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Dave Campbell
Editorial Content Chief, *WOOD* magazine



Adobe Acrobat Reader Troubleshooting Guide

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Construction-Grade *Excavator*

Kids (*and grown-ups*) will dig this scaled-down scooper.

Put this toy and a pile of marbles or Legos in front of children and watch them while away the time scooping and moving them. The excavator shares design elements with the crane DP-00594 [**More Resources**, page 8].

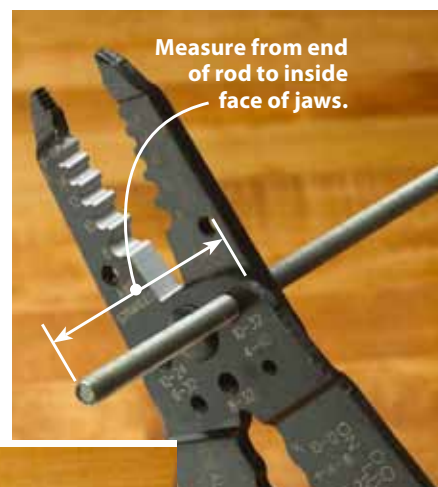
AT A GLANCE

- Overall dimensions: 19 $\frac{3}{16}$ " long × 6" wide × 6 $\frac{7}{16}$ " high with the bucket at ground level
- Bucket capacity: Approx. .00008 cu. yd. (3.75 cu. in.)
- Boom reach: 14"
- Dig depth: 8 $\frac{1}{4}$ "
- Engine rated at 1 kidpower, continuous duty

SHOP TIP

Cutting threaded rod: It's a snap

Cut 4-, 6-, 8-, and 10-gauge threaded rod quickly and cleanly with a pair of wire stripper/cutters. Thread the rod into the appropriately sized hole in the tool, *below*, then shear it to length. Twist the rod out of the cutter, and the tool cleans up the cut threads. Find stripper/cutters at most hardware and home-improvement stores for about \$20.



We start with a bucket, then boom

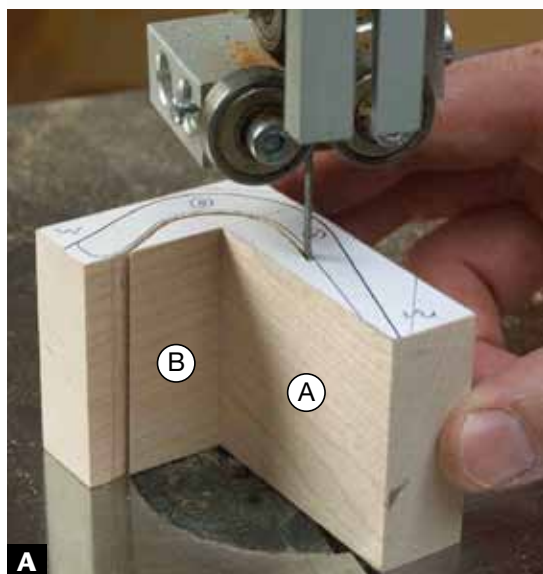
1 From $\frac{3}{4}$ "-thick stock, cut the bucket bottom (A) and bucket back (B) to size [Materials List, page 7]. Glue the pieces together with the grain running in the same direction [Drawing 1].

2 Make two copies of the **Bucket Side Pattern** from page 9, and set one aside. Trim the other along the dashed lines around parts A and B, and adhere the pattern to the bucket assembly (A/B). Cut away the inside waste at the band-saw [Photo A].

3 Cut the bucket sides (C) to size and apply the remaining **Bucket Side Pattern** to one. Stack the bucket sides with their edges flush and drill holes where indicated. Cut two 2 $\frac{3}{4}$ " lengths of threaded rod [Shop Tip, at right], and screw an acorn nut onto one end of each. Glue and clamp the bucket sides to the bucket (A/B) [Photo B].

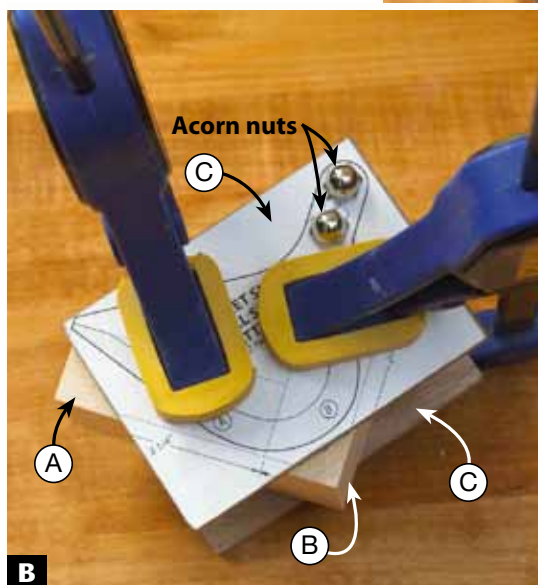
4 Make two copies of the **Boom Side Pattern** and one copy of the **Jib Pattern** page 10. Spray-mount them to your stock, then cut and sand the jib (D) and boom sides (E) to shape. Spray-mount a copy of the **Cab Pattern** page 9, to a piece of 1 $\frac{1}{2}$ "-thick stock (or laminated $\frac{3}{4}$ " stock) and cut the cab (F) to shape. Drill the holes where indicated on the patterns, then chamfer the edges. Sand the parts to 150 grit, then glue the Shaker peg into a boom side [Drawing 1]. **Note:** The peg can go on either boom side.

5 Apply one copy of the **Jib Lever Pattern** and two copies of the **Boom Pivot Pattern** to $\frac{1}{2}$ " stock, and cut the jib lever (G) and boom pivots (H) to shape. Cut the jib pistons (I) to shape following the **Jib Piston Pattern**. Sand away the patterns and any mill marks with 150-grit sandpaper. Cut five lengths of threaded rod for the boom [Drawing 1], then set the bucket (A/B/C), boom pieces (D, E, G, H, I), and cab (F) aside.



A CUT THE BUCKET TO SHAPE

Bandsaw just outside the line inside the bucket, then sand to the line using a spindle sander. Use a $\frac{1}{8}$ " or $\frac{1}{4}$ " blade to cut this curve.



B CROSS THIS OFF YOUR BUCKET LIST

Align the dashed lines on the pattern with the edges of the bucket (A/B). Threaded rod through the bucket sides (C) aligns them.

Turn your attention to the pivot table

1 Cut to size and shape the pivot table (J), counterweight (K), and catwalk (L). Cut the engine cover (M) to size [Drawing 2] and apply a copy of the **Engine Cover Pattern** to it. Drill the holes in the engine cover, counterweight, and pivot table [Drawing 2]; then rout round-overs on the counterweight and engine cover. Glue the smokestack into the engine cover and set the cover aside.

2 Glue the catwalk (L) to the pivot table (J) with the top and front ends flush [Drawing 2]. Then, glue a boom pivot (H) to the pivot table [Photo C]. After the glue sets, glue the remaining boom pivot in place [Photo D].

3 Glue and clamp the counterweight (K) to the pivot table (J) against the boom pivots (H) and centered side-to-side. To center the counterweight hole over the hole in the pivot table, push a bolt through both holes.

4 Assemble the jib (D), boom sides (E), jib lever (G), and jib pistons (I) with threaded rod and acorn nuts [Drawing 1]. Attach this assembly to the boom pivots (H). Then screw (don't glue) the cab (F) to the pivot table (J). This allows for removing the cab to adjust resistance on the boom arm.

Fabricate a massive chassis

1 Cut the chassis (N) to size and lay out the tapers and axle holes on both sides [Drawing 3a]. Drill the $\frac{3}{8}$ " hole and counterbore centered on the bottom [Drawing 3]. Then cut the tapers

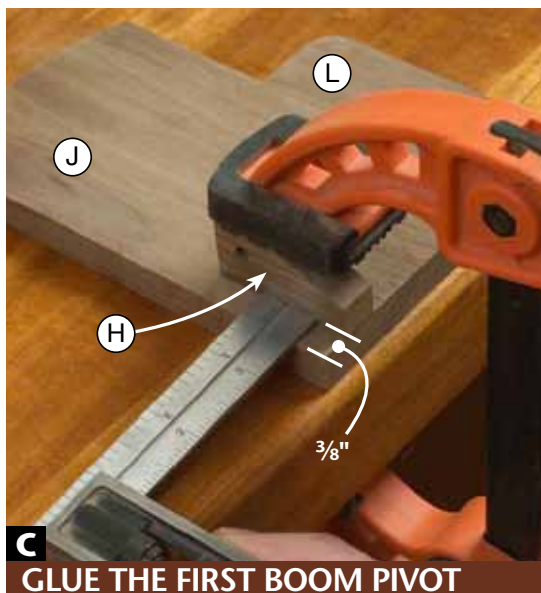
and drill the axle holes [Photo E].

2 Adhere two copies of the **Wheel Spacer Pattern** to $\frac{3}{4}$ "-thick stock. Cut the wheel spacers (O) to size, and drill the holes. Glue the spacers to the chassis (N), centered between the ends and flush at the bottom [Drawing 3a].

3 Cut the turntable (P) to size and chamfer the top edges [Drawing 2]. Glue and clamp the turntable to the chassis, centered. After the glue dries, drill through the turntable, using the hole in the chassis as a guide.

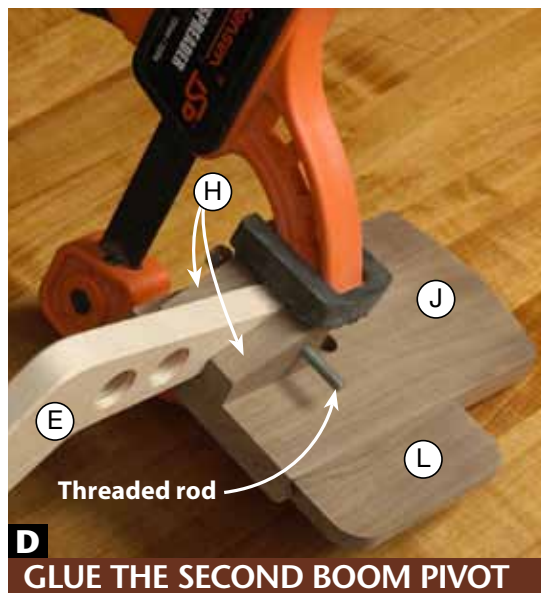
4 Spray-mount two copies of the **Wheel Cover Pattern** to $\frac{1}{2}$ " stock and cut the wheel covers (Q) to size and shape. Glue the covers to the chassis [Drawing 3a, Photo F].

5 If needed, sand the axle pegs to fit snugly in the axle holes in the chassis (N) and wheel spacers (O). Cut $\frac{1}{8}$ " from the $\frac{7}{8}$ "-long pegs [Drawing 3]. Test the fit of the wheels and axles, but don't glue them in place.



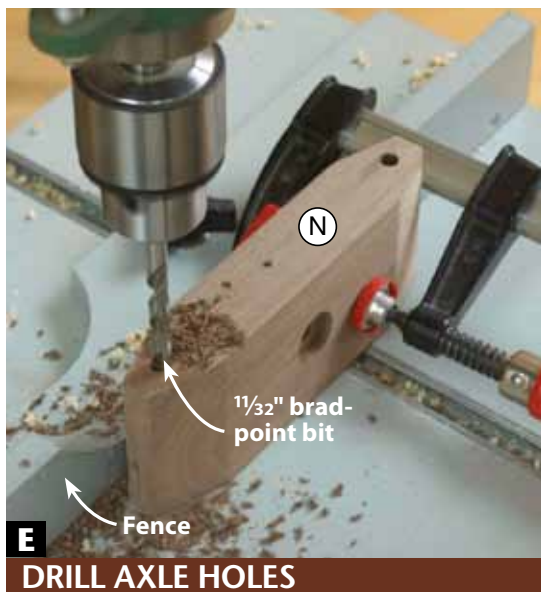
C GLUE THE FIRST BOOM PIVOT

Measure to position the first boom pivot (H). Glue the pivot in place with the narrow end flush with the end of the pivot table (J).



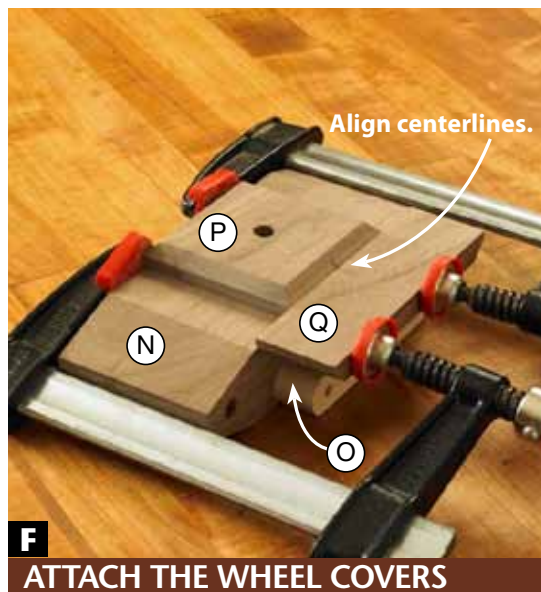
D GLUE THE SECOND BOOM PIVOT

Use a boom side (E) and threaded rod to position the second boom pivot (H). The boom should move with very light resistance.



E DRILL AXLE HOLES

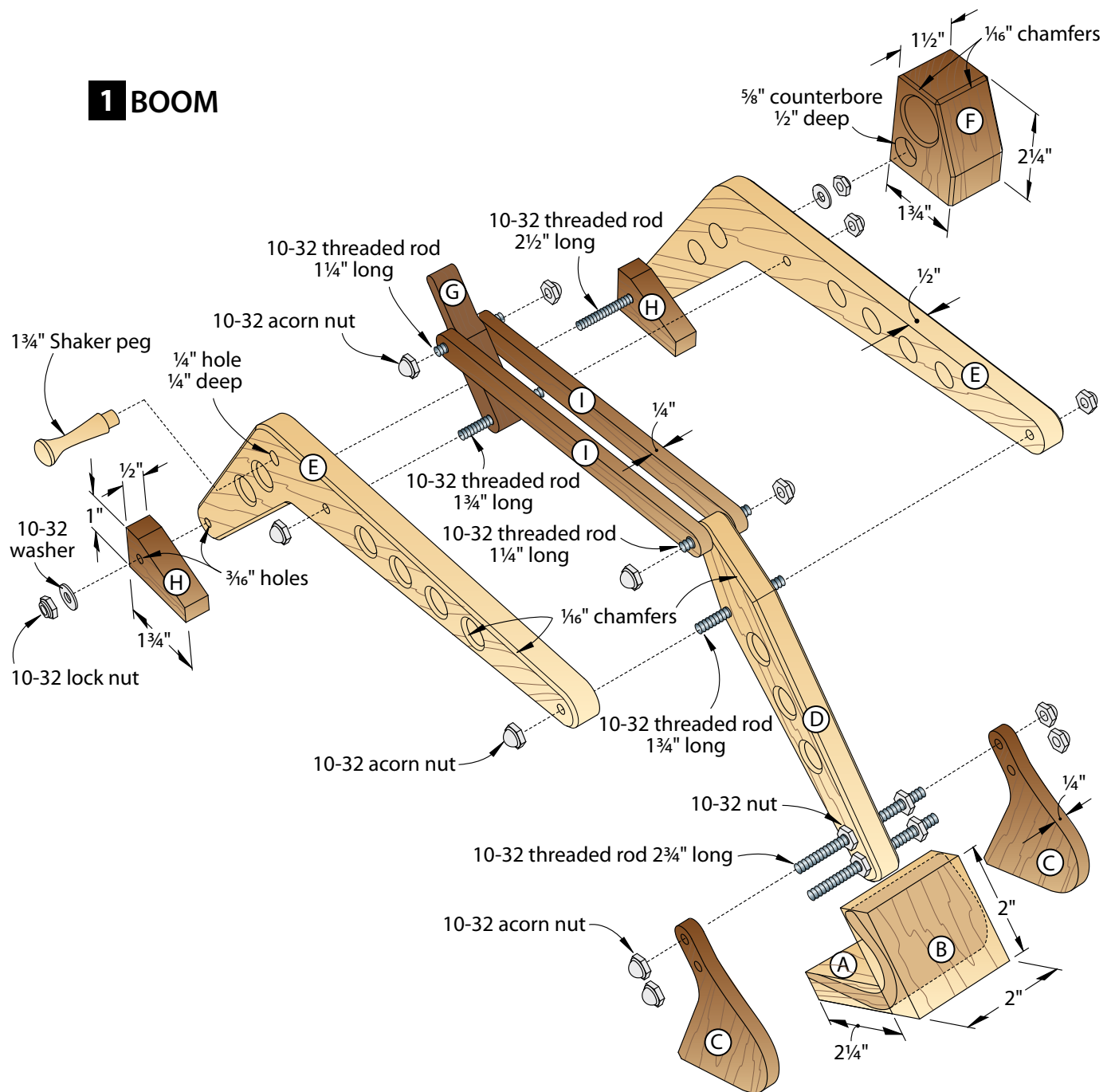
Use a drill-press fence to position the chassis (N). Drill halfway through one side, then flip the chassis over and complete the holes.



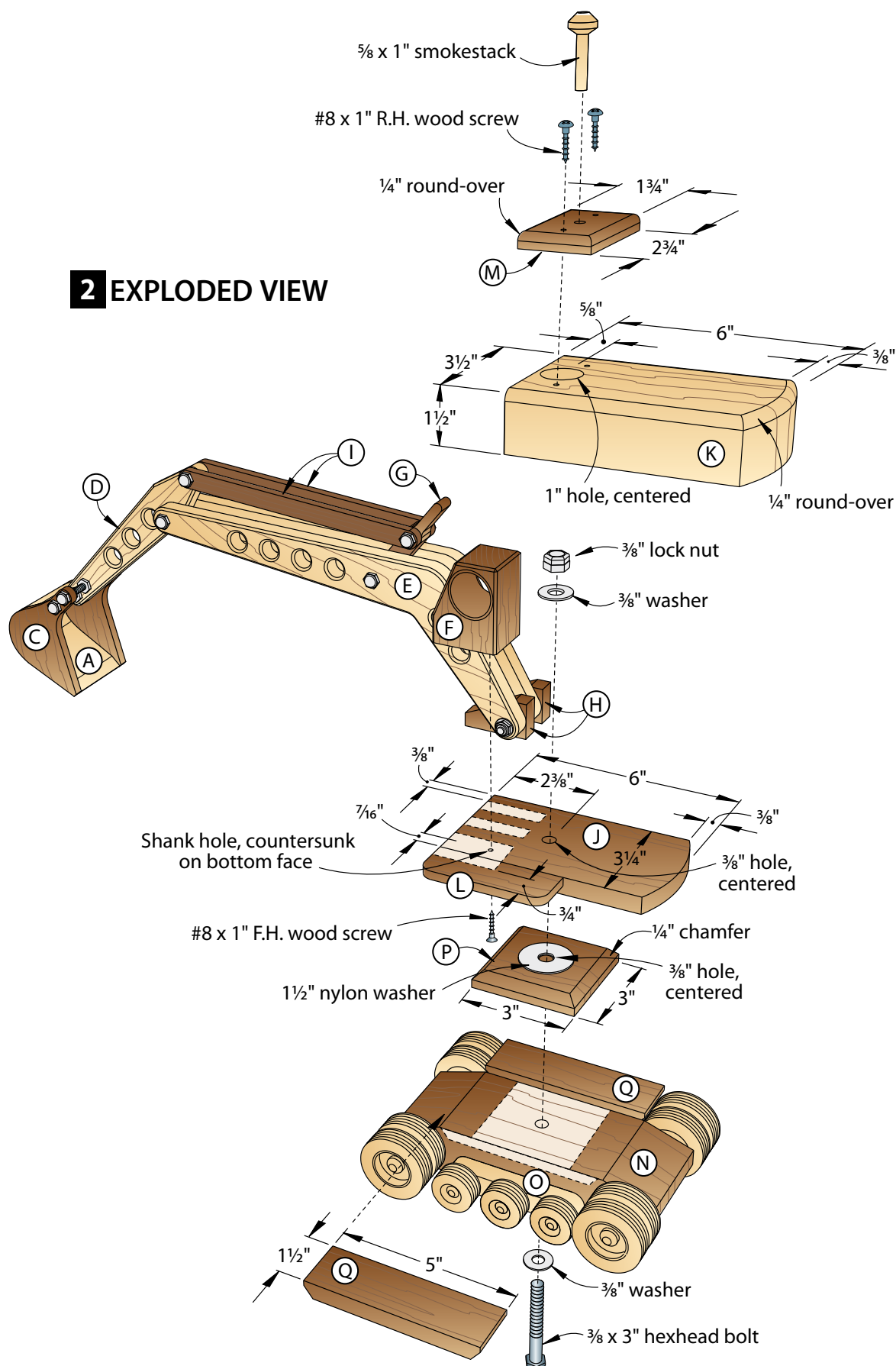
F ATTACH THE WHEEL COVERS

Align the top of the wheel covers (Q) with the bottom edge of the chamfer on the turntable (P) and centered on the turntable's length.

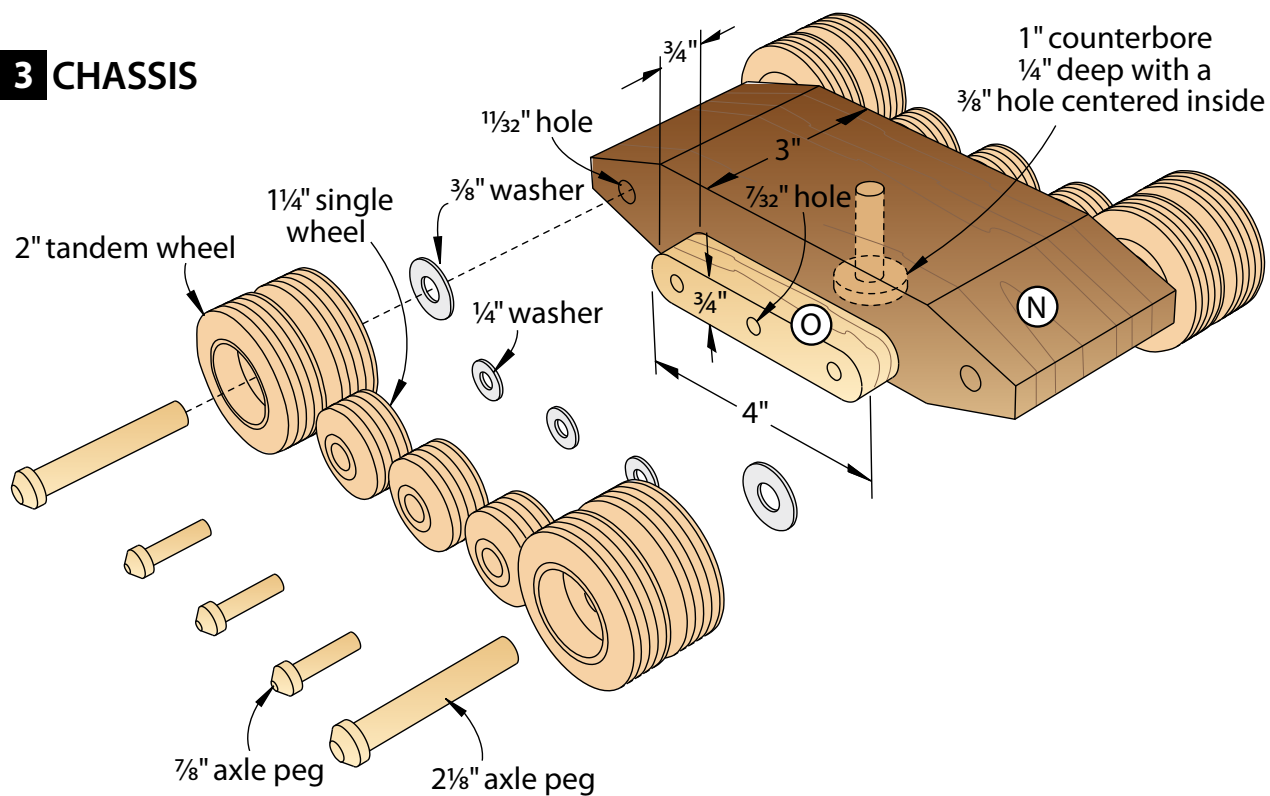
1 BOOM



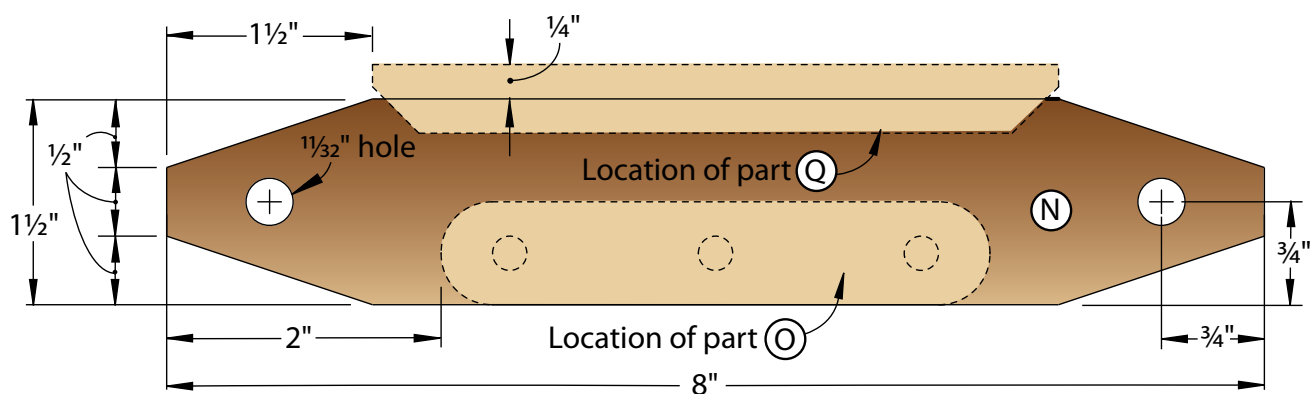
2 EXPLODED VIEW



3 CHASSIS



3a CHASSIS SIDE VIEW



Materials List

Part	FINISHED SIZE			Matl.	Qty.	
	T	W	L			
Boom						
A*	bucket bottom	¾"	2"	2¼"	M	1
B*	bucket back	¾"	2"	2"	M	1
C*	bucket sides	¼"	2½"	3½"	W	2
D*	jib	½"	1¼"	6¾"	M	1
E*	boom sides	½"	3¾"	11¾"	M	2
F*	cab	1½"	1¾"	2¼"	W	1
G*	jib lever	½"	½"	3"	W	1
H*	boom pivots	½"	1"	1¾"	W	2
I*	jib pistons	¼"	½"	7¼"	W	2
Body						
J	pivot table	½"	3¼"	6"	W	1
K	counterweight	1½"	3½"	6"	M	1
L	catwalk	¼"	1¼"	3½"	W	1
M	engine cover	½"	1¾"	2¾"	W	1
Undercarriage						
N	chassis	1½"	3"	8"	W	1
O*	wheel spacers	¾"	¾"	4"	M	2
P	turntable	½"	3"	3"	W	1
Q	wheel covers	½"	1½"	5"	W	2

*Parts cut from blanks using patterns. See the instructions.

Materials key: M—maple; W—walnut.

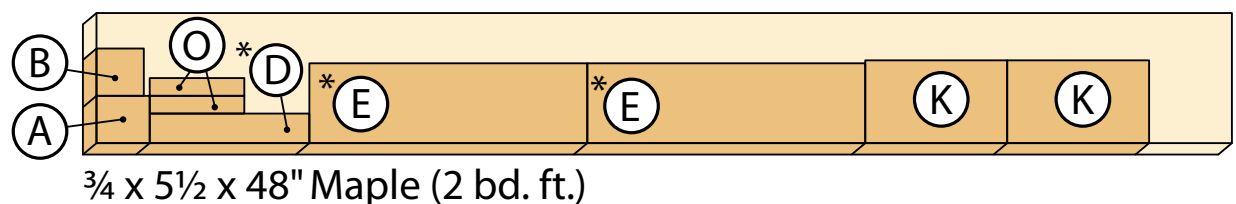
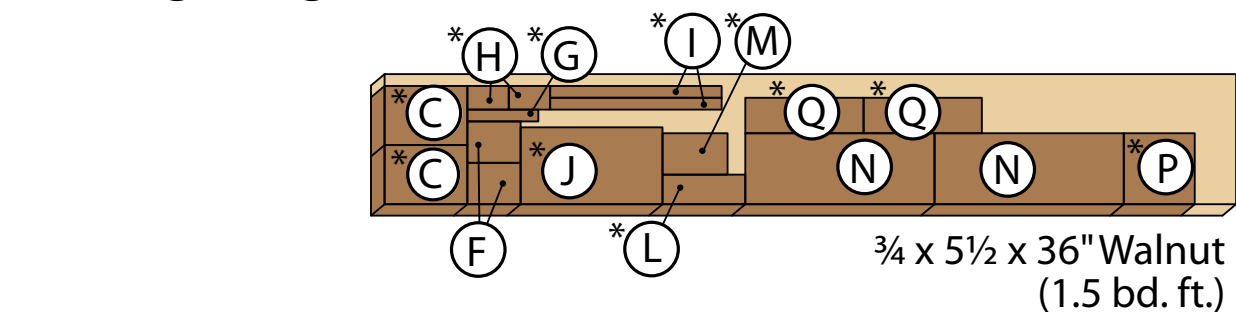
Supplies: Spray adhesive, #8×1" flathead wood screw (1), #8×1" roundhead wood screws (2), blue thread lock.

Bits: ¼" round-over, 45° chamfer router bits; ⅝", 1" Forstner bits; ⅛" drill bit.

Source

Wood/hardware kit: Contains the following wood parts and hardware: 2" tandem wheels (4), 2⅛" axle pegs (4), 1¼" single wheels (6), ⅞" axle pegs (6), 1¾" Shaker peg (1), 1½" nylon washer (1), ⅝×1" smokestack (1), 10-32 lock nuts (2), 10-32 acorn nuts (12), 10-32 nuts (4), 10-32×12" threaded rod (2), 10-32 washers (2), ¼" washers (6), ⅜" washers (6), ⅜×3" hexhead bolt (1), ⅜" lock nut (1). Order kit RS-00737, woodmagazine.com/excavator

Cutting Diagram



*Plane or resaw to the thicknesses listed in the Materials List.

Finish and assemble

1 Remove the wheels, axles, and all of the hardware and apply a finish. (We sprayed on two coats of polyurethane, buffing between coats with a 320-grit sponge.) After the finish has dried, reassemble the boom (A/B/C, D, E, G, I) using thread lock on all acorn nuts. Attach the boom assembly and cab (F) to the pivot-table assembly (H/J/K/L).

2 Place a wheel and a washer on each axle peg and glue the pegs in place, making sure no glue gets on the wheels and that the wheels turn freely [Drawing 3]. After the glue dries, bolt together the chassis assembly and pivot table/boom assembly [Photo G]. Then screw the engine cover (M) in place [Drawing 2].

3 Power up the “engine” with cookies and milk, point the kids toward the marble quarry and let them dig in. 🌿

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Project design: **Jeff Mertz**

Illustrations: **Roxanne LeMoine; Lorna Johnson**

Graphic design: **Lorna Johnson**

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ALMOST READY TO SCOOP

To remove wobble but allow the assemblies to pivot, snug a lock nut onto the bolt joining them. A nylon washer reduces friction.

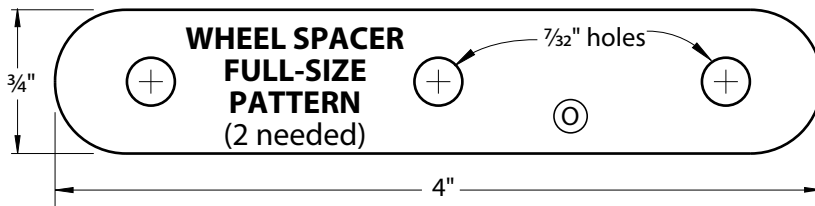
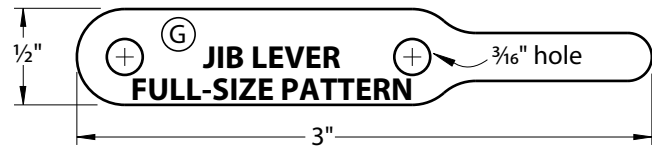
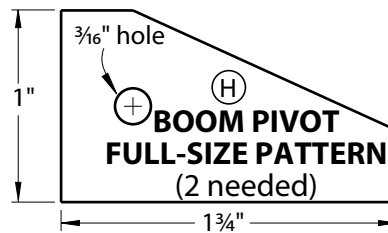
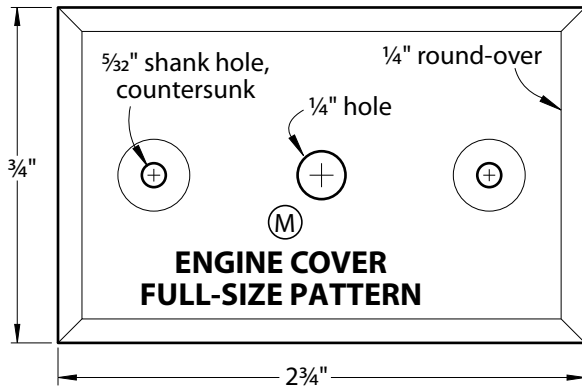
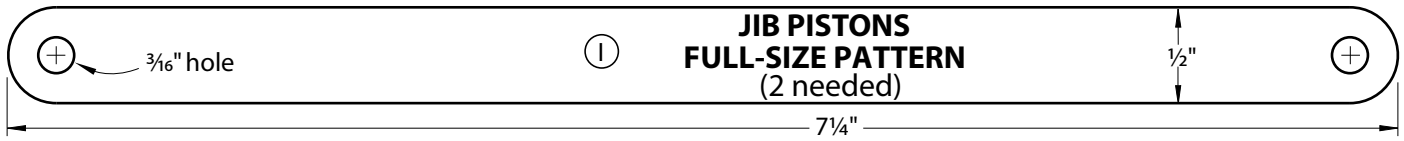
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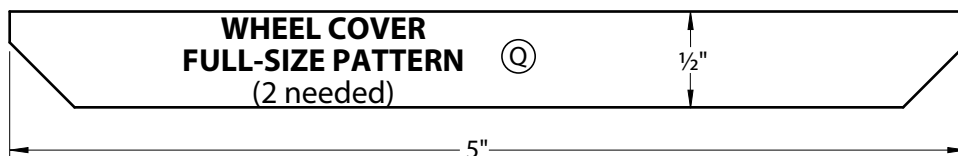
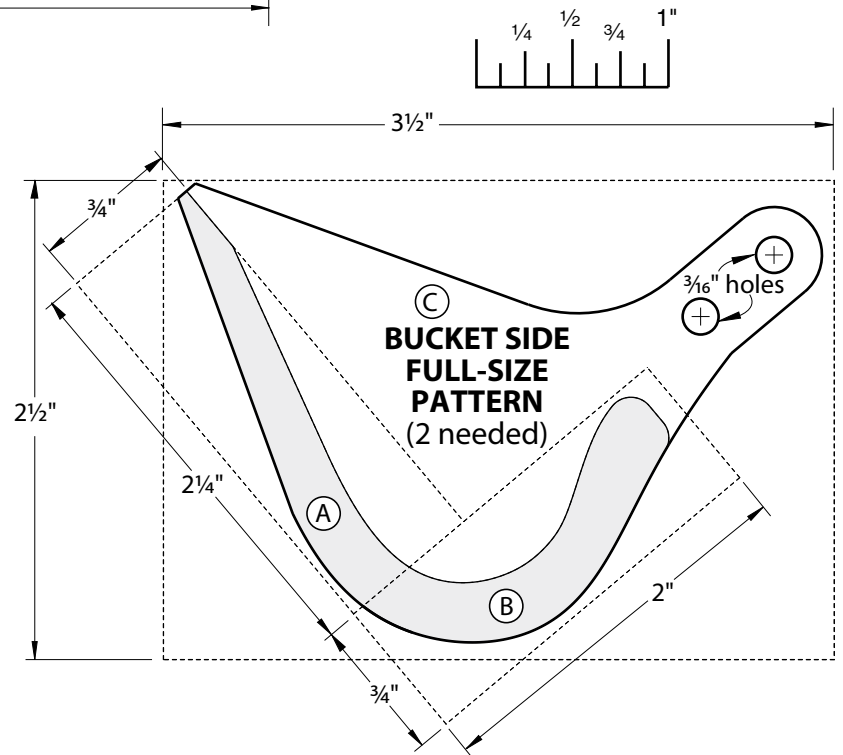
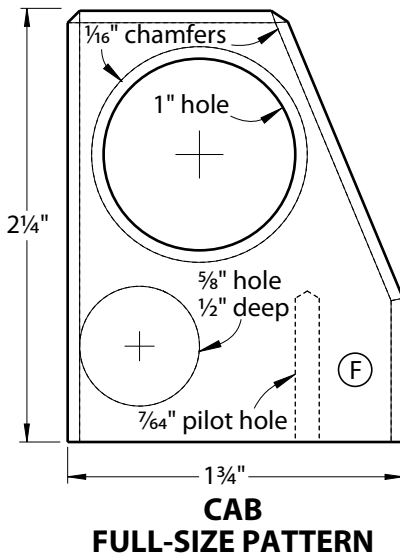
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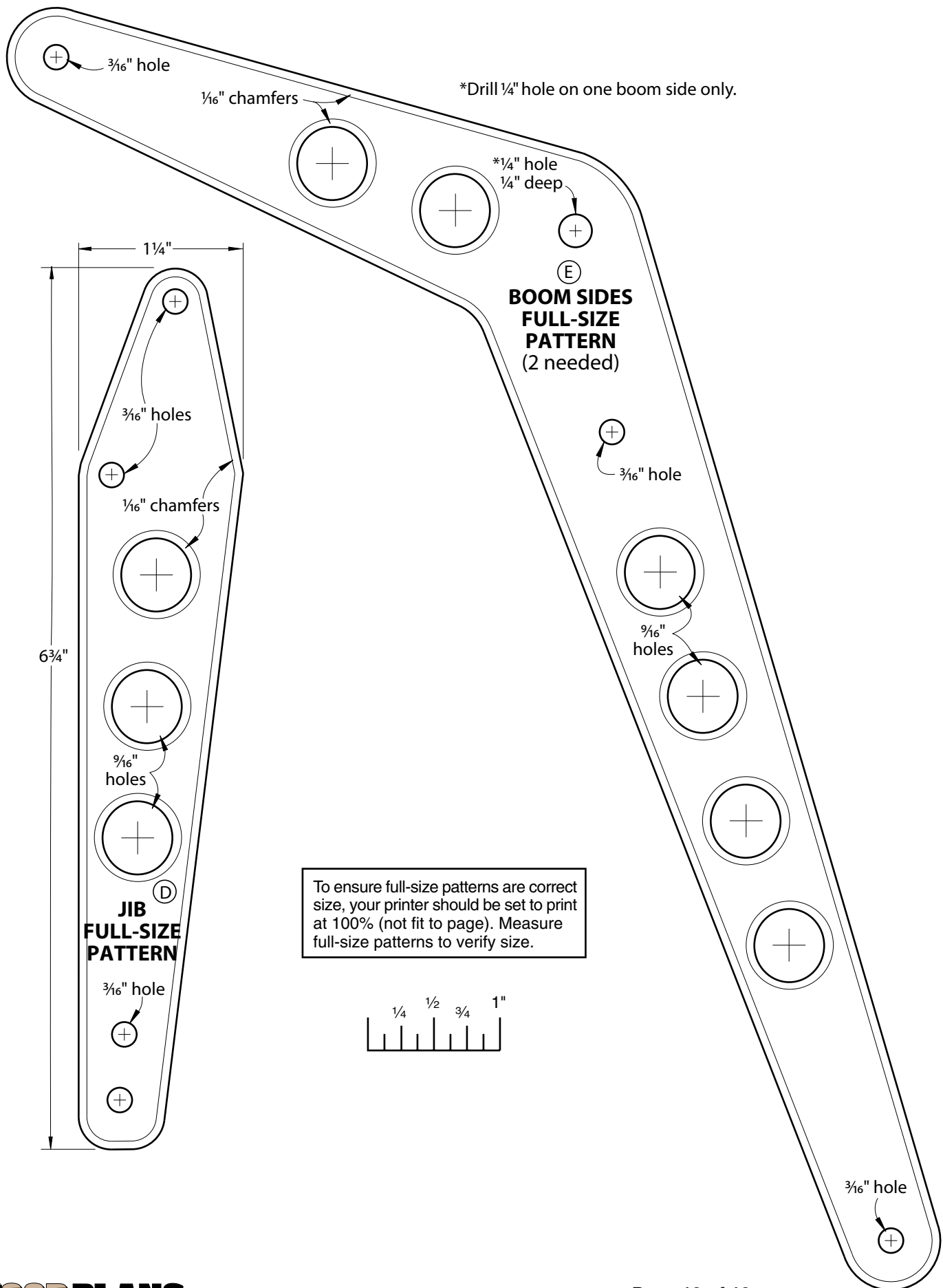
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