CP: Signaling for greater

Computer-aided ctc will increase capacity 30% on the heavily-used Winnipeg-Thunder Bay line. The Mountain subdivision is also getting attention as CP strives to stretch productivity limits.

By FRANK MALONE,
Associate Editor

Thanks to ingenious operating practices, CP Rail manages to move 60 million tons a year over its most difficult route segment, the Mountain subdivision in British Columbia. That's 25 million tons more than some experts claim is the rated capacity of a single-track railroad. It's also 30 million tons short of the capacity that still may be needed.

To help close the gap, CP will build new tunnels and more double track through the Selkirk Mountains. However, that's not the only area needing greater capacity, nor is tunnel-and-track the only response to the need.

CP is also looking to increased use of advanced electronics technology to make its signaling and communications systems more flexible. That will permit more tonnage to pass through a route segment in less time, with or without extra trackage.

"It's a very exciting time period that we're entering now," says Ken Peters, CP Rail director-signals and communications. "The technology has changed so rapidly that it's now economically feasible to do these things, where before we couldn't afford them."

Accompanying the drop in cost is a rise in revenue from the railway's biggest commodity, grain. This followed the Canadian government's 1983 revision of statutory rates that had forced both CP Rail and CN Rail to absorb huge losses on movements of grain from the prairie provinces.

Much of that grain moves to Pacific or Great Lakes ports for export. Along with other export commodities, such as petrochemicals and lumber products, grain has been putting pressure on the railways for substantial expenditures for physical improvements.

Resolution of the grain-rate problem (the railways claim they still will not make a profit on grain; they simply will come closer to breaking even on it) prompted CP Rail to raise 1983 capital spending 74% to $315 million. This year's capital program is valued at a record $350 million.

• **A broad spectrum of investment.** Capital spending for 1984 signaling and communications will total an estimated $22 million. The program includes:

—Continuing installation of computer-aided centralized traffic control over 415 miles of line between Winnipeg, Man., and Thunder Bay, Ont.

—Continuing installation of microwave over the 125-mile Mountain subdivision between Field and Revelstoke in British Columbia.

—Installation of fiber-optic cable in the five-mile Connaught Tunnel on the Mountain subdivision.

—Completion of microprocessor-based upgrading of signal systems at the Winnipeg terminal and at Montreal.

—Installation of "talking" hotbox detectors, although on-board, direct-display, digital types are under study for eventual installation.

—Continuing installation of point-to-point radio communications.

Extensive communications improvements are planned for CP's rugged Mountain subdivision—more microwave, plus a fiber-optic cable in the Connaught Tunnel. (Photo by Frank Malone)

capacity

Starting last year and continuing through 1986, the Winnipeg-Thunder Bay signaling improvement is valued at $40 million. It centers on a microprocessor-based display console at Winnipeg, where dispatching for CP Rail's Prairie Region is being consolidated.

Peters says CP Rail adapted CAD elements in use elsewhere to a system supplied by Union Switch & Signal. "The fact that the system is computer-driven," he says, "gives us the flexibility to add further automation to the standard ctc package." That includes automatic train-tracking, automatic train meets and passes, automatic advance clearing of signals, and automatic protection of trains entering red-signal areas where track work is under way.

As for train-tracking, the theory is similar to that followed elsewhere: A train can be automatically guided from one terminal to the next according to preset priorities. However, display of train identification will be limited for now to cathode ray tubes. Display panels will provide an overall view of train movements on the system.

In addition, the dispatcher remains responsible for issuing track-occupancy permits, but the new system will automatically act on the dispatcher's orders and establish protection.

An additional feature being considered is an "electronic trainsheet" that will virtually eliminate paperwork by dispatchers.

Known as the Lakehead division, the Winnipeg-Thunder Bay route is double-track and heavy-capacity. It handles Great Lakes export commodities such as grain. The new ctc system will be functioning on the Winnipeg-Kenora subdivision later this year, on Kenora-Ignace by late 1985, and on Ignace-Thunder Bay by the end of 1986. The result will be a 30% increase in Lakehead capacity.

- **Consolidated dispatching.** Also this year, CP Rail will install a new computerized control system for Brandon division ctc as part of the plan to consolidate dispatching at Winnipeg. The Brandon system will incorporate the same automatic features as the Lakehead system but will be applied to single track.

Planned for 1985 is a relocation of Moose Jaw division dispatching facilities to Winnipeg with a new control system similar to Brandon's. The last dispatching facilities to be relocated will be from the Saskatoon division, which has no ctc. That will take place in 1986, giving the Winnipeg center the control of all train movements from Thunder Bay to Swift Current, Saskatchewan.

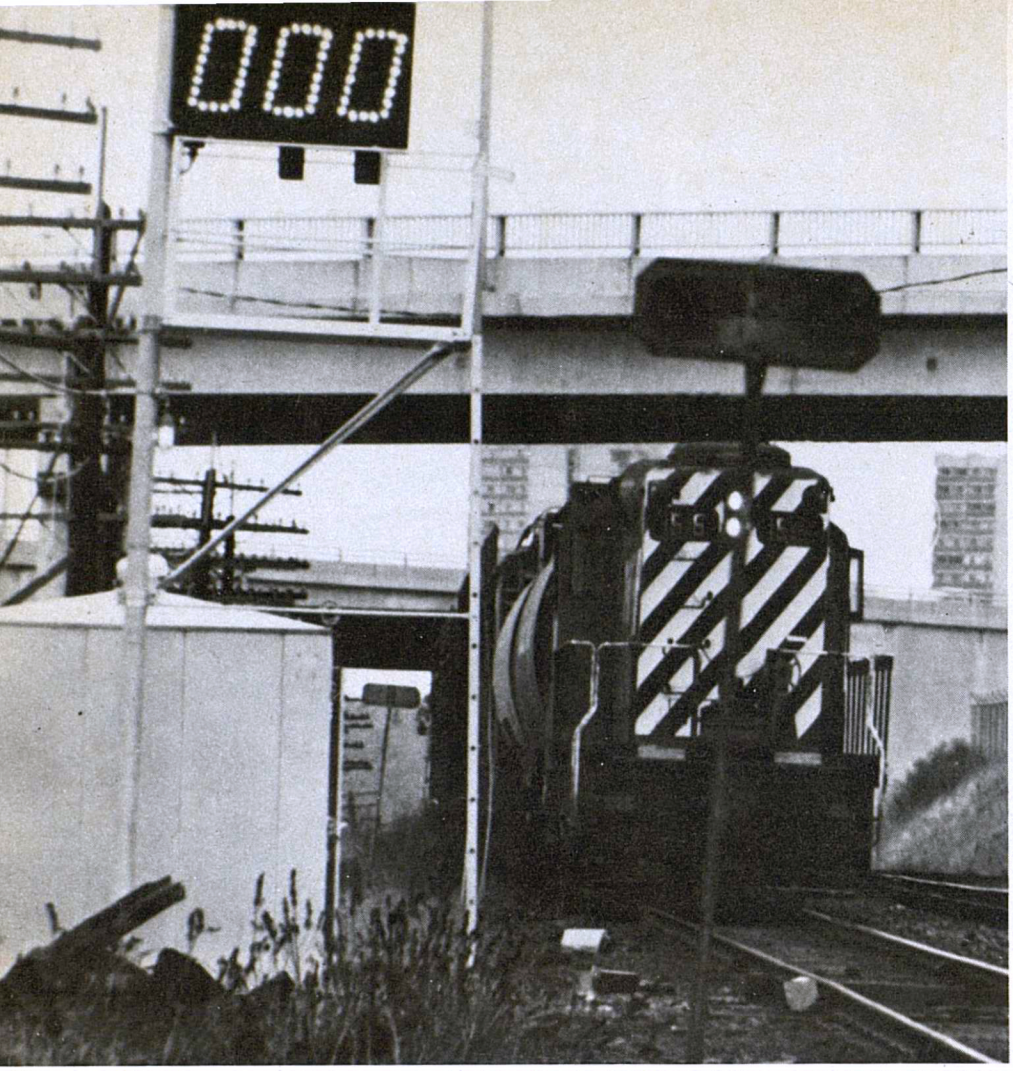
Farther west, dispatching for Alberta routes has been consolidated at Calgary since 1965. What's happening at Winnipeg will influence consolidation yet to come in other provinces. "Our plan now is that any improvement that we make in any of our systems will include all these up-to-date features that we're talking about for Winnipeg," says Peters.

- **More ctc on the way.** Extensive further ctc installation may begin as soon as next year. With completion of the Lakehead project, CP Rail will have about 2,500 miles of ctc, or 60% of main and important secondary lines.

Competing with the Lakehead segment for attention is the railway's rugged Mountain subdivision, which features an extraordinary tunneling-under-a-tunnel project. The railway is drilling a nine-mile tunnel below the existing Connaught tunnel in order to reduce gradient through Rogers Pass so that more trains can use the route.

Along with a one-mile tunnel, eight bridges, and a 4,000-foot elevated trestle, the big tunnel will allow addition of 21 miles of second main track through the area—at a total estimated cost of more than $600 million. Completion is set for 1988.

Continuing there this year is installation of 40 miles of 18 GHZ digital-relay microwave,



A CP Rail train passes a visual-display hotbox detector in Ontario. This year, 23 "talking" hotbox detectors will be installed on the railroad.

the last of three segments, so that the entire 125-mile subdivision will be equipped. Installation began in 1982, in an effort to provide fixed trackside communications that could survive the environment.

Open pole wires are especially vulnerable where avalanches and snowslides are routine winter hazards. In addition, relatively-mild winter temperatures cause ice buildup on wires and pile up heavy wet snow on crossarms. The new microwave system has been virtually unaffected by winter conditions.

• **The fiber-optic connection.** The decision to go with microwave was made in 1981, after a survey of various alternatives to open-wire circuits, fiber optics being one of them. Then, fiber optics drop-insert capability was expensive and therefore not competitive. Since then, the drop-insert costs have dropped significantly, and this year the railway is installing a fiber-optic cable through the five-mile Connaught tunnel to connect the east and west sections of microwave.

"At this time, we have no long-range plans to install any more microwave," says Peters. "The Connaught connection will give us experience with both systems. We have to improve the reliability of our trackside communications, and we are looking at both fiber optics and microwave as ways to do that."

Meanwhile, upgrading of signal control systems in the Winnipeg terminal and at Montreal will be completed this year. Both systems involve new microprocessor-controlled display consoles providing the same efficiencies without the same automation as expected from the Winnipeg-Thunder Bay ctc system.

At Winnipeg, one signal tower will handle work formerly done by two towers controlling five separate interlockings. At Montreal, the new system will control train movements over 115 miles from Sherbrooke to Outremont, Windsor Station to Montreal West, and Monteal West to Dorval.

Also this year, CP Rail will install 23 hotbox detectors that transmit radio warnings directly to train crews. They'll join 232 non-talking types installed since 1981 at a cost of $25 million.

• **Expanding point-to-point radio.** One of CP Rail's major ongoing programs has been installation of point-to-point radio communications. This now covers more than 7,400 miles of mostly primary and secondary main trackage. This year, the coverage will rise to more than 8,400 miles, leaving 1,400 to be covered by late 1986.

Point-to-point radio provides immediate two-way communication between a dispatcher and train crews or m/w workers, for better planning of train movements, reduction of delays, and increased track-work time. The links are radio antenna towers 35 miles apart.

"Railways in North America do not have a sufficient number of assigned radio voice channels to satisfy their needs," says Peters. "Other forms of communication will have to be employed to reduce the present congestion on voice channels. One thing I see coming in the near future is the ability to call a locomotive, almost like dialing on a phone system, and leaving messages on some sort of display in the cab.

"At the present time we're looking at the ability to go to the next step beyond the 'talkies' in the hotbox detector system. Instead of verbally broadcasting over a radio, it would provide data on a display or printout in the cab. The objective is to digitize as much as we can.

"The other area that we have to look very closely at is monitoring systems that will allow us to reduce the labor requirements for ongoing maintenance. This is completely feasible today, where it wasn't a few years ago. You can put sensors in wayside equipment and monitor them from a central location."

• **"Just a small sample."** Viewing the current and yet-to-come outlays as "productivity-generating" investments is William W. Stinson, president of parent Canadian Pacific Limited and a career railwayman. "These investments are essential to enhancing capacity, reducing delays, controlling fuel and crew costs, and, most importantly, increasing safety," says Stinson.

"Projects such as these, however, are just a small sample of the potential of computers and communications as tools to enhance the productivity of railway operations.

"When we view this potential from where we are today it may well be that railways are entering a period as vital to their fundamental efficiency as dieselization was thirty years ago. In its time, the diesel was as close to a revolutionary change as you could find in an evolutionary industry.

"As time passes, we may look back on advances in the technology of information and control as the new revolution. Even today, it is increasingly blurring the line between signals and communications, it is reshaping organizational structures and placing new pressures on skills and technical training.

"The information and control systems will become more complex and far-reaching as subsystems become more integrated with each other. And more of them will become connected to company and industry-wide data bases. That growing integration will in turn require a whole mix of new approaches to research and development by railways and suppliers—individually, in groups with similar needs, and on an industry-wide basis by the AAR and other organizations.

"And, for signal and communications executives, the challenge goes beyond mastering and managing technological change. The real challenge will be to assess the long-term implications of technology for the continued functioning of the railway as a business which must be both viable and cost-competitive." ■