



# Forest Research

The Research Agency of the Forestry Commission

**TECHNICAL DEVELOPMENT**

## REPORT 2/94



## EQUIPMENT FOR ALL TERRAIN CYCLES

An extensive range of sophisticated equipment is available which can enhance the roles of All Terrain Cycles in forests and small woodlands.

**FOREST RESEARCH  
TECHNICAL DEVELOPMENT BRANCH  
REPORT 2/94**

**EQUIPMENT FOR ALL TERRAIN CYCLES**

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## **REPORT 2/94 EQUIPMENT FOR ALL TERRAIN CYCLES**

### Summary

1. This Report describes a range of equipment which can be trailed by or mounted on All Terrain Cycles. Recommendations are made on equipment that should be evaluated for forest and woodland use, for both establishment and harvesting operations. Current Health and Safety Executive Guidelines (1993) are included.

### Introduction

2. The range of equipment designed and adapted for use with All Terrain Cycles (ATC) has grown steadily, especially since powerful 4 wheel drive machines were introduced. The choice of ancillary equipment continues to grow, with UK based equipment in competition with imported products.

3. Ancillary equipment can safely extend the role of ATCs, providing the implement and ATC are suitably matched and training is given in the correct operating procedure.

4. As part of a continuous review of ATCs, Technical Development Branch (TDB) were asked to investigate ancillary equipment.

5. The terms of reference were to:

- Identify the range of ATC equipment that is available.
- Recommend ATC equipment for evaluation that is suitable for forest, farm, and urban woodland use.

6. The term All Terrain Cycles is used to describe 'sit astride' off-road machinery, although such cycles may also be described as All Terrain Vehicles (ATV).

### Health and Safety Executive Guidelines

7. Guidelines have been issued by the Health & Safety Executive (Appendix I) following studies to investigate braking and overturning of ATCs with trailed and mounted loads. The studies were carried out by The Scottish Centre For Agricultural Engineering based at Penicuik near Edinburgh.

### ATC Equipment Manufacturers and Agents

8. Manufacturers and agents consulted are detailed at Appendix II. Not all are represented in the main text of the report. Prices (1994) quoted exclude value added tax and delivery charges.

### Tyre and Wheel Rim Specifications

9. Tyre specifications for equipment are described as, for example 22x11x8. This means the tyre has an outer diameter of 22 inches, a width of 11 inches and a wheel rim diameter of 8 inches. Bead lock tyre rims have 2 channels which are designed to reduce the incidence of tyre throw. The tyre is inflated to a recommended high pressure to seal the tyre edges in the channels and then the pressure is reduced to the recommended working level.

### Winches and Winch Accessories

10. TDB Report 18/93<sup>1</sup> contains information on ATC winch techniques and winch line pulls recorded in the field.

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<sup>1</sup> Technical Development Branch (1993). Report 18/93. Further Investigation into Handling of Deer Carcasses Phase II.

11. Before any winch is fitted to an ATC, the modification must be agreed with the manufacturer.
12. **TFM Engineering Winch Unit:** The unit is front mounted on the main frame of the ATC and can be modified to accept a range of electric winches such as the Warn A1500CL and Superwinch X1F models. When pulling loads to the ATC, the winch unit is used with 2 stabilising legs. The legs anchor the ATC by digging into the ground when a load is applied. The legs also reduce the amount of front suspension deflection especially when winching loads up a gradient to the ATC.
13. The prototype unit mounted on a Kawasaki KLF300 (Plate 1) can be adapted to fit most models of ATC. A unit constructed for forest use will have increased ground clearance and legs that are stored horizontally during cross country travel.
14. The expected cost of the base unit (without winch) is £200. The winch mounting plate, stabilising legs and a winch remote control lead are currently being evaluated for Forest Enterprise use.
15. **Cairnbaan Winch Kit:** Cairnbaan Forest Enterprise Workshop has constructed a winch mounting plate to fit a Warn A1500CL winch onto a Honda 300TRX ATC. The braced mounting plate is welded onto the main frame of the machine. Correct winching techniques must be used with this kit to minimise stresses exerted on the ATC frame during deer carcass retrieval and debogging operations.
16. The TFM Winch Unit is likely to be recommended in preference to the Cairnbaan Winch Kit.
17. **Logic ATV-Equip (Logic) Winch Kit:** Logic manufacture a base plate to fit the Warn A1500CL electric winch to most ATC main frames. Winch forces are transmitted directly to the machine frame, so it is particularly important that the correct winching techniques are used.
18. A complete Logic winch kit costs £398. This unit will not be evaluated for Forest Enterprise use because the TFM Winch Unit is likely to be recommended in the near future.
19. **Kolpe 500 Winch:** The winch is powered by a 2-stroke engine with a stated line pull of 500 kgf. It has 35 m of 4 mm wire rope and the winch with rope weighs 14 kg. The winch could be mounted on a trailed log sulky for timber extraction.
20. A Kolpe 500 including wire rope costs £875. This winch should be evaluated for forest use. The agent is Image Forestry Ltd.

### Sledges

21. **Forest Enterprise Conveyor Belt Sledge:** This sledge is used to skid heavy loads behind an ATC to reduce manual handling and where loads exceed rack capabilities. It is manufactured from colliery conveyor belt and has a rigid metal frame at the front which forms a shaped leading edge (Plate 2). This edge allows the sledge to ride over obstacles and provides an attachment point for winching and towing. Six metal eyelets are bolted onto the sledge which enable the load to be secured using rope or ratchet tightened loadstraps.
22. The sledge has been evaluated and is recommended for forest use.
23. **TFM Sledge:** This sledge (front cover) is smaller than the Forest Enterprise model. It has a rigid metal frame running the entire length of the sledge fitted with 4 load securing eyelets. The frame enables the leading edge to be raised and provides a mounting point for the tow chain.
24. A price is available on request and the sledge should be evaluated for forest use.
25. **Logic Timber Skid:** The skid is made from moulded fibreglass (Plate 3), bonded with a wear resistant resin and is 8 mm thick. A steel cable passes through a metal eyelet in the skid body and forms a noose which is placed around the timber and tightens under load. The skid has a smooth rounded shape to facilitate its passage over obstacles. A utility box and carrying frame are supplied with the timber skid.

26. The complete skid unit costs ú398. This skid should be evaluated for forest use.

27. **FERIC Self Loading Sled:** This unit (Appendix III) was designed and developed by the Forest Engineering Research Institute of Canada (FERIC) to enable ATCs to extract 3 m shortwood and pole length material. The unit is designed to be self-loading and can self unload if required.

28. This unit should be evaluated for forest use.

#### Traction Aids

29. **Wheel Chains:** Logic are the agents for studded Swedish forestry/snow chains and can supply chains to fit most machines. The studded cross chains (18 to 19 per wheel) are held in place by a ring chain on either side of the wheel (Plate 4). The outside ring chain has a quick release tensioning link for ease of use.

30. The chains cost between £140 and £170 per pair depending on ATC model and should be assessed in forest use.

#### Forwarding Trailers

31. **TFM Multi Role Forestry Trailer:** This unit can be used as a conventional load carrying trailer (with metal sides and a tail-gate) or as a forwarding unit, when the general purpose trailer body has been removed. The trailer body has 2 shelves and a central trough which follows the contours of the forwarder chassis. This shape enables the maximum use of space and provides a platform for personnel transport. The transformation from trailer to forwarding unit can be seen in Plates 5 and 6. The 4 wheeled trailer fitted with 22x11x8 tyres is 3.15 m long (2.16 m load bay), 1.35 m wide and 1.17 m high. The wheels are mounted on 2 asymmetric bogie arms. The pivot point for each bogie is set closer to the rear wheel, which gives the leading wheel a greater arc of travel to facilitate smooth passage over rough ground. The main chassis can slide on the central spine, which allows some adjustment of the drawbar load depending on the timber length carried. The timber bolsters can be turned through 90° from vertical to horizontal to enable easier loading and unloading.

32. The trailer is equipped with a swivel hitch and adjustable jockey wheel with a ground plate for soft conditions. The trailer can be equipped with over-run brakes.

33. This trailer should be evaluated for forest use. A price is available from the manufacturer on request.

34. **Logic Timber Trailer:** The trailer is 2.74 m long (load bay 1.90 m), 1.40 m wide and has 4 22x11x8 tyres with bead lock wheel rims mounted on 2 articulating bogies. The phosphor/bronze bogie bushes have a grease nipple for lubrication and the trailer can be equipped with over-run brakes. An electrically powered wire loader can be fitted as an optional extra (Plate 7). The drawbar is fitted with a swivel hitch.

35. The trailer without brakes or electric wire loader costs £1 350. This unit should be assessed for forest use.

36. **Herefordshire College of Agriculture Small Scale Forestry Trailer:** This trailer has a forwarding capacity of 0.5 tonnes. It can be "made to order" with movable bolsters and bogies, enabling it to be used as a 0.75 tonne bunk skidder. A scaled up 2 tonne forwarding version can be supplied for compact tractors. The ATC forwarding unit has a maximum product length of 2.2 m and can be equipped with an electric wire loader. The timber bolsters move from an upright position to below horizontal to facilitate loading and unloading. The standard trailer is equipped with 2 wheel brakes but 4 wheel braking is available and recommended by the College.

37. The basic 0.5 tonne trailer with 2 wheel braking costs £1 030. The following additional options are also available:

- Movable bolsters and bogie £155
- Four wheel brakes £143

- Electric wire loader £427

38. The trailer with 4 wheel braking and an electric wire loader should be evaluated for forest use.

#### Timber Sulkies

39. **TFM Hand Winch Sulky:** The sulky (Plate 8) is 2.0 m long, 1.26 m wide and has a height of 1.08 m. The chassis and frame is constructed from 3 mm gauge 50 mm x 50 mm box section steel, mounted on 21x12x8 flotation tyres. The unit has 2 spade lugs which dig into the ground when the winch is used, effectively anchoring the sulky. The unit was demonstrated with a small hand winch commonly used on boat trailers which had a stated line pull of 636 kgf with a 6.3 m wire rope. It would be possible to fit other types of hand or electric winch to this unit.

40. A price is available on request and it is recommended for evaluation.

41. **TFM Electric Winch Sulky:** This unit is larger than the previous model being 2.24 m long, 1.4 m wide and 1.57 m high with 22x11x8 flotation tyres. The sulky has a mesh butt plate, a movable toothed grip bar, a notched bar for 6 choker chains and 2 spade lugs for anchorage during winching. The unit is equipped with a timber skid constructed from 10 gauge aluminium sheet which is shown in its storage position in Plate 9. The X3F Superwinch mounted on the sulky has a stated 1818 kgf line pull and 15 m of 5.6 mm wire rope. This winch is free spooling and can be operated with a remote control lead which is 3.16 m long. It is possible to fit other makes of winch onto this implement, such as the petrol Kolpe winch (Paragraph 19).

42. A price is available on request for this unit and it should be assessed for forest use.

43. **Norwegian Arch:** This implement was designed specifically for timber extraction with horses but can be adapted for use with ATCs. TDB Information Note 2/93<sup>2</sup> shows a Norwegian Arch in use. The arch has 4 chain ratchet winches with captive chokers to secure the load during extraction. It has to be placed over the load or the load pulled to it because it has no winching facility.

#### Off-road Trailers

44. **Logic UET Range:** These trailers are supplied in kit form to 'self build' and measure 1.5 m long, 1 m wide and 0.8 m high. They are equipped with 22x11x8 flotation tyres on beaded wheel rims. High or low sided body kits and tailgates are available. The floor is constructed from half lap tanalised softwood timber. The trailer body is mounted on a triangular frame for increased support. A swivel hitch is fitted to the frame.

45. A high sided trailer complete with high tailgate costs £467. A UET trailer should be evaluated for forest use.

46. **Logic SDT Dump Trailer:** This trailer is constructed from galvanised steel and can be equipped with standard or flotation tyres. The dumper body is mounted on a triangular frame (Plate 10) which has a swivel hitch. The trailer wheels move forward to assist the trailer body to tip during dumping. A locking lever is depressed and the ATC is reversed or the dump body manually lifted (depending on load distribution) to assist the dumping action. The trailer can be fitted with road suspension and a pin to lock the dump lever in position.

47. A dump trailer with flotation wheels costs £590. This model should be evaluated for forest use.

48. **Logic OCT and ORT Trailers:** The ORT range is 2.25 m long, 1.16 m wide and 0.3 m high. The OCT range is 0.28 m shorter in length than the ORT range. The trailers have low sides, headboards and tail-gates which can be extended with galvanised steel body panel kits. A canvas top is available and the trailers can be equipped with wheels mounted on a single axle or with tandem axle units. The wheels can

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<sup>2</sup> Technical Development Branch (1993). Information Note 2/93 - Horse Extraction on a Sensitive Site.

be fitted with 22x11x8 or 25x12x9 flotation tyres (Plate 11). If the leading wheel drops into a drain or hole and encounters sufficient resistance, the connecting beam between the 2 axles will rotate the trailing wheel in front of the lodged former leading wheel. This axle configuration enables the trailer to travel more smoothly over undulating ground.

49. An ORT trailer with tandem axles costs £980. One unit should be evaluated for forest use.

50. **Logic DST Trailer:** This is a flat bed trailer is 2.1 m long, 1.4 m wide and 0.3 m high. The sides and tailgate can be extended in height and the trailer supplied with 22x11x8 or 25x12x9 flotation tyres on beaded wheel rims. The trailer is fitted with a swivel hitch.

51. A standard DST trailer with 25x12x9 tyres costs £672. One of these trailers should be assessed for forest use.

52. Logic trailers can be fitted with wheel guards to protect the tyres and stub axles (£28.50 per pair). These should also be assessed.

53. **TFM TF314/TF316 Trailers:** These trailers are 1.52 m long and 0.91 m wide. They are equipped with 22x11x8 flotation tyres. The TF314 has detachable mesh sides that are 0.86 m high and the TF316 has 0.86 m high solid side panels with a mesh tailgate. The floor is constructed from Keruing hardwood.

54. The TF 314 costs £435. One of these trailers should be evaluated for forest use.

#### Transport Crate

55. **The Sheep Safe:** This carrier (Plate 12) was designed and tested at the Scottish Centre of Agricultural Engineering (SAC). The crate loadbed is lower than the ATC rack carriers, which minimise lifting when loading. The crate has a light hollow section frame and a plywood floor with weldmesh sides and back. The front panel is made from galvanised steel and 1 side panel opens for access. The crate is designed to clip onto the rear ATC carrier and can be mounted or removed quickly. The unit is designed to carry 80 kg, with a 30 kg counterbalance weight fixed to the front rack. The SAC have evaluated the 'Sheep Safe' and have concluded that it has only a minor effect on stability.

56. This implement will have limited use in forest conditions and should not be evaluated for Forest Enterprise use.

#### Grass Maintenance Equipment

57. **Logic MFG320 B16 Flail Mower:** Logic list 13 models of flail mowers in their range. The cutting widths available are 1.0 m, 1.2 m and 1.5 m, powered by a Honda 9.5 kW (13hp) single cylinder engine, a 9 kW (12.5 hp) or 11.75 kW (16 hp) Briggs & Stratton 'V' twin engine. The flail mower can be supported by wheels alongside or wheels behind the mower. Optional extras include flotation tyres (22x11x8) which can only be supplied for wheels along side mowers, a remote throttle control and a remote engine on/off switch.

58. Logic recommend the MFG. 320 B16 flail mower (Plate 13) for general forest use. This has an 11.75 kW Briggs & Stratton 'V' engine, wheels alongside and cuts a 1.2 m swath. The 440 cc engine has electric start with forced lubrication and an external oil filter. Power is transmitted to the flail shaft via a double 'V' belt drive with automatic tensioning. This acts on a centrifugal clutch which ensures that the shaft does not rotate at low engine revolutions. At maximum engine revolutions the shaft speed is 3 000 rpm. A full width anti-scalping roller is fitted to the rear of the flail. The drawbar angle can be adjusted, which allows the flail to be offset from the ATC. This unit is fitted with a 50 mm swivel coupling.

59. The mower can be equipped with 3 flail options:

- Standard - for general use on heather, coarse grasses etc.
- Scarifier - for surface raking.

- Lawn - for smoother level finish.

60. The mower can be equipped with 36 pairs of standard and scarifier cutters and 36 lawn cutters. A range of cutters are available (Plate 14). The cutting height can be set from 0 - 240 mm with a hand operated screw jack.

61. A trailed flail mower does not load the ATC frame and suspension, as a mounted implement will and does not restrict manoeuvrability to the same extent. It can be hitched to the ATC quickly and does not require a specialised mounting frame.

62. A Logic MFG 320 B16 flail mower costs £2 395. One of these units should be evaluated for forest use.

63. **Slater Fielden Ltd Tow Mow:** This is a trailed implement using a belt driven Wessex flail base powered by an 8 kW (11 hp) Honda 4 stroke engine. The unit is supported by 5 solid wheels on a rear trailing axle, which helps to prevent flail over cut. The flail has a 1.08 m cutting swath and the cutting height can be adjusted from 1 cm to 18 cm using a screw handle on the drawbar. The swinging drawbar system allows the mower to be offset from the ATC.

64. The mower costs £1 600. One of these mowers should be assessed for forest use.

65. **Logic Rotary Grass Mower:** A Kawasaki 9.2 kW (12.5 hp) electric start engine drives 3 rotary arms each equipped with 2 knives. The mower is mounted on a Logic System 20 sub chassis, on the front of the ATC. Additional support is provided by 4 spring adjusted jockey wheels mounted on the mower body.

66. The implement has a cutting swath of 1.2 m with height adjustment from 0 mm to 100 mm. A leaf spring (Plate 15) allows the mower to pivot and absorb shock loads on its mounting point.

67. A front mounted rotary mower is not suitable for forest ride and track grass maintenance on rough or stony ground. The unit costs £1 798.

68. **Logic ATV-Equip Chain Harrows:** Harrows for light ground scarification are available in 1.22 m and 1.83 m widths, with a length of 2.3 m and 50 mm long tines. The implement can be turned over and the smooth side used as a rake for levelling surfaces. The harrow is connected to the ATC tow hitch with a ring link (Plate 16).

69. The chain harrows cost £145 to £195 and should be evaluated for forest use.

#### Herbicide Applicators

70. **Logic OBS 125 Sprayer:** The sprayer (Plate 17) is mounted on the rear carrier of the ATC, using non slip rack pads and two hand tightened bolts for quick attachment. The unit is made from moulded fibreglass and has a tank capacity of 118 litres (26 gal). The unit will weigh approximately 127 kg (280 lbs) when full of liquid. **The recommended rack carrying capacities of most 4 wheel drive ATCs is between 60 kg and 70 kg (132-154 lbs).** Therefore, the tank should only be half full to comply with the recommended weights. Operators should check the weights of any manufacturers spraying equipment, to ensure rack capabilities are not exceeded when using water and herbicide. The unit is equipped with an electric diaphragm pump, an in-line filter, a tank isolation valve and a pressure regulating valve with pressure gauge. The tank has an anti-spill vent/filler cap and the electric wiring harness is fitted with a waterproof quick release coupling and a fuse.

71. The sprayer has an integral mounting for the boom which can be supplied in widths from 1.5 m to 3.5 m. The boom can be offset and is supplied with a break back mechanism, which allows the booms to swing back if they hit an obstruction. A hand lance can be connected quickly to the boom. The Lurmark anti-drip nozzles are secured in bayonet couplings to maintain a set spray angle. The sprayer seen was set for low volume application at a volume rate of 92 litres/ha.

72. The sprayer should be evaluated for forest use. It costs £933 complete with 2.0 m boom and hand lance.

73. **Logic OBS 124 Sprayer:** This sprayer is very similar in design to the Logic OBS 125 but has a 120 litre capacity. Herbicide is applied by a hand lance which has 10 m of hose stored on a static reel. The electric pump output is suitable for hand lance operation.

74. The unit costs £468 and should be evaluated for forest use.

75. **Logic OBS 200 Sprayer:** A 200 litre (44 gal) capacity sprayer is available for ATCs with larger load bed capabilities such as the Yamaha Pro-Hauler. This machine has a load bed capacity of 180 kg (396 lbs).

76. An evaluation of the OBS 125 should provide indicative performance of the OBS 200, because they use similar components. The OBS 200 unit costs £1 030.

77. **C-Dax Systems Ltd SR60 and SR100 Sprayers:** These ATC mounted sprayers share the same characteristics and have volumes of 60 litres (13 gal) and 100 litres (22 gal) respectively. The SR60 is recommended for front and rear rack mounting and the SR100 for rear rack mounting.

78. The SR units have a tank(s), an electric pump, a 3 stage filter system, a twin sheathed wiring loom with fuse and a quick connection 2 pin plug. Herbicide can be applied using one of:

- A hand lance.
- Micron Micromax rotary atomiser boom kit.
- Pressure nozzle boom kit.

79. The hand lance can be supplied with an extensive range of spraying accessories including hose reels, spray guards, extension booms and a motor speed controller to reduce the volume application rates.

80. The rotary atomiser boom kit is available in widths from 1.8 m to 7.2 m (6' to 24') with claimed ultra low volume and very low volume application rates.

81. The pressure nozzle boom kit is available in widths from 2 m to 6 m (6'7" to 19'8") and applies herbicide at low volume application rates. The booms are equipped with break back clutches.

82. The tanks are manufactured from rotationally moulded polyethylene which has been "Ultra Violet" stabilised. They have a "saddle bag" design, being moulded around and down the operator's riding position. This tank configuration is designed to keep the weight low and close to the ATC's centre of gravity. A baffle is fitted to reduce liquid surge. A ratchet tightened load strap with 2 hooks is used to secure the tank on the ATC load rack.

83. To increase capacity and/or distribute weight more evenly on the ATC, dual tank kits are available. A second tank is mounted on the rack at the other end of the ATC from the SR unit and connected to the SR system. The dual tank kits are similar in construction to the SR units and are available in 45 litre, 60 litre and 100 litre sizes (10, 13 and 22 gal). Mounting a full SR60 on the front rack and a full SR100 on the rear rack will exceed the rack carrying capacities of most 4 wheel drive ATC machines.

84. The C-Dax SR60 and SR100 systems used in conjunction with the dual tank kits should be evaluated for forest use. A SR100 complete with hand lance, hose reel kit (with hose) and 2 m pressure nozzle boom kit costs £642.

85. **C-Dax U200 Sprayers:** This sprayer unit has a 200 litre capacity (44 gal) and is designed for use with high rack capacity ATC machines and trailers. The tank is rectangular in design and has a zinc plated steel frame. The range of accessories used with the SR system is compatible with the U200 sprayer. An evaluation of a C-Dax SR series should provide indicative performance of the U200 sprayer because they use similar components.

86. **Other C-Dax Sprayers:** The range of sprayers expands to include 280 litre and 540 litre (62 to 119 gals) trailer mounted tanks with the option of a 4 stroke petrol engine providing power for a high pressure double diaphragm pump. Pressure nozzle and rotary atomiser booms are available for these larger sprayer units.

87. **Team Sprayers Ltd Twin Tank Sprayer:** The sprayer unit has a 50 litre capacity (2 x 25 litre tanks), an electric pump and a pressure gauge with regulator and filtration system. The unit is mounted on a metal frame which clamps onto the ATC carrier rack. The unit can be used with a hand lance or boom which has 3 pressure nozzles.

88. The unit should be assessed for forest use. It costs £545.

89. **Hardi Ltd ATV Sprayer:** This is a trailed unit mounted on flotation tyres with a polyethylene tank and a capacity of 120 litres. The sprayer has an electric pump, pressure regulator with gauge and a removable filter. The unit has a 2 m boom with 4 pressure nozzles and a hand lance with 6 m of hose.

90. The Hardi sprayer costs £920 and should be evaluated for forest use.

91. **Logic WW 300 Weedwiper:** The Weedwiper is 2 m wide (Plate 18) has a 10 litre capacity and is towed behind the ATC. Two adjustable metal skids are used to set the Weedwiper height. A front mounted version is available for use with the System 20 sub-chassis. Flow rates can be monitored with a pressure control kit.

92. WW 300 unit costs £570 and a pressure control kit costs £315, exclusive of VAT.

93. **Rotowiper System:** The Rotowiper is a revolving drum Weedwiper mounted on a wheeled carriage. It has an electric pump supplying the fabric drum with a pre-mixed solution of herbicide and water. The pump is controlled by the operator who visually estimates wetness of the drum fabric. The drum is chain driven by 1 of the carriage wheels and the pump is powered by the ATC electrical system. The Weedwiper is available in 1.8 m, 2.4 m, 2.8 m and 3.2 m widths.

94. A 1.8 m Rotowiper costs £1 060 exclusive of VAT.

95. **C-Dax Z Wipers:** A range of ATC mounted and carriage trailed Weedwipers are designed to be used with the C-Dax SR and U series sprayers. The Z wipers are available in 2.2 m and 2.75 m widths.

96. An ATC mounted 2.2 m width Z wiper with electronic controller and quick release mounting system costs £520 exclusive of VAT.

#### Roll Over Protection

97. There is no ATC on the market which provides roll over protection or indeed provides or approves fitting of roll over protection facilities. The reason for this is difficulties associated with providing a 'safe envelope' within which the operator is protected.

98. The concept of creating a 'free space' for the rider during a machine roll over through provision of a metal 'A' frame is worthy of evaluation. The Scottish Centre of Agricultural Engineering has demonstrated this concept to the Health and Safety Executive. However, any work in this must be done with the full agreement and support of manufacturers.

#### Gun Carriers

99. **Doskocil Gun Guard:** The rectangular plastic moulded case will accept rifles with bipods and telescopic sights (fitted with covers) and shotguns. Guns are secured and protected during transport by a contoured foam lining. The case opens on full length metal piano type hinges and has a carrying handle. The case is carried on the ATC racks using TFM mounting brackets.

100. The case costs £70 and has been evaluated for Ranger use<sup>3</sup>.

#### Heated Handlebar Grips and Protective Muffs

101. **Logic Heated Handlebar Grips:** The grips are powered by the ATC's 12 volt electrical system and have an on/off switch. They cost £35 and should be assessed for forest use.

102. **Logic Handlebar Muffs:** The muffs are lined with a thermal fleece and have a plastic waterproof cover. The adjustable muffs can be positioned clear of the ATC controls. They cost £18.50 a pair and should be evaluated for forest use.

#### Puncture Sealant

103. **Tyrol Sealant:** Tyrol Ltd produce a solution which seals holes up to 5 mm diameter in both tubed and tubeless tyres. The solution is water based and contains anti-freeze and a rust inhibitor.

104. This product should be assessed for forest use.

#### Road Legal ATC Kits

105. **Farmeasy Kit:** This kit includes 18 cm 60/55 Watt Halogen headlamps with main beam warning light indicator, sidelights, trailer socket and heavy duty electronic flasher unit with warning indicator lights. A horn, hazard light relay, tax disc holder, rear view mirror and rear mud-flaps are also supplied.

106. The agricultural road legal kit costs £285 and can be fitted to Honda 350, 300 TRX 4 and 2 wheel drive ATCs.

107. **Logic Kits:** Logic manufacture road legal kits for Honda 350, 300 and 200 TRX models. The kits cost between £240 and £260 and are subject to price fluctuations.

108. Road legal ATC kits may have a role in urban and farm woodland situations.

#### Speedometers/Area Meters

109. Logic and Farmeasy supply speedometers and area meters for ATC use. These instruments can be used to check herbicide application rates and would have a role in large spraying programmes.

#### ATC Engine Cooling Fan Kits

110. Logic supply fan cooling kits for a number of ATCs. A kit should be evaluated on a Honda 300 TRX when used for heavy draught work with an ATC accessory. The kits cost £100.

#### Specialised Mounting Systems

111. **Logic System 20:** This chassis is bolted onto the ATC frame, enabling implements to be front mounted. A quick release chassis will soon be available allowing the operator to remove it easily for rough ground travel. A system 20 chassis will not be evaluated for forest use because no front mounted implements have been recommended for trial.

112. **Logic System 40 Chassis:** This chassis has been designed to allow towing of implements and to mount auxiliary petrol engines. It is not intended to evaluate a system 40 chassis for forest use.

#### All Terrain Vehicle Equipment

113. TFM Engineering manufacture an increasing range of equipment for the Kawasaki Mule models. The company makes off-road trailers, a Mule transport trailer and body kits from side panels to lockable pods with roller doors.

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3 Technical Development Branch (1994). Information Note 4/94 The Doskocil Gun Guard for all Terrain Cycles.

## Discussion

114. The concept of horse logging with ATC support is being discussed by TFM Engineering and a contract horse extraction business. The aim is to reduce horse extraction distances in sparsely roaded woodlands without increasing extraction damage. The initial idea is to use the horse for short pole length extraction to a conversion bay where the material is converted to shortwood and extracted by ATC and forwarder trailer. TFM Engineering produced the Multi Purpose Forestry Trailer to carry equipment, personnel and to extract timber.

## Recommendations

115. The following items of ATC equipment should be evaluated:

a. Winches and Winch Accessories:

TFM Mounting Unit.  
Kolpe 500 Winch.

b. Sledges:

TFM Sledge.  
Logic Timber Skid.  
Feric Self Loading Sled.  
(A Forest Enterprise sledge has been evaluated and is recommended).

c. Traction Aids:

Logic Wheel Chains.

d. Forwarding Trailers:

TFM Multi Role Forestry Trailer.  
Logic Timber Trailer.  
Hereford College of Agriculture Trailer.

e. Timber Sulkies:

TFM Handwinch and Electric Winch Sulkies.

f. Off-Road Trailers:

Logic UET, SDT, OCT and DST Trailers.  
TFM TF/314 and 316 Trailers.

g. Grass Maintenance Equipment:

Logic MB320 B/b flail mower.  
Logic chain harrow.

h. Herbicide Applicators:

Logic OBS125 and OBS124 sprayers  
C-Dax SR60 and SR100 sprayers with dual tank kits.  
C-Dax Z wiper.  
Team Sprayers twin tank sprayer.  
Logic WW 300 weedwiper.  
Hardi ATV sprayer.  
Rotowiper weedwiper.

i. Other Items:

Logic heated handlebar grips and handlebar muffs.  
Tyrol tyre sealant.

116. Concepts to be developed include:

- The development of 'Roll over' protection which must be done with the full agreement and support of manufacturers,
- Modification to the Norwegian Arch.

117. The concept of Horse Logging with ATC support should be investigated.

Acknowledgements

118. I would like to thank the following parties for their assistance:

- Logic ATV-Equip,
- TFM Engineering,
- Slater Fielden Ltd and
- Forest Engineering Research Institute of Canada for permission to reproduce their Field Note No Skidding/Forwarding-21 (Appendix III).

Ian Richard Murgatroyd  
Technical Development Forester  
February 1995

## **HEALTH AND SAFETY EXECUTIVE GUIDELINES**

### **GUIDELINES CONCERNING THE DESIGN OF EQUIPMENT USED WITH ATVs IN AGRICULTURE**

#### Introduction

1. The increasing use of ATVs and the proliferation of new equipment designed to be operated in conjunction with them has led to continuing concern about safety, especially where the equipment has been designed and used outside the limits set by the ATV manufacturers.

#### Scope

2. These guidelines concern equipment designed to be used with motorcycle derived ATVs more usually fitted with 4 wheels and having a high power to weight ratio. They may be relevant to other types of ATVs.

3. The guidelines refer to towed equipment (usually mounted on a single or tandem axles) and to equipment wholly or semi-mounted on the ATV.

#### General

4. These guidelines are not exhaustive. They do not seek to cover specific requirements imposed by regulation, or other items which would be subject to British or International Standards. However, a comprehensive set of instructions emphasising the relevant safety considerations should be supplied with the equipment in keeping with the Supply of Machinery (Safety) Regulations 1992.

#### Towed Equipment

5. Such equipment should be designed with a low centre of gravity, a wide wheel base and a long drawbar. Rigid structure, where reasonably practicable, should not project beyond the sides of a triangle formed by the wheels and the hitch point. All detachable equipment should be rigidly secured in position.

6. The drawbar should be capable of secure connection to a standard 50 mm diameter ball hitch. A swivel hitch should be incorporated.

7. By requiring the fitting of a swivel hitch and avoiding projections outside the triangle detailed in paragraph 5, designers will minimise twist and lift at the rear of the ATV in the event of the towed equipment overturning.

8. The gross weight of any towed equipment should not exceed 4 x the unladen weight of the ATV.

9. Where the gross weight of the towed equipment exceeds 2 x the unladen weight of the ATV, overrun brakes should be fitted. In addition, a hand operated brake should be accessible to the operator to prevent a rear runaway occurring.

10. Permanent markings on the drawbar of towed equipment should be as clear and unambiguous as possible. This may not always be easy as some equipment may be designed for use behind a Landrover as well as an ATV.

11. Where equipment is designed solely for ATV use, marking could simply state:

"Max gross weight of trailer must not exceed 4 x ATV unladen weight for braked trailer - 2 x ATV unladen weight for unbraked trailer".

or

"ATV unladen weight must exceed: X kg for braked trailer: Y kg for unbraked trailer".

12. For universal trailers the maximum gross weight and unladen weight will usually be stated on a separate notice.

13. Instructions should be given that, where possible, loads should be positioned to ensure:

- a. A positive drawbar nose weight of 10% of gross trailer weight.
- b. The load is as near to the trailer fore/aft centre line as possible.

14. Instructions should draw attention to the danger of operating with negative drawbar weight. ATVs are capable of travelling at 50 km/h or even 80 km/h depending on the make and model. It is important that the tyres and running gear for trailed equipment are rated for the higher speeds; the rating does not need to be for prolonged periods of road use but should be adequate to cover intermittent use.

#### Mounted Equipment

15. Controls within reach of the ATV driving position should not create a hazard.

16. Equipment should be designed with a low centre of gravity and mounted in a position which will minimise adverse effects on the ATV's stability. It should be rigidly attached. Any need for ballast to aid longitudinal stability should be stated in the instructions. The instruction should clearly state that all equipment carried on a rack will affect longitudinal and lateral stability.

17. Designers should aim for gross weights as close as possible to those stipulated by the ATV manufacturer.

18. The equipment should be designed so that there are no dangerous projections and the use of protective headgear is not inhibited.

19. No equipment should be designed to operate at more than 20 kph and a maximum safe working speed should be stipulated.

#### Training

20. No person should be employed to use an ATV unless they are adequately trained. Training should be sufficient to enable the trainee to acquire the basic skills and knowledge required for safe operation. Any certificate gained on completion of training should indicate proficiency rather than attendance. Relevant training courses are run by bodies such as the Agricultural Training Board and the Forestry Training Services.

#### Protective Clothing

21. ATV operators should wear suitable head protection providing protection which preferably provides protection for the neck as well. Motorcycle helmets to BS 6658 : 1985 adequately meet this requirement.

Date of Issue: 25 January 1993

**ATC MANUFACTURERS AND AGENTS**

Logic ATV-Equip  
Foundry Industrial Estate  
Bridge End  
Hexham  
Northumberland  
NE46 4JL  
Tel: 01434 606661  
Fax: 01434 608143

TFM Engineering  
Unit 1  
Ghyll Mill  
New Hutton  
Kendal  
Cumbria  
LA8 OAJ  
Tel: 01539 733881  
Fax: 01539 721616

A & J Bowen & Co Ltd (Agents for C-Dax Systems Ltd)  
Almondgrove Place  
Inveralmond Industrial Estate  
Perth  
PH1 3TR  
Tel: 01738 20549

Slater Fielden Ltd  
Starhouse Farm  
Onehouse  
Stowmarket  
Suffolk  
IP14 3EL  
Tel: 01449 612999  
Fax: 01449 678282

Farmeasy Limited  
Nastend Grange  
Nastend  
Nr Stonehouse  
Glos  
GL10 3RS  
Tel: 01453 824650

Scottish Centre of Agricultural Engineering  
Bush Estate  
Penicuik  
EH26 0PH  
Tel: 031 445 2147  
Fax: 031 445 2778

Image Forestry Ltd  
Tel: 01903 774999

Herefordshire College of Agriculture  
Holme Lacey  
Hereford  
HR2 6LL  
Tel: 01432 870316

J Rutherford (Earlston) Limited  
Agricultural & Automobile Engineers  
Rhymer's Mill  
Earlston  
Berwickshire  
TD4 6DF  
TEL: 0189 684 326/308  
Fax: 0189 684 8061

Graham Edwards Trailers  
Bolton  
Wilberfoss  
York  
YO4 5QS  
Tel: 017596 563

Agritek Sales & Service Ltd  
New Road  
Acle  
Norwich  
Norfolk  
NR13 3BD  
Tel: 01493 751870

June 1992

Field Note N°: Skidding/Forwarding-21  
Previous Reference Sheet N°: None

## SELF-LOADING SLED FOR SKIDDING LONG LENGTHS WITH AN ATV (Prototype)

Jean Dunnigan, F. E., M.Sc., Woodlot Technology

This Field Note introduces the concept of a self-loading sled designed and developed by FERIC for use with an all-terrain vehicle (ATV). Many woodlot owners are already using ATVs for forwarding shortwood (1.2 and 2.4-m lengths). However, in some parts of eastern Canada (especially in Quebec), there is a change to longer length wood (3 to 10-m lengths) since some pulp mills no longer accept round wood and are turning completely to chips (which are usually supplied to them by sawmills). Round-wood producers are therefore required to deliver their product to sawmills, which are usually not well equipped to process shortwood economically. With this trend toward the extraction of long-length wood, the use of ATVs and other small equipment is jeopardised. FERIC is looking into solutions which would allow small producers to continue harvesting with their small machinery. The self-loading sled is an outcome of this research.

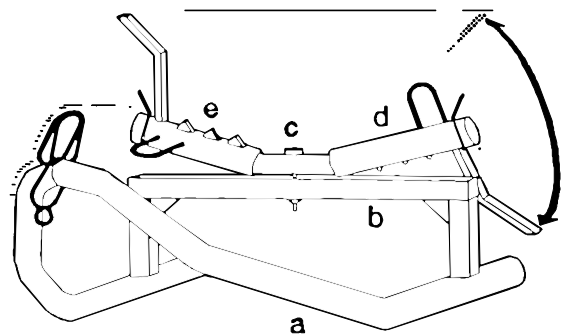


Figure 1. Self-loading sled designed by FERIC

### THE CONCEPT

The self-loading sled uses several principles of physics, and has features which integrate well with the ATV's capabilities.

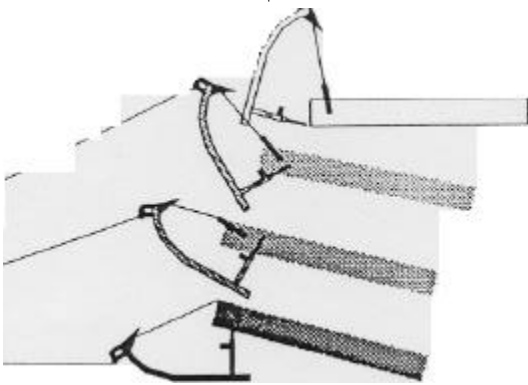
### DESCRIPTION

The frame is made of steel tubing (a) measuring 5.7 cm in diameter, bent to act as a deflector (see Figure 1). The width between the skids is the same as the ATV's and ground clearance is 27 cm, allowing it to follow in the ATV's tracks without running into obstacles. Across beam (b) made of a 5 x 5 cm steel section supports a swivelling cradle (c). This cradle consists of a 5-cm inner tubing and two 5.7-cm outer tubes on either side of the pivot point. The outer tubes support the wood, either on a smooth section (d) or on a toothed section (e), depending on the loading method selected. The prototype weighs 35 kg, which permits manual handling. However, this weight could be significantly reduced by optimising materials. The cost of manufacturing and materials is estimated to be about \$250 (1992).

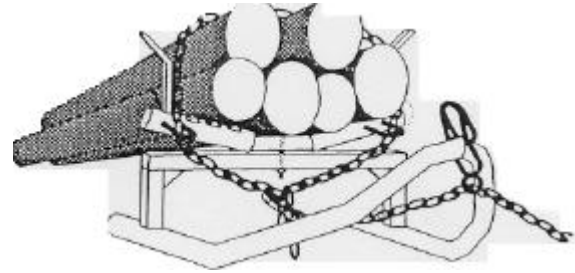
### OPERATION

To load a large log or tree length, the sled is placed upright to act as a lever. When the ATV moves forward, the sled acts as a cantilever, thus lifting the log into position on the cradle (see Figure 2). A sling or loading tongs may be used to grip the log. The single log is transported on the smooth section of the cradle so that at the landing, it is easily unloaded by undoing the sling or tongs and driving the ATV forward. The long towing chain and the low hookup point under the nose of the sled help maintain good traction on the ATVs rear wheels when loading and unloading.

Loading several small logs is done manually using the toothed section of the cradle which has high side stakes (see Figure 3). A secondary chain around the load is linked to the towing chain so that the pulling force power helps hold the load against the cradle teeth. In this position, the cradle can pivot sideways, giving the sled the proper angle when turning, while securely holding the logs against the cradle. At the landing, the secondary chain and the two retainer pins anchoring the two exterior tubes of the cradle are removed.



*Figure 2 The cantilever effect allows larger logs to be loaded and skidded without having to move them manually.*



*Figure 3. Several small logs can be manually loaded onto die cradle and can be automatically unloaded since die Teeth and pickets pivot back.*

When the sled moves forward, the teeth and side stakes pivot back, and the load slides over the now- exposed smooth section of the cradle.

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### PRELIMINARY TESTING

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Two series of tests were conducted to validate the concept. A first prototype was built by LA FORGE J.M.S. of L'Islet Sud, Quebec, and was tested in February 1992. Following the initial tests, a second prototype was built and tested in April 1992 at the Duchesnay Forestry Station in Quebec.

During the Duchesnay test, mild temperatures prevented the packed-snow trails from hardening overnight Traction chains were installed on the tires on one A TV and a YETI traction package was installed on the other A TV to provide traction in the loose snow. In spite of the unfavourable conditions, the prototype sleds worked well. The maximum load capacity varied since traction was dependent upon snow and ground conditions. Loads varying between 150 and 3.50 kg in weight with logs 2.44 to 4.88 m in length were hauled. Based on these tests, it is estimated that an effective normal load size for this sled will be around 200 kg.

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### CONCLUSION

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Tests showed that the concept of a self-loading sled could allow an A TV to transport long wood while eliminating the need for manual moving or loading of large stems. This concept proved simple to build, inexpensive to manufacture, and effective under harsh winter test conditions. Further testing will be done in 1992 to assess the sled's performance in summer.

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### INFORMATION

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A VHS video cassette on the self-loading sled for ATVs is available from the following organisations:

Forest Extension Service, Department of Natural Resources, Box 6000, Fredericton, N.B. E3B 5H1.

Publications, Department of Forestry, Box 2006, Corner Brook, Newfoundland. A2H 6J8.

Publications, Extension Services Division, Department of Natural Resources, Box 698, Halifax, N.S. B3J 2T9.

Publications, Private Woodlands Policy Section, Forest Resources Brand1, Ministry of Natural Resources, Suite 300, 70 Foster Drive, Sault Ste. Marie, Ont. P6A 6V5.

Publications, Department of Energy & Forestry, Box 2000, Charlottetown, P.E.I. OA 7N8.

Service de mise en valeur de la foret privee, Ministere des FortIs, 5700, 4 eave. ouest, Charlesbourg, Que G1H 6R1.

Publications, Dept. of Parks and Renewable Resources, Forestry Branch, Box 3003. Prince Albert, Sask. S6V 6G1.

For more information, please contact the author of this report or the manufacturer of the prototypes:

Mr. Yvon Caron, owner  
 La Forge J.M.S. Inc.  
 240, route 285  
 L'Islet Sud, Quebec GOR 2CO  
 Telephone & Fax: 418-247-5510



Plate 1. TFM Engineering Winch Unit

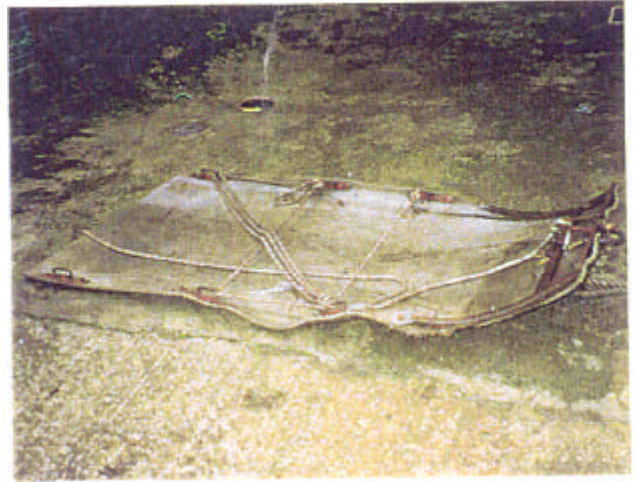


Plate 2. Forest Enterprise Sledge



Plate 3. Logic ATV-Equip Timber Skid

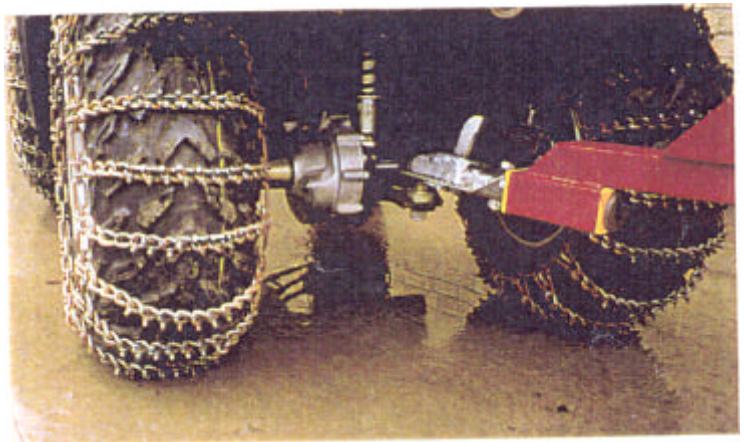


Plate 4. Logic ATV-Equip Forestry/Snow Chains. Note: Logic swivel hitch which is a standard fitting on their trailer range



Plate 5. TFM Engineering Multi Role Forestry Trailer



Plate 6. TFM Engineering Multi Role Forestry Trailer with Trailer Body removed enabling forwarder chassis to be used



Plate 7 Logic ATV-Equip Timber Trailer with electrically powered wire rope loader



Plate 8 TFM Engineering Hand Winch Sulky



Plate 9. TFM Engineering Electric Winch Sulky



Plate 10. Logic ATV-Equip Dump Trailer



Plate 11. Logic ATC-Equip ORT Trailer with twin axle bogie



Plate 12. SAC Sheep safe on a 55% slope (operator should be wearing safety helmet)



Plate 13. Logic ATV-Equip MFG 320816 Flail Mower

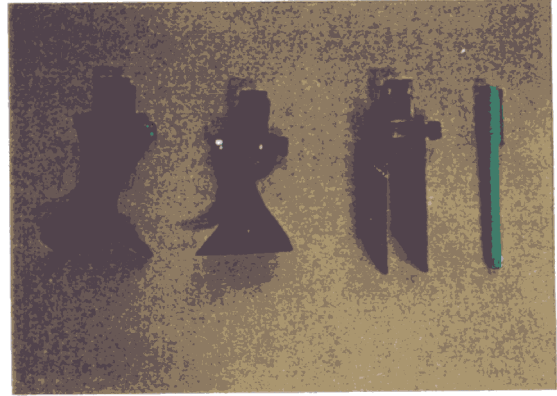


Plate 14. Logic ATV-Equip Flail Knives. Right to Left Standard, Lawn, Scarifier

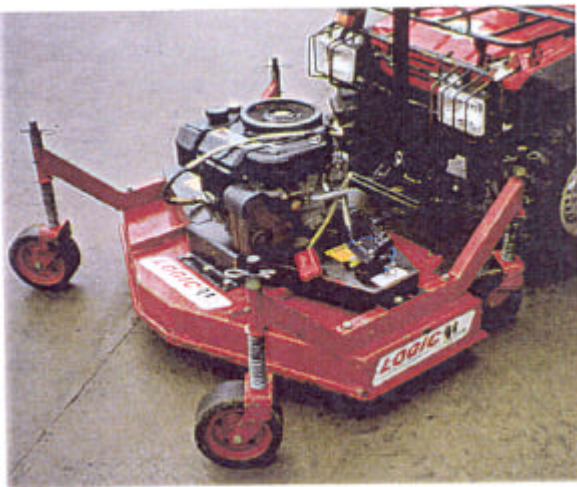


Plate 15. Logic ATV-Equip Rotary Grass Mower

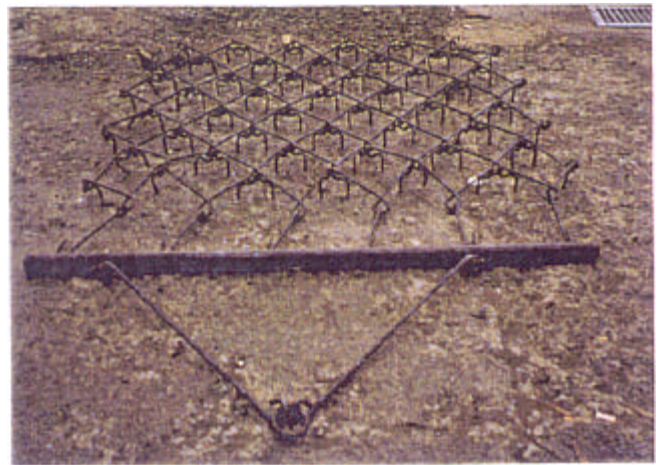


Plate 16. Logic ATV-Equip Chain Harrows



Plate 17. Logic ATV-Equip OBS 125

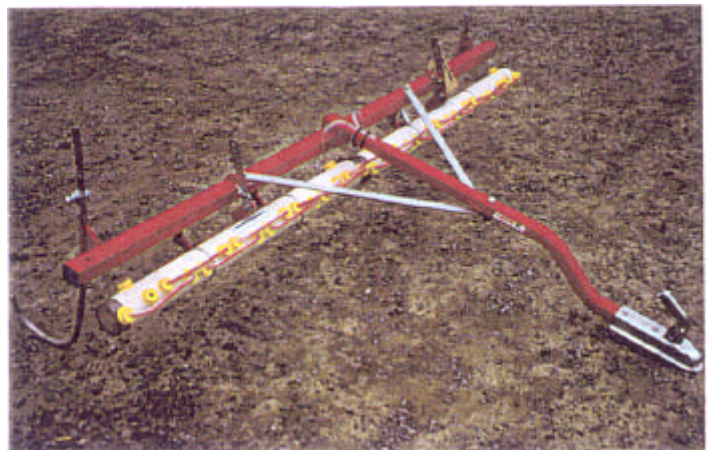


Plate 18. Logic ATV-Equip Weedwiper