped to accommodate 84 passengers). The unit has a capacity of 10 tons equally divided between two five-ton evaporators, located at each end of the car above the ceiling. The compressor for the air conditioning system is located beneath the car floor. Also beneath the car floor is the hydraulic power pack which energizes the banking servo mechanism on each truck. It contains a 10 hp. electric motor, a hydraulic pump and the servo valves which operate the banking mechanism. Power for this pack and all the 'housekeeping' services in the coach is taken from the locomotive's 575 volt three-phase AC electrical supply.

The hydraulic power banking and suspension system is the LRC train's major innovation. The design of this system is the responsibility of Dominion Foundries & Steel Ltd. of Hamilton, Ontario. The low profile LRC train will operate at speeds up to 120 mph and will be able to accelerate to 50 mph in 50 seconds. The accommodation of these speeds with a much higher level of passenger comfort called for the design of an advanced suspension system with means for neutralizing the centrifugal forces on passengers when travelling through curves at high speed. Dofasco engineers tackled these design objectives using, in the main, extensions of contemporary railway technology which have resulted in the development of a patented, active suspension system of banking the coaches as the train moves through curves.

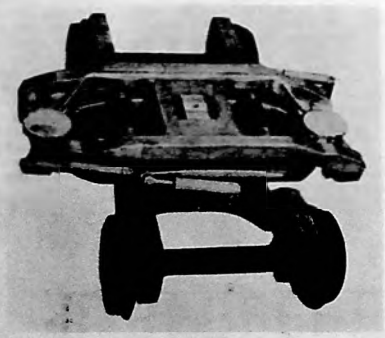


LRC CLUB CAR



LRC COACH CROSS SECTION

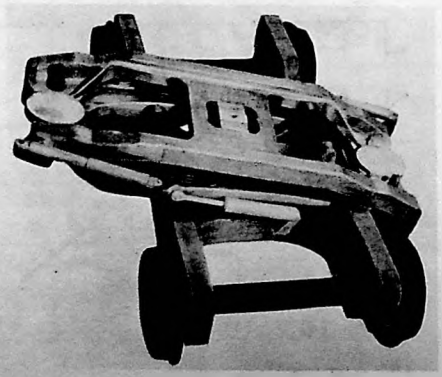
These two photographs of a wooden model of the Dofasco truck for the LRC coach serve to illustrate well the action of the powered banking system on curves. This system is the LRC train's major innovation.



In the photograph on the left, the model shows the action of the bolster carrying the hydraulic cylinder when the truck is travelling on straight track.

In the photograph on the right, the model of the truck shows the banking system in action as the truck traverses a curve. The hydraulic cylinder acts on the lower bolster to neutralize the centrifugal forces applied to the coach as it traverses the curve.

(Two photographs -- Alcan Canada Products)



The dramatic difference in height between the LRC coach and conventional railway passenger equipment is illustrated in this view of the prototype LRC coach attached to a CN baggage car enroute to the unveiling and demonstration ceremonies at Ottawa, October 5, 1971. The coach rides only ten inches above the tops of the rails.

Canadian National has cooperated with the LRC project consortium by providing test facilities. The coach underwent high-speed tests on CN lines around Montreal and between Montreal and Belleville.

(Alcan Canada Products)

LRC

According to R. N. Dobson, Director of Product Development for Dofasco: "It's much like the banking of a jet airliner as it changes course. The application of the new suspension system in the LRC train brings next generation performance to railroading, without pioneering esoteric technology. It's a case of using existing technology to the limit and of making the most efficient use of the operational safety limits inherent in all train designs."

The suspension system for the LRC train is based on a two-axle truck with conventional characteristics. The basic configuration involves a rigid, one-piece truck frame, chevron primary springs, widely spaced, low-rate secondary springs and two bolsters. Viscous damping of all significant spring elements is used and there is also a link mechanism to produce a roll or bank centre close to the passenger seat location. The major new element is the banking mechanism which counteracts the centrifugal forces or 'unbalanced super-elevation.' A servo-controlled roll bolster in each truck acts as a separate stable platform which is always trying to provide the coach with the correct bank angle for desired passenger comfort.

While conventional systems rely on a single truck bolster, the Dofasco design has two per truck. The lower one has a relative motion to the frame, to allow it to tilt. It does not bounce, and does not turn, and is only allowed relative angular motion to the frame. It has a tilting motion which is controlled by links which maintain the centre of rotation at just about the centre of gravity of the car. Hydraulic cylinders tilt the bolster to compensate for unbalanced super-elevation.

The hydraulic system operates at 2000 psi., and the 4-inch cylinder which actuates the banking mechanism as well as other hydraulic components are of conventional design, which will mean that maintenance on these units will be of a routine nature. Engineers expect a long and trouble-free life for the system, and if it is necessary to replace any of the components in the hydraulic system, this can be done by regular maintenance personnel within thirty minutes thanks to modular design.

Operation of the banking system depends on a null-seeking sensor which is essentially an accelerometer responding to centrifugal force and seeking to establish a bank angle that will reduce this force on the passenger to near equilibrium (0.05 g.). Each truck has a sensor which controls a servo. Each sensor responds to the amount of unbalanced super-elevation encountered and activates the servo mechanism, which causes the bolster to be rotated until it meets the desired bank angle. Rate of deployment is commensurate with the accelerometer response. The sensors and their related electronic amplifiers were designed by SPAR Aerospace of Toronto, and for their application in the LRC they are encased in plastic for complete protection.

Dofasco has drawn to a large extent upon its experience in rolling mill technology in the design of the super-elevating suspension system. Existing processes, machine tools and materials are in use in the fabrication of the new suspension system.

Since the LRC coach has a much lower profile than conventional trains, and thus a lower centre of gravity it can operate on present trackage at much higher speeds without going beyond the accepted empirical limits of safety used in rail car design and operation. One such safety limit is essentially that the resultant from the centre of gravity of the vehicle remain within an envelope whose base is the middle third of the track gauge. Others relate to the ability of the rail car to be guided around curves at speeds higher than the balance speed built into the track by means of super elevation of the outer rail. Very few railway trains approach these limits or operate anywhere near them. Conventional railway passenger stock can never approach these safety limits because well before the train comes near the limit, the passengers are subject to uncomfortable jostling motions. Without banking, the passengers would be pressed to the sides of their seating or to the side walls of the car, a very uncomfortable mode of travelling. The banking system is purely and simply to make passengers comfortable and to permit trains to run faster through curves, making more efficient use of safety limits inherent in current train designs.

The active suspension system can handle all the transitions now used on Canadian railways. (Transitions are spirals in the railway track in which the rate of curvature changes gradually from zero to the curve radius. The length of the spiral governs the rate at which the train slips into the curve). In comparison with non-active suspension on current railway passenger stock, the power banking system will permit railway passenger stock to go around a curve, without loss of passenger comfort, at speeds 35-40% faster than is otherwise possible.

The power banking system will permit a higher average point to point speed without ever getting to excessive speeds. Canadian railways normally have main line trackage signalled for 95 mph operations, but conventional railway equipment cannot maintain that speed on curves. The LRC train's suspension will permit many curves to be taken at much higher speed; approaching the permissable top speed and reaching the limits of current track design.

This suspension system is an integral part of the LRC train design and the design takes advantage of the suspension system characteristics and low centre of gravity of the coaches. Stability motions against wheel lift are maintained within the usual safety limits. The stability of the truck and its response to typical track conditions were explored with computers and sophisticated mathematical models before actual testing began. The studies indicated complete 'stability and freedom from the tracking or guidance functions to well above 120 mph.'

Motive power for the LRC train will be provided by two diesel-electric locomotives, one unit at each end of the train to make it bidirectional. The units may be operated singly, or MU'ed with each other--the trailing unit under remote operation. The locomotives are also as interesting as the other components in the LRC system.

The responsibility for the design and construction of the LRC locomotive is with MLW Industries. Work is currently underway on the construction of the unit, and it is expected to be unveiled sometime during the month of September.

The design concepts used in the construction of the prototype coach have been carried through to a large extent in the construction of the LRC locomotive. The body of the locomotive is of lightweight welded aluminum construction and the cross-section matches that of the coach, streamlining the train and allowing use of a flexible shroud between the locomotive and coach next to it. The frontal area of the unit is only 103 sq. ft. The overall height of the locomotive matches that of the coach (11' 9"), this being achieved by using a new design depressed box underframe which permits installation of the prime mover at a very low level. As a result the locomotive has a very low centre of gravity.

When one starts to propel a train at high speeds (above 100 mph) one starts to think of traction power requirements. The power requirement for traction at 120 mph is 2000 hp. at the rail. The LRC locomotive achieves this modest demand for traction power through its low aerodynamic resistance and light weight of the train. Weight of the locomotive with one-half of its consumable supplies is 200,000 lb. The operating weight of each coach is 85,000 lb.

Despite its special modifications and adaptations for its special purpose, the LRC locomotive incorporates equipment which is already well-known to railway maintenance personnel. Many of the features to be found on the unit are also found on the M-line of diesel road locomotives marketed by MLW. The new locomotive represents new generation applications of known 'state of the art' railway technology and procedures.

Let's take a look at the innards of the LRC locomotive. The prime mover for the unit is a 2900 hp. V-12 251F turbocharged diesel engine, with 9" bore and 10-1/2" stroke, driving (at constant speed) a 60 cycle 575 volt three-phase AC train services alternator and traction alternator. Traction power is rectified (through solid state silicon rectifiers) to direct current for the traction motors. The train services current is transmitted unrectified to the train through two sets of train lines. All electric traction equipment for the locomotive is built by Canadian General Electric.

The 66' 4" locomotive is mounted on two specially developed Dofasco high speed two-axle 9' 6" wheelbase trucks utilizing 40" wheels. On each axle is mounted a CGE 752 traction motor in the conventional nose mount configuration. The suspension system used on the locomotive has ride characteristics similar to that of the coach, but without the banking system.

The locomotive control system utilizes a single-handle controller for traction and braking. The braking position actuates air brakes on the coaches and dynamic braking on the locomotive at higher speeds. As the speed decreases, air brakes come into play on the locomotive, supplementing the dynamic brake as the dynamic braking effort fades.

The LRC locomotive (and train if necessary) can be towed by conventional equipment through the standard knuckle coupler on the nose of the locomotive.

The operating cab of the locomotive is completely insulated and accoustically lined. Fixed safety glass windows are mounted in rubber.

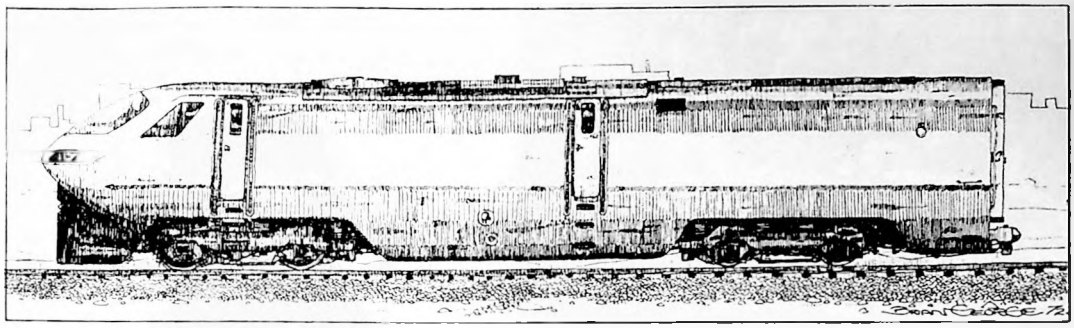
The LRC locomotive has been designed to comply with all of the requirements of the Canadian Transport Commission, the Interstate Commerce Commission, and the Specifications of the Association of American Railroads.

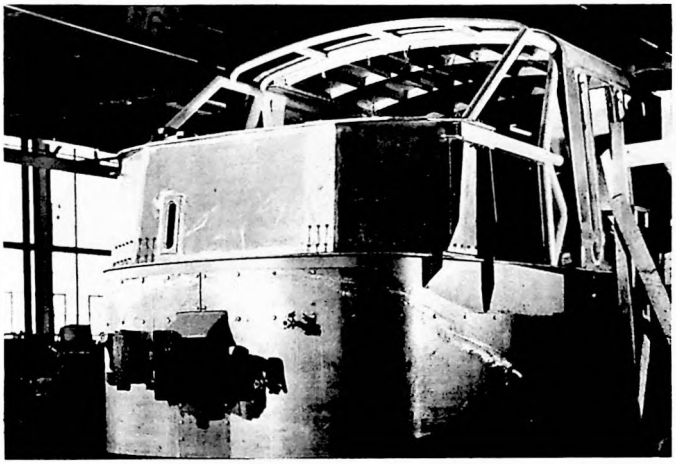
In utilizing tried and proven components in its propulsion system, the LRC locomotive will be no stranger to railway maintenance personnel. Maintenance procedures for the unit will be compatible with procedures already in use in railway maintenance facilities. The locomotive has been designed with a view to ease of maintenance of its equipment.

Having examined the components of the LRC system, one now wonders what advantages the LRC offers when compared with conventional railway passenger equipment and certain other forms of lightweight trains. The work that has gone into the LRC train project has been done with a number of goals in mind. The LRC train will offer potential travellers the prospects of fast, convenient, downtown-to-downtown passenger service by rail --- doing this in comfort, with a quiet, vibration-free ride. The revolutionary banking system will straighten out the curves at high speed, so that passengers will find that the ice cubes in their drinks take the curves as jiggle-free as do their stomachs. The LRC train will be able to offer improved timings in railway schedules, without any drastic improvements to the railway's physical plant, as it has been designed to operate within the confines of present-day track conditions and signalling to give a top speed of 120 mph with a 1-10-1 consist. This means a three-hour schedule can be maintained between Toronto and Montreal with an LRC trainset, with as many as three round trips per day.

An LRC trainset will be able to achieve amazing flexibility of operation. Using the push-pull concept of independently supported coaches coupled to each other and to the locomotives at either end of the train gives the LRC train a flexibility matched only by conventional passenger stock. Flexibility means that coaches can be added to, or, alternatively removed from, an LRC trainset with a minimum amount of time and difficulty. As a result the consist of a train can be altered to suit demand and conditions. The LRC train will be economic to operate. This economy of operation will be achieved by the low power requirements of the train; the low specific fuel consumption of the locomotives (fuel consumption of one diesel unit will be about 0.38 pounds of fuel per horsepower hour); and the flexibility and high utilization potential of the trainset. Because the LRC train utilizes components and equipment which have been proven and use-tested and are known to railway maintenance personnel, it will achieve low maintenance cost.

In September 1970 a study was published by the Research Branch of the Canadian Transport Commission, evaluating the various modes of transport in the corridor between Windsor and Quebec City. Quoting from the Summary of this study: "Based on this financial analysis, the major conclusion of the study is that the most profitable strategy to adopt involves maximizing the potential of existing railway facilities through the introduction of new vehicle technology....Heavy capital expenditures to improve the existing track structure do not appear to be justified on financial grounds." The LRC system fulfills the need for new vehicle technology.

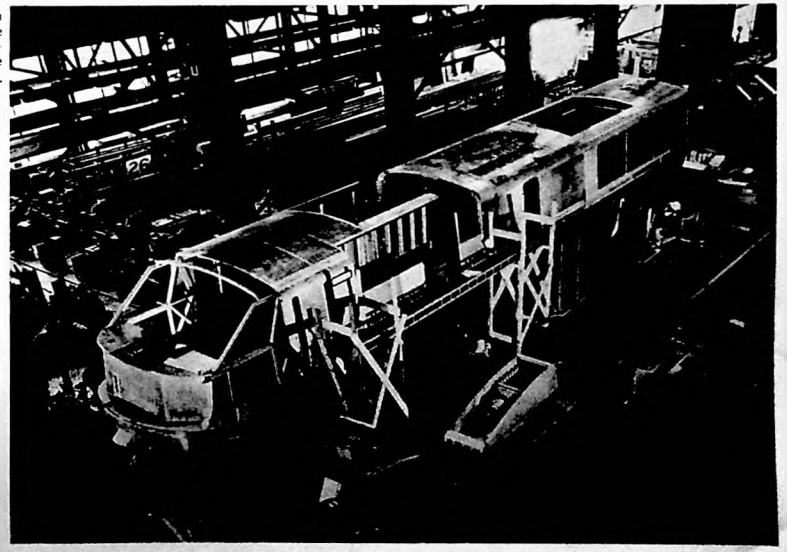




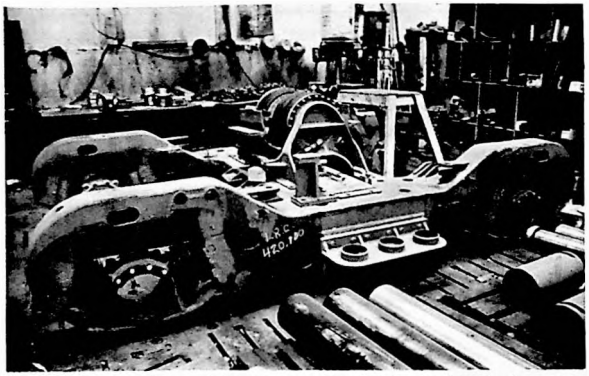
The prototype LRC locomotive is nearing completion in the MLW plant in East Montreal. Here are two photographs showing the unit under construction during the month of July.

This is the cab end of the locomotive before the application of the streamlined nose. The nose or shroud streamlines the front of the unit. Detail of the cab and body construction is evident in the photograph.

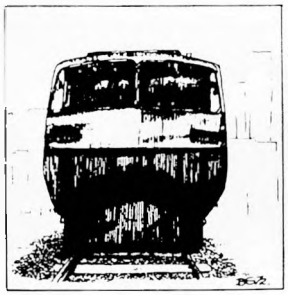
Construction is well advanced in this overhead view of the locomotive and the major components are in position on the frame. The streamline shroud sits behind the unit.



(Two photographs -- MLW Industries)

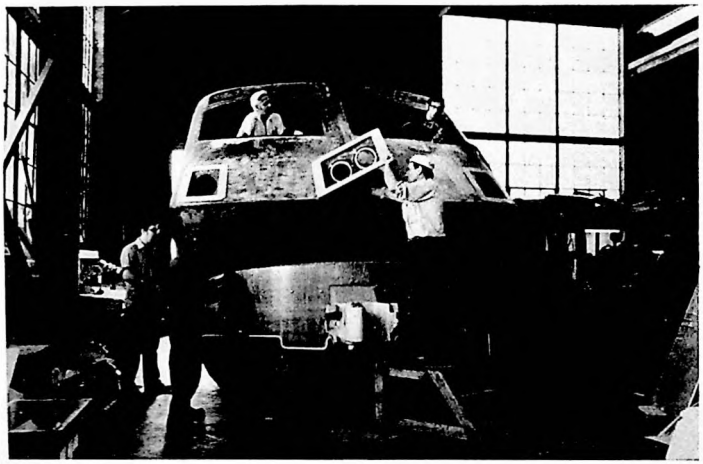


The LRC locomotive rides on two specially designed low profile two-axle Dofasco trucks. This is the bolster and sideframe casting for one of the trucks. The wheels and axles and the traction motors are yet to be installed. (W. Grendys)



The streamlined front shroud is the most striking feature of the LRC locomotive design. In this photograph, the shroud has been attached and the locomotive set on its trucks. The low height of the unit is particularly evident in the relationship of the heights of the workmen to the unit.

(Alcan Canada Products)



Canadian-designed and built, the LRC train not only will offer improvements in surface ground transport between major population centres in this country, but will do the same for other countries on this continent and abroad. Designs incorporating American and European standards have already been worked out.

LRC...LRC...LRC...remember these initials. Perhaps one day in the not too distant future you will be riding such a train, sampling the improvements in ground rail transportation that the LRC system has to offer!

ACKNOWLEDGEMENTS

The contributions and assistance furnished by the following people in the preparation of this article is gratefully acknowledged:

-- W. Grendys, Centennial Motion Pictures
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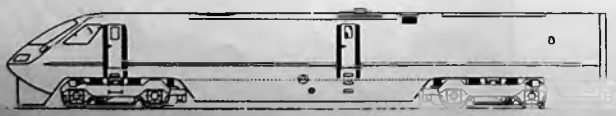
-- R. F. Corley, Canadian General Electric
-- D. Thurgarland
-- J. Bryce Lee

Cover and interior drawings by Brian George.



M-Line Diesels for Mexico

Deliveries were recently completed by MLW Industries on two export diesel locomotive orders of considerable interest. The two orders were for railways in Mexico--the Ferrocarril del Pacifico S.A., and the Nacionales de Mexico--and the total number of units involved were twenty-eight. These orders are noteworthy for the facts that these are the first export orders for MLW's successful M-line of domestic diesel-electric road units--examples of which are to be found on most major railways in this country, and the fact that these orders were filled for railways in another country in North America. The F del P received eight M636 units during June, and the N de M took twenty M630 units in delivery from the middle of June to the middle of august. The specifics of each order are given below.

Ferrocarril del Pacifico S.A.: eight M636 units

Road Number	Builder's Number	Shipping Date*
651	M6062-01	June 1/72
652	M6062-02	June 3/72
653	M6062-03	June 6/72
654	M6062-04	June 7/72
655	M6062-05	June 9/72
656	M6062-06	June 10/72
657	M6062-07	June 13/72
658	M6062-08	June 16/72

Ferrocarriles Nacionales de Mexico: 20 M630 units

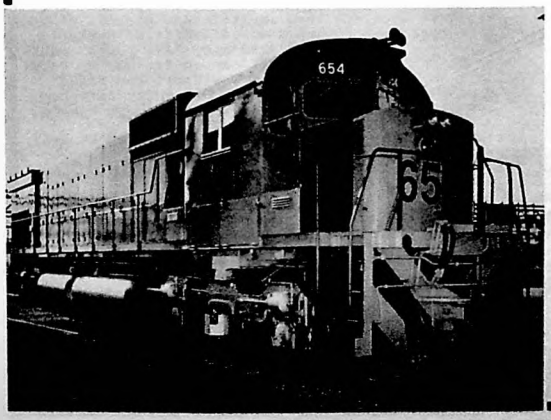
Road Number	Builder's Number	Shipping Date*
8600	M6064-01	June 17/72
8601	M6064-02	June 20/72
8602	M6064-03	June 22/72
8603	M6064-04	June 23/72
8604	M6064-05	June 27/72
8605	M6064-06	June 28/72
8606	M6064-07	June 30/72
8607	M6064-08	July 5/72
8608	M6064-09	July 6/72
8609	M6064-10	July 7/72
8610	M6064-11	July 11/72
8611	M6064-12	July 13/72
8612	M6064-13	July 14/72
8613	M6064-14	July 20/72
8614	M6064-15	July 25/72
8615	M6064-16	July 28/72
8616	M6064-17	Aug. 4/72
8617	M6064-18	Aug. 8/72
8618	M6064-19	Aug. 10/72
8619	M6064-20	Aug. 11/72

* Shipping date is the date that the unit left the MLW Montreal East plant on its own wheels for rail delivery to the customer. Both Canadian National and CP Rail handled units to Windsor where they were turned over to American roads for handling.

In the United States, the F del P units travelled N&W from Detroit to St. Louis, SSW/SP from St. Louis to Nogales, Arizona, and then onto the F del P to Empalme, Sonora, Mexico.

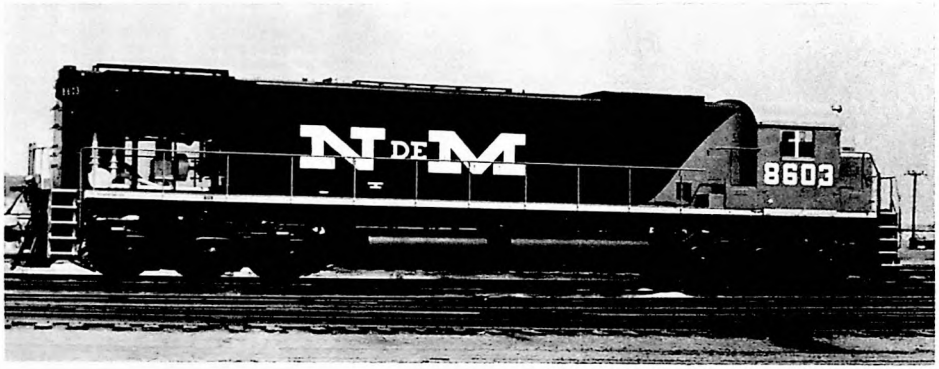
During 1971, MLW-Worthington established a new subsidiary in the United States--MLW-US Inc. of Chicago, with the objective of pursuing transportation objectives in that country. Recently, this subsidiary received a $6-million contract from the West Suburban Mass Transit District of Chicago for the rebuilding and modernizing of 21 diesel-electric locomotives. The work is to be undertaken in conjunction with Morrison-Knudsen Co. and will be done at that company's Boise, Idaho equipment centre.

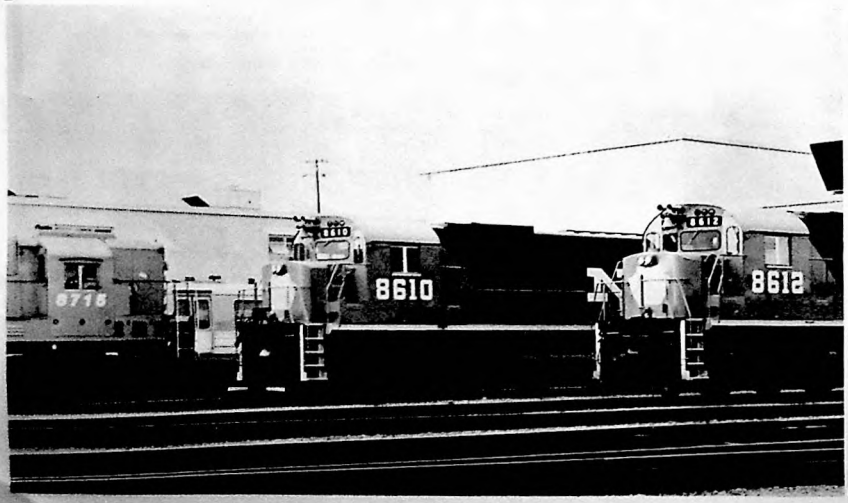
(BELOW) Representatives of the two export orders pose for their respective builder's portraits--left, M636 654 for the Ferrocarril del Pacifico S.A., and right, M630 8604 for the Nacionales de Mexico. Both units are similar to M-line diesels delivered by MLW to railways in this country.
(Two photographs -- MLW Industries)



FdelP M636 654 sits in the late afternoon sun at the diesel shop at CN Toronto Yard on June 9. This unit is similar to CN's own M636's, except for lights, footboards, and other details.
(J. Bryce Lee)

(Centre) NdeM M630 8603 posed for this full broadside view at CP Rail Agincourt Yard on June 27. Note the notched rear nose.
(Robbin Rekiel)



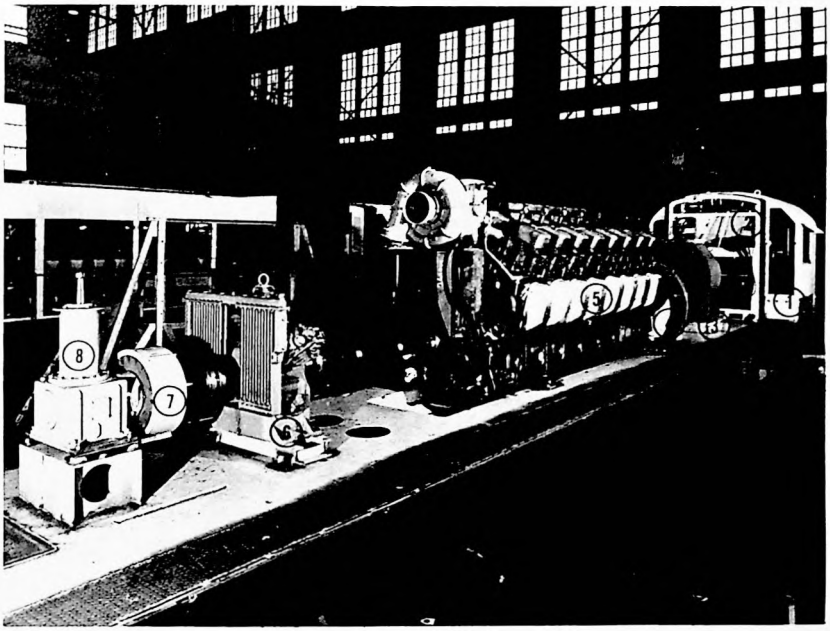


Strange bedfellows at CP Rail Agincourt Yard. From left to right: CP Rail CLC-FM H16-44 8715 sticks its nose in (a rare visitor to these parts), centre an unidentified Hawker-Siddeley PA-3 rapid transit car on its way to PATH in New York, and right NdeM M630 units 8610 and 8612. Photograph date is July 29, 1972.
(Robbin Rekiel)

HAVE YOU EVER WONDERED WHAT LIVES UNDER THE HOODS OF A MLW M-LINE DIESEL LOCOMOTIVE??

This is the chassis of a M630 unit with a number of the components installed. From the front end of the unit (right) the components are numbered:

1. operating cab
2. electrical cabinet and control compartment
3. central air blower
4. alternator
5. diesel prime mover (251F V-16)
6. air compressor
7. eddy current clutch
8. radiator fan gear box



(MLW Industries)

PASSENGER TRAIN NEWS

* Passenger service between Montreal and New York City will be restored to operation on September 29, 1972. The decision was made by AMTRAK Board of Directors on August 24th. The new service will actually operate between Montreal and Washington, via New York and Springfield, Mass., and the states of Vermont and New Hampshire.

The new train, which will operate with sleepers, coaches, and a grill-lounge car, will provide overnight service from Washington and key East Coast cities to the resort areas in Vermont and New Hampshire, and connect with Canadian National and operate into Central Station, Montreal. Under the proposed schedule, the train will leave Washington at 5:05 p.m., and New York at 9:10 p.m. It will arrived at White River Junction at 5:05 a.m., Montpelier at 6:40 a.m., Waterbury at 7:05 a.m., Essex Junction at 7:35 a.m., and Montreal Central Station at 10:35 a.m. Southbound, the train will leave Montreal at 6:25 p.m., Essex Junction at 9:25 p.m., Waterbury at 9:55 p.m., Montpelier Junction at 10:20 p.m., and White River Junction at 11:50 p.m. Arrival in New York is 7:30 a.m. the following morning and Washington arrival time is noon.

The announcement of the Montreal service climaxed ten weeks of study and on-site inspections by an AMTRAK task force on all possible route options between Montreal and the U.S. AMTRAK president Roger Lewis said the decision to operate through New England versus a New York/Albany route "was extremely close." The New York route, he said, is shorter by 59 miles and end-point to end-point running time is about three hours faster. "While these factors were important considerations, they could not, in our opinion, offset the fact that the train would have to operate to New York's Grand Central Station making it necessary for all through traffic to change stations across town." Lewis said the New England route provides a higher potential for traffic growth. In addition to the fast-expanding ski market in the Northeast (and Quebec), almost a million Canadians visited Florida in 1971 with a majority coming from Eastern Canada.

Other factors favouring the New England route were:
-- Vermont and New Hampshire, states not presently included in the AMTRAK network, gain intercity service.
-- Annual revenues from a New England/Montreal service are forecast at $2.4-million, about double for the route via Albany. This includes "feeder revenues" to and from existing AMTRAK trains to Washington and Florida.

Additionally, the New England route would provide transportation service to areas where there is no through intercity service of any type now. "There are 11 through buses and 15 flights each way per day between New York City and Montreal, but virtually no service north of Springfield. More people would therefore benefit with the availability of train service through New England," Lewis said.

AMTRAK estimated that either route would lose approximately $400,000 the first year of operation.

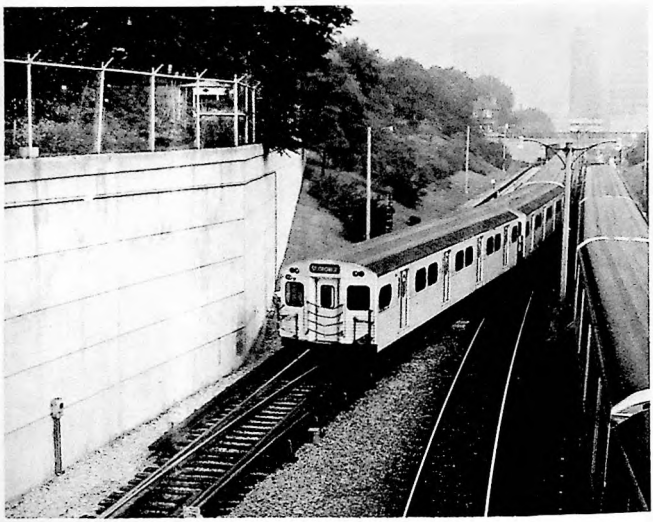
* GO Transit fares were increased on September 6th by 6 to 13%--5 to 20¢ on rides that now cost from 60¢ to $1.75 to Union Station. Ten-ride fares which varied between $5 to $14 were increased, and now vary from $6 to $15.70.

Monthly tickets, with the privilege of unlimited rides, will go on sale for the first time at the end of October at GO train and bus stations at new rates of from $23 to $60. Monthly tickets are currently only sold by mail.

The fare increases on GO Transit are the first in two years.

* Here is the consist of southbound CN train 88, the Northland, observed at Richmond Hill station on the morning of August 5, 1972.

ON FP7A 1513	
CN FPA4 6780	ON coach 812
ON baggage 411	CN sleeper Glace Bay
ON sleeper Greenock	CN sleeper Val Cote
ON coach 827	CN coach 5226
CN coach 4884	CN coach 5221



September 30, 1972 is the tenth anniversary of the entry into revenue service of the first Canadian designed and built subway cars. These cars, 36 in number, were built by MLW for the Toronto Transit Commission for the University Subway.

In the photograph, TTC M-1 subway car 5323 leads sister 5322 and four H-1 cars into Davisville Yard after the morning rush hour service on the Yonge-University line.
(NEWSLETTER/Robert McMann)

TRACTION TOPICS returns next month.

OBITUARY: WILLIAM T. SHARP

Society members will be saddened to hear of the recent sudden death of member William T. Sharp. Bill, as he was known to all of his friends, was killed in a mountain climbing accident while on an expedition with the Alpine Club of Canada in British Columbia.

Bill held membership number 52. He was an active member of the Society and held many positions and offices during his years as a Society member. His last position was that of Society President in 1967. Bill was a frequent contributor to the NEWSLETTER and his name appears as the author on numerous articles.

Bill was born in England and emigrated to Canada with two brothers during World War II. He studied mathematics at the University of Toronto, and completed his Ph.D in mathematics at Princeton. He then became a consultant to the Defence Research Board and a research officer for the Atomic Energy Board of Canada. He was on the staff of the mathematics department of the University of Alberta for three years, before joining the University of Toronto as professor of mathematics in 1963. Bill held the post of associate dean of arts and sciences at the University of Toronto at the time of his sudden death.

Bill is survived by his mother and a brother in England and another brother in Singapore. He was buried in British Columbia. In his memory, a donation was made by the Society to the Varsity Fund.

Contributors:

Bruce Chapman
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Brian George
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Bill Linley
Robbin Rekiel
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Production: Wanda Grendys
J. Bryce Lee

COLLINGWOOD COLORFEST

Don't be left out! Come along and join the fun on the train to the Collingwood Colorfest excursion sponsored by the Upper Canada Railway Society. Date is Saturday, October 14, and the train will traverse the scenic Meaford Subdivision, with runpasts and stops at Stayner, Collingwood, Craigleith Provincial Park. Fares are adult $8.50, children $4.00, infants $1.00. Trip leaves Toronto Union Station 8:30 a.m. Tickets are available at Union Station, Eaton's Special Attractions, and by mail from the UCRS Excursion Committee, Box 242, Station M, Toronto 21, Ontario.

Sunday, October 15 is the date of the UCRS Autumn Trolley Ramble. Ride around Toronto on two of the TTC's interesting PCC cars. Trip leaves Church and King 10:30 a.m., and includes photostops, runpasts, lunch stop, and an interesting routing. Fare is $4.50 (2/$8.00) and tickets are available from the Excursion Committee at the above address.

BARRY'S BAY EXCURSION

Sunday, October 15 is the date of a special diesel excursion to Barry's Bay, Ontario, sponsored by the Bytown Railway Society of Ottawa. The trip will traverse former trackage of the Canada Atlantic Railway. Tickets are $9.50 adults, $5.00 children, and are available from the Bytown Railway Society, 93 O'Conner St., Ottawa, Ont., K1P5M8. Trip leaves Ottawa Union Station 8:00 a.m. EDT and returns 6:10 p.m. Excursionists are advised to bring a picnic lunch.

Coming Events

Regular meetings of the Society are held on the third Friday of each month (except July and August) at 589 Mt. Pleasant Road, Toronto, Ontario. 8.00 p.m.

Oct. 14: Collingwood Colorfest Excursion. See above. (Sat.)

Oct. 15: TTC Trolley Ramble. See above. (Sun.)

Oct. 20: Regular meeting. To be announced. (Fri.)

Oct. 27: Hamilton Chapter meeting, 8:00 p.m. in the CN James Street Station, James Street North. (Fri.)

Nov. 17: Regular meeting. To be announced. (Fri.)