

APPENDIX G
BASICS OF MOWER DECK OPERATION

G-1 GENERAL.

G-1.1 Appendix G contains information on the basic principles of mower deck operation. Knowledge of these principles can be helpful when attempting to determine the cause of poor mowing deck performance.

G-2 BASIC CUTTING BLADE OPERATION.

Figure G-1 below depicts the normal cutting blade of a rotary mower deck as it moves through the grass.

The leading edge (relative to the direction of rotation) at each end of the blade will have a sharpened cutting edge.

The trailing edges of the blade will have *lift wings*, curving upward from the top surface of the blade. The height and pitch (angle) of these lift wings control the amount of vacuum created by the blade. This *vacuum action* serves the following functions:

- Stands the grass up for a quality cut.
- Provides the air movement needed to discharge the grass clippings.

The designed form of the deck housing directs this air movement, creating the *air flow* which carries the grass clippings out the discharge tunnel of the housing.

Any condition that will spoil this *air flow*, such as a damaged deck housing, grass build-up from previous

mowings, or mowing an excessive volume of grass, will adversely affect the mower deck performance.

As the cutting blade moves forward, it takes *bites* of grass. First one tip then the other, A,B,A,B,A,B, etc.

The size of these *bites* is determined by two things, the *ground speed* of the tractor and the *tip speed* of the cutting blade. Generally it is desirable to keep the bite size very small for a quality cut. The smaller bites allow efficient discharge of the grass clippings, which will lessen problems with clogging. The smaller bites also require less engine horsepower.

The *tip speed* of the cutting blade is limited by regulations to 19,000 feet per minute. The mower deck *must be designed to operate within this regulated tip speed* when the tractor engine is running at top (no load) speed. Consequently, mowing at a slower engine speed will **not** produce the preferred blade tip speed.

The bite size of the of the cutting blade is under the control of the operator through ground speed and engine speed. Because of the *regulated tip speed*, it is

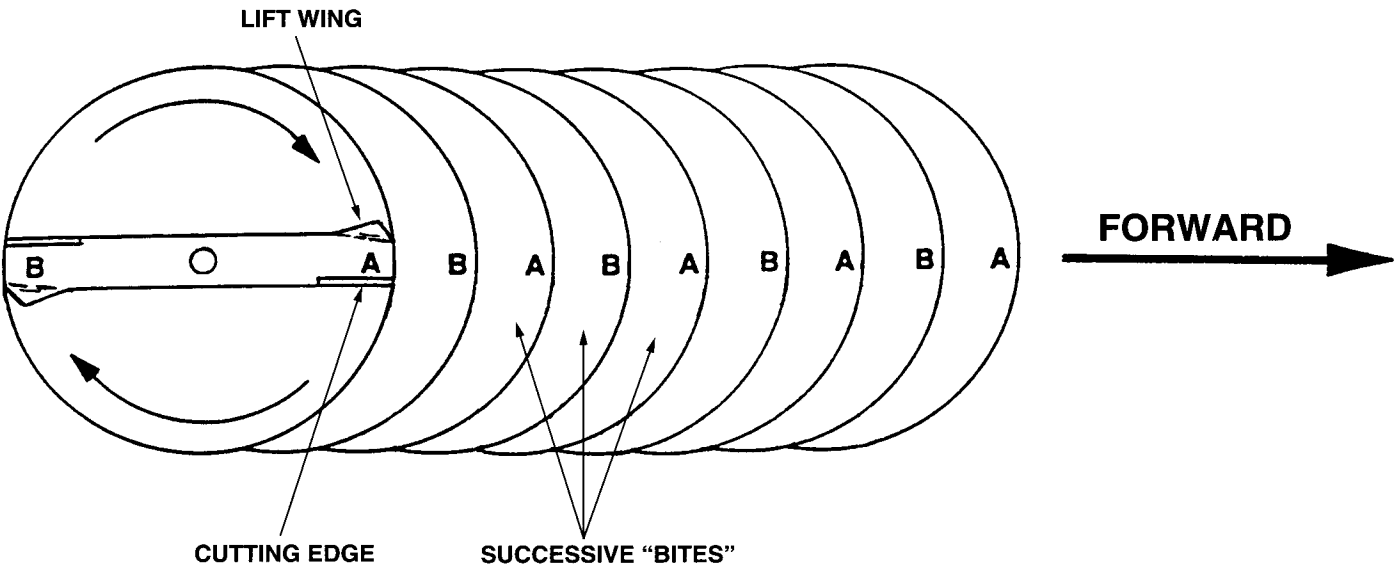


Figure G-1. Basic Cutting Blade Operation.



NOTE:

The forward tilt of the cutting blade shown in this figure is exaggerated for informational purposes. In practice, the front of the blade should be approximately 1/8 to 1/4 inch lower than the rear.

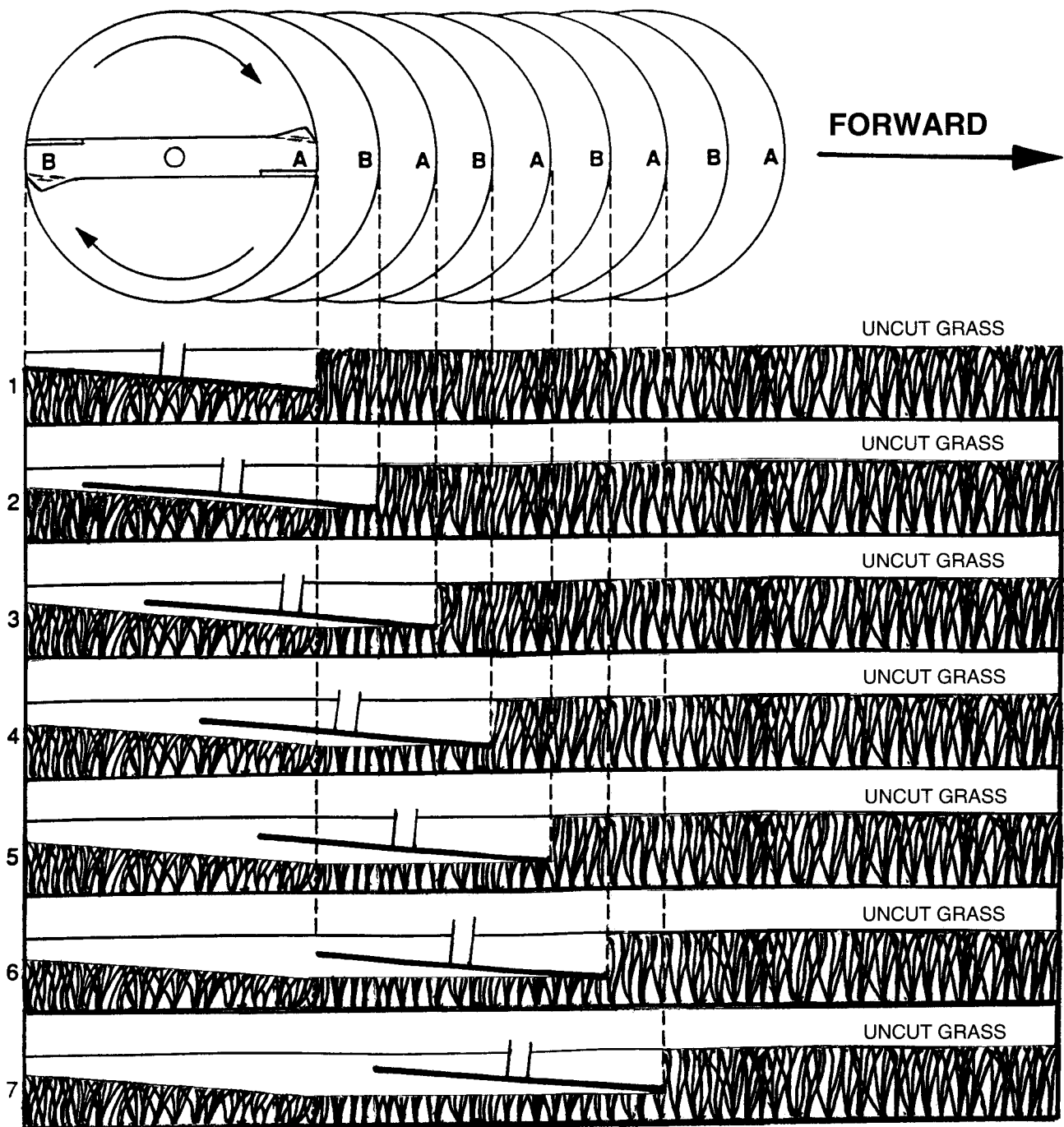


Figure G-2. Cutting Grass With Mower Deck Correctly Leveled.

normally recommended that the tractor engine be operated at full throttle when cutting grass. The operator must decide what *bite size* is right for the particular lawn being mowed, and adjust the ground speed to control the bite size. The right bite for the same lawn may differ from one cutting to the next, or one area to another. The ground speed may have to be adjusted to compensate for changes in *grass length*, *desired cutting height*, *moisture content*, and possible *horsepower* or *terrain* changes. In all cases, the right bite size is determined by the conditions.

G-3 MOWING WITH A CORRECTLY LEVELED MOWER DECK.



The forward tilt of the cutting blade shown in Figure G-2 is exaggerated for informational purposes.

Figure G-2 depicts the cutting blade of a properly leveled mowing deck as it moves through the grass.

Line 1 shows the plane of the cutting blade with the tractor stationary on the lawn. At this point, the mower deck is *engaged* and the blade starts spinning.

Note (line 1) when the mower deck is initially engaged, the cutting blade is in *full contact* with the grass. The entire length of the blade is attempting to cut grass, even the unsharpened areas of the blade. This results in ragged cut at the spot of engagement.

The succeeding lines (2 through 7) show the plane of the blade as it moves forward through the grass. Note that **only** the leading edge of the blade is in contact with the grass, due to the *forward tilt* of the mower deck. Each blade of grass is cut to the proper height with just one cut. **This is the condition desired when performing deck leveling procedures.**

G-4 MOWING WITH AN INCORRECTLY LEVELED MOWER DECK.



The rearward tilt of the cutting blade shown in Figure G-3 is exaggerated for informational purposes.

Figure G-3 depicts the cutting blade of an improperly leveled mowing deck as it moves through the grass.

Line 1 shows the plane of the cutting blade with the tractor stationary on the lawn. At this point, the mower deck is *engaged* and the blade starts spinning.

Note (line 1) when the mower deck is initially engaged, the cutting blade is in *full contact* with the grass. The entire length of the blade is attempting to cut grass, even the unsharpened areas of the blade.

The succeeding lines (2 through 7) show the plane of the blade as it moves forward through the grass. Note that the condition does not improve. The entire length of the blade remains in *full contact* with the grass as a result of the rearward tilt of the mower deck.

As the blade moves forward, the leading edge of the blade makes a major cut of the grass; while the *remainder of the blade length* attempts to make many more *minor cuts*, with the trailing edge making the final cut.

These many *minor cuts* of each blade of grass can result in damaged or frayed grass tips, and, especially in lush grass, can cause a *milking* of the tips. This *milking*, combined with the bits of grass from the many minor cuts, can form a paste-like substance which can stick the underside of the deck housing. As this condition continues, the deck *air flow* is disrupted and eventually the deck becomes plugged.

This multiple cutting of the grass requires more engine horsepower. Also, because of the increased load, may cause premature PTO clutch and/or belt wear.

G-5 CORRECT MOWER DECK LEVELING.



Refer to the appropriate tractor or deck Owner's Manual for the specific deck leveling procedure.

Before attempting to level the mower deck, ensure all deck hangers are properly connected and all tires are inflated properly.

Place the tractor on a hard, flat and level surface.

All measurements requested in the leveling procedure should be measured from the sharpened edge



The rearward tilt of the cutting blade shown in this figure is exaggerated for informational purposes. However, even a minor rearward tilt will result in the condition shown.

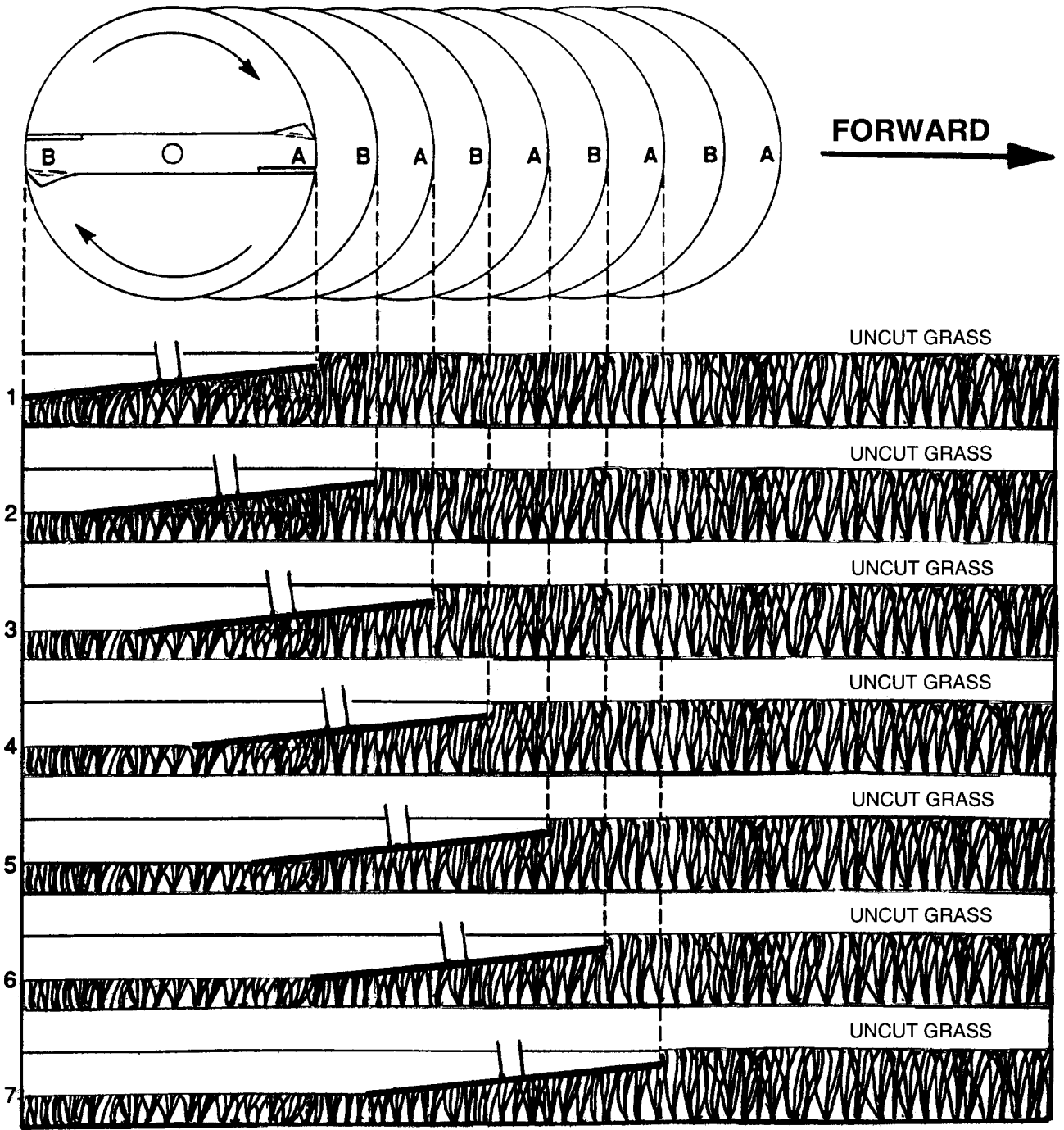


Figure G-3. Cutting Grass With an Incorrectly Leveled Mower Deck.

of the blade tip to the flat level surface. DO NOT take measurements from the deck housing.

Level the mower deck in the following sequence:

- Position the two outer blades so they are pointing left to right (perpendicular to tractor frame).
- Measure the height of the outside blade tips from the flat level surface. The measurements should be within 1/16 inch of each other.
- If necessary, refer to the Owner's Manual to adjust the side to side leveling.
- Rotate the blades 180 degrees and measure again at the same points. The measurements should be the same. A difference in measurements could indicate a bent — blade, blade spindle, or spindle mounting surface.
- Position the outer blades fore and aft (parallel to tractor frame).
- Measure the height of the *forward* blade tips; then measure the *rearward* blade tips. The *forward* measurement should be 1/8 to 1/4 inch **LESS** than the rear measurement.
- If necessary, refer to the Owner's Manual and perform the adjustments needed to achieve the above specified *forward tilt*.

G-6 MOWING WITH A MULTI-BLADE MOWER DECK.

NOTE

The conditions depicted in Figures G-4.2 and G-4.3 are exaggerated for instructional purposes.

There are two basic types of multi-blade mowing decks.

The less popular type is designed with “timed” cutting blades. This design allows the blades to be placed in line with each other, with the blade tips actually overlapping. The problems with this design are:

- The need for costly *toothed* timing belts and pulleys.
- The frequency of belts “jumping time.” This can allow the blades to contact each other, which could result in extensive damage.

The more practical type is the design shown in Figure G-4. With this design, the blades are positioned offset behind one another and cannot come in contact with each other.

Figure G-4.1 depicts this design on a two-bladed mower deck moving in the straight forward direction. Note the *staggered* arrangement of the blades create the *blade overlap* that is necessary to avoid leaving strips of uncut grass.

Characteristics of this style mowing deck can, however, affect the mowing procedure and resulting quality of cut. Particularly when turning the tractor while mowing.

Figure G-4.2 depicts the same two-bladed mower deck in a tight left turn. Note that as the tractor turns, the right blade trails behind the left blade; momentarily increasing the *blade overlap* while decreasing the cutting width.

Figure G-4.3 shows the two-bladed mower in a tight right turn. As the tractor turns, the space between the blades momentarily aligns with the direction of travel. This allows a thin strip of uncut grass to pass between the blades, resulting in a poor quality cut.

On a three-bladed deck, both of the conditions described above (Fig. G-4.2 and G-4.3) apply when turning the tractor in either direction.

- When turning to the left, the space between the left and center blades aligns with the direction of travel, leaving uncut grass. The right blade trails the center blade; increasing the overlap while decreasing the cutting width.
- When turning to the right, although the conditions and results are reversed, the same poor quality cut is obtained.

When mowing the lawn with a multi-blade mower deck, the following procedures are recommended for the best cut quality and appearance:

- When making turns, reduce the tractor ground speed.
- Cut in a “*clover-leaf pattern*,” with the turns being made over the previously cut grass.
- Remow areas where the initial cut was made while turning the tractor.
- Discharge grass clippings toward the previously mowed areas.

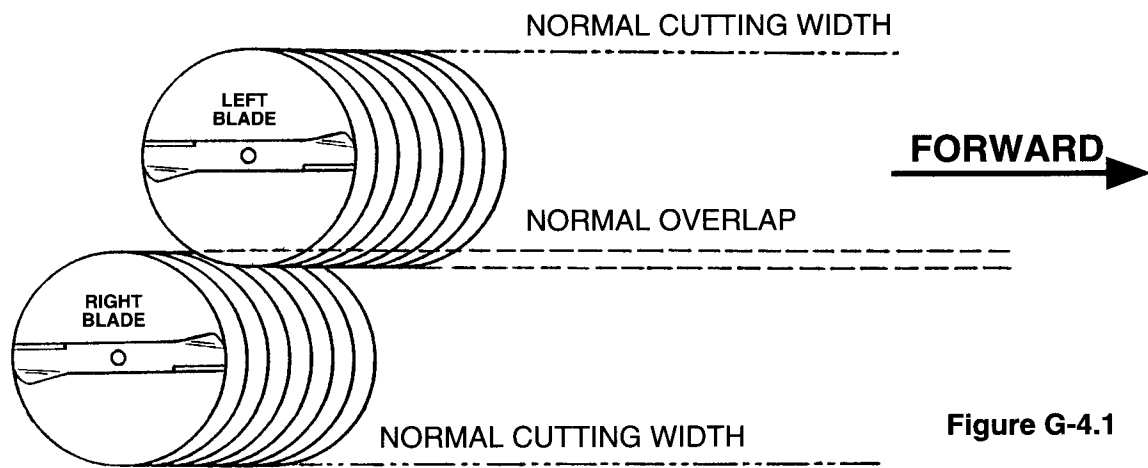
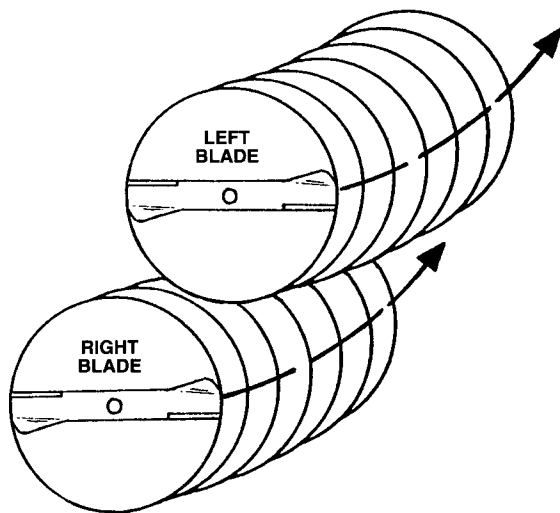
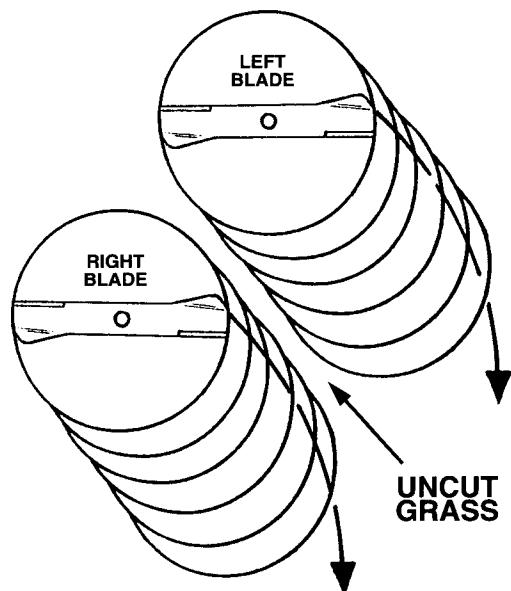


Figure G-4.1



LEFT TURN

Figure G-4.2



RIGHT TURN

Figure G-4.3

Figure G-4. Mowing with Multi-Blade Mowing Decks.

Table G-1. Basic Mower Deck Troubleshooting.

MOWER DECK TROUBLESHOOTING		POSSIBLE CAUSES SYMPTOMS												
		UNCUT GRASS (PATCHES)	UNCUT GRASS (RANDOM)	UNCUT GRASS (BETWEEN BLADES)	UNEVEN CUT	SCALPING	VIBRATION	BELTS SLIPPING	ENGINE LUGS DOWN	POOR BAGGING	PLUGGING DECK/CHUTE	GRASS BLOWING OUT FROM UNDER DECK	BLADE SPINDLE BEARING FAILURE	DECK DRIVE PULLEY BEARING FAILURE
OPERATOR CONTROLLED	GROUND SPEED TOO HIGH	•	•	•	•			•	•	•	•			
	ENGINE RPM TOO SLOW	•	•	•	•		•		•	•	•			
	CUTTING TOO LOW					•		•	•	•	•			
	CUTTING TOO HIGH	•	•	•										
	TURNING SPEED TOO FAST	•	•	•	•	•								
ENVIRONMENT RELATED	ROUGH OR UNEVEN TERRAIN	•	•	•	•	•			•					
	GRASS VERY DRY	•	•	•						•				
	GRASS VERY WET	•	•	•	•		•	•	•	•	•			
	GRASS TOO HIGH	•	•	•	•		•	•	•	•	•			
	SANDY TERRAIN												•	•
MAINTENANCE PROBLEMS	DECK INCORRECTLY ADJUSTED	•	•	•	•	•	•	•	•	•	•	•		
	DEBRIS UNDER DECK	•	•	•			•	•	•	•	•	•	•	
	'V' BELTS DAMAGED/STRETCHED	•	•	•			•	•		•	•			
	OIL OR GREASE ON BELTS	•	•	•				•		•	•			
	PTO CLUTCH SLIPPING	•	•	•			•			•	•			
	DULL OR WORN BLADES (CUTTING EDGE OR LIFT WINGS)	•	•	•	•				•	•	•	•		
	BLADES BENT/OUT OF BALANCE	•	•	•	•	•	•			•	•	•		
	BLADES INSTALLED UPSIDE DOWN	•	•	•	•	•	•	•	•	•	•			
	INCORRECT BLADES	•		•		•		•	•	•	•	•		
	TIRES OVER/UNDER INFLATED	•	•		•	•								
MECHANICAL PROBLEMS	DAMAGED OR SEIZED SPINDLES OR BEARINGS	•	•	•			•	•	•	•	•		•	•
	PTO CLUTCH WORN OR IMPROPERLY ADJUSTED	•	•	•			•			•	•			
	DECK WORN OR DAMAGED									•	•	•		