

MULTI-BLADE WINDMILL

DESIGN A

PARTS AND MATERIALS

NUMBER REQUIRED	PARTS	SIZE		MATERIALS
		ENGLISH "	METRIC mm	
1	Base	3/4 x 10 x 10	20x254x254	Pine
1	Tower	3/4 x 5 x 18	20x127x457	Pine
1	Gearbox	3/4 x 2 1/2 x 5 1/2	20x64x140	Pine
1	Bedplate	1/8 x 3/4 x 16	3x20x407	Strap iron
1	Tail-vane	1/8 x 4 x 12	3x101x305	Hardboard or aluminum plate
8	Blades	1/8 x 4 x 9	3x101x230	Hardboard
1	Hub	3/4 x 4 x 4 5/8	20x101x118	Pine
8	Dowels	1/4 x 5	6x127	Birch
8	Dowel connectors	1/2 x 3/4 x 3	12x20x76	Pine
1	Shaft	1/4 x 5 1/2	6x140	Cold rolled steel or bolt
1	Axis	1/4 x 2	6x50	Birch dowel
2	Bushings	1 x 1 x 1	26x26x26	L extruded aluminum

PROCEDURE

BASE

1. Cut to size (3/4x10x10). File and sand end grain.
2. Rout design on top edges.
3. Drill two 3/16" (5mm) holes completely through on centerline. Countersink for flat head screws.
4. Finish sand.

TOWER

1. Layout your own design and cut to shape. Disc and drum sand edges.
2. Drill a 9/32" (8mm) hole 1" (25mm) deep in middle of the top.
3. Rout sides and finish sand.
4. Use glue and attach tower to base with two No.8 1 3/4" (20mm) flat head screws.
5. Apply finish.

GEARBOX

1. Layout gearbox and cut to shape. Disc and drum sand to size.
2. Cut notch 1/2" (12mm) deep and 3/8" (9mm) wide in location shown on drawing.
3. Drill 1/4" (6mm) hole 1/2" (12mm) deep for axis dowel.
4. Final sand and apply finish.

BEDPLATE

1. Cut a 1/16" (1.5mm) x 3/4" (20mm) piece of strap iron 15" (380mm) long. File ends smooth.
2. Layout and drill 1/8" (3mm) holes for screws on drill press. Remove burrs with file.

TAIL-VANE

1. Cut tail-vane to size (4"x12"). Taper leading edge as shown in drawing.
2. Draw centerline and layout for bedplate. Use bedplate for proper alignment and center punch with scratch awl.
3. Drill 1/8" (3mm) holes on drill press.
4. Attach tail-vane to bedplate with nuts and bolts or rivets.

BLADES

1. Cut blades to shape. Disc sand to size.

HUB

1. Layout hub according to drawing using 45° triangle, rule, and compass.
2. Cut to rough shape and disc sand to size.
3. Layout for blade holes and center punch. Also center punch shaft center location.
4. Drill all holes with a 1/4" (6mm) drill bit. Use press vise for drilling holes 3/4" (20mm) deep. Use construction lines on hub to keep drill holes in proper alignment. Drill shaft hole completely through stock.
5. Sand smooth.

DOWELS AND CONNECTORS

1. Cut eight dowels to length. Slightly round all dowel edges and sand surfaces smooth.
3. Layout and drill hole 1/4" (6mm) diameter hole in center of one side of each connector. Drill 1" (25mm) deep.
4. Layout and disc sand curve on non-drilled end.
5. Glue and nail connectors to each blade.
6. Glue dowels in place.

SHAFT

1. If bolt is used, cut off head. File smooth and taper edge. If round cold rolled steel is used, cut one 5 1/2" (138mm) length. Use die and cut threads to a depth of 1 1/4" (31mm) in one end.
2. Use fine emery cloth and polish shaft smooth in drill press.

AXIS

1. Cut one 1/4" (6mm) dowel 1 3/4" (45mm) long. Slightly round ends with sand paper.
2. Glue axis dowel into gearbox.

BUSHINGS

1. Cut two 1" (25mm) wide bushings from 1" (25mm) aluminum stock. File edges square and smooth.
2. Carefully layout and center punch.
3. Drill holes on drill press using drill press vise. For shaft holes, use 17/64" (7mm) drill bit. For screw holes, use 1/8" (3mm) drill bit. Remove burrs with file.

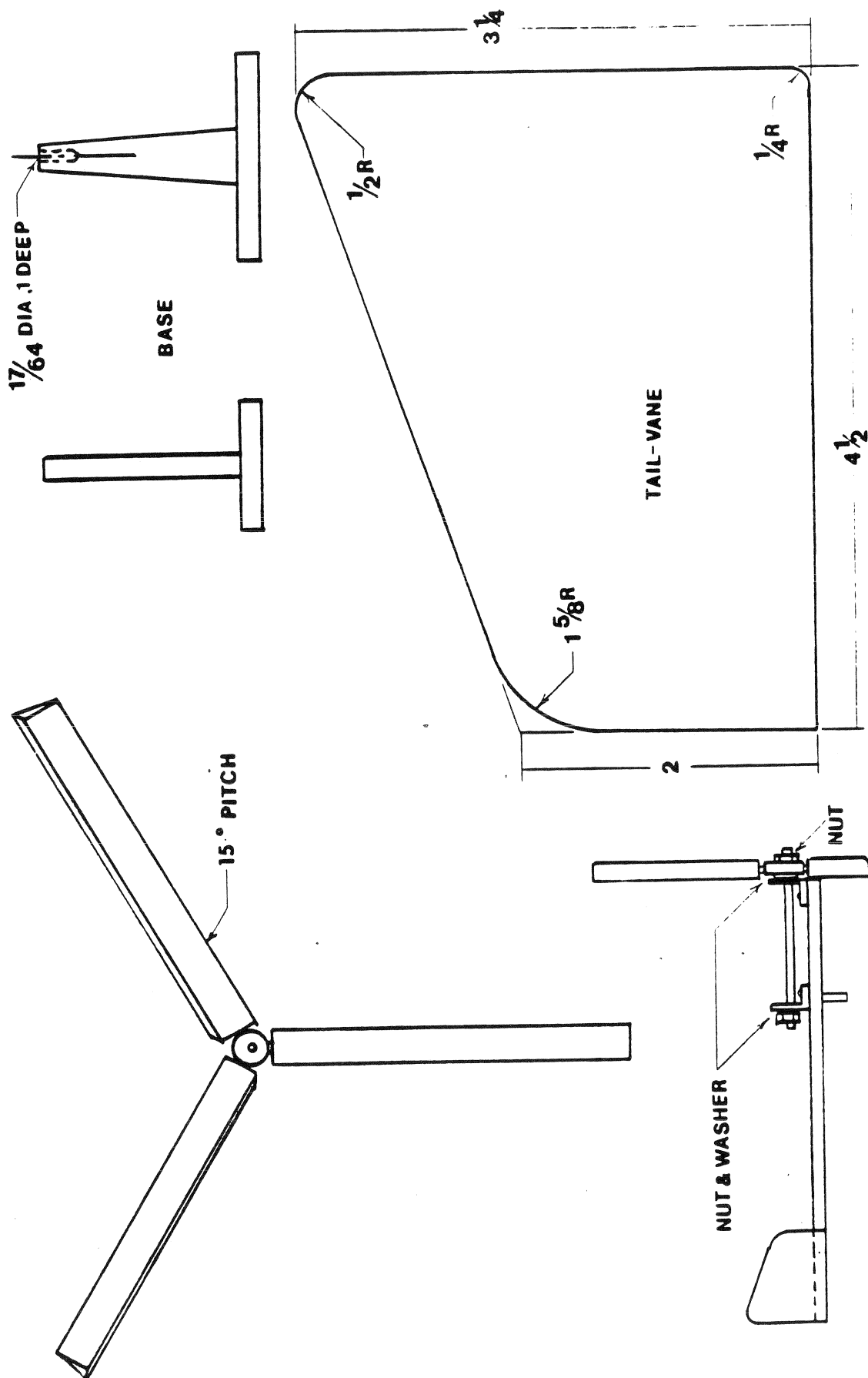
ASSEMBLY

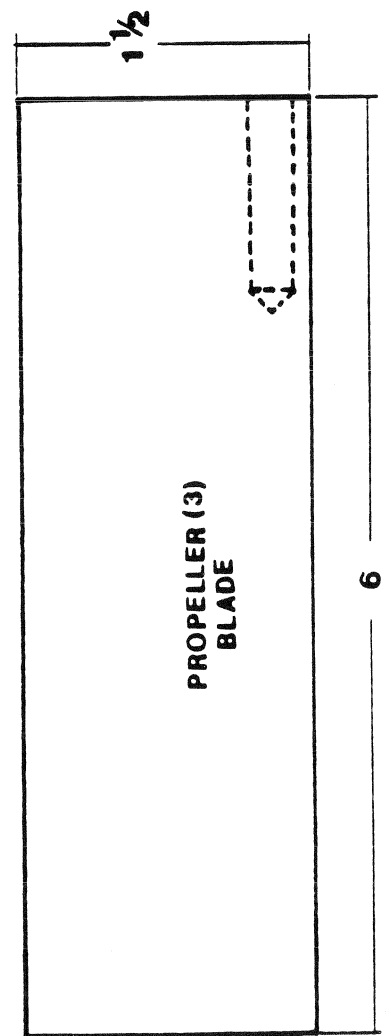
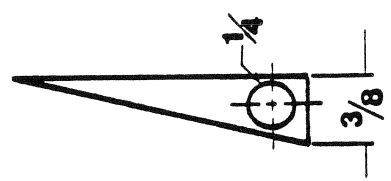
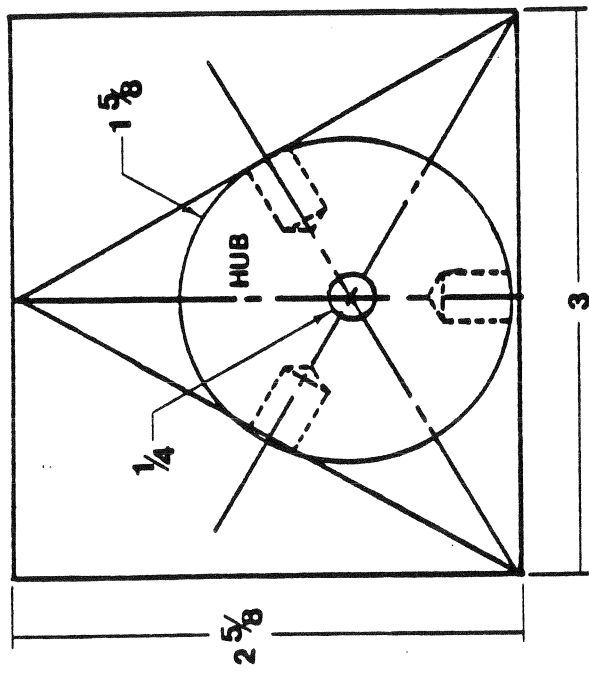
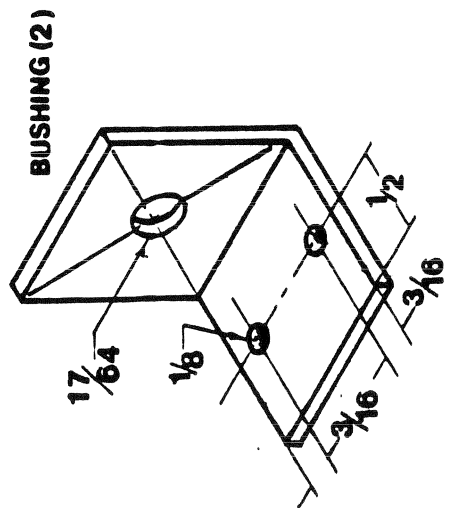
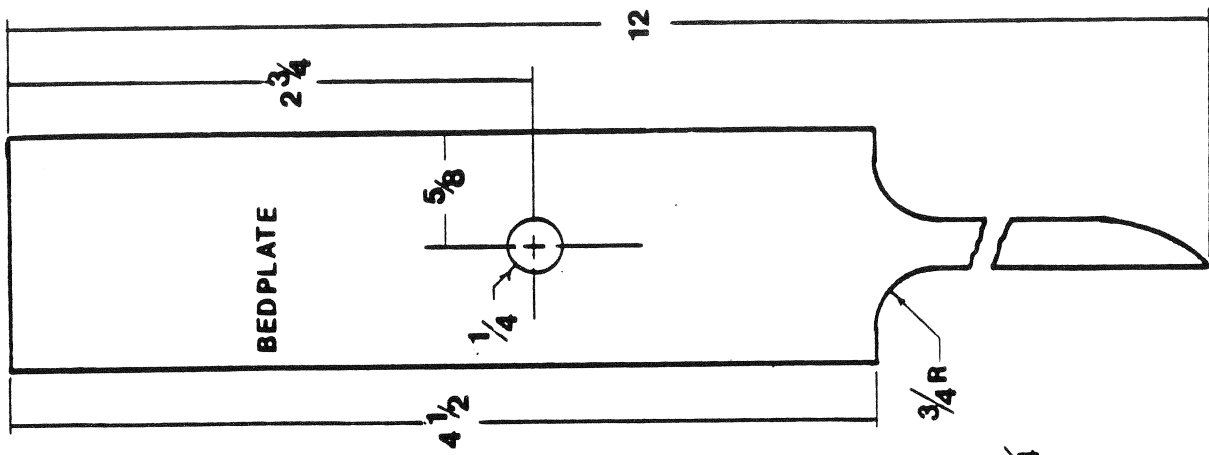
1. Attach bushings to gearbox with No. 6 one-half inch round head screws. See drawing.
2. Attach tail-vane assembly with No. 6 one-half inch round head screws.
3. Install shaft in hub using nut on front and back of hub. Tighten with wrenches.
4. Use glue and install blades with a 30° pitch. Use sliding T-bevel for measuring pitch.
5. Use a washer between hub and front bushing.

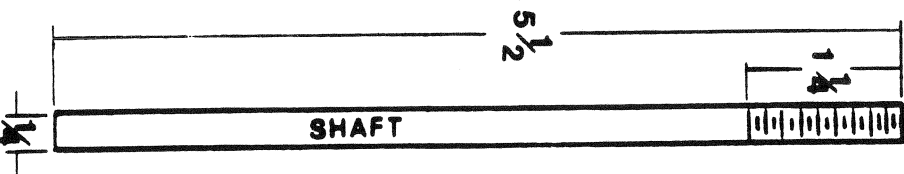
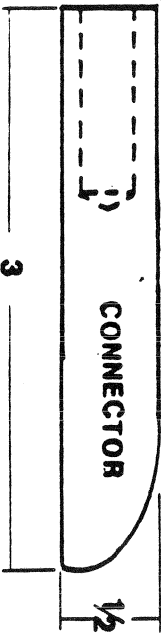
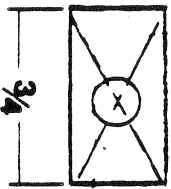
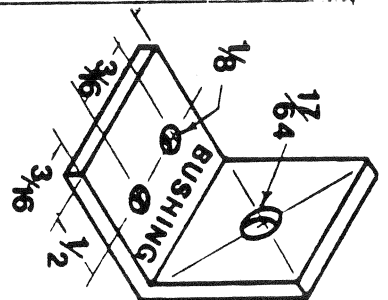
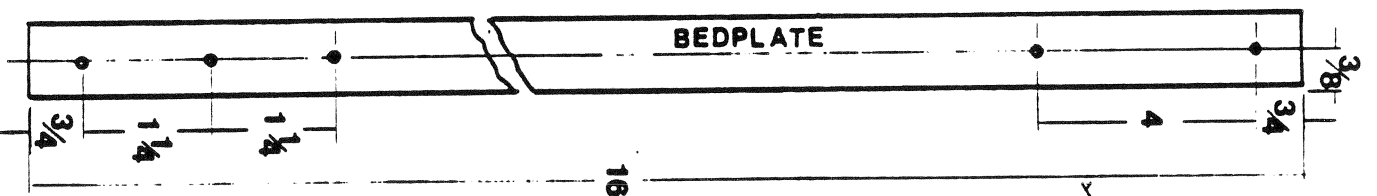
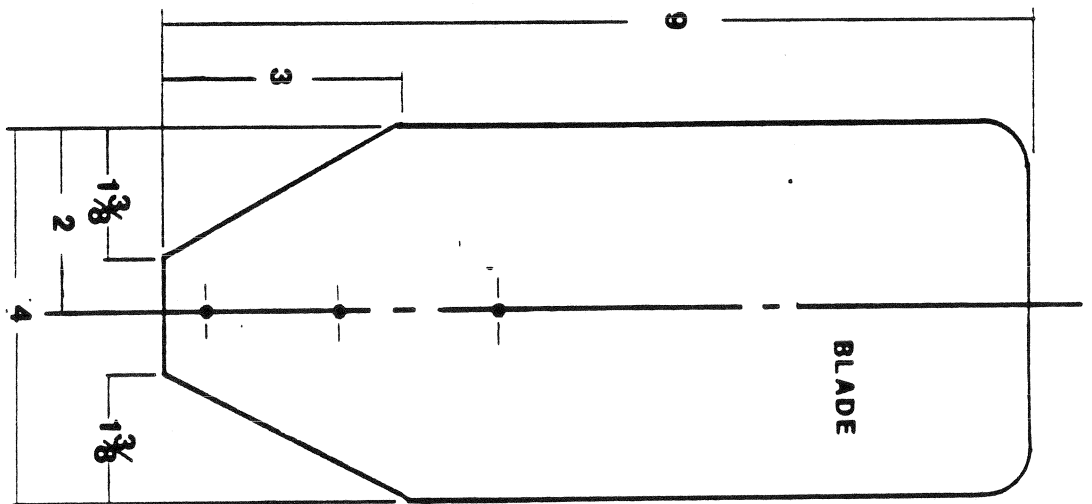
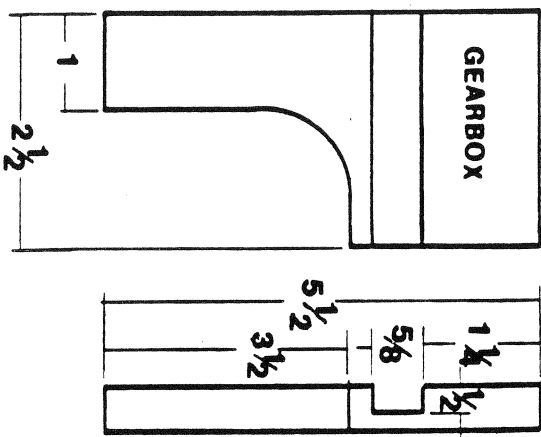
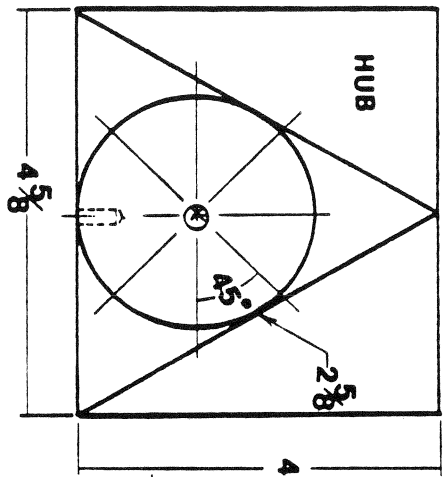
NOTE:

This windmill is designed so that with proper gearing and the use of a 1 1/2 volt DC motor as a generator electrical power can be produced. If you are interested in doing so, discuss it with your teacher and he or she will provide you with the necessary information on how to do it and where to obtain the parts.

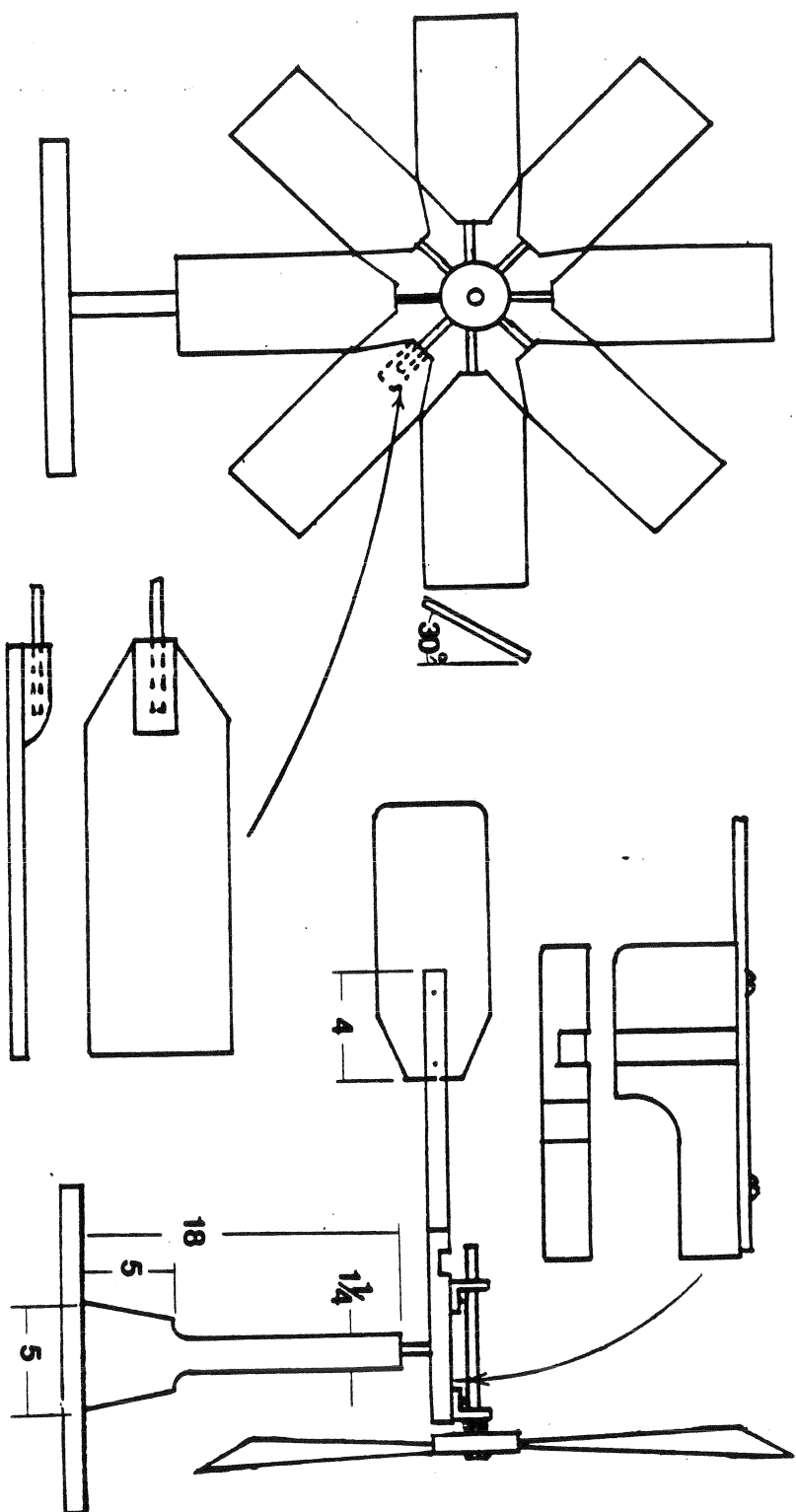
3 BLADED WIND MACHINE







MULTI-BLADE WINDMILL design A



TAIL-VANE

1. Layout and cut tail-vane to size on bandsaw.
2. Disc sand to shape.

BUSHINGS

1. Cut two 1" (25mm) wide bushings from angle stock. File edges smooth.
2. Layout and drill holes as specified. Use drill press and drill press vise.
3. File off burrs.

SHAFT

1. Cut 1/4" (6mm) stock 5" (126mm) long. File and chamfer both ends.
2. Use a die and thread one end 1 1/4" (31mm) deep and the other end 1/4" (6mm) deep.
3. Polish shaft on drill press with emery cloth taking care not to damage threads by using masking tape.

ASSEMBLY

1. Use two nuts and secure propeller assembly to shaft with an open end wrench.
2. Glue and nail tail-vane in place.
3. Apply finish and let dry.
4. Locate bushing on top side of bedplate as shown in drawing.
5. Install shaft in bushings with washers as shown in drawing.

BASE

1. A sample base is shown in drawings. Design and size is at the option of your instructor.
2. A 3/4" x 3/4" (20mm x 20mm) board at least 12" (305mm) long can be used instead of a base if the wind machine is going to be installed to a structure at your home. The hole in the top of the board should be 17/64" (7mm) in diameter and drilled 1" (25mm) deep.

