DRAFT

SUGGESTED CONTROL CONSOLE ARRANGEMENT - NEW LOCOMOTIVES

The accompanying drawings represent a design proposal for a drivers control console arrangement for new locomotives. The console design has been incorporated into the present Goninan/G.E. cab as a comparison.

The concept is a semi- wrap-around desk-type console with major operating controls in front of the driver thus providing him with a balanced seated position. This concept is best described by Prof. Frederick C. Gamst, Associate Professor of Anthropology at Rice University, Houston and more lately at the University of Massachusetts in Boston in his paper "The Diesel-Electric Locomotive as a Work Environment". Professor Gamst states that in human engineering discussions of general rules to be observed in the layout of a workspace, one of the cardinal rules is that controls must be "balanced" or arranged so that no one limb is overburdened and each limb will be used most effectively. He states that anthropometric investigation in the design of rational cabs should include the problems of balancing controls for road service and the location of controls with respect to the reach envelope of the driver.

It is significant that early carbody models of American diesel locomotives such as the EMD E and F models and Alco-G.E. PA's with controller to one side, brake valves to the other and dash panel between were closer to the ideal design than are todays road/switcher hood units with everything on the left-hand control stand.

The forward control desk-type console arrangement proposed here is similar to many European locomotives however one aspect that differs markedly is that the driver must still be seated next to the cab side wall for easy operating access to the side window. This provides a problem with designing a totally symetrical console layout, hence the need still for some left-hand wrap-around structure to carry minor controls, switches, and instumentation.

This proposal utilizes the 30-CDW brake valve which is specially designed for desk mounting. This brake valve is soon to be manufactured in Australia as the 30-ACDW and in a significant departure from the original design can be supplied with the automatic and independent portions separate - offering greater control layout design flexibility.

The brake valve has been placed on the right due to my belief that this would be more convenient for shunting and back-up moves requiring use of the independent brake, however this has not been proved. The brake valve can be mounted in the reverse to that shown so that operation is pull to apply and push to release. This however may place the independent handle in an inconvenient position.

The drawings depict a standard AAR control panel mounted flat in the desk in front of the driver. This is a tentative suggestion only, which, if the controls had modified handles would provide for the throttle movement to be forward for increase and the dynamic brake handle movement to be backward for "slower" or increased braking effort. Along with the reverse mounting of the brake valve this would be a significant departure from previous experience of control handle operation on American locomotives, and it may be difficult to get drivers to accept the change. However, it may be pointed out that on some railway systems such as NSWSRA which use the standard American control stand in a left-hand drive configuration, all control movements are reversed. The throttle and (26L) brake valve

handle movements are reversed relative to the drivers' forward-facing position. The throttle is pushed to increase (moving right to left in the control stand as normal) and the brake valve is pulled to apply (moving anti-clockwise around the quadrant as normal). By my own observations, this configuration appears to find favour with those using it.

The fact of the matter is that current professional thinking on the subject of anthropometry in the design of an operators workspace is that speed controls should be pushed to increase speed and hand-operated braking controls should be pulled to decrease speed. This theoretical ideal is applied successfully to aircraft but it is accepted that practical considerations may rule it out in this application.

Whatever design of throttle/dynamic brake/reverser handles are eventually used they should be grouped slightly to one side and balanced relative to the position of the brake valve handle(s) so as to properly address the consideration of reach envelope and posture of the driver.

Conventional analogue airbrake gauges are depicted, but developements in locomotive cab instrumentation may be towards vertical strip gauges or other. These should be able to be incorporated in the front display panel if required.

The ACET Locologger Data Display Unit is placed in the same position on the front panel as with the Goninan rebuilds.

No detail of switches on the side panel has been depicted as I am not sure what will be required apart from headlight switches and the usual circuit breakers. A space for the radio handset is shown but I am not sure where the control -head itself might be located.

The Locotrol II console is shown integrated into the side panel to further streamline the workspace. When not required and removed, a spring-loaded flap would cover the hole in the side panel. The Locotrol II console has connections that plug into the back rather than the side so this idea should not pose any major problems. Access to the back of the Locotrol console could be through the back of the side display panel.

No provision for a Locotrol air-brake push-button console has been made as it is highly probable that the normal brake valve will be able to be fitted with transducers so that remote operation is automatic.

The cab side window openings on the Alcos were 920mm long (or wide) by 700mm high. This length was a carry-over of a standard American design feature which allowed for two seats on each side of the cab. Of course this does not apply to our locomotives hence the side windows in the Goninan rebuilds being reduced to 800mm long - a more realistic size. However, although the height of the Alco side windows (700mm) was totally acceptable to even the tallest of our drivers and was not even considered for change, it was somehow increased in the rebuilds to 800mm. This has resulted in a huge cab side window totally out of proportion with the rest of the cab (as any comparison will show), unecessary in its sheer size and against our own submission that cab glass area be kept to the minimum required consistent with safe and practical operation. It has also resulted in the exterior sunshades being too high to be of much use. I have therefore suggested that the side windows be reduced to 700mm in height and the whole window lowered slightly so that the padded window-sill is about level with the seat arm-rest when an average-size occupant has depressed the seat suspension.

The footrests are shown with one dimension modification (height). This is suggested by ergonomic studies of locomotive cabs done in New Zealand by James Coe, Senior Lecturer in Ergonomics at Wellington Polytechnic and lecturer in Architecture, Victoria University, Wellington.

In conclusion, I note that General Motors Diesel in Canada have provided Candian National with a new cab layout (part of their "Comfort Cab" concept - see accompanying photo) incorporating modified throttle and reverser controls for desk-mounted operation. (This unit does not appear to be equipped with dynamic brake). It is not known if other North American manufacturers can provide similar modified controls, however it can be presumed that such modifications are not beyond the capabilities of these builders.

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(On behalf of the Port Hedland sub-Branch FEDFU)