



# Multi-axis Turning with a Four-jaw Chuck

## Introduction

There is a variety of approaches to multi-axis turning that includes turning between centers and turning with a self-centering chuck. I prefer to use a four-jaw chuck, because it gives me more turning options. My preferred chuck is the Oneway Talon with number two jaws, though other brands of chucks will work also.

One advantage of using a chuck rather than turning between centers is that the blank can be hollowed when turning a multi-axis pedestal box or goblet. In this instructional handout, I will discuss how I use the chuck and the kinds of multi-axis pieces I turn.

## Multi-axis Candlestick

The blank for a multi-axis candlestick is 2" x 2" x 9" with a 7/8" wide hole drilled 3/4" deep in one end. This end will be the top. Upon completion, a brass grommet will be inserted into the hole to hold the candle.

Mount the blank between centers with the 7/8" hole at the tail stock end of the lathe. The live center should fit into the hole. Turn the blank to a cylinder with a spindle roughing gouge and then turn a tenon at the headstock end. Keep the tenon as close to 2" as possible and 3/8" wide, so that it can be securely tightened "off-axis" into the chuck's number 2 jaws. (A reliable tenon will be even more important if you choose to turn on more than two axis angles.)

Shape and turn the end of the blank into a cup that will hold the candle. This will be the top of the candlestick.



## Multi-axis Candlestick (continued)

Slope the remainder of the blank toward the top of the candlestick. The diameter of the blank just below the cup should be approximately  $\frac{1}{2}$ " to  $\frac{5}{8}$ ". Using a sharp parting tool, turn a slight recess about 3" from the top end of the blank. This is where you will begin a v-cut with a spindle gouge. It is important that you sand before moving the blank to the next axis.



The jaws on the Talon chuck are numbered. If your chuck jaws are not numbered, write the number for each jaw on the blank.

Loosen the jaws and tip the blank about  $\frac{1}{8}$ " at the number 1 jaw and retighten the chuck. All four jaws must be securely holding the blank. You are now ready to turn the first "off axis."



With a light cut, continue to widen the v-cut with a spindle gouge. It is important that you ride the bevel and not push your tool into the wood.



The length of the slope on both sides of the v-cut will affect the design of the finished piece. I prefer a longer slope on the left side of the v-cut towards the base, because this gives the candlestick a more elegant appearance.



## Multi-axis Candlestick (continued)

Remount the blank fully into the chuck. For this example, I will complete the piece by making a v-cut while on the main axis. Sand this last section of the candlestick and then undercut the base before parting it off.

You can make as many off-axis v-cuts as you want. If you make v-cuts tilting first at the number 1 jaw, then number 2, etc., you will get a spiral effect.

If you turn your first multi-axis at number 1 jaw and then turn the second multi-axis v-cut at number 3 jaw, you will get a different appearance and profile.



## Pedestal Box and Goblet

Other multi-axis pieces that I turn in a similar fashion are the pedestal box and goblet. Both require hollowing the end of the blank.

After turning the blank into a cylinder with a well-formed tenon, mount the blank on the chuck. Turn, hollow, and shape the tail stock end of the blank for a goblet or box.



As with candle stick, turn a long slope while still on the main axis and sand. Mark at the chuck end where the blank will be parted. Also write the jaw numbers on the blank.



## Pedestal Box and Goblet (continued)

After sanding, tilt the blank approximately 1/8" in the jaws at number 1 and turn v-cuts as with the candlestick. Depending on your design, you may turn one or more off-axis v-cuts on the stem of the box or goblet. Don't forget to sand immediately after turning each axis and remember to make light cuts only.



The first photo above shows one off axis v-cut. The second photo shows the blank on the main axis with the base turned and the goblet ready to be parted. The third photo shows the finished goblet.



## Bottle Stoppers

Bottle stoppers are intriguing when turned multi-axis. To turn a bottle stopper in a four-jaw chuck, a simple homemade jig is required.

To make the jig, you need a 2" x 2" x 2" blank of wood, and a 3/8"-16 x 2 1/2" long hex bolt.



On the drill press, drill a 5/8" hole 3/16" deep in the end of the blank. Then drill a 3/8" hole through the 5/8" recess through the complete length of the blank. This allows the head of the bolt to be flush with what will be the tenon end of the jig and the bolt to extend 11/16" from the front of the jig. The front end is where the bottle stopper blank will be screwed onto the protruding bolt for turning.



## Bottle Stoppers (continued)

After completing the drilling, mount the jig blank between centers on the lathe. I use a bullet drive in the head stock and a cone shaped live center in the tail stock. Both of these fit into the hole that you have drilled in the blank and help to center it on the lathe. Turn a tenon on the rear end of the blank that will fit your chuck.



Mount the blank in the chuck and turn a 3/8" wide tenon on the front end of the blank. The diameter of this tenon needs to be the same as the base of the bottle stopper kit you intend to use. Typically, these kits are between 7/8" and 15/16".



After removing the blank from the lathe, epoxy the bolt into the hole. The screw end of the bolt should be flush with the back of the jig and extend through the front of the jigs by 11/16".

When turning a multi-axis bottle stopper, pre-drill the bottle stopper blank with a 21/16" drill bit on the drill press. This will ensure a tight fit when the stopper is screwed into the finished blank.



Screw the drilled blank to the jig and mount the jig in the lathe. Be sure to wax the bolt before screwing it into the blank. This will make the process of removing the blank from the jig much easier.

The bottle stopper blank is now ready to be turned.

I have found that multi-axis turning and laminated wood offer an exciting combination. The laminated pieces are turned the same way as non-laminated wood and result in unpredictable patterns of shapes and colors. If you are interested in designing and turning laminated pieces, see my handout, "Designing and Turning Laminated Handles."



# Gallery

1

## Multi-axis box on a pedestal with a multi-axis top

### Multi-axis pedestal

2 1/2" x 2 1/2" x 6"

### Box

3" x 3" x 3"

### Top for box

3" x 3" x 4"



2

## Multi-axis birdhouse on a pedestal with a multi-axis top

### Multi-axis pedestal

3" x 3" x 6"

### Birdhouse body

2" x 2" x 3"

### Top for birdhouse

3" x 3" x 3"

### Perch for birdhouse

1/2" x 1/2" x 2"



3

## Multi-axis bottle stopper

### Blank

2" x 2" x 3"



4

## Bottle stopper jig

### Jig

2" x 2" x 2"

### Bolt

3/8" x 2 1/2"



5

## Multi-axis birdhouse ornament

### Birdhouse body

2" x 2" x 3"

### Top for birdhouse

2 1/2" x 2 1/2" x 4"

### Finial for birdhouse

2" x 2" x 4"

### Perch for birdhouse

1/2" x 1/2" x 2"



## Gallery (continued)

6

Multi-axis mushroom

Blank

2 3/4" x 2 3/4" x 6"



7

Multi-axis golf tee



8

Multi-axis candlestick



Blank

2" x 2" x 9"

9

Multi-axis goblet



Blank

2 3/4" x 2 3/4" x 6"

10

Multi-axis spinning top



Blank

2" x 2" x 3"

11

Multi-axis magic wand

Blank

2" x 2" x 14"



12

Multi-axis platter

Blank

2" x 14" x 14"

