Competing for the light-rail vehicle market

By WILLIAM D. MIDDLETON
Contributing Editor

With the departure of Boeing Vertol and the ill-starred U.S. Standard Light Rail Vehicle (SLRV) from the field in the wake of the car's Boston debacle, only a single wholly North American vehicle—the Urban Transportation Development Corp.'s Canadian Light Rail Vehicle (CLRV)—is now competing for what promises to be a sizable market for new light rail equipment over the next decade. But with three European and Japanese builders already in the market with orders for some 250 light rail vehicles, and at least four other manufacturers now actively competing for orders, UTDC can look forward to lively competition as orders materialize into the market with orders for some 250 light rail vehicles, and at least four other manufacturers now actively competing for orders, UTDC can look forward to

The corporation's first major order and market transit equipment and systems. UTDC was set up by the Ontario government in 1973 to design, develop, and manufacture transit equipment and systems. The corporation's first major order—and still its largest single contract—was an $87-million contract signed with TTC in 1975 for the development and supply of the 196 light rail vehicles now being delivered as replacements for a major part of the commission's PCC streetcar fleet. The design for the CLRV was developed jointly by UTDC and TTC. Six prototype vehicles were completed by the Swiss Industrial Company (SIG) during 1977-78, while the 190-car production order is being constructed by Hawker Siddeley Canada at its Thunder Bay, Ont., works.

Significant advancement. In its technical features and performance characteristics, the CLRV represents a significant advancement over the PCC cars it replaces. As it is being supplied to TTC the CLRV is a 50-foot-8-inch, single-ended, double-truck car capable of single- or multiple-unit operation in trains of up to six cars. Car body construction is of welded low-alloy, high-tensile steel. In its TTC production version, the CLRV seats 46 passengers and can accommodate as many as 85 standees.

The CLRV's fabricated, monomotor trucks are each equipped with a single dc traction motor rated at 185 hp continuous. Trucks are fitted with a rubber and steel primary suspension system, and an air bag secondary system. A Garrett chopper control provides semiautomatic control of both acceleration and deceleration, and the cars are provided with antispin/slide control.

Service braking blends regenerative/dynamic braking and axle-mounted disc braking, while emergency braking combines electromagnetic track brakes and spring applied disc brakes. A load weighing system provides maintenance of both braking and acceleration rates.

The majority of the Toronto order is being delivered in a low-performance (LP) mode for street and city service. A total of 22 cars, however, will be completed in a modified high-performance (HP) mode for operation on TTC's planned 4.5-mile Scarborough light rail transit line, which is scheduled to open late in 1982. These cars will have higher acceleration and braking rates, and will be capable of a 50 mph maximum speed. Equipment variations will include pantographs, rather than the trolley poles being supplied for the remainder of the TTC order, automatic doors or some other high capacity warning device, brighter headlights, and similar modifications for operation at higher speeds on private right-of-way.

With only a gear ratio change, and the addition of higher-capacity chopper compartment ventilation, UTDC's CLRV can also be delivered in a high-speed version capable of a maximum operating speed of 70 mph.

Variations possible. With still other variations, the basic CLRV design and components can be employed in a modular approach to develop vehicle configurations to meet the needs of specific light rail systems.

For the Niagara Frontier Transportation Authority's Buffalo (N.Y.) light rail project, for example, UTDC has offered a lengthened, 66-foot version of the basic four-axle CLRV equipped for double-end operation, and both-side loading and unloading. The corporation also plans to develop a prototype articulated car (ALRV). This will be a six-axle car about 78 feet in length utilizing the same basic shell section, trucks, and other components employed for the CLRV. Trucks and some other components, in fact, are already available.

The original CLRV prototype contract with SIG provided for production of 10 vehicles; this was later reduced to six to make components available for an ALRV prototype. UTDC has contracted with Hawker Siddeley for production of a single prototype. Although design details have not yet been established, the prototype should be available by mid-1981. ALRV prototype testing may be on an existing system, such as MBTA or TTC, although UTDC would prefer to test the car at its Kingston, Ont., test facility. A planned 4-mile, $5-million light rail test track for the Kingston site has not yet been financed, however.

Although the CLRV has been in operation on TTC since September 1979, a full evaluation of its performance and reliability has not yet been made. The car first entered service on TTC's Long Branch line, and has since been introduced on four additional routes as well. Currently, some 89 vehicles have been received. of

Railway Age
September 29, 1980
which more than 60 have completed acceptance testing and been put into service. Operation thus far is categorized as "revenue testing," with TTC still in what Equipment Department Manager Leonard Bardsley calls a "maintenance learning stage." Problems encountered thus far have been relatively minor ones, most of them either interface problems between major components, or problems associated with the severe winter operating environment of the Toronto system. The cars were withdrawn from service for several months early this year as a result of problems resulting from snow. "There have been no basic component failures," says Bardsley, "and we haven't had any catastrophes yet."

"The feeling now," he says, "is that the car will require somewhat more maintenance because it's more complex, and we expect more of it."

The real test for the CLRV, however, is yet to come. Once a minimum of 80 accepted cars is on hand, TTC will commence a full operational test and reliability demonstration. TTC expects to begin the program this fall.

In addition to the current revenue testing on TTC, the CLRV was extensively tested on Boston's MBTA earlier this year. Three of the cars were leased back by UTDC for a 90-day Boston test period that ended early in June. Although full test results are not yet available, the program is reported to have been generally satisfactory, with the CLRV's operating in revenue service for 78 days out of the 90-day test period.

Although full operational testing of the CLRV has not yet been accomplished, experience thus far indicates that the vehicle's novel regenerative braking feature—the first on any North American light rail vehicle—will afford significant energy savings. TTC, for example, expects that regenerative braking will provide an overall energy savings of about 30% in comparison with PCC car performance. And during the recent MBTA test program, energy savings of 25 to 30% were reported in a five-day test of the regenerative braking feature.

Overseas suppliers. If UTDC and its CLRV seem to have a bit of a lead in the North American light rail equipment market, they are getting strong competition from European and Japanese suppliers. With a total of 141 light rail vehicles now on order for the Southeastern Pennsylvania Transportation Authority (SEPTA), for example, Kawasaki Heavy Industries is close behind UTDC in total orders.

The SEPTA order includes 112 cars for operation on the system's Philadelphia subway-surface routes. These will be 50-foot, four-axle cars arranged for single-end operation, and capable of a 50 mph maximum speed. The propulsion system will include four dc series motors and an electronic chopper control. Service braking will include a self-controlling regenerative and dynamic braking system, and air-operated disc brakes, with electromagnetic track brakes fitted for emergency braking. The remaining 29 cars will be similarly equipped, double-end suburban cars for Red Arrow division lines.

September 29, 1980

Siemens-Duwag has supplied 17 U2 cars for Edmonton (picture), and they have given virtually trouble free service. Calgary has ordered 27 identical vehicles and San Diego 14 of a slightly modified design.
operating from SEPTA's 69th Street terminal in Upper Darby. This suburban version of the car will be capable of a 62 mph maximum speed.

A single prototype for each type was delivered to SEPTA during July and August, with the first production cars scheduled to begin arriving in June 1981.

With a SEPTA subway car order now on its books as well, Kawasaki has now established a strong position from which to compete for future U.S. orders.

Two European builders have also been successful in landing U.S. and Canadian light rail vehicle orders. Breda Costruzioni Ferroviarie of Italy won a $39-million contract in 1977 for the delivery of 48 LRV's for the Greater Cleveland Regional Transit Authority. Breda is supplying a 78-foot, two-unit, six-axle articulated vehicle seating 84 passengers. These cars, too, will have both chopper control and regenerative braking. The first Breda LRV is expected to arrive in Cleveland before the end of the year, with delivery of the entire order to be completed about August 1981.

While Kawasaki and Breda have been able to win orders only with new designs for their North American markets, the German combination of Siemens-Duwag has been successful in marketing the standard U2 car originally developed in cooperation with Frankfurt, Germany. The U2 is a 76-foot, two-section, six-axle articulated design equipped with two powered monomotor trucks. Control equipment includes a solid-state regulator interface between the operator and the vehicle's conventional cam controller which maintains smooth acceleration, limits jerk, and corrects for wheel slip. Service braking is provided by a combination of dynamic and disc braking. Electromagnetic track braking is available for emergencies.

Siemens-Duwag supplied an order for 14 of the U2 vehicles for the Edmonton (Alberta) Northeast Light Rail Transit line in 1978, while another three cars have been supplied since then for a short extension of the original line. Edmonton's decision to adopt a standard European car has proven a good one, for the U2 has given virtually trouble-free service since the line's opening.

The same U2 vehicle was selected for the 8-mile light rail line now under construction at Calgary, Alta., and scheduled for opening in 1981. Deliveries under a 27-car order began in June, and are scheduled for completion early in 1981.

Slightly modified for Southern California requirements, the same basic U2 design is being supplied for the new Metropolitan Transit Development Board light rail project at San Diego (RA, June 9, p. 34). The first of 14 of the Siemens-Duwag cars was received at the end of July, with the remainder due for delivery before the end of the year.

Other Canadian suppliers. Two Canadian manufacturers are now also competing for light rail equipment orders by offering proven European designs manufactured under licensing agreements. Bombardier Limited, which has already successfully entered the market for rapid transit, commuter, and long-distance rail equipment in the U.S. and Canada, recently acquired a license to manufacture and market the light rail vehicle designs of the Belgian firm, Constructions Ferroviaires et Metalliques (BN). Bombardier is now offering as a basic vehicle for the North American market the articulated light rail vehicle developed by BN for the Rio de Janeiro Pre-metro. As built for Rio, this is an 83-foot-7-inch, two-unit, six-axle articulated car with a maximum speed of 50 mph. The car is powered by two 265-hp traction motors on monomotor trucks; one is equipped with rubber suspension and disc braking. Control is of the switched resistor type.

Bombardier will also offer the BN design in a number of modular variations to meet the needs of individual markets. Four- and eight-axle versions in widths up to 9 feet will be offered, along with a wide variety of specific equipment and performance options.

Hawker Siddeley is also offering a European design, in this case under license from M.A.N. of Germany. For the Niagara Frontier Transportation Authority, for example, Hawker Siddeley has offered a standard M.A.N. six-axle articulated vehicle 92 feet in length, and equipped with monomotor trucks and dynamic and regenerative braking.

Aside from the licensing arrangements with Bombardier and Hawker Siddeley.
Kawasaki Heavy Industries of Japan (represented by Nissho-Iwai American Corp.) is building 141 LRV's for the Southeastern Pennsylvania Transportation Authority. Above, the first Kawasaki car as it arrived in August at SEPTA's Woodland Avenue Depot.

at least three other European or Japanese firms are competing directly for North American orders; Tokyu Car Corporation, the Swiss Industrial Company (SIG), and Fiat were among the firms competing for the current Niagara Frontier order.

• U.S. market sizable? If it is not yet particularly well-defined, the potential North American market for light rail equipment over the next decade could be a sizable one.

Orders likely to be placed within the next year total well over a hundred cars. Buffalo's Niagara Frontier Transportation Authority is expected to call for price bids this month in the second step of a two-step bidding process, with bids due in October. The exact fleet size will be based on the car proposed by each bidder, but the order is expected to total around 30 cars. Bombardier, Hawker Siddeley, UTDC, SIG, Siemens-Duwag, and Tokyo Car are the qualifying bidders. Boston's MBTA expects to call for bids some time this fall for sufficient equipment to provide a capacity equivalent to the 40 cancelled Boeing Vertol SLRV's. And Pittsburgh's Port Authority Transit should also be ready late this year to request bids for a replacement for about 50 of its aging PCC cars.

New light rail systems now in the advanced planning stage at Portland, San Jose, Denver, and Detroit, or extensions planned for the systems already operating or under construction at San Francisco, San Diego, Edmonton, and Calgary, could require close to 400 new vehicles over the next several years.

Less certain than these are the equipment requirements for new light rail projects or extensions in preliminary planning or under consideration at Baltimore, Boston, Dayton, Sacramento, New York City, and Vancouver.

Replacement of existing PCC cars or other, even older equipment represents an even larger potential market for light rail vehicles during the 1980s. Modernization of the Newark (N.J.) light rail subway will require about 20 cars to replace existing PCC's. Even after current or planned LRV orders are completed, Pittsburgh, Boston, Philadelphia, and Toronto will continue to operate more than 400 PCC cars. While many of these cars have recently been modernized, or are scheduled for modernization over the next few years, almost all will require replacement before the end of the decade. SEPTA's Red Arrow division still operates about 20 cars that are 50 years or more old on its high speed Norristown line, while New Orleans operates some 35 standard streetcars of similar vintage.

• "Buy American" problems. For both the Canadian and overseas light rail equipment builders competing for U.S. markets, the "Buy American" provisions of the 1978 Surface Transportation Act present some difficult problems. Typically, the foreign firms plan to meet the requirements of the Act through substantial use of U.S.-built components, and final assembly of vehicles in the U.S. For its current SEPTA order, for example, Kawasaki is reaching a 50% or better U.S. content through the use of U.S. suppliers for such major components as propulsion and control systems (Westinghouse), braking equipment (WABCO), doors and door controls (Vapor Transportation Systems), and seating (American Seating).

Final assembly will be accomplished at the Boeing Vertol plant in Philadelphia.

Through the use of both U.S. suppliers and its own U.S. electrical subsidiaries, such as Siemens-Allis, Siemens-Duwag expects to be able to reach a 60% U.S. content. Final assembly, according to Siemens representative Hermann Eiselle, will always be in the city for which the order is being built.

Perhaps the strongest commitment to the U.S. market is being made by Bombardier, which has had particular success in its recent U.S. marketing efforts. The firm now plans to incorporate in the United States as the second U.S. passenger car builder, and will establish a U.S. plant. The firm expects to announce the site of this new plant soon.

UTDC has already set up a separate U.S. organization, UTDC (USA) Inc., with headquarters at Arlington, Va.