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INCREASING SKIDDER OPERATOR SEATBELT USAGE

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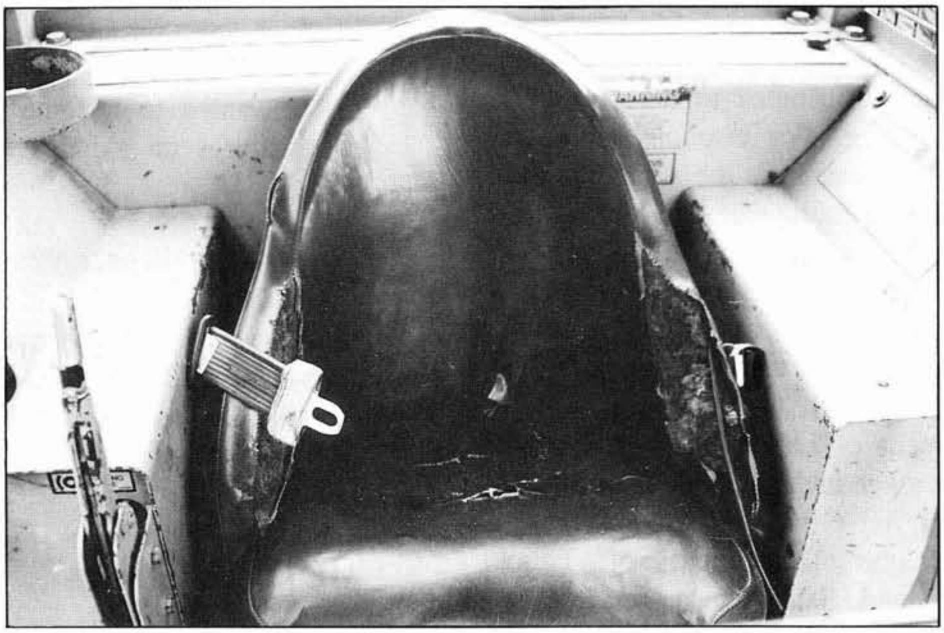

Figure 1 - LIRO seatbelt design

ABSTRACT

Despite the recent increase in the penalties for operators failing to wear a seatbelt, skidder operator seatbelt usage has continued to remain low. With this in mind, LIRO investigated alternative means for increasing seatbelt usage. A standard seatbelt was redesigned and a reminder light installed in the machines of seven full-time skidder operators. Results showed mean seatbelt usage for six of the operators was increased by 58% through providing a more convenient seatbelt design and by installing a reminder light.

INTRODUCTION

The number of accidents involving forestry machinery is relatively high. In the period 1985 to mid-1993 there were 63 reported machine rollovers in New Zealand logging, and of these six (10%) resulted in fatal injury. The wearing of a seatbelt has been highlighted as one method of reducing the number of machine-related fatalities and serious injuries. Historically, the level of seatbelt use in logging machinery has been low (Kirk, 1992).

A preliminary study of skidder operators revealed that there were two main reasons given for not wearing seatbelts. These were that they simply forgot, and the inconvenience of the standard seatbelt design. A standard skidder seatbelt has both ends of the belt on webbing only, and is not conveniently placed for the operator to use. Consequently, the belts often end up lying on the floor of the skidder gathering grease, mud and slash.

The lack of enforcement is a further factor which has contributed to the low level of seatbelt usage. For example, in a recent survey conducted in the Otago/Southland region it was found that 72% of the loggers interviewed had seen the Health and Safety Inspector three times or less in the last year, with 12% not having seen an inspector at all in the last year (Gaskin and Adams, In prep). On August 1, 1992, the Department of Labour decided to enforce seatbelt usage under section 12c of the Bush Workers Act (1945). This part of the Act enabled the Department of Labour's "Health and Safety Inspectors" to give directions regarding the use of protective equipment. The Safety Code for Forest Operations (1992) was taken as the standard which all logging operations had to reach. Anything below this standard was considered dangerous and forbidden by law.

On April 1, 1993, the Bush Workers Act was replaced by the Health and Safety in Employment (HSE) Act (1992). This Act requires employers to provide a safe working environment for their employees.

In addition to enforcement, it was considered that seatbelt usage could be increased by removing some of the factors that skidder operators see as deterrents to wearing the belt. This involved making both halves of the seatbelt easier to grasp, easier to adjust, and overall designing a seatbelt that required less effort to use. Aside from the conventional seatbelt design, the problem of simply forgetting also needed to be addressed. LIRO attempted this by installing an orange light that flashed when the seatbelt was not fastened. Flashing has been shown to be a good method of attracting attention (Baker, 1958). In fact, Thackray and Touchstone (1991) found that the use of flashing could improve detection rates by up to 82%.

LIRO wanted to test the impact of these two features on skidder operator seatbelt usage.

ACKNOWLEDGEMENTS

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METHOD

Subjects

The subjects in the study were seven full-time skidder operators, who worked for either the Forestry Corporation of New Zealand (Waiotapu), Tasman Forestry Limited (Taupo) or Tasman Forestry Limited (Murupara). In order to lower the number of variables, only the Clark/Ranger/Valmet make of skidders were used. This included one F66, one F67, two F65s, two 666Fs and one 668F.

Seatbelt Design

The seatbelt prototype was designed using information obtained from skidder operators, analysing the available technology and solving the problems associated with the standard design. The resulting seatbelt configuration (Figure 1) consisted of a non-inertia type ALR retractor with a K-style female half.

This type of retractor does not lock when pulled out quickly or when the machine is parked at a steep angle. The locking mechanism works off the amount of webbing on the retractor reel. When the webbing has been pulled out, the retractor reels in a small amount of webbing taking up the slack and locking the retractor.

The retractor is mounted behind the seat with a seat mounted bracket holding the webbing close to the operator's hip. The female half of the seatbelt is bolted to the floor pan of the skidder. This places both halves of the belt in easy to reach positions.

Measures

The level of seatbelt usage was measured by mounting a magnetic reed switch on the outside of the seatbelts. The switch consisted of an open circuit on one side and a magnet on the other. The circuit half of the switch was attached to the non-adjustable side of the seatbelt because it had wires coming off which needed to go down the belt. The magnet was mounted on the other half so adjustability was not impaired. The circuit was connected to a relay which was connected to the skidder's ignition. When the magnet and the open circuit were placed in close proximity (that is, the seatbelt was closed) the magnetic field completed the circuit and 12 volts flowed through the circuit. This was registered by a Husky Hunter field computer, also connected to the relay.

The Husky Hunter was programmed to act as a data logger, registering every time the status of the circuit changed and the time this happened. This allowed the researcher to determine if the operator of the skidder was just sitting there clocking up a whole lot of seatbelt closures, or closing the belt and sitting on it. To make sure that the Husky Hunter was going the whole time it was in the skidder, it was programmed to make an automatic entry every half hour, recording the time and date.

To protect the equipment, the Husky Hunters and relay boxes were housed in either the skidder's battery box or a small ex-army ammunition box bolted behind the operator's seat. A sampling schedule was set that allowed each skidder to be sampled five times a fortnight.

The operator kept a weekly record of hours and days the machine was working, whether he had a breaker-out and the number of drags he completed each day. To establish the accuracy of the data reported by the operators, a small video camera was occasionally installed in each skidder. This allowed the researcher to put a degree of confidence in the data reported by the operator.

Reminder Light

The reminder light was also connected to the relay but worked independently from the Husky Hunter, as the Husky Hunter was not in the machine permanently. The reminder light was controlled by the reed switch on the seatbelt, and flashed whenever the machine's ignition was turned on and the seatbelt was not done up. This happened whether the operator had completed his drag, was just sitting in the cab with the ignition turned on or was driving around in the bush.

Data Processing

The data collected by the Husky Hunter needed to be related to the number of drags, as the operator is legally required to wear the belt twice for every drag. Therefore, in order to calculate seatbelt usage, the number of seatbelt closures was divided by two times the number of drags.

$$\text{Percent seatbelt usage} = \frac{\text{Closures x 100}}{\text{2 x Drags}}$$

This gave the percentage of times that the operator engaged the belt when he was legally required to do so. After all observational data were collected the operators were given a questionnaire which asked them to compare the two seatbelt designs, what they liked/disliked about the designs and where they saw improvements could be made.

RESULTS

Number of Drags

The data obtained through the use of the video camera indicated that all seven operators were 100% accurate in reporting the number of drags.

Seatbelt Usage

The results from the six skidder operators were combined to form Figure 2. The results from operator 2 are treated separately because of their complete dissimilarity with the results from the other operators.

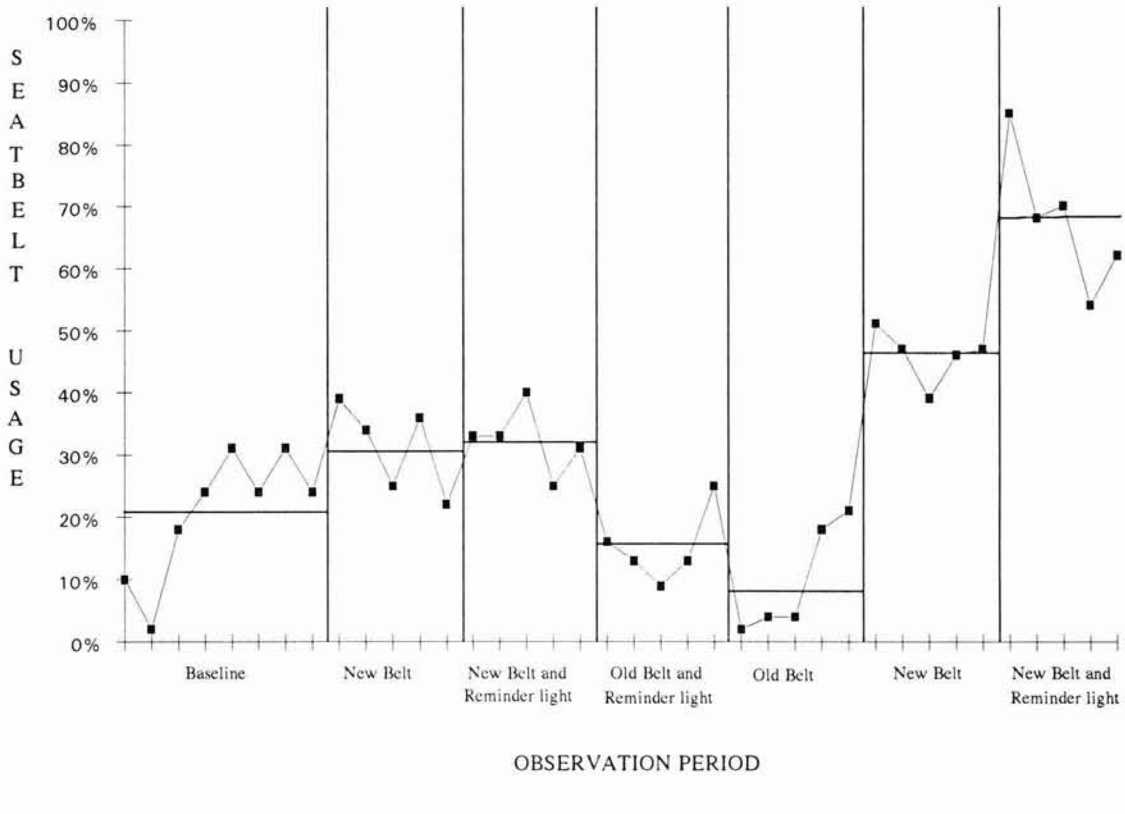
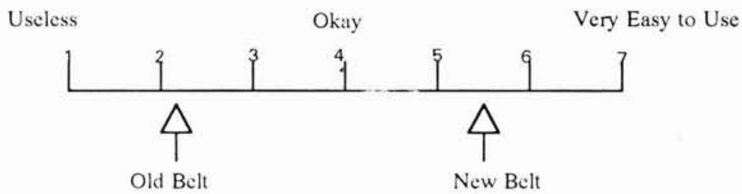


Figure 2 - Seatbelt usage - mean usage for six skidder operators

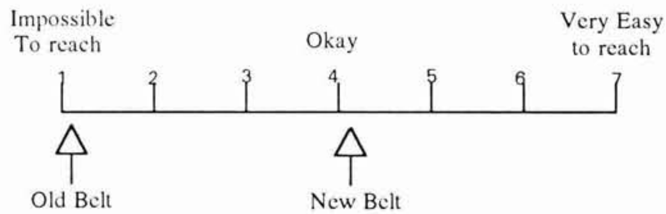
Seatbelt Evaluation - Summary

The subjective evaluation of the seatbelt, obtained through the questionnaire, shows that the operators thought a lot more highly of the new seatbelt than the standard seatbelt design.

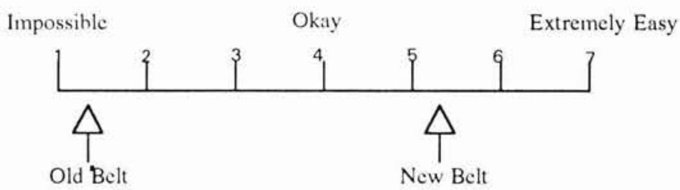
Ease of use : how easy is the belt to use ?



Presentation : how well is the belt presented to you ?



Adjustability : how easy is the belt to adjust ?



Overall Assessment : rate each belt out of seven.

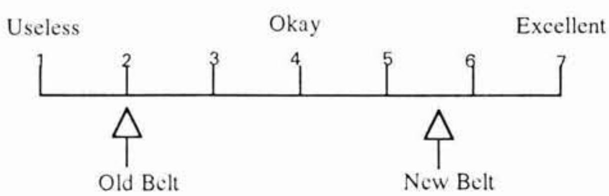


Figure 2 shows the percentage that the seatbelt was used when it was legally required. Each data point contains one day's data averaged over the six skidder operators, with the horizontal lines representing the mean for that period. The mean baseline level of 21% was unusually inflated, by the fact that the operators knew seatbelt usage was being measured. This increase in seatbelt usage is understandable when it is considered that under the HSE Act (1992) an operator can get fined up to $25,000 for failing to wear a seatbelt. When the new seatbelt was first introduced, the level of seatbelt usage rose to 31% (10% above the baseline). However, at this point the first of the crews were moved into production thinning operations, which unfortunately reduced seatbelt usage. This is shown by the fact that seatbelt usage only increased to 32% with the introduction of the reminder light. This was reduced to 15% with the removal of the new belt. Taking the reminder light out resulted in a further decrease of 5%. During this period most of the crews had returned to clearfell operations.

The reinstallation of the new seatbelt resulted in a 36% increase (Figure 2). A further increase to 68% was achieved by reinstalling the reminder light. This is 47% higher than the first baseline period and 58% higher than the return to baseline "old belt" period of observation.

This shows that for these six operators seatbelt usage was increased considerably with the introduction of the new seatbelt design. The reminder light in conjunction with the new seatbelt also significantly increased seatbelt usage. However, without the new belt in, the reminder light appeared to make no change. As mentioned earlier this could be due to a number of the crews being in production thinning operations at the time.

Skidder operator 2 did not wear any seatbelt at all and disconnected the reminder light whenever it was on. The operator did not care that he was legally required to wear the seatbelt and basically stated he would do almost anything to avoid using one. For this operator neither the new seatbelt design, nor the reminder light resulted in any change in the level of seatbelt usage.

CONCLUSIONS

A more user-friendly seatbelt was designed and found to increase the level of seatbelt use.

A reminder light was found to increase seatbelt usage over and above that of the new seatbelt.

The problem with skidder operators failing to wear a seatbelt can, to a large extent, be solved by providing an easier to use seatbelt and using a reminder light.

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