BUILDER'S GUIDE – INERTIA WHEEL

INTRODUCTION

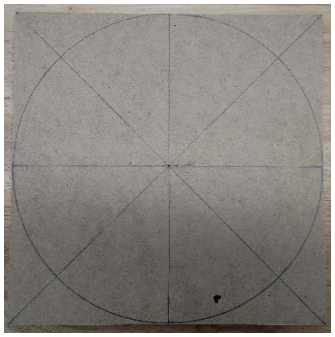
This following guide is to show how to build a physical demonstration that represents the effect of the moment of inertia has on rotating objects.

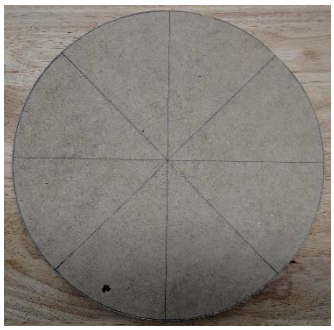
REQUIRED MATERIALS

1. (1) Spin Bucket Seat
2. (1) 5-gallon bucket
3. (1) 5-gallon bucket organizer
4. (1) ½" or ¾" MDF 12" x 12" square
5. (1) Wood insert nut (4-pack) ¼" – 20 tpi – 20mm
6. (1) Connecting Bolt ¼" – 20 tpi – 2-½"
7. (1) Extra strength construction adhesive or glue (2 oz minimum)
8. (6-10) 100 gram weights
9. Velcro (self-adhesive) 2 feet x 2 inches
10. (1) Oak dowel 1-¼" x 5"

ASSEMBLY PROCESS

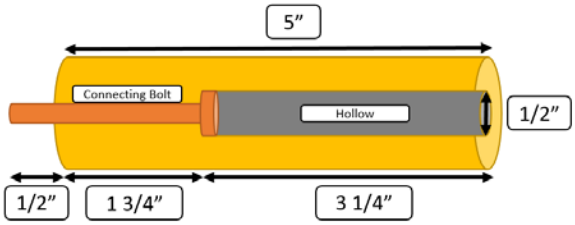
STEP 1 – CUTTING THE WHEEL





Bucket seats can be purchased from multiple retailers and commonly have a 12-inch diameter. Measure the diameter of the bucket seat, then cut the MDF into a circle with the same diameter. Cutting the MDF into a square first may simplify the process depending on the builder's skill level. Mark the MDF every 45°. Along one of the lines, mark the MDF at 1", 2", 4", and 5". At those marks, drill a pilot hole using a 1/8" bit. Once complete, use a 5/16" bit to drill each pilot hole in order to place the insert nuts. The inset nut box recommends 11/32", but 5/16" worked well and ensures a snug fit between the MDF and the insert nut. Using a 6mm hex wrench, screw the insert nuts into the MDF until the top of the insert nut is flush with the top of the MDF. If you are using ½" MDF, part of the insert nut will stick out of the wheel. Using ¾" MDF prevents this issue.

STEP 2 – THE HANDLE



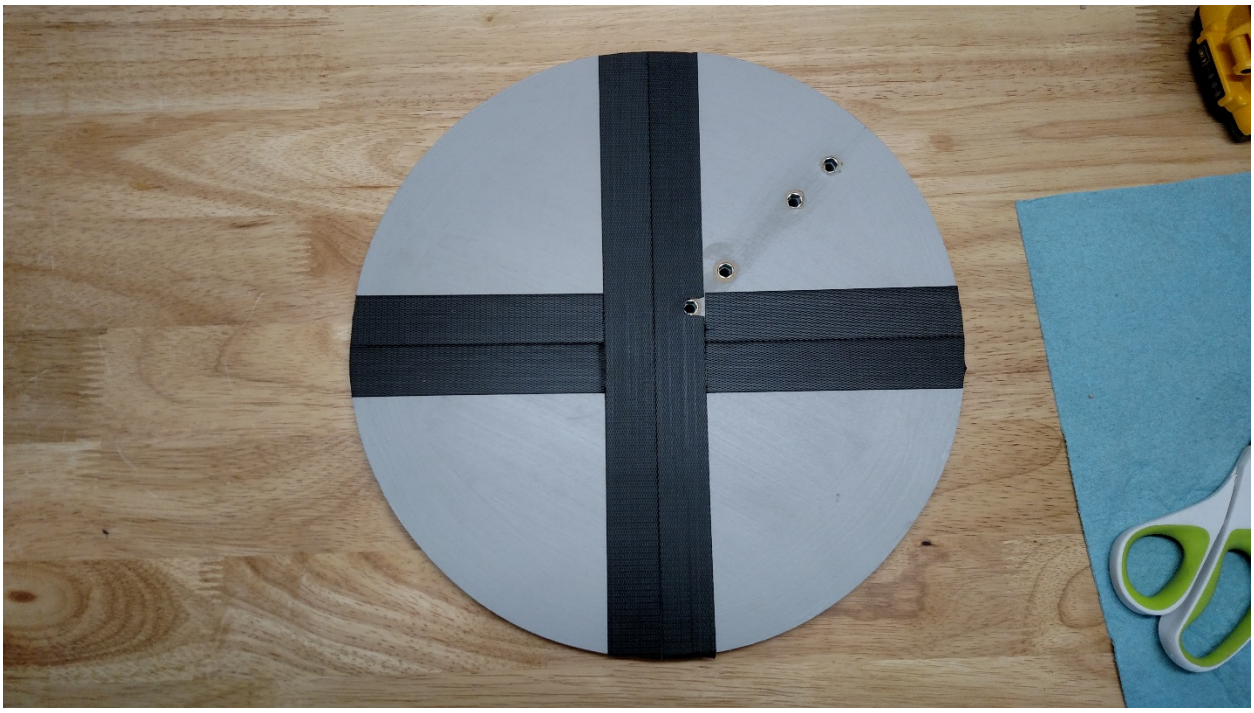
Cut a 5" section from the oak dowel. Mark the center of the flat surface on the top and bottom of the dowel. Using a ½" speedbor bit, drill 3-¼" inches into the center of the dowel along its length. From the opposite end, use a 7/32" drill bit to drill 1-¾" along the length of the dowel to connect to the ½" opening from the other end. The ½" space allows enough room for the face of the connecting bolt and the 7/32" hole enables a snug fit for the bolt to prevent it from sliding out of the handle. It can be lightly coated with adhesive before placement to ensure a permanent hold. Use a 4mm hex wrench to screw the connecting bolt through the 7/32" hole until approximately ½" of the bolt is protruding from the bottom of the handle. This will enable the handle to be moved between the various insert nut locations installed on the wheel.

STEP 3 – PAINT

If desired, now is the time to paint the wheel and handle. Company logos or decals are encouraged.

STEP 4 – ADDING AND MARKING THE VELCRO

Now is the time to apply the Velcro (hook section) to the wheel along the 0°, 90°, 180°, and 270° axes. Measure and cut the Velcro to each section and ensure that you make a cutout for the insert nut located at 1" from the center on the 45° line.



The best way to trim the Velcro at the edge of the wheel is with a utility knife. Once the adhesive is exposed, as well as for small trims, scissors are not as effective.

After adding the Velcro to the wheel, the opposite type of Velcro (loop section) is applied to the bottom of each 100-gram weight. Like the wheel, use a utility knife to trim the Velcro around the edges.

Once the Velcro is applied, use a white paint marker or white paint to mark 1″ intervals from 1″ to 5″ along each axis (0°, 90°, 180°, and 270°). These will be the weight reference points.

STEP 5 – GLUING THE WHEEL TO THE SEAT

Remove the screw cap on the bottom of the seat to expose the head of the screw holding the seat and lid together. Once separated, remove the seat cover and pad then sand the edges of the wooden seat base. A flathead screwdriver and pair of pliers are the best means to remove the 20+ staples holding the fabric to the seat.

Now that the seat is stripped down to the required pieces, center the seat base with the wheel and mark the center on the bottom of the wheel. Using a ¾" speedbor, counter sink the center of the bottom of the MDF wheel by approximately $^1/_8$" to enable the seat and wheel to lay flat on each other. This is required to create space for the screw retaining bracket that holds the seat to the bucket lid and enables it to rotate.

Once flush, remove the insert nuts from the wheel if installed to prepare for gluing. Apply construction grade adhesive to the seat since it is the smaller of the two pieces to be glued together. Using two to four clamps, secure the seat to the MDF until the adhesive dries. Ensure the adhesive used is capable of bonding to both materials. Three exercise weights (25 pounds each) can be used as well as they can create significant pressure with fairly uniform distribution. This will create a strong bond between the seat and wheel without damaging either.

After the adhesive has set, use a 5/16" bit to drill holes through the seat that are line with the insert nut holes already drilled. If using ½" MDF, this will enable the insert nuts to screw into the seat as well as the MDF to maintain an even connection, as well as help secure the two pieces.

NOTES

- Build Time: 3-4 hours

- Demo Time: 5-10 minutes

- MDF thickness is adjustable because the insert nuts will screw into the seat base if required.

- Different size connecting bolts can be used as long as a minimum of ½" of the bolt extends from the handle in order to connect with the insert nut. The depth of the ½" speedbor hole would have to adjust to any bolt length changes.

- Due to the rotation, it is recommended that you add weight inside the bucket for stability. This can range from permanent weights that travel with the demonstration or adding jobsite tools as temporary weights.

- As long as the weight is consistent, homemade weights can be used, such as wrapped coins, in place of standardized scientific weights.