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DEVELOPMENT OF THE HI-SKID LOG FORWARDER: A SHORT-YARDING, SELF-LOADING TRUCK

Introduction. The Hi-Skid log forwarder, manufactured by Alfa Fab Ventures in 100 Mile House, B.C., is a truck-bed attachment designed to yard logs up to 100 m in distance, and then load, transport, and dump them. The capacity of the truck is 12 m^3. The Forest Engineering Research Institute of Canada (FERIC) was asked to help design the attachment, and the pre-production prototype was completed in August 1998. Financial assistance was provided by Forest Renewal BC's Forest Innovation Development Program delivered by BC Advanced Systems Institute. In November 1998, FERIC observed the Hi-Skid log forwarder during a demonstration in a second-growth coastal hemlock-cedar-fir stand on the British Columbia Institute of Technology Forest Society woodlot (Woodlot 007) near Maple Ridge, B.C.

Equipment Description. The yarding and loading components of the Hi-Skid log forwarder (Figure 1) include a hydraulically driven winch and a travelling trolley-mounted fairlead suspended from a track assembly extending out over the back of the truck. The winch cable (100 m of 13-mm diameter cable) passes through the fairlead and out to the logs prepared for yarding. Dumping is accomplished with three hydraulic cylinders which are vertically mounted on the driver's side of the truck. These cylinders tension three open-link-chain slings which extend under the load to pivoting stakes on the opposite side.

The pre-production prototype was designed for maximum log lengths of 6.5 m, but the modular design could be easily modified for other lengths. This unit had a maximum yarding speed of 69 m/min and a line pull of 18.8 kN. The line pull may be increased to a maximum of 26.7 kN. The truck was rated at a maximum of 15 250 kg gross vehicle weight. Depending on the options, the list price will be between $50 000 and $60 000.

Site Description. The demonstration took place in a 70-year-old second-growth stand in the Coastal Western Hemlock (CWHdm) biogeoclimatic zone. The stand consisted of Douglas-fir, western red cedar, and western hemlock. Average diameter at breast height and height before thinning were 22 cm and 35 m, respectively. The average slope was 0–10% with frequent obstacles (old stumps and windthrow), uneven ground roughness, and medium ground strength (thick moss).

Operating Methods. The residual trees were pre-marked by the woodlot forester at approximately 9-m spacing. The trees to be removed were hand felled, top towards the road. The stems were delimbed and topped at the stump. Stems close to the road were bucked into short logs to the specifications requested by the woodlot forester (5.6, 6.25, and 6.86 m), but stems further from the road edge were left tree length and bucked at the roadside.

The machine operator carried three chokers, a breakaway block, and the mainline to the prepared logs. The operator attached the next turn to the mainline, returned to the landing and, using a hand-held remote control, operated the yarding and loading functions. A breakaway block was used to deflect logs around hang-ups and to increase lift, thus improving yarding efficiency. The breakaway block, developed by Alfa Fab, was strapped to a tree and released through a latching mechanism that was triggered as the rigging passed through the block (Figure 2). The block and strap then followed the rigging into the landing, where they would be retrieved by the machine operator.

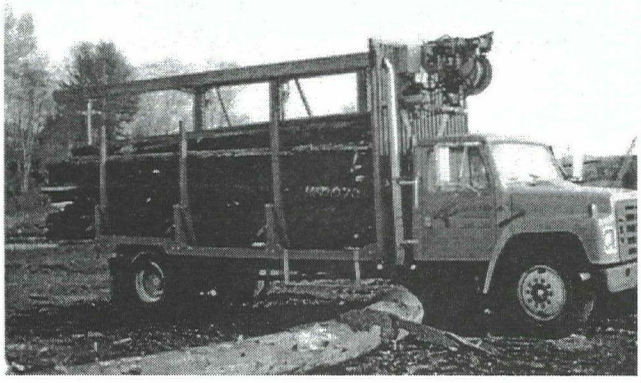

Figure 1. Hi-Skid log forwarder.

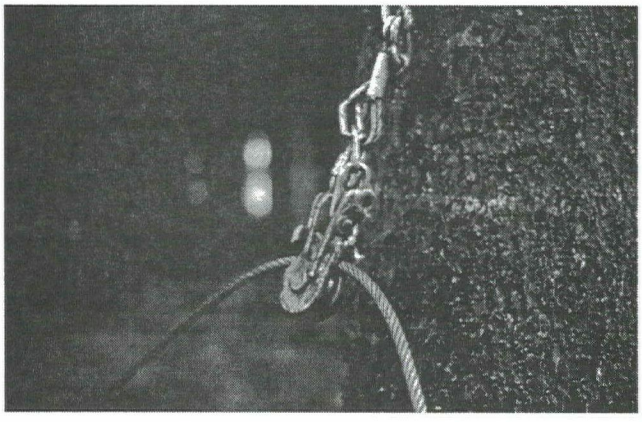

Figure 2. Breakaway block.

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While yarding, the trolley-mounted fairlead was extended to its limit over the back of the truck. As the turn reached the truck, the fairlead moved forward along the track, pulling the turn onto the truck bed. However, tree-length logs were unhooked at roadside and bucked before loading. The Hi-Skid was positioned on the roadside parallel to the road and at 90° to the yarding direction. Until the load was large enough to counterweight the pull from yarding, the Hi-Skid was anchored with a strap to a tree across the road.

Once the Hi-Skid had a full load, wrappers were added to secure the load before it was driven to a log dump in Mission, approximately 15 min away. Prior to dumping, locking pins were removed from the pivoting stakes. As the hydraulic cylinders tensioned the slings, the load was displaced up and over the stakes as they swung out of the way (Figure 3). Several times during the loading cycle, a partial activation of this unloading feature served to align and compact the load (Figure 4).

Observations. Twenty yarding cycles were timed during the demonstration to determine cycle times and cycle elements. Ten logs were scaled and an average piece size of 0.24 m^3 was determined. The estimated average and maximum yarding distances were 30 and 80 m, respectively.

Figure 3. Load being dumped.

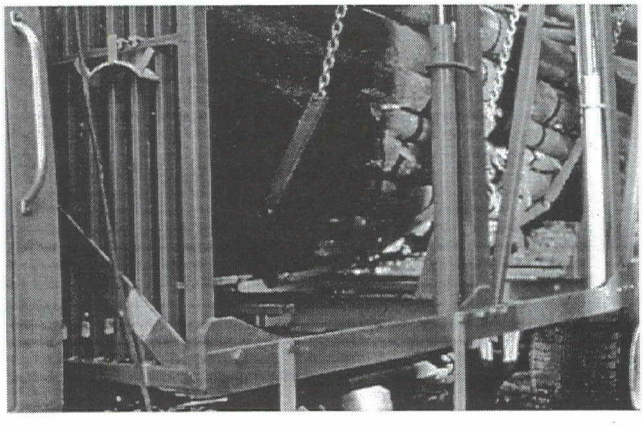

Figure 4. Load being realigned.

During the demonstration, the Hi-Skid was able to yard and load 4.16 m^3/h. At this rate, including travel time to the log dump and unloading time, the Hi-Skid could deliver a load to the log dump every 4 hours, or 24 m^3 in an 8-hour shift.

In one instance, a log came into contact with the lateral, track-support members. This unusual incident was exacerbated by the slipperiness of the logs, contributing to misalignment of the logs within the load. This situation demonstrated the importance of periodically aligning the load through partial activation of the unloading function.

Conclusions. The Hi-Skid log forwarder was successful at yarding, loading and delivering the logs to the dump. Yarding productivity was affected by the obstacles on the site and the inability of the Hi-Skid to pull the logs free without intervention by the operator or faller. Loading productivity is affected by the alignment of the previously loaded logs. The Hi-Skid is able to yard logs within 100 m of a road or trail. By using the breakaway blocks, the logs can be "snaked" through the residual trees without yarding corridors.

Potential Applications. The concept of having yarding and loading capability on the same vehicle that can haul the logs to the mill and unload on its own is well suited to woodlot owners or other contractors that need to harvest or salvage timber in isolated patches, in areas where machine access is restricted (machine free zones and riparian zones), or urban tree removal.

Disclaimer. The information contained in this report is based on limited field observations and is only published to disseminate information to FERIC members and partners. It is not intended as an endorsement or approval by FERIC of any product or service to the exclusion of others that may be suitable. More information may be obtained from:

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