

Evaluation Report

540



Cereal Implements 722 Self-Propelled Windrower

A Co-operative Program Between



CEREAL IMPLEMENTS 722 SELF-PROPELLED WINDROWER

MANUFACTURER AND DISTRIBUTOR:

Vicon Western Canada
1000 - 6th Avenue East
Portage la Prairie, Manitoba
R1N 3R3
Phone: (204) 239-5544

RETAIL PRICE:

\$48,650.00 [April, 1988, f.o.b. Humboldt with 30 ft (9.1 m) double windrow header].

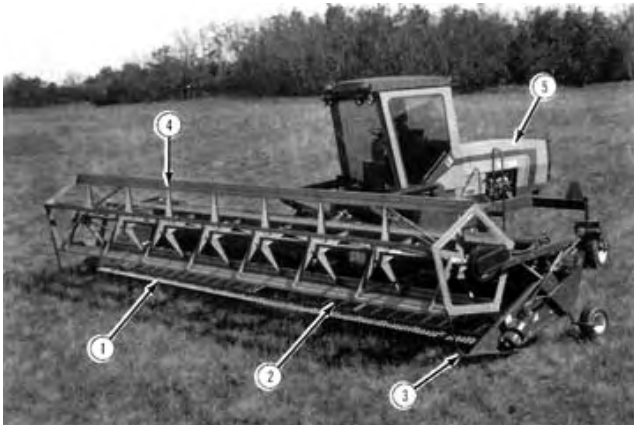


FIGURE 1. Cereal Implements 722: (1) Cutterbar, (2) Drapers, (3) Dividers, (4) Reel, (5) Traction Unit.

SUMMARY AND CONCLUSIONS

Rate of Work: Average speeds for the Cereal Implements 722 were 5 to 7 mph (8 to 11 km/h). Average workrates varied from 15 to 22 ac/h (6 to 8.8 ha/h). Maximum workrate was about 28 ac/h (11.2 ha/h).

Quality of Work: Performance of the dividers was good. The header gauge wheels trampled some crop that was pushed aside by the base of the dividers. Reel performance was very good. The range of vertical and fore-and-aft reel adjustments was suitable for all crops. Cutting ability was very good. The knife had adequate power in all crops. The header height indicator greatly aided in setting minimum cutterbar height. Header flotation was very good, and minimized cutterbar damage in stony fields. Draper performance was very good when single windrowing and fair when double windrowing. When double windrowing, the crop material slid down onto the cutterbar as it was conveyed the entire width of the header. The platform angle was 17 degrees at a cutting height of 6 in (150 mm) and was not adjustable.

Windrow formation was very good. Mostly parallel windrows were formed. Depending on the width of windrow opening, single, centre delivery windrows were normally 3 to 5 ft. (0.9 to 1.5 m) wide. Side-by-side double windrows were usually 6 to 9 ft. (1.8 to 2.7 m) wide. Windrow uniformity was excellent when single windrowing and good when double windrowing. When double windrowing in short crops, some bunched windrows resulted when material slid forward on the drapers and the reel had to be lowered to sweep it back.

Ease of Operation and Adjustment: Operator comfort was good. The seat was positioned too far forward to suit tall operators, and cooled air was blown at the operator's back. Operator station sound level was 84 dBA. Ease of operating the controls was very good. The instruments were very good, and were easy to observe. The lighting was very good. There was ample lighting for operating at night.

Handling was very good. Steering was very quick and responsive. The windrower was very stable on slopes. A side-loading windrower transporter was needed for road travel.

Ease of adjustment was very good. Most adjustments were easily made. Ease of lubrication and maintenance was very good. Daily servicing took about 15 minutes.

Engine and Fuel Consumption: The engine had ample power for all conditions. Average fuel consumption was 2.5 gal/h (11.5 L/h)

Operator Safety: No safety hazards were apparent on the Cereal Implements 722. However, normal safety precautions were required. Safety stops were not provided for the header lift cylinders. The header should be fully lowered or properly blocked when working near the header or when the windrower is left unattended.

Operator's Manual: The operator's manual was very good. It contained much useful information on operation, adjustment, lubrication and maintenance. A separate manual was provided for the diesel engine.

Mechanical History: A few mechanical problems occurred during the test. Two hydraulic cylinders leaked, and a reel hub weld failed.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to reduce crop loss caused by the header gauge wheels
2. Modifications to improve crop flow on the drapers when double windrowing.
3. Improving air distribution within the cab.
4. Providing an easier windrow opening width adjustment.

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Project Engineer: M.E. Jorgenson

Project Technologist: A.R. Boyden

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Header gauge wheels are only suggested as an alternative to the existing skid shoes when cutting very close to the ground or when the skid shoes do not function optimally due to soil conditions. This information will be added to the operator's manual.
2. As noted in the report, primarily short crops slid down on the drapers, which could easily be controlled by running the reel low enough to sweep the material back onto the drapers. The alternative solution of modifying the draper angle would be detrimental to windrow formation in most crops.
3. The 1988 production swathers have an improved air conditioning/heating and distribution system.
4. Cereal Implements believes most operators will not have to adjust their windrow opening frequently. However, we will take this point into consideration.

GENERAL DESCRIPTION

The Cereal Implements 722 (FIGURE 1) is a self-propelled windrower with a draper header capable of centre, left or right end delivery for laying single or double windrows. It runs on two traction drive wheels and two rear castor wheels. It is powered by an ISUZU 219 cu in (3.6 L) four cylinder diesel engine. The traction unit drive wheels are hydrostatically powered with planetary gear reduction final drives. The cutterbar, sliding drapers, the right divider draper and the reel, are driven by hydraulic motors.

Draper and reel speeds are hand controlled from the operator station with electric switches. The reel and header lift valves are foot controlled. The draper delivery position is electrically controlled. Header gauge wheel height, skid plates and width of the windrow opening were adjustable.

The test machine was equipped with a 30 ft (9.1 m) double windrow draper header and five bat reel.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The main purpose of the test was to determine the functional performance of the Cereal Implements 722. Measurements and observations were made to evaluate the Cereal Implements 722 for rate of work, quality of work, ease of operation and adjustment,

engine performance, operator safety, and suitability of the operator's manual. Although extended durability testing was not conducted, the mechanical failures, which occurred during the test were recorded. The Cereal Implements 722 was operated in the conditions shown in TABLE 1 for 122 hours while cutting about 2295 ac (918 ha).

TABLE 1. Operating Conditions

Operation	Crop	Variety	Yield		Hours	Field Area	
			bu/ac	t/ha		ac	ha
Single and Double Windrows	Barley	Bonanza Harrington Klages	30 - 85	1.7 - 3.6	30	540	216
	Durum Wheat	Madora	25	1.7	5	100	40
		Columbus Katepwa Nee pawa	20 - 45	1.4 - 3.0	52	990	396
Single Windrows	Canary Seed	Keet	15	1.2	4	70	28
	Fall Rye	Muskateer	30	1.9	8	160	64
	Flax	Norlan	10 - 20	0.6 - 1.2	7	130	52
	Canola	Westar	20 - 30	1.1 - 1.7	16	305	122
Total					122	2295	918

RESULTS AND DISCUSSION

RATE OF WORK

Uniform windrows were formed in most crops at average speeds of 5 to 7 mph (8 to 11 km/h). Slower speeds were required in tangled or tall leaning crops, and in rough fields. Speeds up to 9 mph (14 km/h) were achieved in straight even stands on smooth ground.

Average workrates for the 30 ft (9.1 m) windrower varied from 15 to 22 ac/h (6 to 8.8 ha/h). In straight even stands on level fields, workrates as high as 28 ac/h (11.2 ha/h) could be achieved.

QUALITY OF WORK

Dividers: Divider performance was good.

The header gauge wheels trampled some crop that was pushed aside by the base of the divider (FIGURE 2). This most often occurred in tangled crops. Adjusting the divider rods did not eliminate crop loss. Crop loss was eliminated by moving the header gauge wheels to the header jack stand locations, which were positioned further inward and away from the crop edge (FIGURE 3). It is recommended that the manufacturer consider modifications to reduce crop loss caused by the header gauge wheels.

When double windrowing, the right divider draper laid the first windrow away from the standing crop. This provided ample room for maneuvering on the second round, and the left divider seldom snagged the first windrow.



FIGURE 2. Crop Flattened by the Header Gauge Wheels.

Reel: Reel performance was very good.

Reel speed was variable from 0 to 62 rpm. Reel tip speed ranged from 0 to 10 mph (0 to 16 km/h). The reel was usually operated at a tip speed 10 to 20 percent faster than ground speed to minimize shatter losses. Material did not wrap on the reel ends.

The range of vertical and fore-and-aft reel adjustments was suitable for all crops. The reel was normally positioned slightly ahead of the cutterbar.

Cutterbar: Cutting ability was very good in all crops provided the knife was maintained in good condition.

The knife had adequate power in all crops. Stubble ranged from smooth to ragged ends (FIGURE 4) depending on condition

and adjustment of knife system.



FIGURE 3. Header Gauge Wheels in Header Jack Stand Locations.

The skid plates and gauge wheels adequately protected the cutterbar from contacting the ground. The header height indicator greatly aided in setting minimum cutterbar height.

Short crop material slid down the drapers onto the cutterbar. The knife was kept from plugging by running the reel low enough to sweep material back onto the drapers.

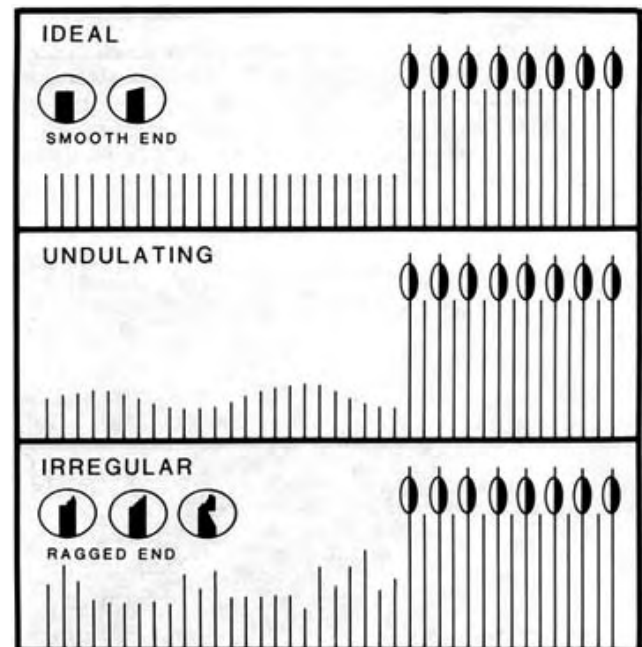


FIGURE 4. Types of Stubble.

Header Flotation: Header flotation was very good.

Flotation was provided by two tension springs on the traction unit linkage (FIGURE 5). Header flotation minimized cutterbar damage in stony fields and enabled the header to follow most ground contours.

Undulating stubble occurred in rough fields as the header bounced.

Drapers: Draper performance was very good when single windrowing and fair when double windrowing. Draper speed could be varied from 0 to 620 ft/min (0 to 3.1 m/s). In most crops, the drapers were run between 460 to 550 ft/min (2.3 to 2.6 m/s). Draper speed control within the cab was helpful in forming uniform windrowing when crop conditions varied.

Platform angles of less than 20 degrees are suitable for grain windrowing while steeper angles are suggested when windrowing hay. The platform angle was 17 degrees at a cutting height of 6 in (150 mm) and was not adjustable. This platform angle worked well in all crops when single windrowing, but when double windrowing the crop material slid down onto the cutterbar as it was conveyed along the entire width of the header. To prevent knife plugging, the reel had to be lowered to sweep the material back onto the drapers, resulting in bunched windrows. It is recommended that the manufacturer consider modifications to improve crop flow on the drapers when

double windrowing. The Cereal Implements 722 with the 30 ft (9.1 m) header was not used for cutting hay.



FIGURE 5. Header Flotation System.

The hydraulically driven drapers had adequate power to convey all crop materials, while laying single or double windrows.

When double windrowing, the right divider draper laid the first windrow about 20 in (508 mm) from the standing crop edge (FIGURE 6). This kept the divider from snagging the windrow on the second pass.



FIGURE 6. Double Windrowing.

Windrow Formation: Windrow formation was very good.

Windrows may be classified into four general patterns (FIGURE 7), although many combination and variations exist. FIGURES 8 to 11 show typical windrows formed by the Cereal Implements 722. Centre and end delivery windrows were usually formed parallel. Herringbone windrows occurred in light crops, while forming single windrows. Depending on direction of crop lean, angle parallel windrows were formed while alternating end delivery. The width of the windrow opening could be adjusted if the quantity of crop material varied. While using a wide windrow opening, delivery to the right end produced an offset windrow with less material on the right side, formed by the right divider draper. This was less evident with more crop material or a narrow windrow opening.

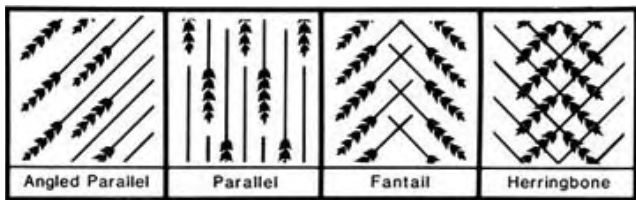


FIGURE 7. Windrow Types.

Depending on the width of windrow opening, single centre-delivery windrows were normally 3 to 5 ft (0.9 to 1.5 m) wide. Single canola windrows varied for 4 to 6 ft (1.2 to 1.8 m) wide, after they had been rolled. Side-by-side double windrows formed with alternating end delivery varied from 6 to 9 ft (1.8 to 2.7 m) wide. The gap between the windrows could be reduced from 20 in (508 mm)

to almost 0 in (0 mm) by driving closer to the first windrow on the second pass. However, this reduced the width of cut slightly.



FIGURE 8. Wheat, Double Windrow: 40 bu/ac (2.7 t/ha).



FIGURE 9. Canola, Single Windrow: 30 bu/ac (1.7 t/ha).



FIGURE 10. Barley, Double Windrow: 45 bu/ac (2.5 t/ha).



FIGURE 11. Fall Rye, Single Windrow: 30 bu/ac (1.9 t/ha).

Windrow Uniformity: Windrow uniformity was excellent when single windrowing and good when double windrowing.

Windrows were uniform when single windrowing at typical speeds up to 7 mph (11 km/h). When double windrowing in short crops, some bunched windrows resulted when material slid forward on the drapers and the reel had to be lower to sweep it

back. Modifications to improve stop flow on the drapers have been recommended.

The cab-mounted speed controls for reel and drapers aided in forming uniform windrows, as they were easily set when ground speeds changed.

EASE OF OPERATION AND ADJUSTMENT

Operator Comfort: Operator comfort was good.

The header and stubble were easily viewed. The cab was clean and quiet. The seat was positioned too far forward to suit tall operators and did not conform well to operator contours. Incoming air was effectively filtered, however, the cooled or heated air was blown at the operator's back. It is recommended that the manufacturer consider improving operator comfort.

Like most self-propelled windrowers, the ride was rough, especially when windrowing at right angles to the previous seeding operation.

Operator station sound level at full speed under load was about 84 dBA. For sound levels exceeding 85 dBA, ear protection should be worn.

Controls: Ease of operating the controls was very good.

All controls (FIGURE 12) were conveniently located and properly identified. The travel speed control lever and the header clutch lever were conveniently located and easy to engage. Header and reel heights were conveniently operated with two foot pedals located on the right side of the steering column. The reel and header raised and lowered smoothly, and responded immediately.

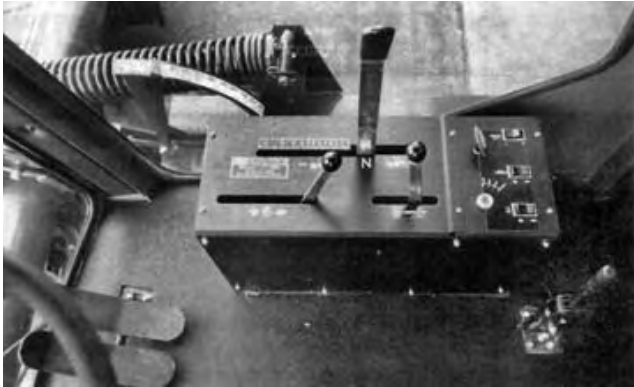


FIGURE 12. Operator Station Controls.

Reel and draper speeds were hand-controlled with electrical switches in the cab. The switches were clearly identified, and were very easy to adjust on-the-go.

For double windrowing, the sliding drapers had to be manually latched together. Draper positions and directions were then easily controlled with a switch from the operator station.

Instruments: The instruments were very good.

The console was conveniently located and easy to observe (FIGURE 13). It included gauges for fuel level, battery voltage, engine coolant temperature, and engine hours. Warning lights and audible alarms indicated low engine oil pressure, high engine coolant temperature, low hydrostatic oil pressure, high hydraulic oil temperature, hydraulic oil filter plugged, park brake engaged, and neutral position for engine starting.



FIGURE 13. Instrument Panel.

Lighting: The lighting was very good.

The windrower was equipped with four forward or side lights and one rear light. This provided ample lighting for operation at night. Warning lights were provided for road travel, but the wide header made road travel at night unsafe.

Handling: Handling of the Cereal Implements 722 was very good in all field conditions.

Steering was very quick and responsive. Following the edge of the crop became easier with operator familiarity. Double windrowing was convenient, since the right divider draper laid the first windrow away from the standing crop. This allowed for some error in steering on the following round without missing crop or snagging the windrow.

The hydrostatic drive made reversing direction quick and easy. The header lifted high enough to maneuver over tall windrows and similar obstacles. The windrower was stable, and only tipped forward with the rear wheels lifting briefly when operating down steep slopes during sudden stops.

Transporting: The 30 ft (9.1 m) wide header on the Cereal Implements 722 was too wide for meeting traffic. The windrower had to be backed into the ditch to allow vehicles to pass. For safe road travel, a side-loading windrower transporter was required. Many transporters were not suitable for transporting the Cereal Implement 722 because a long hitch is needed between the truck and the 30 ft (9.1 m) header. The Blanchard 3 in 1 transporter, used during the PAMI tests, was suitable.

Adjustments: Ease of adjustment was very good.

The header side-to-side levelling and flotation were easily adjusted using instructions in the operator's manual. Reel fore-and-aft position and cutterbar clearance were easily adjusted. The drapers were easily tightened with a wrench.

The windrow opening could be adjusted for widths of 36, 42 and 48 in (914, 1067 and 1219 mm). Full adjustment took two men 90 minutes. Short sections were added to each draper, and the draper drive rollers were moved. A jack was required to support the draper deck, and care was required for proper alignment of the draper decks and rollers. This was inconvenient when changeovers were frequent. It is recommended that the manufacturer consider providing an easier windrow width opening adjustment.

Lubrication and Maintenance: Ease of lubrication and maintenance was very good.

Daily lubrication took about 15 minutes. The Cereal Implements 722 had eight pressure grease fittings on the traction unit and header which required greasing every 10 hours. Lubrication points were very accessible. In addition, the engine and hydraulic oil levels and engine coolant level had to be checked daily, and the radiators and cab air filter cleaned if necessary. The knife had to be oiled daily, except in sandy soils where oiling was not recommended. The operator's manual contained a handy maintenance schedule.

Most routine maintenance and service, such as tensioning belts and changing guards and knife sections, were easily performed.

ENGINE AND FUEL CONSUMPTION

The ISUZU 4BB1 diesel engine started easily and ran well. The engine had ample power for all conditions. Average fuel consumption was 2.5 gal/h (11.5 L/h). The 35 gal (160 L) fuel tank permitted about 14 hours of operation between fillings. Oil consumption was insignificant.

OPERATOR SAFETY

No safety hazards were apparent on the Cereal implements 722. However, normal safety precautions were required.

All moving parts were well shielded. Safety stops were not provided for the header lift cylinders. The header should be fully lowered or properly blocked when working near the header or when the windrower is left unattended. If the operator must make adjustments or work in dangerous areas, the speed control lever should be in neutral position, the park brake engaged, and the header drive and engine should be shut off. Safety switches prevented the engine from starting if the park brake was not on, and the speed control lever and steering wheel were not in neutral position.

The 30 ft (9.1 m) header was too wide to allow safe travel down the road. A side-loading transporter should be used, and transport speeds should not exceed 20 mph (32 km/h). A slow moving vehicle sign, warning lights, taillights, rear view mirror, and seat belt were

provided. The operator should avoid transporting the windrower at night.

The operator's manual emphasized operator safety. Warning decals adequately indicated all dangerous areas.

OPERATOR'S MANUAL

The operator's manual was very good.

It contained much useful information on operation, adjustment, lubrication, and maintenance of the windrower. A separate operator's manual was supplied for the ISUZU diesel engine. All information was easy to follow and well illustrated.

MECHANICAL HISTORY

TABLE 2 outlines the mechanical history of the Cereal Implements 722 during 122 hours of field operation while windrowing about 2295 ac (918 ha). The intent of the test was functional performance evaluation. Extended durability testing was not conducted.

TABLE 2. Mechanical History

Item	Operating Hours	Equivalent Area	
		ac	(ha)
-A knife drive hydraulic motor seal leaked and was replaced at	8	160	(64)
-The table shift solenoid valve stuck, and was cleaned at	17	315	(126)
-A gauge wheel tire went flat and was reinflated at	22	415	(166)
-A loose hydraulic fitting for the right draper drive motor was retightened at	26	490	(196)
-The short right draper tore at its seam from running out of alignment at	33	640	(256)
-The right reel lift cylinder leaked and was replaced at	33	640	(256)
-The left rear castor tire went flat and was reinflated at	37	740	(296)
-The left end reel hub failed at its weld at	63	1200	(480)
-The engine thermostat failed causing the engine coolant temperature warning system to activate at	69	1310	(524)
-The right header lift cylinder leaked and was replaced at	76	1455	(582)
-The left draper tightener cog bent at	87	1655	(622)
-Six knife sections were replaced		During the Test	

Hydraulic Cylinders: The leaking that occurred with the two lift cylinders was caused by poor quality control during assembly. This problem has been identified by the manufacturer and corrected.

**APPENDIX 1
SPECIFICATIONS**

MAKE:	Cereal Implements
MODEL:	722
SERIAL NUMBER:	
Header	380016-00105
Traction Unit	38017-00070
MANUFACTURER:	Vicon Western Canada 1000 - 6th Avenue East Portage la Prairie, Manitoba R1N 3R3
CUTTERBAR:	
-- width of cut (divider points)	30.7 ft (9.36 m)
-- effective cut (inside dividers)	30.6 ft (9.34 m)
-- range of cutting height	0 to 32 in (0 to 810 mm)
-- guard spacing	3 in (75 mm)
-- knife section (under serrated)	
-width	3.0 in (75 mm)
-full depth	3.5 in (90 mm)
-cutting length	2.5 in (64 mm)
-- knife stroke	3.1 in (79 mm)
-- knife speed	710 cycles/min
HEADER:	
-- platform angle	
-fully raised	4° below horizontal
-fully lowered	17° below horizontal
-- number of drapers	3
-- draper width	41 in (1040 mm)
-- draper lengths	
-left	11.6 ft (3.54 m)
-right	11.4 ft (3.52 m)
-right extension draper	1.9ft (0.58 m)
-- draper material	rubberized polyester with fiberglass slats
-- draper speed range	0 to 545 ft/min (0 to 2 m/s)
-- draper roller diameter	2.5 in (64 mm)
-- height of windrow opening	24 in (610 mm)
-- widths of windrow openings (between rollers)	36, 42, 48 in (914, 1067, 1219 mm)
-- raising time	24 s
-- lowering time	32 s

REEL:	
-- number of bats	5
-- number of arms per bat	8
-- diameter	54 in (1372 mm)
-- speed range	0 to 62 rpm
-- range of adjustment	
- fore-and-aft	9 in (229 mm)
- height above cutterbar	26 in (660 mm)
-- raising time	1.1 s
-- lowering time	1.6 s
TRACTION DRIVE:	
-- type	hydrostatic pump (Vickers) hydraulic motors
-- speed control	hand lever
-- maximum forward speed	14 mph (23 km/h)
STEERING:	steering wheel mechanically linked to hydrostatic pump
BRAKES:	caliper disc brakes with hand lever
HYDRAULIC SYSTEM:	
-- hydrostatic traction drive	(see traction drive)
-- reel and draper knives	variable speed displacement pump, flow control valves, and motors on reel and drapers
-- reel lift	2 double acting cylinders in parallel
-- header lift	2 double acting cylinders in parallel
NO. OF CHAIN DRIVES	
-- traction unit	1
-- header	1
NO. OF V-BELTS:	
-- traction unit	3
LUBRICATION POINTS:	
-- pressure grease fittings	8
-- gearboxes	3
NO. OF PRELUBRICATED BEARINGS:	15
ENGINE:	
-- make	ISUZU
-- model	4BB1 (4 cylinder diesel)
-- displacement	219 in ³ (3.6 L)
-- no load speed	3050 rpm
-- power (nominal)	72 hp (54 kW)
-- fuel tank capacity	35 gal (160 L)
TIRES:	
-- drive wheels	two, 18.4 to 16.1, 6-ply traction tread
-- caster wheels	two, 9.5 L to 15, 6-ply ribbed implement
-- header gauge wheels	two, 16 x 6.50, 8 NHS, 4-ply
OVERALL DIMENSIONS:	
-- width	31.9 ft (9.7 m)
-- length	20.4 ft (6.2 m)
-- height	10.0 ft (3.0 m)
-- wheel tread	8.7 ft (2.7 m)
-- wheel base	11.4 ft (3.5 m)
WEIGHT: (fuel tanks empty)	
-- left drive wheel	3510 lb (1592 kg)
-- right drive wheel	3275 lb (1486 kg)
-- castor wheels	1380 lb (626 kg)
TOTAL	8165 lb (3704 kg)
OPTIONS AND ATTACHMENTS	windshield wiper kit

**APPENDIX II
MACHINE RATINGS**

The following rating scale is used in PAMI Reports:	
excellent	fair
very good	poor
good	unsatisfactory

SUMMARY CHART

CEREAL IMPLEMENTS 722 SELF-PROPELLED WINDROWER

RETAIL PRICE	\$48,650.00 (April, 1988, f.o.b. Humboldt, Sask.)
RATE OF WORK	
Average Speed	5 to 7 mph (8 to 11 km/h)
Average Workrate	15 to 22 ac/h (6 to 8.8 ha/h)
QUALITY OF WORK	
Dividers	Good ; gauge wheels trampled some crop
Reel	Very Good ; range of adjustment suitable for all crops
Cutterbar	Very Good ; adequate power, header height indicator aided in setting minimum cutterbar height
Header Flotation	Very Good ; minimized cutterbar damage in stony fields
Drapers	Very Good ; when single windrowing Fair ; when double windrowing, as crop slid down onto the cutter
Windrow Formation	Very Good ; mostly parallel
Windrow Uniformity	Excellent ; when single windrowing, aided by reel and draper speed control in cab Good ; when double windrowing, bunchy windrows in short crops
EASE OF OPERATION AND ADJUSTMENT	
Operator Comfort	Good ; seat positioned too far forward, cooled air blown at operator's back
Controls	Very Good ; easy to operate
Instruments	Very Good ; conveniently located and easy to observe
Handling	Very Good ; very responsive steering, stable on slopes
Lights	Very Good ; ample lighting for nighttime operation
Transporting	side-loading transporter was required
Adjustments	Very Good ; most adjustments made easily
Lubrication and Maintenance	Very Good ; daily servicing took 15 minutes
ENGINE AND FUEL CONSUMPTION	2.5 gal/h (11.5 L/h); ample engine power
OPERATOR SAFETY	No safety hazards apparent
OPERATOR'S MANUAL	Very Good ; contained useful information, separate manual for diesel engine
MECHANICAL HISTORY	A few mechanical problems occurred



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