



Review and assessment of the procedures for dealing with hung-up and windblown trees

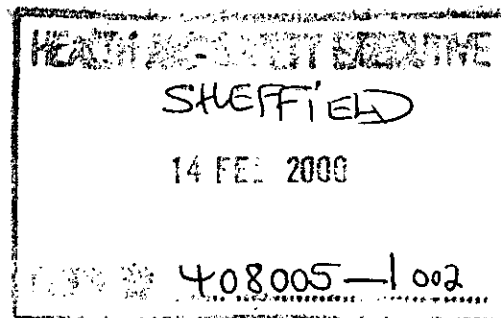
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Review and assessment of the procedures for dealing with hung-up and windblown trees

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The number of accidents occurring during manual felling is thought to be due to either lack of training or the adoption of incorrect working practice. This report highlights that, despite adequate training provision and copious safety guidance, accidents still occur during the takedown of hung-up and windblown trees.

Whilst much innovation has occurred in the form of mechanising harvesting operations, no new technology is currently available to assist the manual feller in the form of a lightweight robust winching systems.

Following a survey of contractors across the country it is clear that recommended and trained techniques are either not being communicated effectively or are not being adequately implemented by supervisors and operators.

The cost of following trained methods, for takedown using a winch system, can equate to £6 - £10/m³ in thinning and £2.20 - £4.50/m³ in clearfell. In most cases this cost is not accounted for in the tender price and results in a loss to the operator.

Proposals are put forward to review training and assessment material and to use the Management of Contractors Initiative to improve the selection of competent staff and supervision of operations.

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REVIEW AND ASSESSMENT OF THE PROCEDURES FOR DEALING WITH HUNG-UP AND WINDBLOWN TREES

Summary

The Forest Industry is very aware that the number of accidents occurring during manual felling is due to either lack of training or the adoption of incorrect working practice. There is adequate training provision and copious safety guidance.

Despite the introduction of operator certification and the large number of operators who have received training, the number of accidents in harvesting remains at an unacceptable level.

The recommended technique for dealing with hung up trees is to use a hand operated winch to assist takedown. There is much evidence that this method of working is not being adopted due to the weight and non-availability of hand winches on site. Winching and recommended alternative methods are either not being communicated effectively or are not being adequately implemented by supervisors and operators.

The influence of productivity payments are assessed and the cost of following trained methods quantified.

Although no new or innovative methods have been identified, proposals are put forward to review training and assessment material and to use the Management of Contractors Initiative to improve the selection of competent staff and supervision of operations.

Objectives

- A To identify and record current equipment used and work methods.
- B To identify the reasons why equipment and methods are not being adopted by the industry.
- C To identify the influence of productivity payments on working method.
- D To test and evaluate new pieces of equipment by experienced operators/FASTCo/FCA instructors to assess their suitability to UK conditions.
- E Identify any opportunities to improve either performance and/or encourage the application of existing systems by operators.
- F To propose items for revision in training course syllabi in light of the findings of the review.

1. OBJECTIVE A: TO IDENTIFY AND RECORD EXISTING EQUIPMENT USED AND WORKING METHOD ADOPTED

1.1 PAST PRACTICES

This section contains information on equipment and methods for the takedown of hung-up trees. Some are no longer regarded as best practice but as they are still in current use they are described.

1.1.1 The Long Handled Timber Tongs

The stance and ergonomic position of the operator when using tongs for takedown is poor. Lifting the tree places the operator in a position that could lead to an injury. The working method is to lift the tree at the butt end and then pull/slide the tree off the stump and across the ground. The weight of the tongs is *circa* 8.50 kg.

1.1.2 Pole Runner

The butt of the tree is bored and cut to allow a long timber pole to be pushed through it. The hinge is then cut and the tree slides off the stump along the pole.

The hazards involved with this operation are:

- The load bearing capacity of the pole is unknown
- The movement of the tree is not controlled
- The operator can be placed in a dangerous position during the boring cut, (working under the hung up tree) and sudden movement of the tree on the pole.
- Site specific –relating to the:
 - Slope
 - Ground Conditions
 - Tree Size

The time to set up often takes longer than using a winch system

1.1.3 Felling Cushion

The felling cushion was introduced approximately 15 years ago as an aid to felling. The principle was inflation of a flexible small bag (Cushion) using the exhaust gas of the saw.

The felling cushion was inserted into the “back cut” of the tree. When inflated the cushion acted as a wedge to assist with the felling of the tree.

The system met its aims but was discarded by operators due to a need for frequent maintenance, a lack of spare parts and the cushion’s inherent unreliability.

The main problems were:

- High maintenance requirement
- Limited number of spare parts, particularly small “O” rings in the system
- Incorrect use of the bag could result in loss of control of the felling operation.

The felling cushion is no longer produced.

1.2 CURRENT PRACTICE

The equipment currently available in the UK has been identified from a wide range of UK and from international manufacturers. The current UK practice appears to be ahead of many countries and equal to the practices used in Scandinavia.

The basic tools identified for taking down hung-up and windblown trees are:

- Muller Cant Hook
- Breaking bar (Felling lever) with cant hook
- Nordic Turning Strap
- Polypropylene strops
- Wire rope strops
- Hand Operated Winch and Powered Winch¹
- Pulp hook
- Timber tongs
- Cut length of Timber to use with the turning strap or on its own as a lever to manually adjust the position of the tree.

Supplier's details for handwinches are given in Appendix 1

The Reipal Tree Pusher can assist with controlling the direction of fall in large trees. Although not recommended for use with hung-up trees its application may prevent a tree from becoming hung-up in the first place.

1.2.1 TRAINING AND ASSESSMENT ON TAKEDOWN PROCEDURE OF HUNG-UP AND WINDBLOWN TREES

Training

Instructors provide training in the use of a Chainsaw in tree felling operations. These instructors are experienced Chainsaw operators that have been given further training before gaining approval from national bodies. All hold relevant Nationally recognised qualifications.

Training/Procedure in Takedown - Small Trees

The technique for the takedown of small trees that can be easily rolled out of the canopy is:

- Assess the direction of the fall/roll
- Plan and prepare a safe escape route
- Have suitable aid tools within easy reach
- With the tree is still attached to the stump cut the hinge at the opposite side of the fall/roll. If the tree does not roll on its own, assistance with a takedown tool is required.

¹ The pulling power, lifting capacity and load bearing properties of the winch, winchrope and safety straps would need to be assessed before the takedown can commence using a hand or powered winch.

- Attach the aid tool (breaking bar with cant hook) firmly to the stem of the tree at a comfortable height that suits the user. The handle should be positioned between waist and chest height. Roll the tree by pushing on the breaking bar, never pull the bar. Pulling can lead to operators falling on their back and sustaining an injury, or may pull the tree over onto themselves.
- Reposition the aid tool to maintain a safe working stance and also to stay out of the danger area. Once the tree starts to fall let go of the handle. Never try to retrieve the aid tool as the tree is falling.

Training/Procedure in Takedown - Small Trees

The techniques for the takedown of small trees that cannot be rolled out of the canopy are:

- Assess the direction of the fall/roll
- Plan and prepare a safe escape route
- Have the suitable aid tool available, for this method of takedown this is a Turning Strap
- The hinge is severed completely. This is done by cutting the hinge from the rear, ie through the back cut. This reduces the possibility of the saw becoming jammed as the tree starts to fall off the hinge.
- The space at the back cut should be clear to prevent the tree being caught up in debris.
- Thread the Turning strap thread one end through the loop and pull up until the strap firmly surrounds the butt of the tree.
- The next step is for the operator to position himself at the butt facing the tree, feet level and to either side of the takedown. The operator, pulling the tree off the stump using the leg muscles and keeping a straight back holds the end/ends of the strap. Ensure the operator's feet are clear of the butt as it moves.
- If the tree is not dislodged a levering bar must be used. Its use is described in the takedown of large tree that **cannot** be rolled.

Training/Procedure In Takedown - Large Trees

The techniques for the takedown of large trees that cannot be rolled out of the canopy are as follows:

- Assess the direction of the fall/roll
- Plan and prepare a safe escape route
- Prepare a suitable aid tool, this is usually a length of timber at least 2 meters long by 10 cm in diameter. Cut a flat face at one end to assist in the positioning of the pole.

- Bore out the middle of the hinge leaving *circa* 10% at each end. Assess the effect of subsequent movement of the tree will have before any further operation. Plan the remaining cuts ensuring a safe working position. Remove the remainder of the hinge with a series of “v” cuts from the side. The cuts done in this manner ensure that the saw does not become jammed as the tree moves.
- If the butt drops below the lip of the hinge then the stump must be shaped to provide a level or rear sloping face for the butt to move on. Position the lever under the tree as close to the butt as possible. The operator needs to position himself to the side of the tree, with the pole at an angle no more than 30°.
- The operator lifts and pushes the lever to move the tree off the stump. Remaining in the safe area at all times the operator repositions the lever to move the tree until the tree starts to fall on its own. The lever should be dropped and the operator step into the safety zone as the tree starts to fall.
- If the tree does not fall using the described method then a hand winch system will need to be adopted.

Training/Procedure In Takedown - Large Trees - Winch Assisted

The techniques for the takedown of large trees that cannot be rolled or levered out of the canopy are as follows:

- Assess the direction of the fall/roll of the tree
- Plan and prepare a safe escape route
- Clear the take down area
- Tools and equipment required are:

Suitable hand operated winch
Appropriate safety strops
- Select a suitable anchor point for the winch. This can be a tree or stump as near in line as possible and at a safe distance from the tree. After anchoring the winch attach the winch rope to the butt of the tree by either a safety strap or a safety hook. Pull up any slack in the winch rope before operating the winch. The winch may need to be repositioned to permit the tree to be completely pulled down.
- When winching down a steep slope the winch needs to be offset to give the operator a good view and to maintain a safe working position.
- The set up and operation on the winching down procedure **has to be carried out by one operator**. An assistant may be required to help in setting up and dismantling of the winch, on no account should two people be involved with the takedown.
- If the tree cannot be winched down by hand or by small powered winch the use of further mechanical assistance is required. The guidelines as specified in FASTCo Guide Nos. 305 & 505 should be followed.

1.2.2 FASTCo Training Course
Takedown of lodged or hung trees as part of FASTCo 2.1- 5 day
Chainsaw Course:

Take down is taught as an integral part of the felling operation

For trees under guide bar length the common method of takedown would be:

- Removing 80% of the hinge leaving 20% on the side on which the tree is to be rolled using either a turning strop or turning bar.
- If removal has not worked with this method the remaining 20% of the hinge should be removed.
- The tree then should be levered from the stump using a rope strop or breaking bar. A pole or billet of wood can be used as a lever.
- If this still proves too difficult then a winch should be used.

The estimated duration of this process would be approximately 1½ hour's instruction discussing all of the above-approved methods.

On trees over 1½ guide bar length the main method of takedown taught would be the use of a hand winch either a Lugall, Tirfor or tractor mounted mechanical winch.

During any period of instruction regarding the taking down of hung up trees the instructor discusses with the trainee the methods that should **not** be employed in removing a hung tree:

- **Never fell the supporting tree**
- **Never fell another tree across the hung tree**
- **Never cut sections of the butt**
- **Do not attempt to climb a hung tree**
- **Never work or walk under a hung tree**

The average cost of a FASTCo 5-day course is £38-£70 per trainee per day

1.3 NPTC ASSESSMENT

The revised NPTC CS units introduced in 1997 include takedown as an element of the felling unit. Prior to this takedown was a stand-alone unit.

The National Proficiency Test Council (NPTC) specifies the criteria their assessors follow. A schedule laying out the modules that cover the use of the Chainsaw is used. On two separate modules the guidance and training on Takedown is given, these are:

CS31 - Fell Small Trees

31.04 - Take down of hung up trees using hand tool

CS32 - Fell Medium Sized Trees

31.04 - Take down hung up trees using a winch.

The smaller trees used in the module have been assessed as not having a butt diameter greater than that of the guide bar length. A Chainsaw fitted with a 15 inch (38 cm) guide bar is commonly used when under instructions for these two modules.

The Chainsaw operator has to be able to meet the objectives of these modules before the instructor can pass the operator competent in the use of a Chainsaw.

1.3.1 Unit CS 33

This unit covers trees whose effective diameter at felling height is over 760 mm (30 inches).

This unit does not require takedown due to the large dimension of the trees being felled.

* Assessment on CS 32.04 can be carried out using a tractor mounted winch.

1.4 ASSESSMENT - PRACTICE

At present assessment is commonly incorporated within a training course. A certificate of competence in Chainsaw units is then obtained with the assessor providing an NPTC Schedule - at the cost of £29 - to the candidate. All the units are now contained in this schedule. The cost of applying for the certificate is included in the purchase price of the schedule. It is only when the certificate holder needs to update the certificate that an extra charge of £10 is incurred per each amendment.

1.4.1 September 1999

As from September 1999 Training and Assessment are to be separated, therefore instructors providing the training are not permitted to assess their own trainees. After training the candidate's will apply to a Chainsaw Assessment centre for their assessment.

Although the charges are recommended there will be a certain flexibility within the assessment fees. It is envisaged that the assessment will be more rigorous than the previous scheme as the assessor has no prior knowledge of the candidate.

1.4.2 Comment

Although the NPTC certificate of competence is a nationally recognised certificate, it does not cover working methods for commercial chainsaw operators. It is fair to say it is confirmation of basic competence.

2. Objective B: To identify the reasons why equipment and methods are not being adopted by the industry.

The contractor base across the country were canvassed for opinion on why current methods are not being adopted or if they have any suggestions on how the operation may be improved. A summary of the results are given in Appendix 2.

In addition to the formal responses many contractors and managers provided additional comment that proves useful in identifying areas of potential concern.

2.1 RESPONSE TO QUESTIONNAIRE

Out of the original 800 questionnaires posted out 140 were returned (17.5%)

Do you commonly use a winch to assist in the takedown of hung-up trees?

Due to the diverse range of answers returned, my feelings are that where "winch" has been referred to this has probably been interpreted as a tractor mounted winch rather than hand winch. This is based on further responses given where the word is used.

Do you commonly use a turning strap to assist in the takedown of hung-up trees?

A large number of this section (110) returned a "NO" response. Some didn't know what a Turning Strap was, or hadn't had the opportunity to purchase one.

Do you commonly use a spoke or lever to assist with the take down of hung-up trees?

The majority (117) identified with the method of using a spoke or lever, however, a number preferred to use the turning bar for all operations. (This could be due to the practicality of carrying a large amount of equipment.)

Do you commonly cut lengths of timber off the butt end of a tree to assist with the takedown of hung-up trees?

Cutting lengths from the tree appears to be the preferred method of removing a hung tree (91). The majority indicated that this was the best method only in thinning sites and only where produced lengths of pulp or chip could be utilised.

What is your preferred method of dealing with hung-up trees?

This question met with a variety of responses, the favoured being that a tractor, forwarder or harvester was the preferred method. However, although this was indicated as a preferred method, in reality many stated that a machine was not always available, and in one case the machine operator forwarder driver was unwilling to help. The number of those questioned who replied "winch" I would estimate to be a small proportion and were meaning tractor mounted winch and not hand winch. The lever or pole method appears to be the most commonly used mentioned method followed by cutting lengths of the butt end or bombing.

What problems have you encountered in complying with the trained method?

Many of the responses (50) referred to the amount of time taken to remove a lodged tree as stated in any training they may have undertaken. A small number questioned the validity and experience of those instructors who actually trained them referring to a possible lack of "hands on" experience. Thirty seven (37) indicated no problems encountered.

Is all the recommended equipment available to you on your worksite?

Seventy five (75) reported that all the recommended equipment necessary to remove a hung tree was available. However some of those who commented further stated that the equipment they understood to be a forwarder or skidder. Any Tirfor winches mentioned were for debogging machines and therefore usually too heavy to carry into the wood to remove a hung tree. Therefore if we take the 50 who stated no and those 10 who said "usually available" and add together with at least 25 who mentioned forwarders, the greater proportion do not have the available equipment. One reply reported that he had no hand winch and relied on the forwarder driver who on occasion was very unhelpful when it came to assisting in the removal of hung trees, this was due to the fact that time lost by the driver meant loss of earnings. Many said that even if winches were available the time taken to use them was high.

Do you feel that you and your workforce are adequately trained in the procedures for windblown and hung-up trees?

One hundred and ten (110) of those questioned stated "yes" to say that they felt the workforce was adequately trained in windblown and hung trees.

What changes would you make to any training course?

Sixty nine (69) reported no changes are required. Sixteen (16) stated that experienced instructors should be used in any training situation. Five (5) said reduction in the cost of training would be significant.

How would you define the main hazards associated with windblow/hung-up trees?

The main response to this question appeared to be trees sliding backwards off the stump, followed by bombing a tree with another.

Do you use an alternative method for takedown of hung-up trees? Please outline method.

To the question of alternative methods of takedown - using a tractor appeared to be the favoured method. I think this needs to be looked at as if this is an alternative method what is the normal method being used. The next preferred alternative method was cutting lengths off the butt of a hung tree.

General comments returned with the questionnaire

A number of returned questionnaires commented on the inexperience of the younger generation of chainsaw operators who, having gained an NPTC certificate of competence are still unable to carry out commercial operations. There were some suggestions for an apprenticeship for new entrants to overcome the problem.

"Having a period of consolidation between training and assessment would allow the necessary experience to be gained and therefore the operators would appreciate all the correct techniques and could identify the dangers involved."

"Training top-ups at 3-5 year intervals would serve as a refresher course as would a series of verification visits to operators by NPTC assessors which would act as a quality control measure."

"Some on site training courses showing cutting techniques and combinations to CS34 CS35 and all the other CS units would provide a source of cheap/free reference material."

"At present it appears that some people are cutting incorrectly because they can't find out how to do it properly. The 'in the woods' scenario is the practice of the experienced cutter guiding the inexperienced. The net result can be likened to Chinese Whispers."

"Most of the training seen in recent years pays no attention to body posture or balance. If the tree worker has no sense of balance they do not last long."

"Having only recently gained my NPTC certificate and having just started on a career in forestry, I feel unable to make much in the way of relevant comment on many of these questions. I do appreciate there are dangers associated with hung up and windblown trees and they can take a long time to deal with safely."

"Every time is difficult so it has to be treated as such. I've worked by myself for 45 years mainly hardwoods and never had any problems and never considered tree felling as dangerous. I think there is a difference between chainsaw operator and a tree feller."

"Due to working conditions in the timber industry, I am currently working outside of piece work, clearance storm damaged trees in producing for a new time, be contractor and have easy access to a Tirfor winch and a tractor winch and working according to HSE guidelines."

"I think it is about time that changes should be made for woodcutters (i.e. Prices) so that proper equipment can be afforded and correct procedures can be carried out."

"You should have some one on HSE who understands what is going on because the rates for the job are so low we had to do it this way."

2.1.1 Harvesting Managers' Response

A few harvesting managers responded to the questionnaire and this gave an insight as to how they perceive the operator.

Do you commonly cut lengths of timber off the butt end of a tree to assist with the takedown of hung-up trees?

This seldom seems to be carried out. We do criticise cutters if short sections are removed.

What problems have you encountered in complying with the trained method?

Economics. The cutter will often tackle the problem as quickly as possible.

Is all the recommended equipment available to you on your worksite?

Usually. However, all operators are self-employed.

Does the price received for windblow match the extra time required to work safely?

We hope so. Often better.

How would you define the main hazards associated with windblow?

Greatest risk being a cutter having a hung up tree by accident and loosing his temper or rushing to pull it down.

Do you use an alternative method for takedown of hung up trees?

Tirfor winch used in extreme conditions.

2.1.2 Summary of responses

The underlying view is that there is a gulf in knowledge and expertise between the new entrants and managers in the industry and the experienced worker. Adding to this the pressures arising from the current economic climate in the timber industry whereby all sectors are having to adjust rates accordingly, this has led to a downward spiral for the contractor.

A further 2 problem areas identified are:

1. **The weight of the equipment.**
2. **Distance from road/vehicle to work site, from work site to work site.**

2.1.3 Problem 1 The weight of the equipment

In normal Chainsaw clearfell operations the operator is likely to carry:

ITEM	WEIGHT
Chainsaw (Husqvarna 262XPG) - full & fitted with a 15" bar and chain	6.8 kg
Fuel/Oil can	7.0 kg
Stump Treatment (1.5 l of Urea)	5.0 kg
Breaking Bar with Cant Hook	2.5 kg
Loggers Belt with 2 Pulp Hooks, 15 m Tape and Tool Holder	2.0 kg
Turning Strap	0.5 kg
Tool Kit	1.0 kg
Hammer and High Lift Wedges -	5.0 kg
Wet Weather Clothing	1.5 kg
Food Bag etc. -	1.0 kg
Safety Clothing -	5.0 kg
Total Weight	37.3 kg

The use of a winch system to assist with the takedown will increase the load carried.

The weight of a 1.4 tonne capacity Tirfor winch including winchrope, handle, safety straps is *circa* 30 kg.

The weight of a 0.25 tonne capacity Lugall winch including winch rope, handle and safety straps is *circa* 6.0 kg.

The inclusion of safety clothing, helmet, boots and gloves are a major inhibiting factor on the operators' ability to carry any further equipment.

2.1.4 Problem 2 Distance from road/vehicle to work site, from work site to work site.

The distance from the road/vehicle to the work site can have an effect on what the operator carries. The further the distance the less carried. This sometimes leads to the operator having to walk back to the road for additional item(s) such Hammer and High Lift wedge.

This scenario is similar if the use of a winch is required to assist in the takedown of a hung up tree. The other problem is retrieving the item(s) from a previous work site.

The terrain where forestry work is undertaken varies considerably across the country. Walking to and from the job can account for a large proportion of working time and considerable effort. In steep terrain many breaks may be required before the operator arrives at their place of work.

3. Objective C: To identify the influence of productivity payments on working method

The current situation in the timber market makes for intense competition to gain work. This tends to lead to pricing being very tight, making no allowance for the hung-up tree that are inevitable in a normal felling situation. This leads to jobs being priced on a perfect scenario where problems are not accounted for. The hung-up tree then becomes an addition to the cost of the job to be borne by the cutter. Prices for windblown crops are more likely to reflect the work involved as the problem can be seen at the time of pricing. Hung-up trees occur during the felling operation and are seen to be the fault of the operator, this is not always the case.

Through the offices of the FCA the survey of the contractor base gained opinion from as wide a range of contractors as possible. The two questions asked relating to payment and the response received are detailed below.

If you encounter hung-up trees does the price for the job take into account the extra time required to deal with them safely?

Ninety four (94) stated that there was no extra allowance given for the taking down of hung trees. Added to that a further 10 wrote no comment and 8% left it blank.

Does the price received for windblown crops match the extra time required to work safely?

Eighty three (83) stated that the price recommended for windblow did not match the extra time required. Nine (9) said that it did and 16 stated this it only sometimes applied to them. Thirty two (32) didn't know.

The view of the harvesting managers appears to be that the rates given for windblown and hung trees are acceptable and that the necessary equipment to do the operations is available. However, the majority of chainsaw operators commented on how low the rates are. Their view appears to be that taking risks is unavoidable if an adequate wage is to be earned.

Reduction in earnings

This is a major factor in determining if a Chainsaw operator will use the correct technique in the take down procedure of a hung up tree or use an unrecognised and potentially unsafe method.

A study was undertaken to identify the actual time taken, using the correct technique to safely remove hung-up trees. The results are summarised below.

3.1 Time to set up and use equipment - Reduction in earnings

Time to set up and use equipment

When a tree becomes lodged or hung up, the operator should normally use the breaking bar or hand winch. The following evaluations were undertaken to review and identify the actual time involved with setting up, using and dismantling recommended equipment following trained procedures. A table of the results is given in Appendix 3

Review of Takedown Times

3.1.1 Operation 1

Take Down of Hung Up Tree by Small Breaking Bar, Felling Lever.

Average tree volume 0.55 m³

In this study the trees moved freely using only a breaking bar to turn the tree and dislodge it. The use of the breaking bar accounted for *circa* 6% of total time recorded.

3.1.2 Operation 2

Take Down of Hung Up Tree by Breaking Bars (Small & Large Breaking bar), Wooden Lever.

Average Tree Volume 0.56 m³

During this operation more force was required to move the tree from its lodged position, the rest allowances have therefore been increased. The use of both bars to remove the tree to a safe position accounted for *circa* 43% of total time.

3.1.3 Operation 3

Take Down of Hung Up Tree by Breaking Bar, Tirfor Winch, Straight Pull

Average Tree Volume 0.59 m³

Operation 3 involved the use of a Tirfor winch to remove the tree. Using the correct procedures the takedown accounted for *circa* 74% of total time. In this scenario it is likely that the operator would have also spent a considerable amount of time trying to free the tree using a breaking bar. Using the times from Operation 2 for use of a bar, making the tree safe accounts for *circa* 79% of total time.

3.1.4 Operation 4

Take Down of Hung Up Tree by Breaking Bar, Tirfor Winch, Off Set Pull

Average Tree Volume 0.63 m³

Operation 3 involved the use of a Tirfor winch to remove the tree. Using the correct procedures the takedown time accounted for *circa* 76% of total time.

Using estimated contract felling costs of £8 13/m³ for thinning and £3 6/m³ for felling, the cost associated with the additional take down element can be calculated. In the worst case scenario the costs incurred equate to £6-£10/m³ in thinning and £2.20-£4.50/m³ in clearfell. In most cases this cost is not accounted for in the tender price and results in a loss to the operator.

During normal work all operators are expected to take rest to alleviate fatigue. There are rest allowances built into output guides, to account for the fatigue and recovery factors. With a greater move to competitive tendering and less reliance on output guides, the allocation of costs associated with fatigue are removed. In reality the operators are not taking the rest allowances. This results in more operator fatigue and a higher likelihood of accidents and injuries occurring.

4. Objective D: To test and evaluate new pieces of equipment by experienced operators/FASTCo/FCA instructors to assess their suitability to UK conditions

Extensive reviews of equipment suppliers, manufacturer's data and contact with International forestry bodies identified no new equipment. The Forestry Commission Safety Officer will continue to commission an annual review of such items and will publicise any innovative designs or methods.

5 Objective E: Identify any opportunities to improve either existing performance or which would encourage the application of existing systems by operators

6. Objective F: To propose items for inclusion in training course syllabus in light of the findings of the review

The above objectives have been combined due to the considerable overlap.

System Modification

No significant modifications to existing methods have been proposed. Some trainers have identified minor modifications to existing practice that are worthy of further consideration.

Before implementing them in revised training courses they will require to be evaluated to ensure:

- safety,
- effectiveness,
- practicality and
- benefit over existing work practice.

The use of arboricultural lowering devices and winches may have applicability in general forest use. The problems encountered with weight and transport will however still apply. Training courses will have to be developed to account for the new technology.

At present only one proprietary system, manufactured by Husqvarna, is available for transporting equipment to the worksite. The Chainsaw Body Harness is constructed in a similar fashion to a rucksack. The chainsaw and, hand tools and saw maintenance tools can be carried along with a small food bag. The design of the carrier distributes the weight of the equipment across the operators back. The hands are then free to carry petrol/oil and urea.

The operators who commonly use turning straps have modified the attachment points to allow the strap to be attached to the saw as a carrying strap. Methods such as this are cheap, simple and effective. In addition the operator is guaranteed to have the strap available at all times.

Supervision

The Management of Contractors initiative highlights the roles and responsibilities of all involved in the contractual chain. The role of the Forest Works Manger and Main Contractor in selecting competent labour will assist in the procurement of skilled individuals who have undergone appropriate training in the tasks they are to undertake.

Agreeing and producing site safety rules relevant to the site and task in hand will assist in identifying safe working practice.

Monitoring the effectiveness of the agreed working methods through such means as FASTCo checklists is fundamental to the overall safety of the operation. This will require managers and supervisors to be aware of the work being undertaken, understand the complexity of the work and be pro active in ensuring compliance with the agreed safe working practice.

- Further work is required to investigate the cost of providing discounted hand winches lighter stronger pulling equipment pulley systems available in the arboricultural industry.
- Training methods and training materials will require updating on a regular basis and should be made available to the industry.
- From the methods identified in the questionnaire, which at present the industry would not recommend, further work may be required to assess if any one particular method has any merit.

7. CONCLUSIONS

No new equipment or radical changes in working method were identified during the evaluations.

Current training guidance covers appropriate action to be followed to deal with a hung-up tree safely.

The methods demonstrated during training are not always followed.

Using recommended techniques to take down a hung-up tree can take up to 3 times longer than normal felling.

From the questionnaire several conclusions can be drawn.

- The operators require the equipment for taking down hung-up trees to be lighter, stronger and easily portable.
- The methods currently being adopted by the workforce do not follow industry guidance.
- Remuneration for taking down hung-up trees is not accounted for in the tender price.
- Enforcement of the uses of correct methods to deal with hung-up trees is not consistent.

8. RECOMMENDATIONS

8.1 Training Guidance

Training guidance should be reviewed with more emphasis being put on the need to follow best practice and the consequence of non compliance.

8.2 FASTCo Safety Guides

FASTCo Safety Guides applicable to chainsaw operations in windblow should be examined and revised according to the findings of this review.

8.3 Assessment Material

Assessment schedules should to reviewed to assess their credibility within the industry.

- Are trainees assessed on enough trees within the existing schedule?
- Are trainees assessed on a wide range of hazardous tree types?
- Is the assessment schedule for multiple windblown trees extensive enough to show operator competence?

8.4 Supervision

Forest Works Managers and Contractors should take an active role in selecting operators with the required competence. Regular checks should be made to ensure safe methods are being followed. The required equipment should be readily available on the worksite.

Risk assessment training courses should be developed to take account of the Management of Contractors Initiative, with particular emphasis on the selection of competent staff and procedures for dealing with hung-up trees.

9 ACKNOWLEDGEMENTS

This report has been produced with considerable assistance from all sectors of the industry. Particular thanks are due to Technical Development Branch, Forestry Commission, The Forestry Contracting Association and all its members who provided constructive comments through the questionnaire and to FASTCo trainers who provided useful comment and opinion.

Appendix 1

Winch Suppliers

Tirfor Winches

Supplied by: Tirfor Ltd.
Old Lane
Halfway
Sheffield
S20 3GA

Tirfor Winches

Model	Weight (kg)	Lift (kg)	Rope Size (mm)	Cost (£ ex VAT)
Trivit	4.00	400	5 - 8	110
Jockey j3	1.75	300	4.5	112
Tirfor T-508	7.6	800	8.2	255
Tirfor T532	26	3200	16.3	320
Tirfor TU-8	9.2	800	8.2	350
Tirfor TU-32	29	3200	16.3	390
Rope				
Dimension (mm)	Length (m)	Weight (kg)	Breaking Strain (kg)	Winch Used
(1) 4.5	10		1500	Jockey j3
(2) 8.2	20	7	4800	Tirfor T508/TU-8
(3) 16.3	20	23	16800	Tirfor T532/TU-32

Costs of the winch rope are extra these range from:

- (1) 4.5 mm rope £35.00 exc. Vat
- (2) 8.2 mm rope £72.00 exc. Vat
- (3) 16.3 mm rope £72.00 exc. Vat

The cost indications for a complete Tirfor hand operated winch range from;£150.00 to £460.00 + Vat.

Lug-all Winches

Supplied by: Key Industrial Eq
Osmond House
Swinton Park Road
Salford
Manchester
M6 7PA

Lug-all Winches

Model	Weight (kg)	Lift (kg)	Rope length (m)	Rope Dimension (mm)	Lever Effect (kg)	Cost (£ exc. Vat)
126R110N	3.2	250	4.88	4.8	35	150.00
127R110N	4.1	1000	3.51	5.6	4.5	197.90
128R110N	7.0	1250	6.71	6.5	52	266.35
129R110N	15.4	2000	5.49	7.9	50	506.50

Safety Strops

The cost of 2 tonne safety strop is in the region of £21.00

RESPONSE TO QUESTIONNAIRE

QUESTION ASKED		RESPONSE	
		YES	NO
1	Do you commonly use a winch to assist in the takedown of hung-up trees?	71	65
2	Do you commonly use a turning strap to assist in the takedown of hung-up trees?	26	110
3	Do you commonly use a spoke or lever to assist with the take down of hung-up trees?	117	18
4	Do you commonly cut lengths of timber off the butt end of a tree to assist with the takedown of hung-up trees?	91	42
5	What is your preferred method of dealing with hung-up trees?	Winch 16	Pick up manually 3
		Lever Pole 33	Horse 3
6	What problems have you encountered in complying with the trained method?	No winch available 7	Time taken to winch 80
		winch quicker in long run 1	None 37
7	Is all the recommended equipment available to you on your worksite?	YES 75	USUALLY 10
			NO 50
8	If you encounter hung-up trees does the price for the job take into account the extra time required to deal with them safely?	YES 24	N/A 10
			NO 94
9	Do you feel that you and your workforce are adequately trained in the procedures for windblown and hung-up trees?	YES 102	NO 22
		One Day course not sufficient 1	course too long 4
			Climb 1
			Cut into lengths 10
			winch not strong enough 2

	None	Not certificated	Reduce cost
10	What changes would you make to any training course?	None 69	15
		Get rid of course 1	increase availability 3
		Hardwood courses 1	require experienced instructors 16
		Need for apprenticeship 5	
		YES 9	Sometimes 16
11	Does the price received for windblown crops match the extra time required to work safely?	NO 83	Don't Know 32
12	How would you define the main hazards associated with windblow?	Inexperience 15	Multiple windblow 2
		Time wasted 2	Poor access/ground condition 11
		Piece work/time work 1	
		Death 2	
		Tree sliding backwards 25	
13	How would you define the main hazards associated with hung-up trees?	Death 2	Cable tension 1
		shatter 1	leaving hung trees 6
		cutting lengths from butt 4	bombing 13
		tractor 31	N/A 17
		use of pole 1	climbing hung tree 2
14	Do you use an alternative method for takedown of hung-up trees? Please outline method.	horse 3	slide rails 3

* Where totals do not equal 140, individuals have responded with answers relevant to their particular situation.

Review of Takedown Times

Operation 1

Take Down of Hung Up Tree by Small Breaking Bar, Felling Lever.

Average Tree Volume 0.55 m³

Operation	Time (BMs)
Time to Fell Tree	3.29
Take down, Lever Over	0.60
Sned Out Tree to 7 cm	5.62
Total	9.51

Rest Allowance 23%, Other Work Allowance 26% - Factor 1.5498

Time to carry out operation including allowances - $(9.51 \times 1.5498) = 14.74$ Standard Minutes.

In this study the trees moved freely using only a breaking bar to turn the tree and dislodge it. An increase in *circa* 6% of total time was recorded.

Operation 2

Take Down of Hung Up Tree by Breaking Bars (Small & Large Breaking bar), Wooden Lever.

Average Tree Volume 0.56 m³

Operation	Time (BMs)
Time to Fell Tree	4.63
Roll Out - Small Bar	3.92
Roll Out - Large Bar	4.24
Sned Out Tree to 7 cm	6.19
Total	18.95

Rest Allowance 29%, Other Allowance 26% Factor 1.6254

Time to carry out operation including allowances - $(18.95 \times 1.6254) = 30.80$ Standard Minutes.

During this operation more force was required to move the tree from its lodged position, the rest allowances have therefore been increased. The use of both bars to remove the tree to a safe position accounted for an increase of *circa* 43% of total time.

Operation 3

Take Down of Hung Up Tree by Breaking Bar, Tirfor Winch, Straight Pull

Average Tree Volume 0.59 m³

Operation	Time (BMs)
Time to Fell Tree	2.76
Trim Butt/Hinge	0.83
Set up operate winch	18.78
Dismantle	10.25
Sned out Tree to 7cm	5.76
Total	38.89

Rest Allowance 29%, Other Allowance 26% - Factor 1.6254

Time to carry out operation including allowances - $(38.89 \times 1.6254) = 63.21$ Standard Minutes

Operation 3 involved the use of a Tirfor winch to remove the tree. Using the correct procedures the increase in time accounted for *circa* 74% of total time. In this scenario it is likely that the operator would have also spent a considerable amount of time trying to free the tree using a breaking bar. Using the times from Operation 2 for use of a bar, making the tree safe accounts for *circa* 79% of total time

Operation 4

Take Down of Hung Up Tree by Breaking Bar, Tirfor Winch, Off Set Pull

Average Tree Volume 0.63 m³

Operation	Time (BMs)
Time to Fell Tree	2.52
Trim Butt/Hinge	0.72
Set up operate winch	20.83
Dismantle	8.29
Sned out Tree to 7cm	5.99
Total	38.35

Rest Allowance 29%, Other Allowance 26% - Factor 1.6254

Time to carry out operation including allowances - $(38.35 \times 1.6254) = 62.33$ Standard Minutes

Operation 3 involved the use of a Tirfor winch to remove the tree. Using the correct procedures the increase in time accounted for *circa* 76% of total time.



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