

Evaluation Report

475



Muxlow Super Swather Model 21-21 Tractor Mounted Windrower

A Co-operative Program Between



MUXLOW SUPER SWATHER MODEL 21-21 TRACTOR MOUNTED WINDROWER

MANUFACTURER:

Muxlow Holdings Ltd.
P.O. Box 4466
Regina, Saskatchewan
S4P 3W7

DISTRIBUTOR:

Muxlow Super Swather
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Phone: (306) 569-3276

RETAIL PRICE:

\$36,165.00 (March, 1986, f.o.b. Humboldt, with two 21 ft (6.4 m) headers, optional draper insert attachment, and two rapeseed roller attachments).

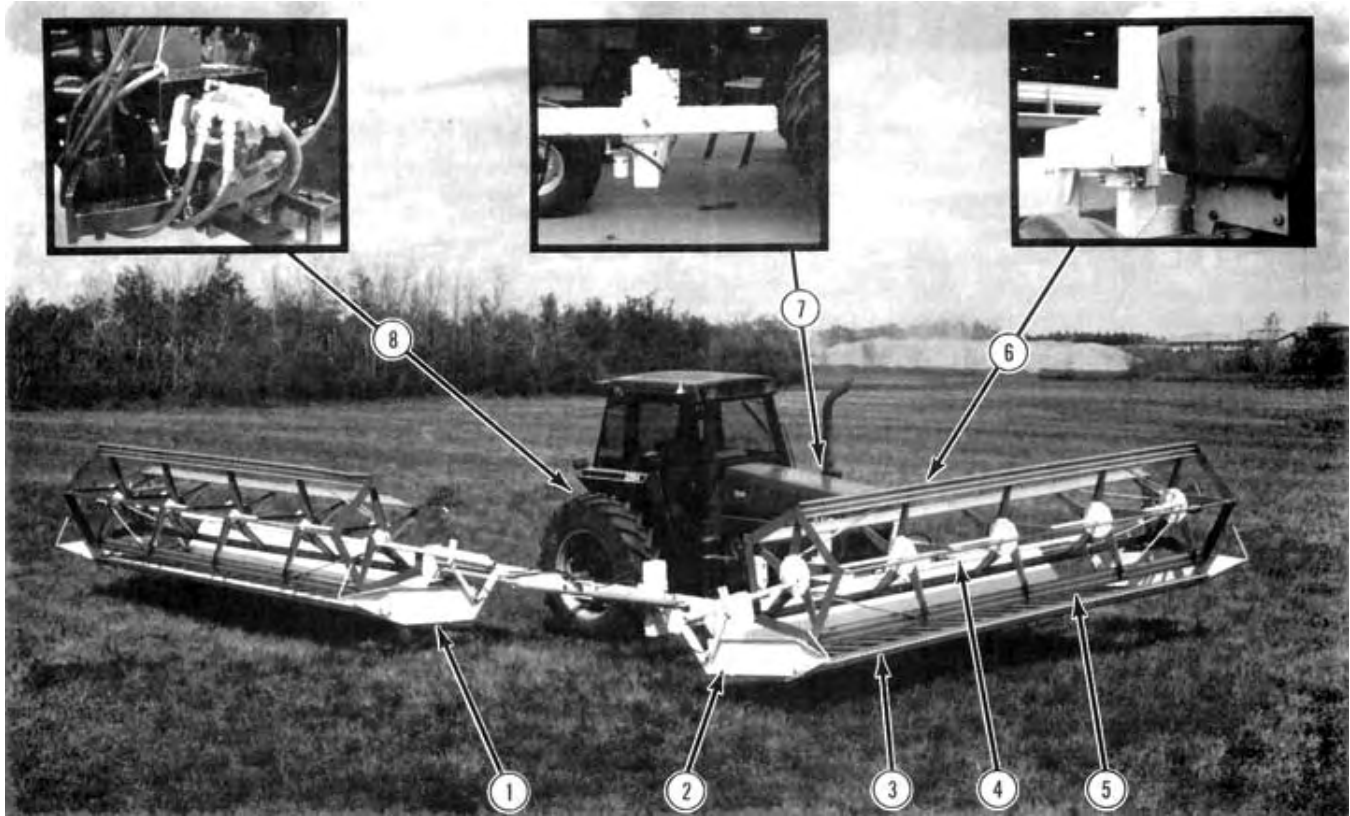


FIGURE 1: Muxlow Super Swather Model 21-21: (1) Side Header, (2) Front Header, (3) Cutterbar, (4) Reel, (5) Draper, (6) Front Tractor Mount, (7) Main Frame/Reservoir, (8) Hydraulic Pump.

SUMMARY AND CONCLUSIONS

Rate of Work: Average speeds for the Muxlow Model 21-21 were 4 to 6 mph (6 to 10 km/h). Average workrates varied from 16 to 20 ac/h (6.5 to 8.1 ha/h). Maximum workrate was about 30 ac/h (12 ha/h).

Quality of Work: Performance of the dividers was fair. The side header right divider flattened a strip of crop. A powered divider was needed in rapeseed. Reel performance was good. The reels could not be adjusted far enough forward. Cutting ability was very good. The knives had adequate power. The cutterbar followed ground contours well. Header flotation was very good. Draper performances was good. However, the front draper was easily overloaded with crop, which caused the drive roller to slip. The optional rapeseed rollers worked well.

Windrow formation was very good. Mostly parallel windrows were formed. Two windrows could be placed 21 ft (6.4 m) apart, or together side-by-side or stacked. Single windrows were 4 ft (1.2 m) wide. Double side-by-side windrows were 6 to 9 ft (1.8 to 2.7 m) wide. Windrow uniformity was good. Uniform windrows were formed in most cereal crops and flax. Bunching occurred in rapeseed, forward leaning tall crops, and heavy cereal crops.

Ease of Installation: Ease of installing was good. It was installed or removed by one man in about 45 minutes. Instructions were adequate.

Ease of Operation and Adjustment: Controls were good. The console was convenient to use and the header height gauges were helpful. Visibility was good. The side header was easily viewed, but the front header was partly obstructed. Handling was good. Considerable operator experience was required. Corners were easily made. The windrower and tractor were very stable on slopes. Ease of transporting was very good. It was placed in transport in less than 1 minute.

Ease of adjustment was very good. Ease of lubrication and maintenance was very good. Daily servicing took less than 10 minutes. The hydraulic system maintained a safe oil temperature

Tractor Requirements: Minimum power required was 18 hp (13 kW) PTO. The manufacturer suggested the Muxlow Super Swather be mounted on at least a 100 hp (75 kW) tractor with dual rear wheels.

Operator Safety: There were no mechanical header safety locks. The front tires on the test tractor were overloaded by 58%. The operator's manual contained no safety tips.

Operator's Manual: The operator's manual was good. It contained adequate assembly and mounting instructions and a troubleshooting guide. There were no sections on safety or operation.

Mechanical History: The hydraulic cylinders and hoses were of poor quality. Several mechanical problems occurred.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifying the right divider on the side header to reduce crop loss.
2. Modifications to permit moving the reels further ahead of the cutterbar.
3. Providing proper adjustment procedures for header flotation in the operator's manual.
4. Modifying the front header draper drive to prevent the drapers from slipping in heavy crops.
5. Modifications to improve shifting of the front draper.
6. Improving visibility of the front header.
7. Supplying mechanical safety locks for the header lifts.
8. Providing safety information with the machine.
9. Including more complete operating instructions in the operator's manual.
10. Improving the quality of the hydraulic cylinders and hoses.
11. Improving quality control during fabrication and assembly.

Senior Engineer: G.E. Frehlich

Project Engineer: M.E. Jorgenson

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The side header divider is being redesigned for 1986. Power dividers will be recommended for rapeseed and similar difficult crops.
2. We will consider extending the reel arms to permit greater forward adjustment of the reels.
3. Complete adjustment instructions for header flotation will be included in 1986.
4. Modifications are being made for 1986.
5. Shifting of the front draper will be improved.
6. Experienced operators have reported that they do not consider this a problem. The header height gauges aid the operator in judging stubble height and cutterbar position.
7. Positive cylinder locks will be considered in 1986.
8. Safety information will be provided with the machine.
9. The 1986 operator's manual will include more complete operating instructions.
- 10 & 11. Better quality control will be enforced throughout the entire machine in 1986. All weak points will be checked and reinforced. All table cylinders will be replaced on all machines manufactured to date, with cylinders from a different supplier.

MANUFACTURERS ADDITIONAL COMMENTS

1. No one divider design is suitable for all crops and conditions. However, on our swather the angle of the side header can be changed from the cab to eliminate divider losses.
2. Many of the above modifications will be made on the first year production machines.
3. Farmer ideas and suggestions are appreciated and will surely lead to improvements in future production.

GENERAL DESCRIPTION

The Muxlow Model 21-21 is a tractor mounted windrower with two draper headers capable of laying one 42 ft (12.8 m) double windrow or two 21 ft (6.4 m) single windrows (FIGURE 1). Double windrows may be stacked or laid side-by-side. It mounts to the front end and under-frame of the tractor. One header is positioned directly in front of the tractor and the other to the right-hand side. It is supported by the tractor and one castor wheel on the far right end. The knife, reel, drapers and lift cylinders are hydraulically driven from a pump attached to the tractor power take-off shaft. The front shifting draper is reversible for right or left delivery.

The draper and reel speeds are adjusted with flow controls on the header. Lifting cylinders and the table shift are controlled with switches on a console in the cab. It is placed into transport from the cab using one tractor remote hydraulic outlet. The side header is swung back alongside the tractor.

The test machine was equipped with two 21 ft headers, a draper insert attachment, and two rapeseed roller attachments.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Muxlow Model 21-21 was mounted on a Case/International 2294 tractor. It was operated for 81 hours while cutting about 1351 ac (620 ha). The Muxlow Model 21-21 was operated in the conditions shown in TABLE 1. During the harvest, it was evaluated for rate of work, quality of work, ease of installation, ease of operation and adjustment, operator safety, and suitability of the operator's manual. Mechanical failures were recorded.

TABLE 1. Operating Conditions

Crop	Variety	Operation	Yield		Hours	Field Area	
			bu/ac	t/ha		ac	ha
Fall Rye	Puma,	Single and Double Windrows	22	1.4	22	351	142
Barley	Muskateer		54 to 70	2.8 to 3.8	18	306	124
Wheat	Bonanza, Klages, Neepawa, Katepawa		20 to 45	1.3 to 3.1	29	505	204
Rapeseed	Westar	Single Windrows	27 to 41	1.5 to 2.2	9	141	57
Flax	Norland		20	1.2	4	68	28
Total					82	1371	555

RESULTS AND DISCUSSION

RATE OF WORK

Uniform windrows were formed in most crops at average speeds of 4 to 6 mph (6 to 8 km/h). Slower speeds were required in heavy or leaning crops and in rough fields. Speeds up to 6.5 mph (11 km/h) were achieved in straight even crops on level fields, but the quality of windrows formed was poorer at speeds above 6.5 mph (11 km/h).

Average workrates for the 42 ft (12.8 m) windrower varied from 16 to 20 ac/h (6.5 to 8.1 ha/h). In straight even stands on level fields, workrates of 30 ac/h (12 ha/h) could be achieved.

QUALITY OF WORK

Dividers: Divider performances was fair. Crop material built up on the divider shields and reel cylinders. The right divider on the side header had a wide flat base, which flattened a strip of crop causing a slight crop loss (FIGURE 2). It is recommended that the manufacturer consider modifying the right divider on the side header to reduce crop loss.



FIGURE 2. Crop Flattened by the Divider.

In heavy rapeseed, the divider rods pushed crop down, plugging a section of the knife. Different shapes of rods were tried by PAMI, but none prevented knife plugging. In heavy rapeseed crops, a powered divider attachment should be used.

When double windrowing, the inside divider on the side header worked well. It ran cleanly between the front windrow and the standing crop. The divider position could be adjusted on-the-go using the transport cylinder, to avoid missing crop between the headers when turning.

Reel: Reel performance was good. Reel speed was variable from 0 to 35 rpm. Reel tip speed ranged from 0 to 6 mph (0 to 10 km/h). The reel was usually adjusted with a reel tip speed 10 to 20% faster than ground speed to minimize shatter losses. Crop material did not wrap around the reel ends.

The range of vertical heights was adequate, but the clearance

between the cutterbar and the reel could not be adjusted. In very short crops, the reel could not be lowered to sweep material off the knife. In addition, the reel could not be positioned far enough forward to feed tall or forward leaning crops (FIGURE 3). It is recommended that the manufacturer consider modifications to permit moving the reel ahead of the cutterbar.



FIGURE 3. Inadequate Forward Reel Positioning.

Cutterbar: Cutting ability was very good. The knife had adequate power in most crops. In tough crops, such as flax, the knife occasionally stopped and had to be cleared by hand before it would restart. Tough crops could be cut if ground speed was less than 4 mph (6 km/h). All field work was conducted with underserrated knife sections. The two cutterbars followed the contours of the land very well. The front cutterbar had to be raised when going through ravines, but the side header followed rolling land without adjustment. Stubble was usually ideal (FIGURE 4). Undulating stubble occurred in rough fields due to header bouncing.

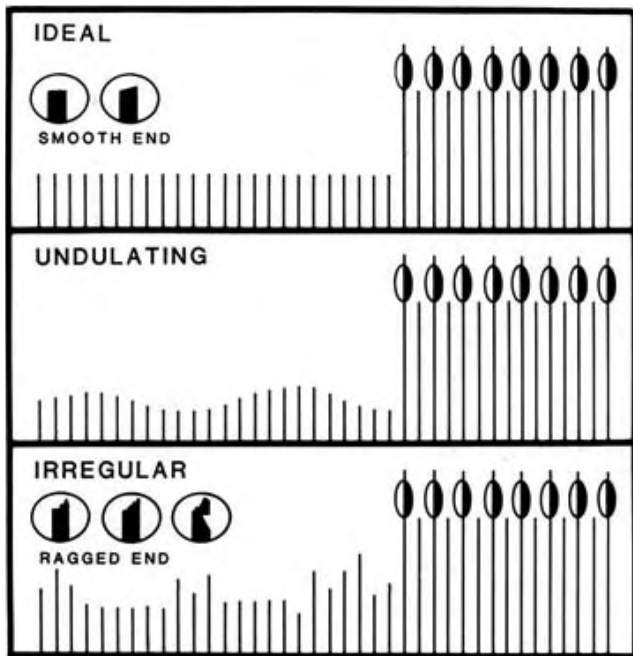


FIGURE 4. Types of Stubble.

Header Flotation: Header flotation was very good when properly adjusted. Flotation was provided by four tension springs and two cushioning links on each header (FIGURE 5). Good header flotation minimized cutterbar damage in stony fields and enabled the header to follow most ground contours. Undulating stubble occurred in rough fields. The operator's manual did not list suggested flotation settings. The springs were adjusted so that about 80 lb (36 kg) was needed to lift the cutterbar. It is recommended that the manufacturer consider providing proper adjustment procedures for header flotation in the operator's manual.

Drapers: Draper performance was good. Draper speed could be varied from 0 to 465 ft/min (0 to 2.4 m/sec). The drapers were run near full speed in all crops. Both drapers had adequate power when single windrowing. However, when double windrowing, the front draper was easily stopped. In heavier crops, the drive roller began to slip and the slats bowed allowing the draper to slip under the rear guide, jamming the draper. Draper performance was improved by

wrapping friction tape on the drive roller. It is recommended that the manufacturer consider modifying the front header draper drive to prevent the drapers from slipping in heavy crops.



FIGURE 5. Header Flotation System.

Platform angles less than 20 degrees are suitable for grain windrowing, while steeper angles are used when windrowing hay. The platform angle of the Muxlow Model 21-21 was about 14 degrees, which was suitable for all grain and oilseed crops. The 42 ft (12.8 m) draper header was not used for cutting hay.

The optional rapeseed rollers (FIGURE 6) worked very well. The rollers improved feeding at the windrow opening and formed a uniform, compact windrow. Shelling might occur in ripe rapeseed.



FIGURE 6. Optional Rapeseed Roller Attachment.

Windrow Formation: Windrow formation was very good. Windrows may be classified into four general patterns (FIGURE 7), although many combinations and various exist. FIGURES 8 to 11 show typical windrows formed by the Muxlow Model 21-21. Windrows were parallel in most crops. Angled parallel windrows were formed in leaning crops. Changes in draper, reel or travel speed did significantly affect windrow formation. Rapeseed windrows were dense and well packed when the rapeseed roller attachments were used.

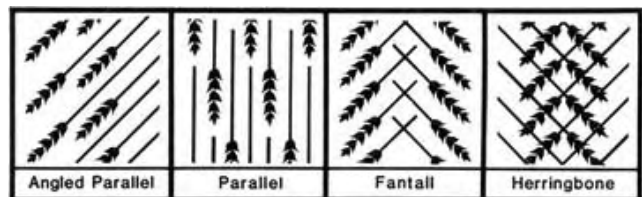


FIGURE 7. Windrow Types.

Single end-delivered windrows from each 21 ft (6.4 m) header were about 4 ft (1.2 m) wide. Double side-by-side windrows were 6 to 9 ft (1.8 to 2.7 m) wide. The gap between the windrows varied from 0 to 10 in (0 to 250 mm), depending on quantity of material in the windrow. Double stacked windrows were typically 4 to 5 ft (1.2 to 1.5 m) wide. Single rapeseed windrows were about 4 ft (1.2 m) wide when the roller was used.

Windrow Uniformity: Windrow uniformity was good. Windrows

were uniform in most cereal crops and flax. Uniformity was poor in rapeseed due to bunching and plugging at the knife and the dividers. A powered crop divider greatly improved windrow uniformity in rapeseed. Windrow bunching also occurred in heavy crops where the front draper stopped or in forward leaning crops, which could not be grabbed by the reel. Modifications to the dividers, front draper drive and reel positioning have been recommended.



FIGURE 8. Wheat, Double Windrow: 45 bu/ac (31 t/ha).



FIGURE 9. Barley, Stacked Double Windrow: 54 bu/ac (2.9 t/ha).



FIGURE 10. Rapeseed, Single Windrow, Rolled: 41 bu/ac (2.3 t/ha).



FIGURE 11. Flax, Single Windrow, Rolled: 20 bu/ac (1.2 t/ha).

EASE OF INSTALLATION

Ease of installation was good. Once assembled, it was removed or reinstalled by one man in about 45 minutes. One heavy jackall, a set of tools, and a few hose ties were required. The operator's manual provided instructions for assembly, installation, and removal. Instructions were adequate, but some information was unclear. For example, it was not specified that the control console power supply had to be wired through the ignition switch.

The Muxlow Model 21-21 is normally assembled and installed by the dealer. Special mounting brackets are supplied for each make of tractor. Twenty-five gallons (115 L) of hydraulic transmission oil were required to fill the reservoir. The test machine was assembled and installed by PAMI on a Case/International 2294 tractor in about 30 man-hours.

EASE OF OPERATION AND ADJUSTMENT

Controls: Ease of operating the controls was good. The control console (FIGURE 12) was conveniently located in the tractor. The four header and reel lift switches were easy to operate, though considerable operator experience was needed to control the two headers. The header height indicators were helpful in setting stubble height on the two headers, but the indicators were small and difficult to read in dusty conditions.

When double windrowing, draper position and direction were easily reversed with the switch on the console. However, the hydraulically shifted draper platform did not always move because the hydraulic pressure across the cylinder was not adequate. It is recommended that the manufacturer consider modifications to improve shifting of the front draper.

The main frame/reservoir made access to the tractor cab awkward.



FIGURE 12. Control Console.

Visibility: Visibility was good. The entire side header was easily viewed from the tractor. The front header was obstructed by the tractor cab and the windrower frame. The front cutterbar and material flow on the drapers could not be seen from the cab. The header height gauges helped in judging cutting height, but problems with knife plugging or poor crop feeding on the dividers or drapers was difficult to see. It is recommended that the manufacturers consider improving visibility of the front header.

Operation at night was difficult because tractor lighting was inadequate. Additional lights should be installed if night operation is desired.

Handling: Handling of the Muxlow Model 21-21 was good. Some operator experience was required. The operator had to watch and control two headers and also control steering and watch for obstructions or changing crop conditions. As operator experience increased, the windrower became much easier to operate. The tractor steering made the crop edge easy to follow. Double windrowing was convenient, since the adjustable transport cylinder made it easy to guide the second header alongside the front windrow.

Right-hand corners were easily made (FIGURE 13). Corners could be made smoothly without crop loss. The Muxlow Model 21-21 could also be used for opening fields or for cutting back and forth as is commonly done with self-propelled windrowers.

Stability on hills was very good and no skewing occurred. It followed rolling land well.

Transporting: Ease of transporting was good. The windrower could be placed into transport (FIGURE 14) on-the-go in only a few seconds. It travelled very well on open roads in transport position at speeds up to 20 mph (32 km/h). Corners were turned easily and safely. The transport width of 25.1 ft (7.7 m) was usually not a problem because the side header rode over the ditch. The windrower was too wide for most gates, bridges, and high-shouldered roads.

The headers did not have mechanical safety locks for transporting. It is recommended that the manufacturer consider supplying mechanical safety locks for the header lifts.

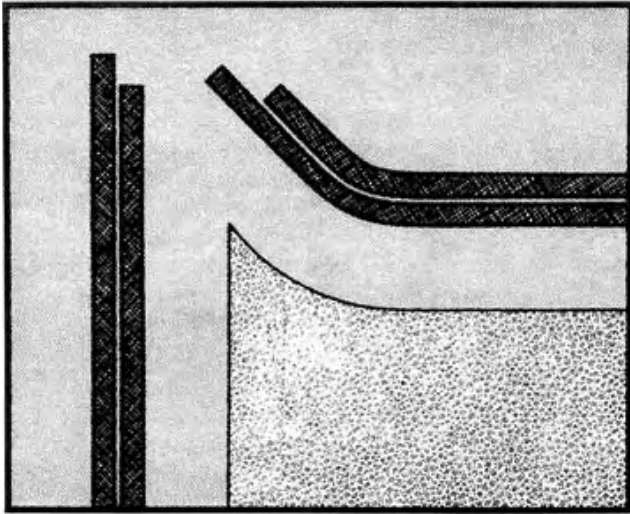


FIGURE 13. Typical Corner Formation.



FIGURE 14. Transport Position.

Adjustments: Ease of adjustment was very good. Draper and reel speeds were easily adjusted by flow control valves on the headers. Reel fore-and-aft position was easily adjusted by removing four bolts and sliding the reel. The draper tighteners were hard to turn due to sticking and binding. However, tension was not frequently adjusted. Table flotation was difficult to adjust, but adjustment was not normally required after initial set-up.

Double windrows were easily changed from side-by-side to stacked by installing the optional draper insert. The optional rapeseed rollers were easily installed with common wrenches, but were awkward to handle by one man.

Lubrication and Maintenance: Ease of lubrication and maintenance were very good. Daily lubrication took less than 5 minutes. The Muxlow Model 21-21 had only 6 pressure grease fittings. The hydraulic reservoir had to be checked daily and the windrower inspected for leaks or loose components. The hydraulic oil temperatures remained well below safe limits for hydraulic fluids.

Guards and knife sections were easy to change. The operator's manual contained a troubleshooting guide, lubrication points, and a parts list.

TRACTOR REQUIREMENTS

The Muxlow Model 21-21 required a tractor with a 1000 rpm power take-off spline and one remote tractor outlet. A minimum of 18 hp (13 kW) PTO was required. The manufacturer suggested using at least a 100 hp (75 kW) tractor with dual rear wheels, to carry the weight of the windrower and provide adequate stability. The Case/international 2294 had ample power and was stable in all field conditions.

OPERATOR SAFETY

Header safety locks for transporting were not supplied. It has been recommended that the manufacturer consider supplying them.

The tractor front tires were overloaded by 58%, according to the Tire and Rim Association guidelines. Front tires should be selected with a load rating of at least 4500 lb (1818 kg) each. Dual wheels must be used on the rear of the tractor. The operator's manual did not list suggested tire load ratings. The operator's manual did not emphasize safety and there were no warning decals on the machine. It is recommended that the manufacturer consider providing safety information with the machine.

OPERATOR'S MANUAL

The operator's manual was good. Assembly and installation instructions were adequate. However, more illustrations would have been helpful. The operator's manual contained a troubleshooting chart and general servicing information, but did not include complete operating instructions. Suggested settings for flotation, the reel, the drapers and some hydraulic valves were not given. It is recommended that the manufacturer consider including more complete operating instructions in the operator's manual.

In addition, safety was not discussed in the operator's manual. A recommendation to include safety information has been made.

MECHANICAL HISTORY

TABLE 2 outlines the mechanical history of the Muxlow Model 21-21 during 82 hours of field operation while windrowing about 1371 ac (555 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)
-Welds failed on the reel hinges, reel pipe positioning stops, and motor arms at	17, 22, 27, 77	273, 351, 418,	(110, 142, 169, 519)
-The reel hinges on the front header interfered with the sliding draper platform. The hinges were pried out of the way at	22	1283	(142)
-The front header height indicator began to stick and bind, stopping the height indicator scale at	22	351	(142)
-The height indicator cable broke at	22, 44	351	(169, 270)
-Four hydraulic fittings loosened and were retightened at	24, 44, 50	418, 668, 386, 668,	(156, 270, 317)
-A draper drive roller bearing seized and was replaced at	27	783	(169)
-The front tractor U-frame mount cracked and was rewelded at	27	418	(169)
-The flotation pins loosened and were rewelded at	27	418	(169)
-The draper roller bearings were dragging because of welds in rollers. The welds were filed down at	27	418	(169)
-The right front tractor tire popped off the rim and went flat during a turn at	32, 39	418	(201, 246)
The tire was not damaged		498, 608	
-The front draper was torn when the draper connector caught on a bent angle iron brace beneath the platform. The brace bent after going over a large stone. The brace was straightened and a new draper installed at	32		(201)
-The front header lift switch failed and was replaced at	39	498	(246)
-A rapeseed roller stopped when the set screw on the motor jammed against the frame. The set screw was filed down at	39	608	(246)
-The chain link supports on the rear of the rape rollers failed. They were replaced with 1/4" bolts welded to the frame at	39	608	(246)
-The plunger came loose inside one reel lift cylinder. It was retightened at	56	608	(385)
-The reel and header lift solenoid valves appeared to slowly creep down starting at	56	950	(385)
-The reel and header lift solenoid valves appeared to slowly creep down starting at	56	950	(385)
-The front header draper drive roller was wrapped with friction tape to reduce draper slippage at	69	950	(467)
		1164	
-Two hydraulic cylinder O-rings failed and two other cylinders began to leak			During the test
-Twelve hydraulic hoses and crimped fittings failed			During the test
-Ten dull or broken knife sections and six bent or broken guards were replaced			During the test

Hydraulic Cylinders and Hoses: The hydraulic cylinders had not been cleaned during assembly and the O-rings were damaged by metal chips in the cylinder. The hydraulic hoses failed due to poorly crimped fittings. Both problems resulted from poor quality control by the manufacturers. It is recommended that the manufacturer consider improving the quality of the hydraulic cylinders and hoses.

Mechanical Failures: The reel hinges failed at a sharp bend in the steel clamp. The knife motor arms failed at a weakly welded steel tab. The front mounting U-frame cracked because it was highly stressed, and had to carry the majority of the windrower's weight. The saddle pins loosened from the movement of the flotation system, and the weight on the pins. The draper rollers dragged on the bearings because of poorly finished weld surfaces in the bearing insert. It is recommended that the manufacturer consider improving quality control during fabrication and assembly.

APPENDIX I

MAKE:	Muxlow Super Swather		
MODEL:	21-21		
SERIAL NUMBERS:	4 MSW-AW 047		
CUTTERBAR:			
-- width of cut (divider points)	41.4 ft (12.6 m)		
-- effective cut (inside dividers)	40.4 ft (12.3 m)		
-- range of cutting height	2.0 to 27 in (50 to 690 mm)		
-- guard spacing	3.1 in (79 mm)		
-- length of knife section (over-serrated)			
- full depth	3.3 in (84 mm)		
- cutting length	2.1 in (53 mm)		
-- knife stroke	3.0 in (75 mm)		
-- knife speed	640 to 715 cycles/min		
HEADER:			
-- platform angle			
- fully raised	5° above horizontal		
- fully lowered	17° below horizontal		
-- number of drapers	2		
-- draper width	42 in (1067 mm)		
-- draper lengths	16.5 (5.0 mm)		
-- draper material	rubberized polyester with plastic slats		
-- draper speed range	0 to 464 fpm (0 to 2.3 m/s)		
-- draper roller diameter	2.4 in (61 mm)		
-- height of windrow opening	3.0 ft (0.9 m)		
-- width of windrow openings			
- between windboards	3.5 ft (1.1 m)		
- between rollers	3.6 ft (1.1 m)		
-- raising time	1.9 s		
-- lowering time	20 s		
REEL:			
-- number of bats	5 (on each header)		
-- number of arms per bat	5 (on each header)		
-- diameter	4.6 ft (1.4 m)		
-- speed range	0 to 35 rpm		
-- range of adjustment			
- fore-and-aft	9.5 in (241 mm)		
- height above cutterbar	34 in (860 mm)		
-- raising time	12 s		
-- lowering time	1.5 s		
HYDRAULIC SYSTEM:			
-- reel, draper and knife drives	power take-off driven pump and individual motors with flow control		
-- reel lift	cab controlled solenoid valve, two single acting cylinders in parallel, on each header		
-- header lift	cab controlled solenoid valve, two single acting cylinders on each header		
NO. OF CHAIN DRIVES:			
-- reels	2		
NO. OF V-BELTS:			
	0		
LUBRICATION POINTS:			
-- pressure grease fittings	4		
NO. OF PRELUBRICATED BEARINGS:			
	9		
TIRES:			
-- castor wheel	9/5 L - 15, 6-ply		
OVERALL DIMENSIONS:			
	<u>Field Position</u>	<u>Transport Position</u>	
-- width	41.8 ft (12.7 m)	25.1 ft (7.7 m)	
-- length	18.6 ft (5.7 m)	41.8 ft (12.7 m)	
-- wheel tread (tractor centreline to castor)	26.2 ft (8.0 m)		
-- wheat base	1.3 ft (0.4 m)	17.7 ft (54 m)	
WEIGHT:			
	<u>Windrower</u>	<u>Tractor</u>	<u>Gross Weight</u>
-- tractor front tires			
- left	2790 lb (1270 kg)	1700 lb (770 kg)	4490 lb (2040 kg)
- right	2790 lb (1270 kg)	1700 lb (770 kg)	4490 lb (2040 kg)
-- tractor rear tires			
- left	-1035 lb (-470 kg)	6000 lb (2720 kg)	4965 lb (2265 kg)
- right	45 lb (20 kg)	6040 lb (2740 kg)	6085 lb (2765 kg)
-- windrower			
- castor wheel	1930 lb (880 kg)		1930 lb (880 kg)
TOTAL	6520 lb (2983 kg)	15440 lb (7000 kg)	21960 lb (9980 kg)
OPTIONS AND ATTACHMENTS:			
-- rapeseed roller drapers			
-- side draper insert for stacked windrows			

**APPENDIX II
MACHINE RATINGS**

The following rating scale is used in Machinery Institute Evaluation Reports:

excellent	fair
very good	poor
good	unsatisfactory

SUMMARY CHART

MUXLOW SUPER SWATHER MODEL 21-21 TRACTOR MOUNTED WINDROWER

RETAIL PRICE	\$36,165.00 (March, 1986, f.o.b. Humboldt, Sask.)
RATE OF WORK	
Average Speed	4 to 5 mph (6 to 8 km/h)
Average Workrate	16 to 20 ac/h (6.5 to 8.1 ha/h)
QUALITY OF WORK	
Dividers	Fair ; flattened a strip of crop, powered divider needed in rapeseed
Reels	Good ; not enough forward adjustment
Cutterbars	Very Good ; adequate power, followed contours well
Header Flotation	Very Good
Drapers	Good ; front draper stopped when overloaded, rapeseed rollers worked well
Windrow Formation	Very Good ; mostly parallel, single or double windrows side-by-side, or stacked
Windrow Uniformity	Good ; bunching in rapeseed, heavy and tall leaning crops
EASE OF INSTALLATION	
Installation and Removal	Good ; took one man about 45 minutes, instructions adequate
EASE OF OPERATION AND ADJUSTMENT	
Controls	Good ; console convenient, header height indicators helpful
Visibility	Good ; side header easily viewed, front header was partly obstructed
Handling	Good ; operator experience required, corners easily made, very stable
Transporting	Very Good ; put into transport on-the-go, wide but side header rode over hitch
Adjustments	Very Good ; all adjustments easy
Lubrication and Maintenance	Very Good ; daily servicing took less than 10 minutes
TRACTOR REQUIREMENTS	Manufacturer suggested minimum 100 hp (75 kW) tractor with dual rear wheels, 18 hp (13 kW) PTO
OPERATOR SAFETY	No header safety locks, no warning decals or safety tips in operator's manual, tractor front tires overloaded
OPERATOR'S MANUAL	Good ; adequate assembly and mounting instructions, inadequate discussion of safety and operation
MECHANICAL HISTORY	Poor quality hydraulic cylinders and hoses, several mechanical problems



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