



NEW ZEALAND

# PROTECTIVE BOOTS FOR CHAINSAW OPERATORS

J. E. Gaskin

## INTRODUCTION

Since the Logging Industry Accident Reporting Scheme commenced collecting accident information on a national basis, there has been an increasing proportion of chainsaw cuts to the feet. In the past three years (1983-1985), a total of 124 accidents to feet have been recorded (that figure includes cuts, strains and sprains, and bruising or crushing, as well as most categories of accidents, lost time, minor or near miss). Of that 124 lost time accidents, those as a direct result of chainsaw cuts have doubled from 12 in 1983 to 24 in 1985.

Some of that increase could be attributed to a better response in reporting accidents. However, this trend was considered too important to ignore.

A pair of boots that offered increased protection from chainsaw cuts could be either imported or made in New Zealand. The use of such boots, while not reducing the incidence of that type of accident, would certainly reduce the severity.

There is a legal requirement under the Department of Labour's Safety Code for Bush Undertakings - Part III, Logging - 1984, for bush workers to wear a pair of approved safety boots. The Code states :

### "2.3.6 Safety Footwear

- (a) All workers engaged in bush operations shall wear steel toe capped footwear made of strong leather and of the lace-up type.
- (b) Steel toe capped gumboots can be worn where adverse or muddy conditions exist."

The emphasis of such regulations is to guard against crush injury, although obviously the steel cap will provide some protection from cuts to the toes.

From analysis of the accident statistics in Table 1, it is apparent that the feet require better protection than that offered by the steel toe cap.

## SELECTION OF BOOTS FOR EVALUATION

Ideally, feet require some form of protection in the instep, the outer side and the top of the foot. A review of footwear available to loggers overseas (Britain and Scandinavian countries) revealed boots with kevlar material or ballistic nylon in these areas were commonly used.

Following the review of available footwear, a pair of boots was imported from Britain through the U.K. Forestry Commission. Approaches were also made to local manufacturers to produce a pair of boots to meet guidelines drawn up by LIRA. King Leo, a subsidiary of Wormald Safety (N.Z.) Limited, responded quickly and a pair of New Zealand made boots were available for evaluation during the testing of the British boots.

Both pairs of boots had leather uppers and the standard leather rubber commando type sole. The padding used in the tongues and flaps was kevlar in both cases - larger strand, loose-weaved type of kevlar in the New Zealand boot, and needle punch type of kevlar in the Forestry Commission boot. Both pairs of boots weighed 1.25 kgs and were size 8. From the outside, both looked like ordinary work boots. On the inside, however, seams and edges of the padding projected into the foot area. With the New Zealand manufactured boots, the edges were lined to prevent fraying, while the Forestry Commission pair were overlapped.

TABLE 1 - FOOT INJURIES DIRECTLY  
RELATED TO CHAINSAW CUTS

(Logging Industry Accident  
Reporting Scheme - 1985)

	<u>Days Lost</u>
Missed limb while trimming and cut foot	4
Kickback on to foot	8
Cut foot while trimming	21
Lost footing and dropped saw on to foot	N/R
Stepped on revolving chain	10
Kickback on to foot	10
Cut foot while trimming	10
Saw kickback on to foot	4
Slipped off log and cut foot	21
Saw kickback on to foot	14
Lost footing chainsaw cut toe	N/R
Kickback on to foot	4
Kickback on to foot	10
Chainsaw cut to foot	14
Cut foot while trimming	14
Saw pushed on to foot during rimming	15
Saw cut big toe	15
Struck on foot by chainsaw	10
Trimming on skids and cut foot	5
Saw cut through log on to foot	7
Chainsaw cut foot	N/R
Chainsaw kickback on to foot	N/R
Chainsaw kickback on to foot	30
Chainsaw cut foot	15

N/R = Not recorded

Mean days lost per accident (where  
recorded) = 12 days



Figure 1 - U.K. Forestry Commission boots



Figure 2 - New Zealand made boots

## EVALUATION OF BOOT

There were two parts to the evaluation :

- (1) Evaluation of comfort by users, i.e. loggers.
- (2) Evaluation of cut resistance of padding.

### User Evaluation

As with any garment, it was considered critical that they pass the most difficult test of all - user acceptance. To that end, two workers from Tasman Forestry Murupara Logging district were selected to use the boots for a three month period. At the same time, another worker was given a pair of conventional boots to enable one comparison. The original objective was to rotate the boots between the three workers each month. This rotation proved to be unacceptable.

Each user was asked to record his comments at two weekly intervals using a prepared form. A summary of their comments is in Table 2 below :

TABLE 2 - USER COMMENTS ON WEARABILITY OF CHAINSAW SAFETY BOOTS

Type of boot	Control	King Leo	Forestry Commission
Flexibility - are the boots easy to move in?	Yes	Yes	Yes
Are they noticeably heavier than your normal air?	No	No	No
Does the padding make them hot to wear?	N/A	Yes	No
Does the padding cause any skin irritation?	N/A	No	No
Has the padding caused blisters?	N/A	No	No
Does the padding hinder putting on or taking off the boots?	N/A	No	No

It is interesting to note that little or no irritation was experienced wearing the boots. One of the wearers of the safety boots indicated that they were hotter than conventional boots, but in the space provided for general comments he recorded that the boots were "more flexible and comfortable."

## Boot Padding Cut Resistance

As no test rig was available in New Zealand to scientifically test the cut resistance of the padding, a simple testing procedure was designed, involving :

- (1) Attaching the boot to a dummy (wooden) leg supported by a person holding the upper end of the leg, but standing well clear.
- (2) Using a 62 cc chainsaw to cut into the boot behind the toe cap :
  - (i) Revving the saw to maximum revs and dropping it from a height of approximately 200 mm so the tip of the bar hit the front section of the boot. The throttle was released immediately before the saw was dropped.
  - (ii) Holding the power on, the saw was then dabbed into the boot to simulate the chainsaw nick situation.
- (3) The three pair of boots were subjected to two cuts.

The Forestry Commission boots stood up well to the cutting action of the chainsaw, although in most cases the padding was cut through and injury would have been sustained. The injury severity would, however, have been greatly reduced.

The King Leo boots appeared to offer less cut resistance than the Forestry Commission boots, but more than the control boots. Again, it was considered that these boots would have reduced the severity.

It must be stressed that these tests were subjective and designed to provide immediate results.

## DISCUSSION

Since these tests and the operator assessment was carried out, considerable development has gone into the King Leo prototype boot. The Company now makes a model that is available by indent order at this stage. At the time of writing, the boots cost approximately \$180.00 per pair, with the actual cost dependent on the size of the

order. Conventional steel-toed boots with no protective padding cost around \$130.00.

The cost must be kept in perspective. In Table 1, 24 accidents were recorded. Of the 20 with the number of days lost recorded, the mean days lost per accident was 12. Assuming that the industry pays for the first 5 days lost at a rate of \$100 per man per day, those 20 accidents cost employers \$9,700 in direct wages alone. That figure is very conservative as it takes no account of the losses in production, or of human suffering.

At the beginning of 1986, a near miss accident was reported involving a wearer of the boots. An account of that accident is given below :

*"The operator was trimming, walking along the top of the log, and overstepped a limb. Instead of stepping back, he swung the saw back towards the limb and boot. The saw hit the boot just behind the toe cap. The operator told the supervisor that the saw was revving quite fast and that when it made contact with the boot, it came to a sudden stop. He felt that the kevlar material in the boot saved him from a very bad cut at best, or loss of some toes at worst."*

It must be stressed that, as with safety trousers/chaps, chainsaw safety boots will not prevent the accident from happening. They should, as has been illustrated, reduce the severity of the accidents and the logging industry is encouraged to consider their widespread introduction.

For further information, contact:

N.Z. LOGGING INDUSTRY RESEARCH ASSOC. INC.  
P.O. Box 147,  
ROTORUA, NEW ZEALAND.

Telephone: (073) 87-168