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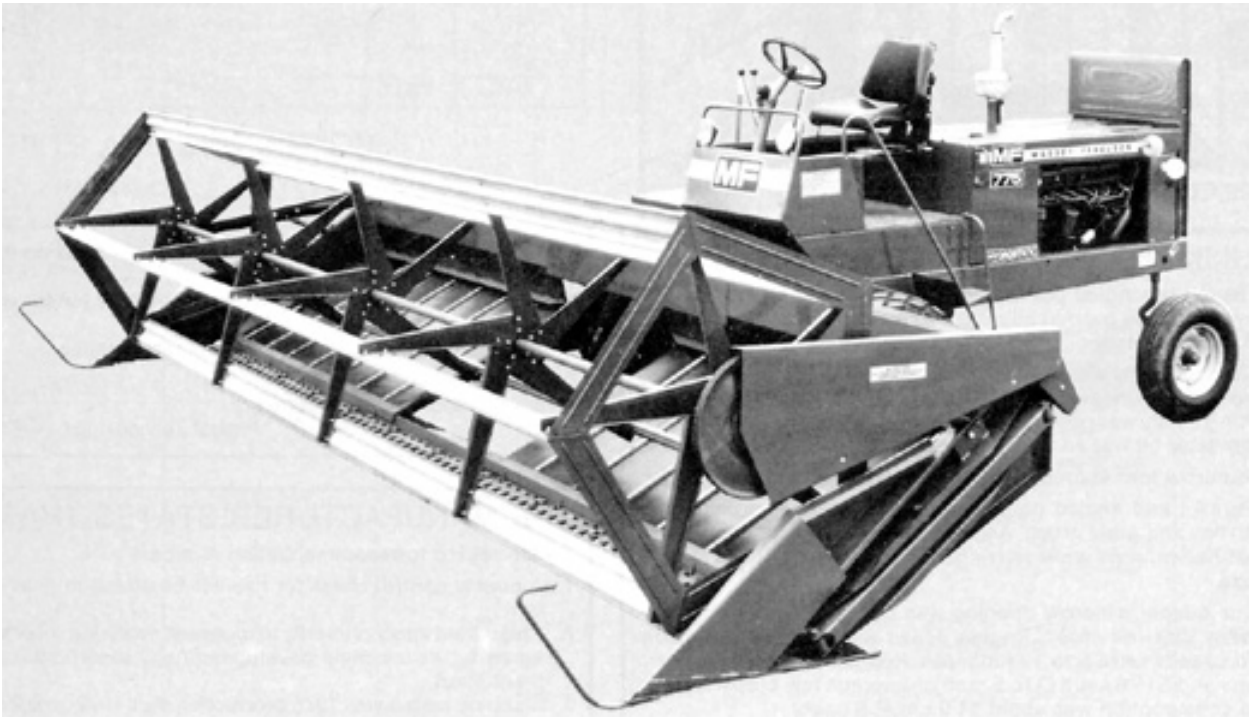
Evaluation Report 116



Massey Ferguson 775 Self-Propelled Windrower

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

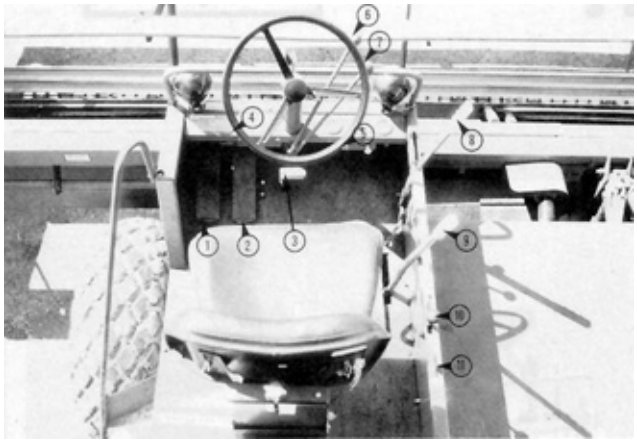
PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

MASSEY FERGUSON 775 WINDROWER

MANUFACTURER: MacDon Industries Limited
680 Moray Street
Winnipeg, Manitoba
R3J 3S3

DISTRIBUTOR: Massey Ferguson Industries Limited
2615 Barlow Trail S.E.
Box 1340, Station T
Calgary, Alberta
T2H 2J1

RETAIL PRICE: $11,083.00 (July 1979, f.o.b. Winnipeg, Manitoba with optional hand controls, 13.5x16.1 traction tires, 7.50x14 rear tire, rear weights and engine air pre-cleaner).



(1) Reel foot control
(2) Header foot control
(3) Parking brake
(4) Steering wheel
(5) Ignition switch
(6) Reel hand control
(7) Header hand control
(8) Header control lever
(9) Variable speed lever
(10) Throttle lever
(11) Choke

FIGURE 1. Operators platform.

SUMMARY AND CONCLUSIONS

Overall functional performance of the Massey Ferguson 775 Windrower was *good* in all crops, when equipped with the 5.5 m (18 ft) grain header.

Cutting ability was *very good* in all grain crops and most hay crops. In very heavy, tough hay crops, and flax and rapeseed cutting ability was *good.* Table floatation was *very good.* The maximum table lift was adequate to clear heavy headland windrows.

Windrow formation and uniformity were *good* to *very good.*

Parallel and angled parallel windrows were predominant in both hay and grain crops. Angled parallel windrows occurred in most heavy crops while herringbone patterns occurred in light crops.

The header windrow opening was not large enough to adequately clear all crops. Engine power was adequate. Suitable field speeds were 6 to 10 km/h (3.5 to 5 mph) in average grain crops and 5 to 8 km/h (3 to 5 mph) in average hay crops. Normal fuel consumption was about 11.0 L/h (2.6 gal/h).

Operator controls were convenient and well positioned. Response to the control was *excellent.* Handling and maneuverability were *very good.* Most adjustments were simple and convenient. Daily maintenance took from 10 to 15 minutes.

Operator station sound level was about 90 dBA. Visibility from the operator's platform was *excellent.* Stability on steep hillsides was *excellent.* Operator safety was *very good,* however, the steering neutral lock tended to engage while the windrower was in motion.

The operator's manual was *very good.* It was concise and clear and contained pertinent information on maintenance, adjustments and safety precautions.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to eliminate the possibility of the neutral lock engaging while the machine is in motion.
2. Modifications to the windrow opening to improve clearance under the windrower and to reduce crop bunching.
3. Modifications to the draper guards to eliminate wear on the front edges of the draper material and slats.
4. Relocating the optional header and reel lift hand controls, to improve their ease of operation.
5. Increasing the size of the fuel tank to allow longer working periods.
6. Reducing the noise level at the operator station.

Chief Engineer -- E.O. Nyborg
Senior Engineer -- J. C. Thauberger
Project Technologist -- P.H. Perk

THE MANUFACTURER STATES THAT:

With regard to recommendation number:

1. A quality control check for this will be added to final inspection.
2. This would apply primarilyto rapeseed swathing; however, we agree future machine development will incorporate recommendation.
3. Machine tested was 1978 production. For 1979, drapers were improved from vinyl coated dacron and wood slates to rubber coated polyester and reinforced rubber slats. This substantially increases durability. The draper shields may have been bent in shipment. They are easily hand adjustable by bending.
4. Optional hand lift controls are not widely marketed. These were located to coincide with right handed operators.
5. We agree and this will be in future machine development.
6. We agree noise control on "less cab" is difficult. 90 dBA is within the 88-91 dBA range of other swathers tested. This problem is under attention in future machine development.

GENERAL DESCRIPTION

The Massey Ferguson 775 is a self-propelled, centre delivery wind rower with two traction d rive wheels and a single rear castor wheel. It is powered by a Chrysler Industrial 225, six cylinder gasoline engine. The traction drive is hydrostatic with two motors driven through a series of sheaves, belts and shafts from the engine crankshaft. Roller chains are used between the hydrostatic motors and the wheels. The header is driven through a belt and d rive-shaft arrangement.

A steering wheel is provided, while a hand lever controls the speed and direction of travel. The hydraulic header and reel controls are foot operated. Optional hand controls are available. FIGURE 1 shows the layout of the operator station and controls.

The test machine was equipped with a 5.5 m grain header with draper platform and bat reel along with optional hand controls, 13.5 x 16.1 drive tires, 7.50 x 14 rear tire, rear weights and engine air pre-cleaner.

Other header options and accessory attachments are available.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Massey Ferguson 775 was operated in the conditions shown in TABLE 1 for 128.5 hours while cutting about 446 ha. It was evaluated in forage, cereal and oil seed crops for windrow formation, cutting ability, ease of operation and adjustment, noise level, fuel consumption, operator safety and suitability of the operator's manual.

TABLE 1. Operating Conditions

CROP	SOIL TEXTURE	HOURS	FIELD AREA ha
Alfalfa	Sandy Loam, Silty Clay Loam	26 5	99
Mixed Hay	Clay Loam	4	8
Slough Grass	Loam	1	1.5
Rye	Clay	9.5	32
Barley	Silty Clay, Loam	21	79
Wheat	Clay Loam. Silty Clay, Clay	28	111
Oats	Almasippi Sand	2	4
Rapeseed	Silty Clay, Loamy Fine Sand	21	49
Flax	Loam	12	49
Buckwheat	Clay	35	14
TOTAL		128.5	446

RESULTS AND DISCUSSION

WINDROW FORMATION

Windrow Types: Windrows may be broadly classified into four general patterns (FIGURE 2) although many combinations and variations exist. The Massey Ferguson 775 produced parallel, angled parallel and herringbone windrows in most grain crops.

TABLE 2 describes the types of windrows produced by the Massey Ferguson 775 in various crops while FIGURES 3 to 11 illustrate typical wind rows.

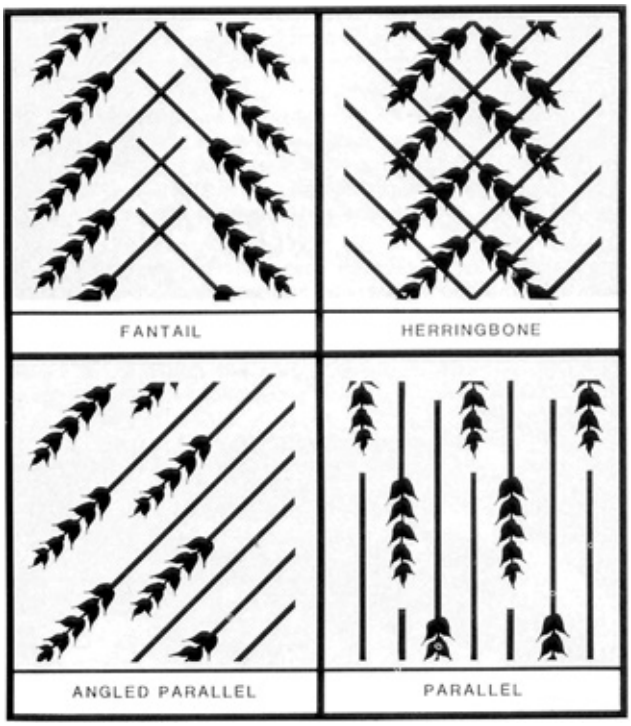


FIGURE 2. Windrow Types.

TABLE 2.

CROP	YIELD RANGE t/ha	CUT CROP LENGTH mm	SPEED km/h	WINDROW TYPE	FIG. NO.
Alfalfa	0.7 - 1.4	300 - 900	1 - 8	parallel, fantail parallel, angled fantail and herringbone where leaning	3
Mixed Hay	0.2 - 1	225 - 425	5 - 8	parallel	
Slough Grass	0.3	100 - 800	1.5 - 8	fantail where leaning	
Rye	1.1	250 - 1100	6 - 13	angled parallel angled parallel and herringbone where leaning	4
Barley	0.5 - 1.5	600 - 1150	3 - 11	angled parallel parallel and herringbone where leaning	5
Wheat	0.8 - 1.3	300 - 900	3 - 10	herringbone, angled parallel. parallel	6, 7, 8
Oats	1.0	710 - 800	6 - 8	herringbone	
Rapeseed	0.5	600 - 1000	5 - 10	parallel, angled parallel where leaning	9
Flax	0.6	400 - 500	8	parallel, herringbone	10
Buckwheat	0.6	800	10	parallel	11

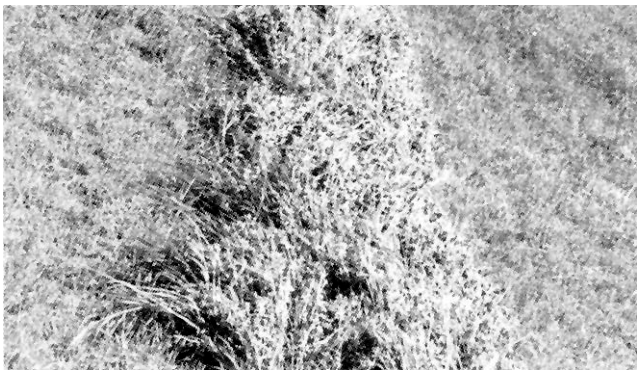


FIGURE 3. Alfalfa (1.2 t/ha).

FIGURE 4. Rye (1.1 t/ha).

FIGURE 5. Barley (1.2 t/ha).

FIGURE 6. Wheat (0.9 t/ha).

FIGURE 7. Wheat (1.3 t/ha).

FIGURE 8. Wheat (1.3 t/ha).

FIGURE 9. Rapeseed (0.5 t/ha).

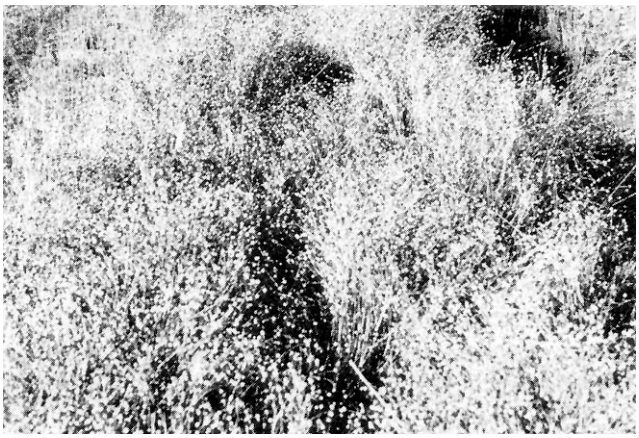


FIGURE 10. Flax (0.6 t/ha).

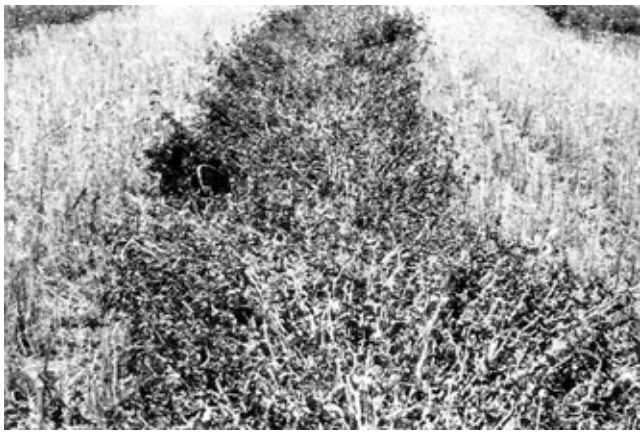


FIGURE 11. Buckwheat (0.6 t/h).

Leaning Crops: The direction of cut was important when windrowing lodged or leaning grain crops. Cutting in the direction of crop lean usually resulted in parallel windrows, while cutting at an angle to the direction of lean generally resulted in angled parallel windrows.

Uniformity: Windrows were uniform in most crops with bunchIng and distortion occurring in certain crop conditions. The Massey Ferguson 775 tended to leave a high windrow when cutting most grain crops. Bunching often occurred, when cutting tangled or bushy crops, because of the narrow windrow opening. Bunching also occurred, on the canvas guards and cutter bar when cutting short crops. In heavy crops the windrow would often catch on the right parking brake drum. This caused rolling and distortion of the windrow.

Draper Speed: Draper speed was variable from 2.0 to 2.4 m/sec by changing spacers in the drive pulleys. At higher speeds, windrows with a herringbone pattern were formed. This type of windrow, while easily picked, could be difficult to thresh. Lower

speeds tended to produce angled parallel and parallel windrows which were both wide and high.

Header Angle: The header angle on the Massey Ferguson 775 was not adjustable and was dependent on cutting height. In the lowered position, the header angle was 26 degrees.

Forward Speed: Forward speed had little effect on windrow formation. Speed limitations were usually due to field roughness or cutting performance.

Windrow Opening: In very heavy crops, the ability of the windrower to clear the crop through the windrow opening did not match its ability to cut.

Windrow opening clearance was not adequate for all crops. The narrow opening obstructed tangled and tall crops, leaving a bunchy windrow.

CUTTING ABILITY

Cutterbar: All test work was conducted with overserrated knife sections. Cutting ability of the Massey Ferguson 775 was very good in all grain crops and in most hay crops. In very heavy, tough hay, cutting ability was good. Cutterbar plugging occurred in heavy slough grass, damp flax and heavily lodged crops. Performance in lodged rapeseed was best when travelling in the direction of crop lean. In lodged grain crops, performance was best working back and forth parallel to the crop lean.

Stubble: The stubble, formed by a windrower, may be divided into three types as shown in FIGURE 12.

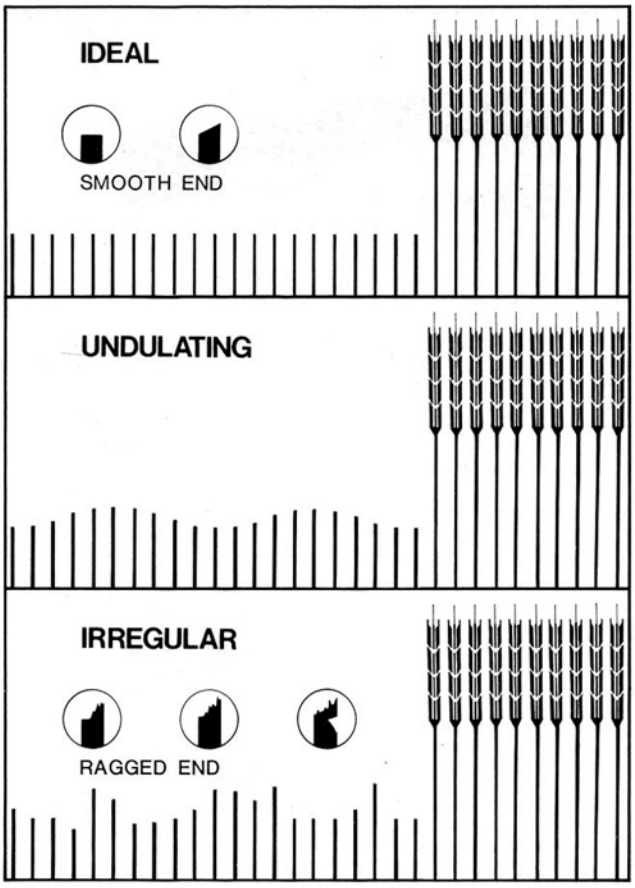


FIGURE 12. Stubble Types.

The Massey Ferguson 775 produced ideal and irregular stubble in all grain crops at speeds up to 9 km/h. In flax or rapeseed, ideal stubble was formed at speeds up to 7 km/h. Higher speeds resulted in irregular stubble. Undulating stubble was formed when the header was allowed to float freely while cutting well above the ground. Undulating stubble was also a result of rough field conditions and high speeds.

In hay crops the stubble was generally ideal provided that forward speed was matched to crop conditions. Excessive speed in tough hay crops resulted in irregular stubble.

Dividers: The performance of the dividers was satisfactory under all conditions. A small amount of hairpinning occurred when cutting tall grain crops such as rye.

The dividers pushed the crop down in rapeseed, leaving a path about 100 mm wide. The performance of the dividers, when cutting rapeseed, was very good and no modifications to the divider rods were necessary.

Reel: Reel speed was variable from 43 to 50 rpm by adjusting spacers on the reel drive pulley. For optimum performance, in most grain crops, it was best to have a reel index[1] from 1.1 to 1.2. While the optimum reel index was obtained at forward speeds 10 to 11 km/h, operation outside this speed range was possible in most crops.

Header Floatation: The Massey Ferguson 775 was equipped with a header floatation system as standard equipment. Performance was excellent.

The system is made up of two springs. The header could be levelled by adjusting the spring tensions. After the level was adjusted the header followed ground contours very well.

FIGURE 13. Floatation System.

EASE OF OPERATION AND ADJUSTMENT

Steering: Directional control and maneuverability of the Massey Ferguson 775 was very good. The hydrostatic steering[2] was positive and effortless. The steering lock tended to engage while the windrower was in motion causing it to veer to the right. It is recommended that the manufacturer consider modifications to eliminate this problem.

When properly adjusted, the Massey Ferguson 775 did not pull sideways in soft fields, and the steering was not influenced by different tire pressures in each drive wheel.

Speed Control: Forward speed variation from 0 to 12.2 km/h was possible with the hydrostatic speed control lever. Speeds in reverse, could be varied between 0 and 2.5 km/h.

Braking: Braking was accomplished hydrostatically with the speed control lever. A mechanical parking brake was also provided to hold the machine stationary.

Header Controls: The header drive was engaged with a conveniently located hand lever. Reel and header lifts were both hydraulically operated with foot pedals on the left of the steering column. In addition two optional hand controls were situated to the right of the steering column. Located there, these hand controls were seldom used as the right hand was often occupied with other functions.

Response to the header and reel lift control was excellent. Header and reel height could be quickly set. Maximum header lift height was adequate to clear tall headland windrows.

Transporting: Maximum forward speed was about 12.0 km/h.

[1]*Reel Index is defined as the ratio of reel tip speed to travel speed.*

[2]*Hydrostatic steering, in reverse, is opposite to that of conventional machine operation. In addition, when the variable speed lever is returned to neutral, the steering wheel must also be returned to neutral to stop machine motion.*

The final drive chains had to be removed to prevent damage to the hydrostatic unit if the wind rower was towed With the drive wheels on the ground. The Massey Ferguson 775 towed well on windrower transporters and castor wheel shimmy usually occurred only at speeds above 40 km/h.

Adjustments: Reel and d raper speeds were adjusted by varying the number of spacers between the two halves of the drive sheaves. To reposition the reel on the reel arm, two bolts at each end of the reel were removed and the reel moved to one of five locations.

Servicing: Daily lubrication of the Massey Ferguson 775 took from 10 to 15 minutes.

NOISE LEVEL

Total noise at operator ear level was about 90 dBA. It is recommended that the operator wear suitable ear protection, especially on long working days.

POWER AND FUEL CONSUMPTION

Engine power was adequate for all the conditions encountered. Average fuel consumption was about 11.8 L/h. Fuel consumption would be greater in extreme conditions. The 80 L fuel tank permitted about 7 hours of operation between fillings in normal crop conditions.

OPERATOR SAFETY

Access to the operator's platform was safe and convenient. Controls were well positioned and identified with standardized symbols. Visibility was good. The two standard headlights and rear working light provided adequate illumination for night operation. The Massey Ferguson 775 was equipped with a slow moving vehicle sign and flashing safety lights for transport on public roads.

The windrower was stable on steep hillsides. One hazard was apparent. The steering neutral lock occasionally tended to engage as the windrower was in motion which caused the windrower to suddenly veer to the right. It is recommended that the steering system be modified to eliminate this problem.

Both the steering wheel and speed control lever had to be in neutral to halt the machine motion.

OPERATOR'S MANUAL

The operator's manual was very good. It contained much useful information on assembly, operation safety and servicing. It was clear and well written.

DURABILITY RESULTS

TABLE 3 outiines the mechanical history of the Massey Ferguson 775 windrower during 128 hours of operation while windrowing about 446 ha. The intent of the test was evaluation of functional performance. The following failures represent those which occurred during functional testing. An extended durability evaluation was not conducted.

TABLE 3. Mechanical History

ITEM	OPERATING HOURS	EQUIVALENT AREA ha
The oil seal on the left hand hydrostatic drive motor failed and was replaced at	18.5	62
The left hand hydraulic motor was replaced at	36	130
The bearing supporting the hydrostatic motor drive shaft failed, scoring the shaft. Both the drive shaft and the bearing were replaced at	39	146
The draper drive V-belt failed and was replaced at	76	235
The castor wheel support failed and was replaced at	88	266
The neutral safety lock was adjusted at	90	270
A header drive pulley bent and was replaced at	101	306
The left hand draper was replaced at	103	312

DISCUSSION OF MECHANICAL PROBLEMS

Hydraulic Motor: The outer oil seal on the left hand hydraulic motor failed. It was replaced but failed again.

Improper machining of the race on the hydraulic motor was determined to be the cause of the problem. The problem did not recur after the motor was replaced.

Driveshaft: The support bearing failed, and scored the driveshaft. Both had to be replaced.

Castor Wheel Support: The castor wheel failed as shown in Figure 14 while the machine was being transported on a windrower transporter. An examination of the broken pieces indicated that the failure was due to fatigue.

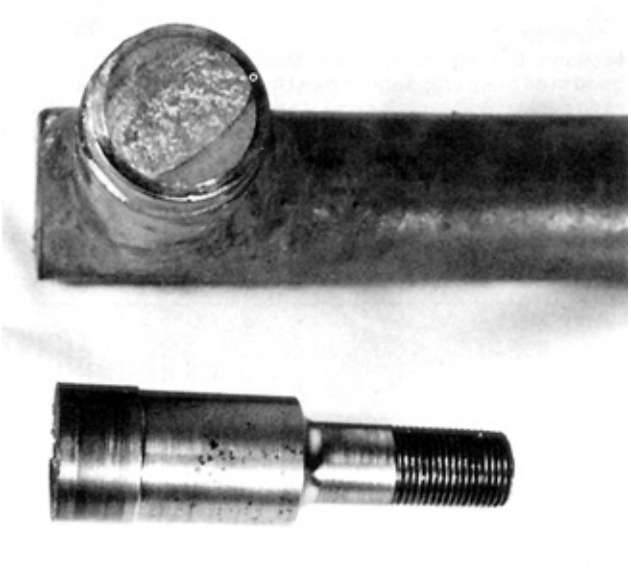


FIGURE 14. Castor Wheel Support Failure.

Neutral Safety Lock: The safety lock tended to engage when the windrower was in motion. A spacer, which was installed to adjust the locking lug, solved the problem.

Drapers: Throughout the evaluation, the drapers and slats required repairs. The problem was traced to the draper guards contacting the drapers.

APPENDIX I

SPECIFICATIONS

Model:	Massey Ferguson 775
Senal No.	Tractor 006475A Header 106307
Cutterbar:	
--width of cut (divider points)	5476 mm
--effective cut (inside divider)	5386 mm
-- range of cutting height	38.1 to 390mm
guard spacing	76 mm
-- length of knife section (overserrated)	76 mm
-- knife stroke	76 mm
-- knife speed	580 cycles/min.
Header:	
-- platform angle (from horizontal)	
-- fully raised	2.5
-- fully lowered	26
-- number of drapers	2
-- width of drapers	1060 mm
length of drapers	
-- right	2160 mm
-- left	2190 mm
-- draper speed range	2.0 - 2.4 m/s
-- draper roller diameter	55 mm
-- height of windrowopening	747 mm
width of windrow opening	1015 mm
-- raising time of table	2.8 s
-- lowering time of table	5.0 s

Reel:

-- number of bats	5
-- number of reel arms/bat	5
-- diameter	1404 mm
-- speed range	48 to 50 rpm
-- range of adjustment	
-- fore and aft	203 mm
-- height above cutterbar	0 to 144 mm
-- raising time	1.2 s
-- lowering time	2.4 s

Ground Drive:

-- type	hydrostatic
-- speed control	variable speed lever
range of forward speed	0 to 12.2 km/h
-- range of reverse speed	0 to 2.6 km/h

Steering: Steering wheel operated hydrostatic pumps

Brakes: Hydrostatic speed control and foot pedal operated parking brake.

Hydraulic System:

--traction drive	Two Sunstrand 15 series hydrostatic motors belt-driven from engine.
--header and reel lift	Cessna Model 24117 - LAC hydraulic pump belt-driven from engine

No. ot Chain Dnves: *5*

No. ot V-Belts:

-- single V	4
-- multiple V	2

No. of Pressure Lubrication Points: *18*

No. of Prelubncated Bearings: *15*

Engine:

-- make	Chrysler Industrial six cylinder gasoline engine
-- model	HB 225
-- no toad speed	2400 rpm
-- power	41 kW
-- fuel tank capacity	80 L

Tire Size:

-- main drive wheels	2 - 13.5 x 16.1, 6 ply
--castor wheel	1 - 7.5 x 14.0, 4 ply
-- wheel tread	
-- drive wheels	2289 mm
-- wheel base	2419 mm
-- overall width	5675 mm
--overall length	5470 mm

Weight as Tested: **(header raised)**

-- right drive wheel	786 kg
-- left drive wheel	1070 kg
-- castor wheel	178 kg
TOTAL	2034 kg

Centre ot Gravity: **(header raised)**

-- height above ground	952 mm
-- distance behind drive wheels	212 mm
-- distance left of right drive wheel	1379 mm

Options and Attachments Available: Tool box, swath forming rods, divider hoop extensions, higher dividers, engine air intake pre-cleaner, dual rear wheels.

APPENDIX II

MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

(a) excellent	(d) fair
(b) very good	(e) poor
(c) good	(f) unsatisfactory

APPENDIX III

METRIC UNITS

In keeping with the Canadian metric conversion program, this report has been prepared in SI units. For comparative purposes, the following Conversions may be used:

1 hectare (ha)	= 2.47 acres (ac)
1 kitometre/hour (km/h)	= 0.62 miles/hour (mph)
1 tonne (t)	= 2205 pounds (lb)
1 tonne/hectare (t/ha)	= 0.45 ton/acre (ton/ac)
1 metre (m) = 1000 millimetres (mm)	= 39.37 inches (in)
1 kilowatt (kW)	= 1.34 horsepower (hp)
1 kilogram (kg)	= 2.2 pounds (lb)
1 litre/hr (L/h)	= 0.22 Imperial gallons/hour (gal/h)

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