

Safetree Safety Alert

Post this alert on your workplace noticeboards. Discuss it at safety or tailgate meetings.

Type of incident: Confusing and unfamiliar machinery set up

Date: March 2017

From: SCION – on behalf of Safetree and the Forest Industry Safety Council

Learning Review

This Incident Alert uses the Learning Review approach to incident investigations – which aims to uncover how an incident happened to help prevent similar future incidents.

Lessons learnt

- ▶ If you are leasing equipment, ensure you have agreements on who is responsible for repair, maintenance and spares.
- ▶ When fitting controls, be aware of the positioning of operational levers. In the case of undertaking maintenance on the Madill 071 hauler, be aware that the 607 Williams Air Control can be installed in either direction. Installation of the part should ensure that the activation orientation is (a) in the direction the hauler operator is familiar with, and (b) in the same position as the other rod toggle levers.
- ▶ Ensure people operating new or unfamiliar equipment have time (preferably 2-3 weeks) to adjust to using it, and this needs to be taken into account in production expectations.
- ▶ During these 2-3 weeks, additional risk management controls should also be put in place to ensure the safety of anyone working near the area.
- ▶ Introduce a method for workers to register when and where they are using different equipment configurations than they are used to. This method should include a risk management section to be discussed during tailgate meetings with the rest of the crew.

What happened

Ground-based operations were conducted during the first two weeks of work while the crew waited for the leased hauler to get out of the workshop. While driving the hauler into the block, the mainline control air pressure function failed which required replacement of the part. The contractor was instructed by the forest management company who owned the hauler to retrieve a spare control part from a nearby Madill 071 hauler and fit it. The replacement mainline control part was back-to-front to the lever set-up in that it secured to the opposite side of the control base with the 'On' position pointing down instead of up (see Figure 1.)



Figure 1. Madill 071 Control Set-up Fitted with Incorrect Replacement Part.

After fitting the spare part, it was understood that it would take about a week for the correct part to arrive during which time operations would continue using the inverse-fitted control lever. For two weeks, cable logging operations proceeded as planned, using a North Bend cable logging approach (Figure 2). The terrain on site was such that there was limited lift for the ropes near the backline bulldozer anchor so it was difficult to get slack to clear the ropes. During the repositioning of the bulldozer, the ropes had become entangled under the slash to the side of the track. The hauler operator made several attempts to clear the ropes using the tight-lining and slacking technique, over a period of roughly 30 minutes. The tree heads that were hooked on the skyline rope were cleared through tight-lining and chainsaw use.

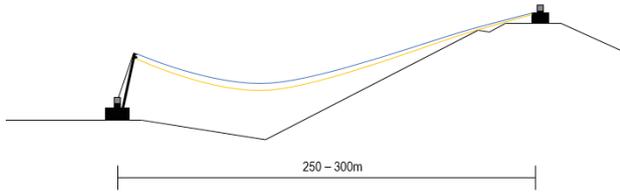


Figure 2. Cable Logging Set-up.

The Skyline rope was raised under maximum tension with minimal deflection. At this point, the tail-rope was still stuck on the butts of the trees that had been pushed down from the ridgeline track the day before. The contractor was unable to see what the tail-rope was stuck on from his location on the track. He radioed the hauler operator to "Hold the ropes". Immediately after the radio call, the contractor proceeded down from the ridgeline under the ropes to try get a view of what was trapping the tail-rope. He was unable to pull the embedded rope from the butt as there was too much weight on the tail-rope to allow for any movement so he started to walk out the way he had come.

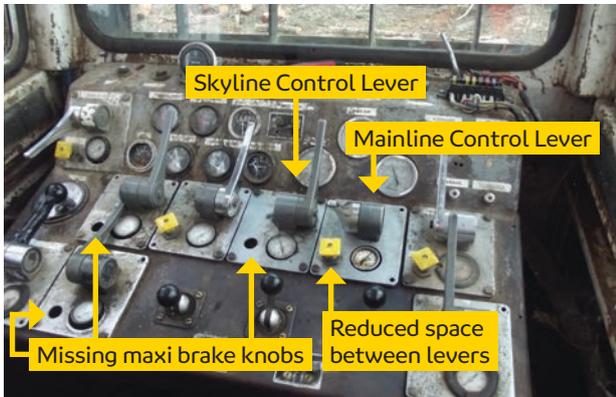


Figure 3. Photograph of the Madill 071 Control Panel.

After hearing the 'hold the ropes' call and assuring all the band brake control levers were in the ON orientation, the hauler operator was sitting and waiting comfortably looking over the control panel out the window. He felt a sudden surge of panic that the mainline brake control lever was in an 'odd' alignment. The hauler operator reached out quickly to remedy this discrepancy and inadvertently knocked or grabbed the skyline control lever which was situated directly beside the mainline control lever (Figure 3). This action disengaged the skyline band brake and triggered the tensioned skyline to suddenly slack. The falling skyline rope stuck the contractor across the shoulders, and he sustained multiple fractures to both legs.

How it happened

These findings represent the conclusions of the project team based on a 'sense-making' focus group discussion, human factors analysis, recorded or reported events, factual data, professional knowledge and good judgment.

Human

- ▶ The North Bend Skyline rigging configuration was familiar to the crew and they had successfully used it before. Contractors are less likely to utilise a set-up they have not been regularly exposed to and alternative configurations can seem time consuming if not utilised often.
- ▶ The contractor and his foreman had replaced the 607 Williams Air Control successfully before, without the need to engage a mechanic.
- ▶ Hauler operators form habits when operating one machine to the next, usually after an adjustment period of two-to-three weeks to become comfortable with new control patterns. Most operators will bear with it until they build enough familiarity to master the operational tasks.
- ▶ For an experienced crew member, operating the hauler during tight-lining may be regarded as a relatively low mental workload task. The hauler console layout and control functions require repetitive actions and responses, which is conducive to the formation of muscle memory. A low mental workload state may have lead the hauler operator to revert to automatic muscle memory mistaking the brake as 'OFF' when it was 'ON'.

Equipment

- ▶ It is normal for forestry crews to carry out as much maintenance as possible on equipment to save on costs associated with mechanics.
- ▶ The replacement control lever was visually inconsistent with the other controls (see Figure 1.) and there was no indication of the direction of control activation on the hauler console.

Environmental

- ▶ Downhill pulling was sporadically used by the crew during their forestry operations in New Zealand, depending on the terrain and woodlot road access available. Downhill hauling has several negatives, including reduced lift to get the ropes off the ground which results in snagged gear leading to damaged, dirty equipment.
- ▶ The terrain was such that there was limited lift for the ropes near the bulldozer anchor and hauler operations were taking longer than usual because the ground-bound ropes were getting tangled on trees and branches.

Organisational

- ▶ Small contractor crews in wood-lot forests around New Zealand struggle with access to the specialist equipment required to successfully and safely harvest wood on steep land. Finance can be difficult to justify in the face of insufficient ongoing contracts for those machines.
- ▶ There is a lack of information regarding the responsibilities around maintenance of leased forestry machines. In most leasing scenarios, however, it is typical for leased machines not to be treated as well as personally owned equipment.

Lessons Learned

Risk Window for New Control Configurations

- ▶ It is easy to form habits operating a machine and this can cause problems when there are changes to that machine. There is an adjustment period of two-to-three weeks to become comfortable with the new control configuration. Most operators will just bear with it until they build enough familiarity to master the operational tasks. During this period, the risk of error increases as a result of the increased workload while you get used to new control configurations. Operators using new equipment are more likely to inadvertently engage the wrong lever, or swing the hydraulic system in the wrong direction or activate the wrong button until they get used to where everything is and what it does. Think of getting into a European spec car after you have been driving a Japanese import – the windscreen wiper lever is where the indicator lever usually is. Until you have been driving that car for a few weeks, you are constantly turning the windscreen wipers on when you go to indicate you are turning. It is very frustrating! The same goes when operating new machinery in forestry.

Control Lever Replacement

- ▶ The 607 Williams Air Control is an aftermarket lever that allows the fitter to alter the control activation direction. The part is purchased as a package in the default orientation. As the replacement part was borrowed from another hauler owned by the same forest management company, the control level had been adjusted from the default orientation to fit the control arrangement in the second hauler.
- ▶ Crews likely to be undertaking maintenance on the Madill 071 hauler should be aware that the 607 Williams Air Control can be installed in either direction. Installation of the part should assure that the activation orientation is (a) in the direction the hauler operator is familiar with, and (b) in the same position as the other rod toggle levers.



Figure 4. 607 Williams Air Control installation.

Safety-critical Control Lever Substitution

- ▶ If it is clear the control will be in an inconsistent orientation, it may be possible to swap the mainline control lever with a lever less critical to normal operations such as the straw-line lever. This reduces the visual incongruity and does not disrupt or distort overlearned response schemas, which could result in inadvertent activation or reactions.

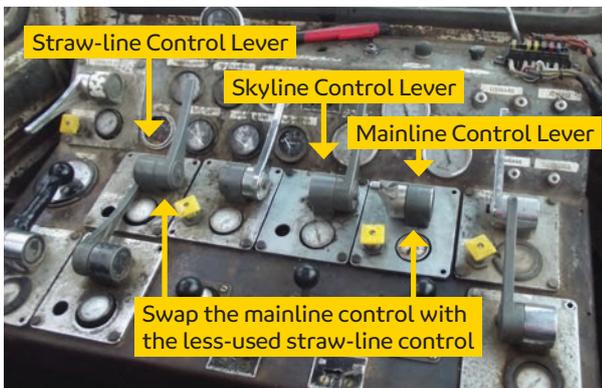


Figure 5. Photograph of the Madill 071 Control Panel.

About the Learning Review approach

- ▶ Traditional approaches to incident investigation focus on 'what' happened – which provides useful information. But they don't always uncover the 'how' – all the things that led to the incident happening. This information is also very useful to prevent future occurrences. FISC has, with the assistance of WorkSafe, commissioned research by SCION to use a 'learning review' approach to investigations – developed by the US Forest Service to better understand the 'context' surrounding an incident. In addition to providing tips that will help the industry conduct better investigations itself, SCION is applying this new approach to investigations of real-life forestry incidents. Its findings will help us understand the context of the incidents and will help the industry better understand how to prevent similar incidents in future.