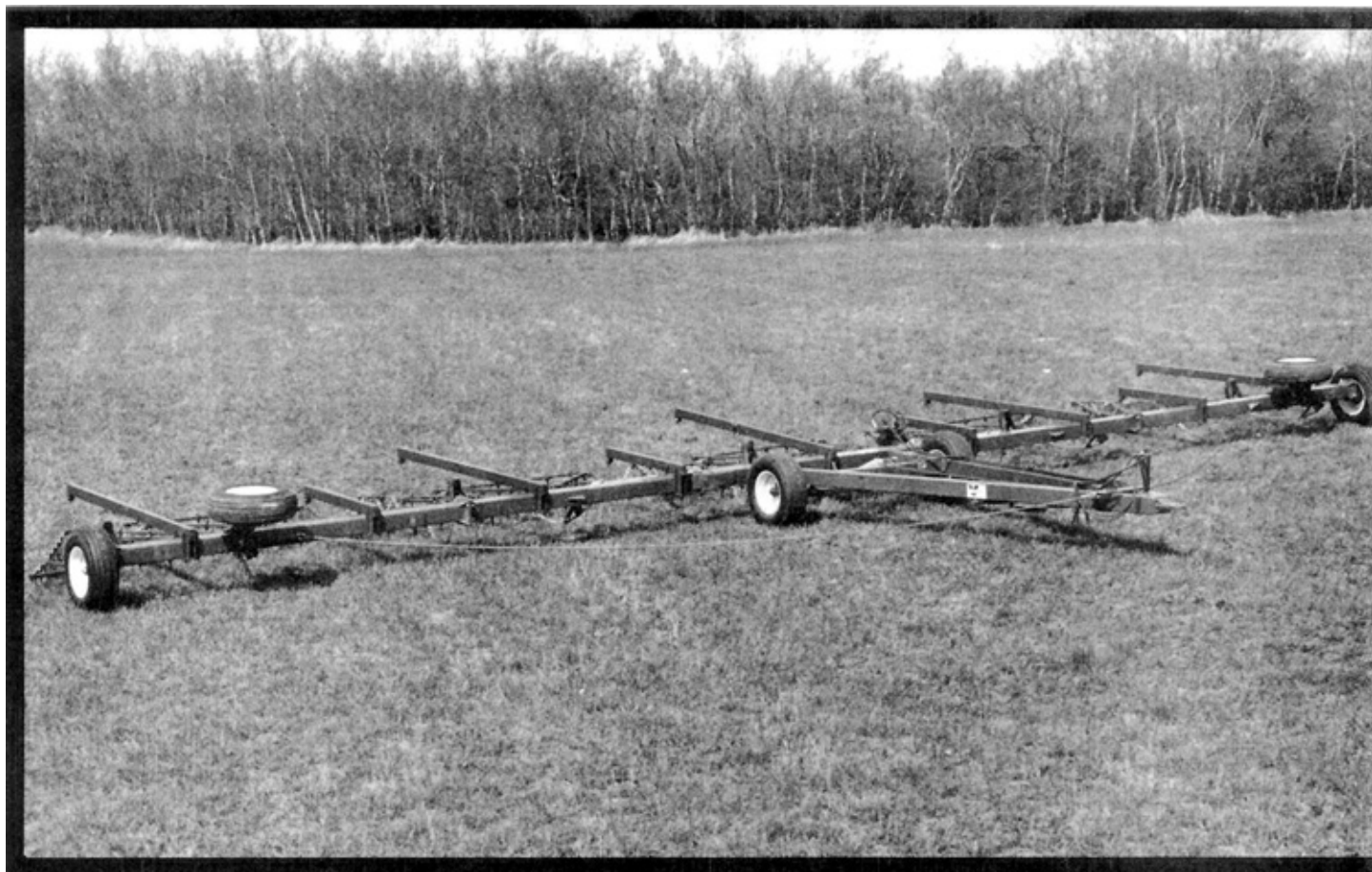


Evaluation Report 471



Victory Hydraulic Oscillating Harrows

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

Victory Hydraulic Oscillating Harrows

MANUFACTURER AND DISTRIBUTOR:

Victory Equipment (1983) Limited
 510 - 36th Street North
 Lethbridge, Alberta
 T1H 5H6
 1-800-661-8060 (toll free)

RETAIL PRICE:

\$9,750.00 [February, 1986, f.o.b. Humboldt, 54 ft (16.5 m) width, with removable end sections].
 \$9,200.00 [Standard 54 ft (16.5 m) width, without removable end sections].

SUMMARY AND CONCLUSIONS

Quality of Work: The Victory hydraulic oscillating harrows produced a very good soil finish in most field conditions. The Victory harrows were more aggressive and had greater penetration than tine harrows and provided slightly better soil mixing. Chemical incorporation was fair. The harrows were very good for spreading large amounts of dry straw and trash but plugged in heavy damp straw. Weed kill was fair. The harrows uprooted and exposed weeds loosened by a cultivator.

Ease of Operation and Adjustment: Ease of transporting was very good. A truck could tow the harrows at low speeds. The Victory harrows were convenient to put into field position. However, the operator had to pivot the wing wheels into transport by hand. Ease of hitching to the harrows was very good in both transport and field position. Maneuverability was very good in field and transport positions. Ease of adjusting and servicing the harrows was very good.

Power Requirements: The Victory harrows required a 75 hp (56 kW) tractor capable of supplying 11 gpm (0.86 L/s) hydraulic flow at 2000 psi (13.8 MPa).

Safety: A transport lock for the hydraulic lift cylinder and a slow moving vehicle sign were not supplied.

Operator's Manual: The operator's manual was good. It provided instructions on initial assembly, operation, maintenance, and safety. It also included a parts list.

Mechanical History: Excessive heat built up in the hydraulic motor circuit.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying a transport lock for the harrow lift cylinder.
2. Modifications to allow easier releasing of the lock pin and pivoting of the wing transport wheel.
3. Supplying a slow moving vehicle sign as standard equipment.
4. Changes to prevent the hydraulic hoses from rubbing against the tire during transport.
5. Modifications to prevent excessive heat buildup in the hydraulic motor circuit.

Senior Engineer: G.E. Frehlich

Project Engineer: H.D. Kydd

Project Technologist: M.J. Bennett

THE MANUFACTURER STATES THAT:

With regard to recommendation number:

1. A transport lock for the lift cylinder will be supplied on all future production.
2. The lock pin for the wing transport wheel was introduced as a safety factor. We have had requests to delete the lock pin but are reluctant to do so. We are now using a different system for releasing the lock pin which is much more convenient.
3. We will supply a slow moving vehicle sign as standard equipment.
4. We will change the routing of the hydraulic hoses to avoid rubbing against the tire during transport.
5. On all new units being produced, we are supplying a cooler to prevent excessive heat buildup in the hydraulic motor circuit.

GENERAL DESCRIPTION

The Victory oscillating harrow is a trailing three section harrow drawbar used for seedbed preparation, soil finishing, and straw spreading. It is available in widths from 32 ft (9.8 m) to 80 ft (24.4 m).

The test machine has a working width of 54 ft (16.5 m). It is equipped with 224 solid teeth arranged in triangular harrow sections. These harrow sections are connected with chains to an offset crankshaft. A hydraulic motor turns the crankshaft and oscillates the harrows. The oscillation rate is adjusted with a flow control valve mounted near the hydraulic motor.

The centre frame is carried by two wheels while each wing is supported by one wheel. In transport, the harrow sections hang by chains from the harrow support arms. One hydraulic cylinder lifts the harrows into transport position. A tractor with dual remote hydraulic outlets is needed to operate the Victory harrows.

Detailed specifications are given in APPENDIX I and FIGURE 1 shows location of major components.

SCOPE OF TEST

The Victory harrows were operated in the field conditions shown in TABLE 1 for 40 hours while harrowing about 620 ac (251 ha).

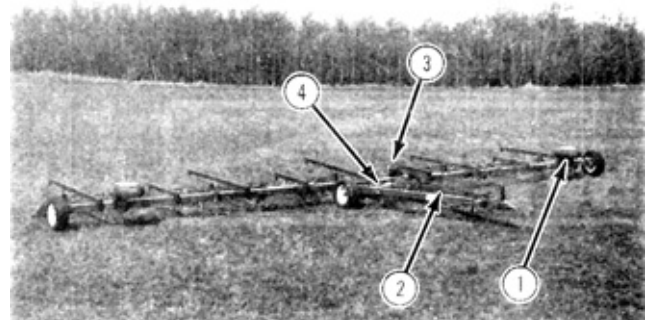


FIGURE 1. Victory Oscillating Harrows: (1) Transport Wheels, (2) Wing Cable Pivot Arm, (3) Hydraulic Motor, (4) Hydraulic Cylinder.

TABLE 1. Operating Conditions.

FIELD CONDITIONS	HOURS	FIELD AREA	
		ac	(ha)
Wheat Stubble	8	90	(36)
Cultivated Wheat Stubble (Behind Cultivator)	20	350	(142)
Summer fallow (Behind Cultivator)	12	180	(73)
TOTAL		620	(251)

RESULTS AND DISCUSSION

QUALITY OF WORK

Soil Finish: The Victory oscillating harrows smoothed soil ridges and broke up lumps to provide a very good soil finish. Soil finish was greatly affected by forward speed and the rate at which the harrows oscillated. A typical oscillating rate was about 32 rpm at a ground speed of 5 mph (8 km/h). Higher oscillating rates or ground speeds caused the harrows to bounce excessively.

Chemical Incorporation: Chemical incorporation was fair. The Victory harrows were heavier and more aggressive than most tine harrows and provided slightly better soil mixing. The harrows might disturb shallow seeded crops if used after seeding.

Straw Spreading: The Victory harrows were very good at spreading heavy deposits of dry straw (FIGURE 2) without plugging. However, in damp conditions straw collected in the harrows and plugging occurred (FIGURE 3). The harrow oscillations helped to reduce plugging, but only slightly improved trash spreading (FIGURE 4). Increasing the oscillation rate had little effect on trash spreading or plugging.

Weed Kill: The Victory harrows were effective in uprooting and exposing weeds loosened by a cultivator. Weed kill was fair and similar to tine harrows.

EASE OF OPERATION AND ADJUSTMENT

Transporting: Ease of transporting the Victory harrows was very good. They could be placed into transport or field position in less than five minutes (FIGURE 5).

To place into transport, the hydraulic cylinder rotated the boom 90 degrees, lifting the harrows off the ground. As the boom rotated, the transport wheels were lowered to the ground and the pivot arm latch was disengaged. As the implement was driven ahead slowly, the wing cable pivot arm swung upwards permitting the wings to fold back into transport position. However, before folding the wings back, the crank arms had to be parallel with the crankshaft supports to prevent damage to the "U" joints or shaft bearings. A transport lock was not supplied for the lift cylinder. It is

recommended that the manufacturer consider supplying a transport lock.

Overall transport width was 12.8 ft (3.9 m), while transport height was 11.1 ft (3.4 m). The Victory harrows towed well at normal transport speeds. The test machine could not be backed up so caution was needed to avoid areas where this was required.

When placing into field position, the wing transport wheels (FIGURE 6) were unlocked and swung forward by hand. The pin for unlocking the transport wheels was often hard to release and it was difficult to pivot the tires forward on some field surfaces. It is recommended that the manufacturer consider modifications to make it easier to pivot the wing transport wheels.

Once the transport wheels were pivoted, the harrows were backed up while the wings were folded out. As the wings folded out, the wing cable pivot arm swung down and automatically locked into place when the harrows were lowered to the ground. Once in field position, the transport wheels were pivoted by hand into their original positions.

Hitching: Ease of hitching to the Victory harrows was very good. The hitch jack and rigid hitch link made one man hitching easy. Hitch weight was positive in transport position, but negative in field position. When unhitching in field position, the hitch jack had to be placed behind the boom on the centre support arm to hold the hitch down as the tractor pulled away.

Maneuverability: Maneuverability of the Victory harrows was very good. In field position, sharp turns could be made in which the inner wheel pivoted on one spot. However, when hooked behind a cultivator, caution was required when turning to prevent the harrows from hitting the cultivator. The harrows could not be backed up in field position. The harrows did not skew in normal field conditions as the harrow pattern was symmetrical (FIGURE 7).

In transport, the Victory harrows easily turned all corners encountered. It could not be backed up in transport position.

Adjustments: Ease of adjusting the Victory harrows was very good. Harrow oscillating rate was easily adjusted using the flow control located near the hydraulic motor.



FIGURE 2. Straw Distribution in Dry Straw.

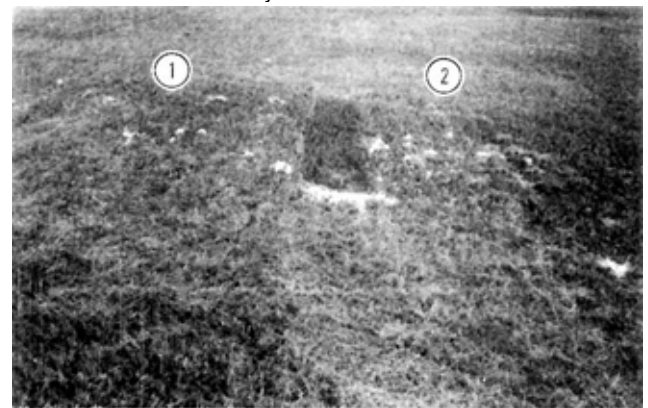


FIGURE 4. Straw Distribution: (1) With Harrows Oscillating, (2) Without Harrows Oscillating.



FIGURE 3. Harrow Plugging in Damp Straw.

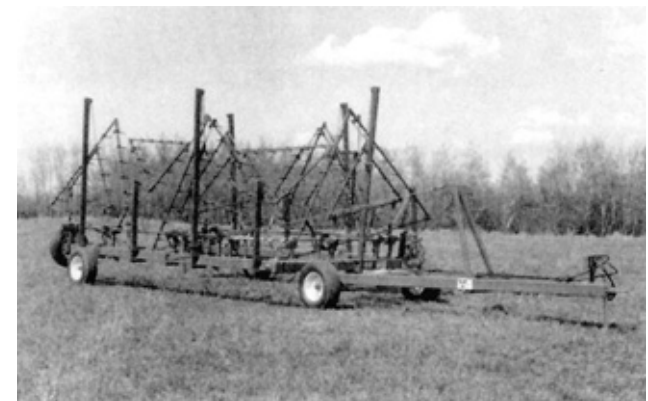


FIGURE 5. Transport Position.

Servicing: Ease of servicing was very good. Oil levels in the gearbox had to be checked once each season. The "U" joints required greasing daily and the transport wheel pivots required greasing once each season.

POWER REQUIREMENTS

Draft: Average draft for the 54 ft (16.5 m) Victory harrows ranged from 1500 lb (6.7 kN) in stubble at 4 mph (6.4 km/h) to 2800 lb (12.5 kN) in summerfallow at 6 mph (9.6 km/h).

Tractor Size: The average power required in summerfallow with light trash cover ranged from 33 hp (25 kW) to 72 hp (54 kW). In primary stubble, 19 hp (14 kW) to 51 hp (38 kW) was required. A 75 hp (56 kW) tractor should have enough power to pull the Victory harrows in most field conditions. This represents a tractor operating at 80% of maximum power on a level field.

This total power includes hydraulic power requirements. The tractor must be equipped with a hydraulic system capable of supplying at least 11 gpm (0.86 L/s) at a pressure of 2000 psi (13.8 MPa). It is important to check with the tractor manufacturer to ensure that the tractor hydraulic system is adequate.

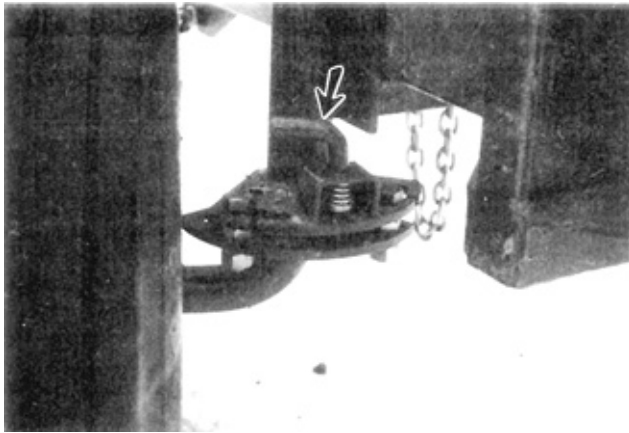


FIGURE 6. Transport Wheel Lock.

OPERATOR SAFETY

Caution was required when unhooking from the harrows in field position. The hitch jack had to be placed behind the boom on the centre harrow support arm to hold the hitch down as the tractor pulled away.

A transport lock for the lift cylinder was not provided. It has been recommended that the manufacturer consider supplying one.

No slow moving vehicle sign was provided. It is recommended that a sign be provided as standard equipment.

OPERATOR'S MANUAL

The operator's manual supplied instructions on initial assembly, operation, maintenance, and safety. It also included a complete parts listing.

MECHANICAL HISTORY

TABLE 2 outlines the mechanical history of the Victory harrows during 40 hours of field operation while harrowing 620ac (251 ha).

The intent of the test was evaluation of functional performance. The following mechanical problems occurred during functional testing. An extended durability test was not conducted.

TABLE 2. Mechanical History.

ITEM	OPERATING HOURS	EQUIVALENT FIELD AREA ac (ha)
-- Leaking hydraulic fittings were repaired	During the test	
-- Hydraulic hoses rubbing against a tire were rerouted at	10	130 (53)
-- "U" joint shaft came loose, fell off, and was replaced at		525 (212)
-- Excessive heat built up in the hydraulic motor circuit	During the test	

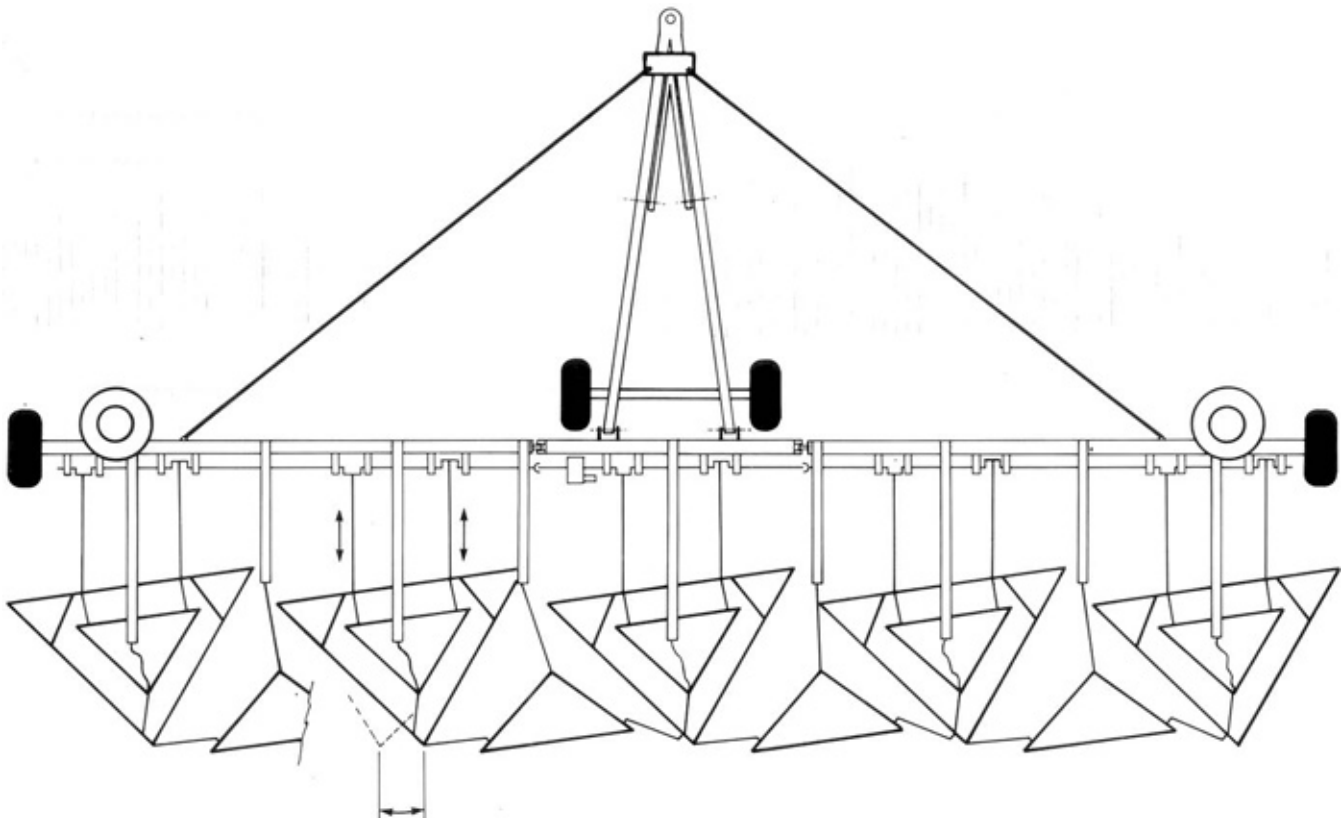


FIGURE 7. Harrow Pattern.

Hydraulic Hoses and Fittings: Two hydraulic hoses rubbed against a tire (FIGURE 8) when the harrows were in transport position. The hoses were rerouted to prevent damage. It is recommended that the manufacturer consider changes to prevent hose damage.

Several hydraulic fittings leaked oil during the tests. The use of pressure rated hydraulic fittings would help prevent these oil leaks.

Hydraulic System Heating: During field operations, heat was generated by the hydraulic motor circuit. After several hours operation, the hydraulic oil temperature became excessive as the hydraulic motor and hoses could not be touched by hand. It is recommended that the manufacturer consider changes to reduce heat buildup in the hydraulic motor circuit.

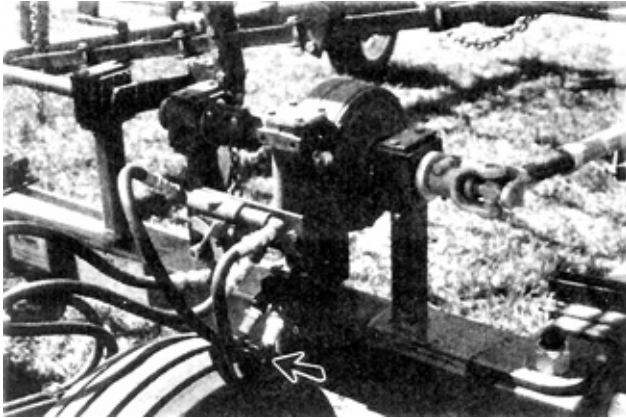


FIGURE 8. Hoses Rubbing on the Tire.

APPENDIX I

SPECIFICATIONS:

MAKE: Victory Hydraulic Oscillating Harrows
SERIAL NO.: CH-85-0171
MODEL:
MANUFACTURER: Victory Equipment Ltd.
 510- 36th Street North
 Lethbridge, Alberta
 T1H 5H6

DIMENSIONS:	FIELD POSITION	TRANSPORT POSITION
-- working width	54 ft (16.5 m)	
-- width (measured)	52 ft (15.8 m)	12.8 ft (3.9 m)
-- length	26.7 ft (8.1 m)	37.7 ft (11.5 m)
-- height	3.1 ft (0.95 m)	11.1 ft (3.4 m)
-- minimum ground clearance		10.3 in (262 mm)
-- wheel tread	50.3 ft (15.3 m)	12.8 ft (3.9 m)

HARROW TEETH:

-- type: solid harrow tooth
 -- number: 224
 -- spacing: approximately 3 in
 -- length: 6 in (152 mm)

FRAME:

-- main frame: 6 x 6 in (152 x152 mm)
 -- boom: 6 x 6 in (152 x 152 mm)

TIRES:

-- centre section: 2,11L x 15, 8 ply
 -- wing section: 4, 9.5L x 15, 6 ply

WEIGHTS:

	FIELD POSITION	TRANSPORT POSITION
	(Harrows clear of ground)	
-- right main frame wheel	1900 lb (860 kg)	1350 lb (610 kg)
-- left main frame wheel	2200 lb (1000 kg)	1500 lb (680 kg)
-- right wing wheel	800 lb (360 kg)	
-- left wing wheel	800 lb (360 kg)	
-- right transport wheel		1120 lb (510 kg)
-- left transport wheel		1120 lb (510 kg)
-- hitch	470 lb (-215 kg)	140 lb (60 kg)
TOTAL	5230 lb (2370 kg)	5230 lb (2370 kg)

SERVICING:

-- grease fittings: 6
 -- wheel bearings: 6

APPENDIX II

MACHINE RATINGS

The following rating scale is used in Machinery Institute Reports:

excellent	fair
very good	poor
good	unsatisfactory

SUMMARY CHART

VICTORY HYDRAULIC OSCILLATING HARROWS

RETAIL PRICE	\$9,750.00 [February, 1986, f.o.b. Humboldt, 54 ft (16.5 m) width with removable end sections]; \$9,200.00 [Standard 54 ft (16.5 m) unit].
QUALITY OF WORK	
Soil Finish	Very Good ; greatly affected by forward speed and oscillation rate
Chemical Incorporation	Fair ; slightly better mixing than tine harrows
Straw Spreading	Very Good ; damp straw plugged harrows
Weed Kill	Fair ; similar to tine harrows
EASE OF OPERATION AND ADJUSTMENT	
Transporting	Very Good ; wing transport wheels had to be pivoted by hand
Hitching	Very Good ; hitch weight positive in transport and negative in field position
Maneuverability	Very Good
Adjustments	Very Good
Servicing	Very Good
POWER REQUIREMENTS	75 hp (56 kW) tractor required with 11 gpm (0.86 L/s) at 2000 psi (13.8 MPa) hydraulic system capacity
OPERATOR SAFETY	Good ; no transport lock for the harrow lift cylinder; negative hitch load required caution when unhooking in field position
OPERATOR'S MANUAL	Good
MECHANICAL HISTORY	Excessive heat buildup in the hydraulic motor circuit



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