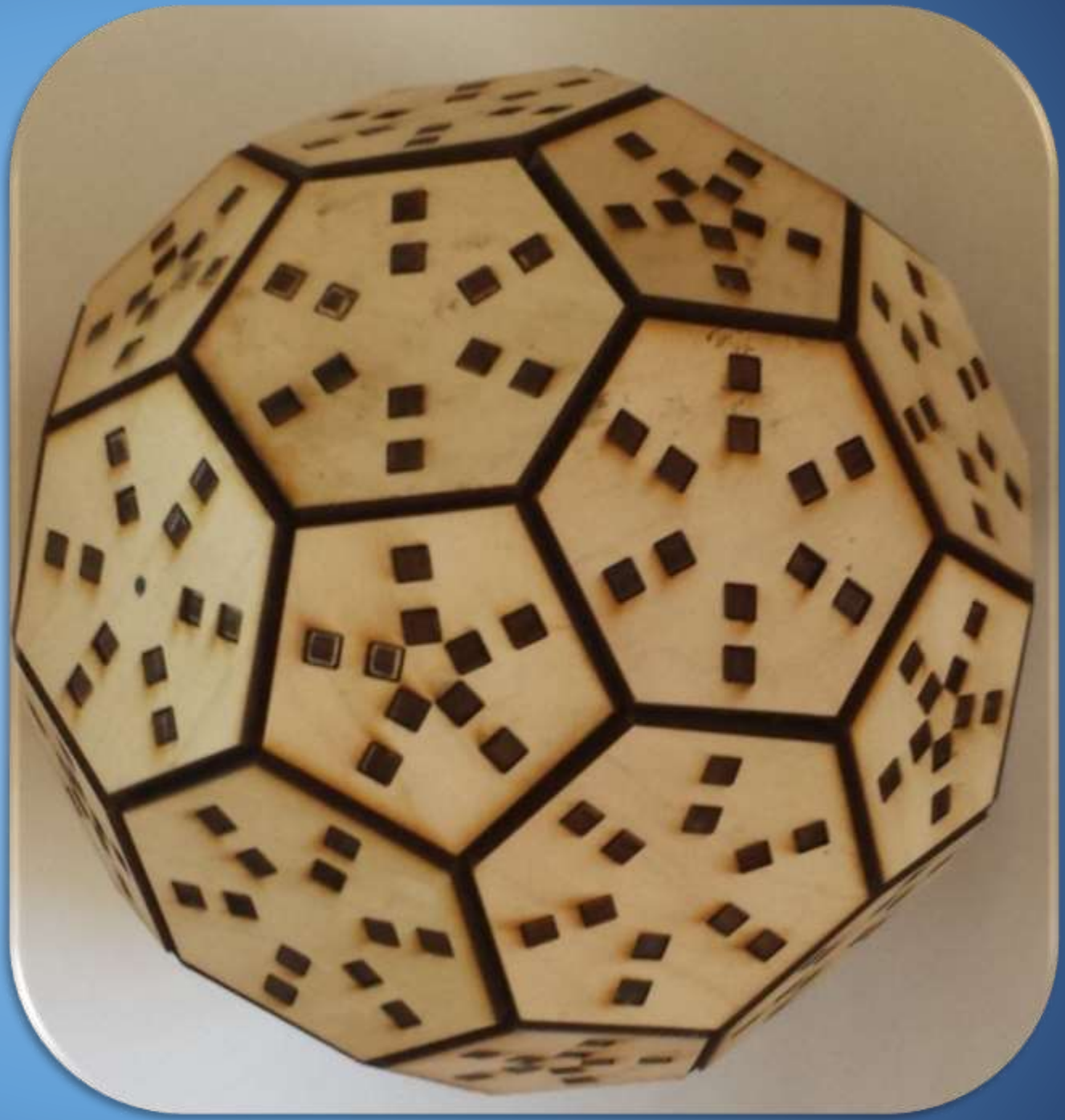
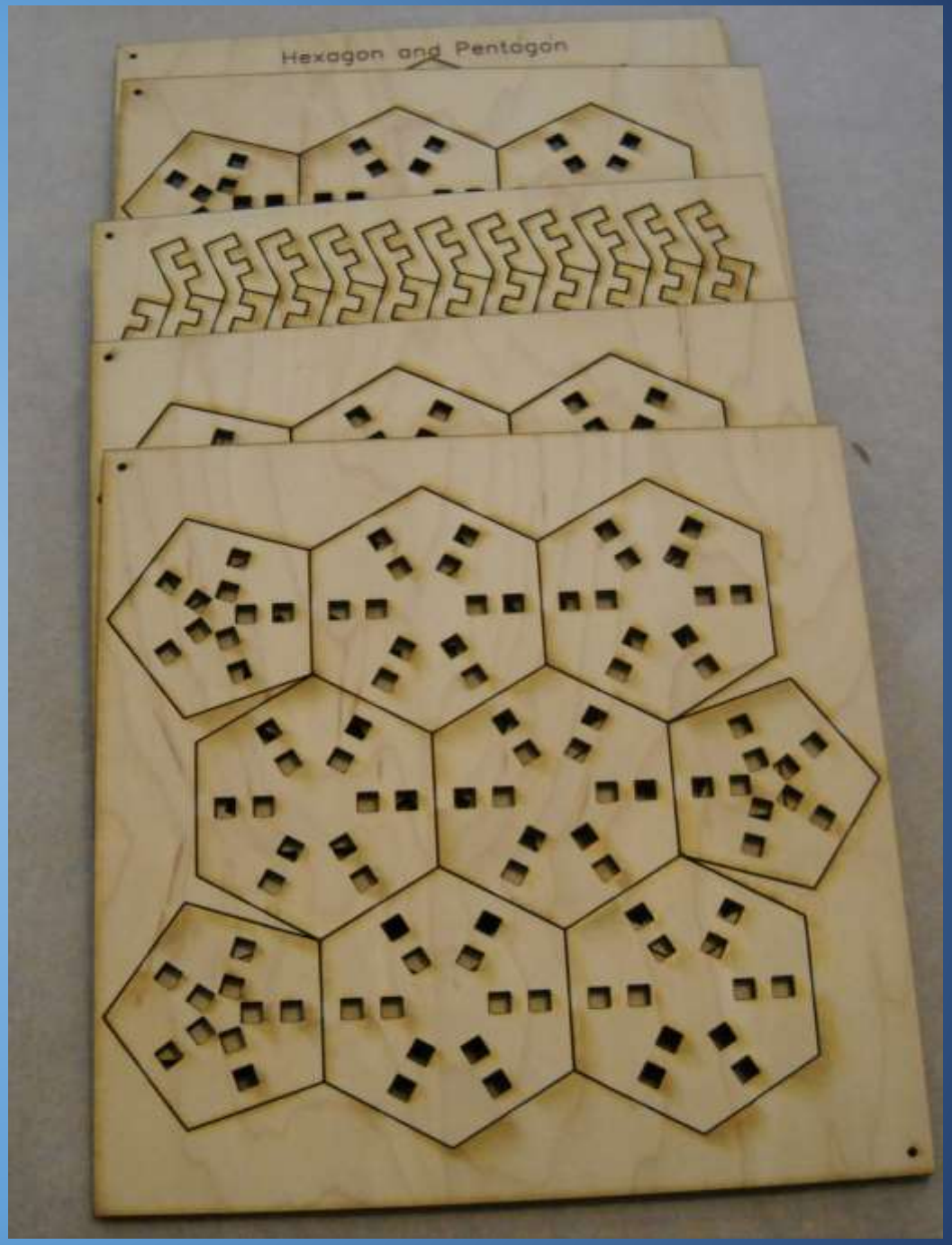
Wooden Truncated Icosahedron Puzzle



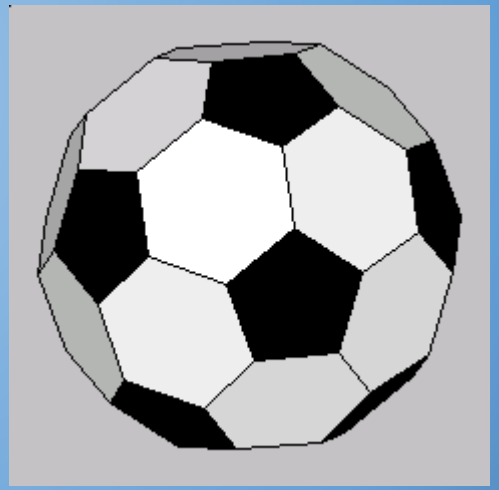
Truncated Icosahedron

- This Instructable makes a laser cut puzzle as a kit you can sell or give away
- The puzzle is a Truncated Icosahedron.
- The attached file makes 8 (8.75” X 8.75”) panels
  - 5 with push out pieces (shown)
  - 1 cover
  - 2 description and instructions



What is a Truncated Icosahedron?

- This shape is associated with Geodesic Domes, Bucky Balls and Soccer balls
- Truncated Icosahedron has 32 sides:
  - 12 Pentagons
    - There are 13 in the kit
  - 20 Hexagons
    - There are 21 in the kit
  - 90 edges / adjacent sides
    - There are 92 tabs in the kit to connect all edges / adjacent sides



Bill Of Materials

- The panels are laser cut from two pieces of 0.210 thick Maple Plywood from Lowes Hardware store.

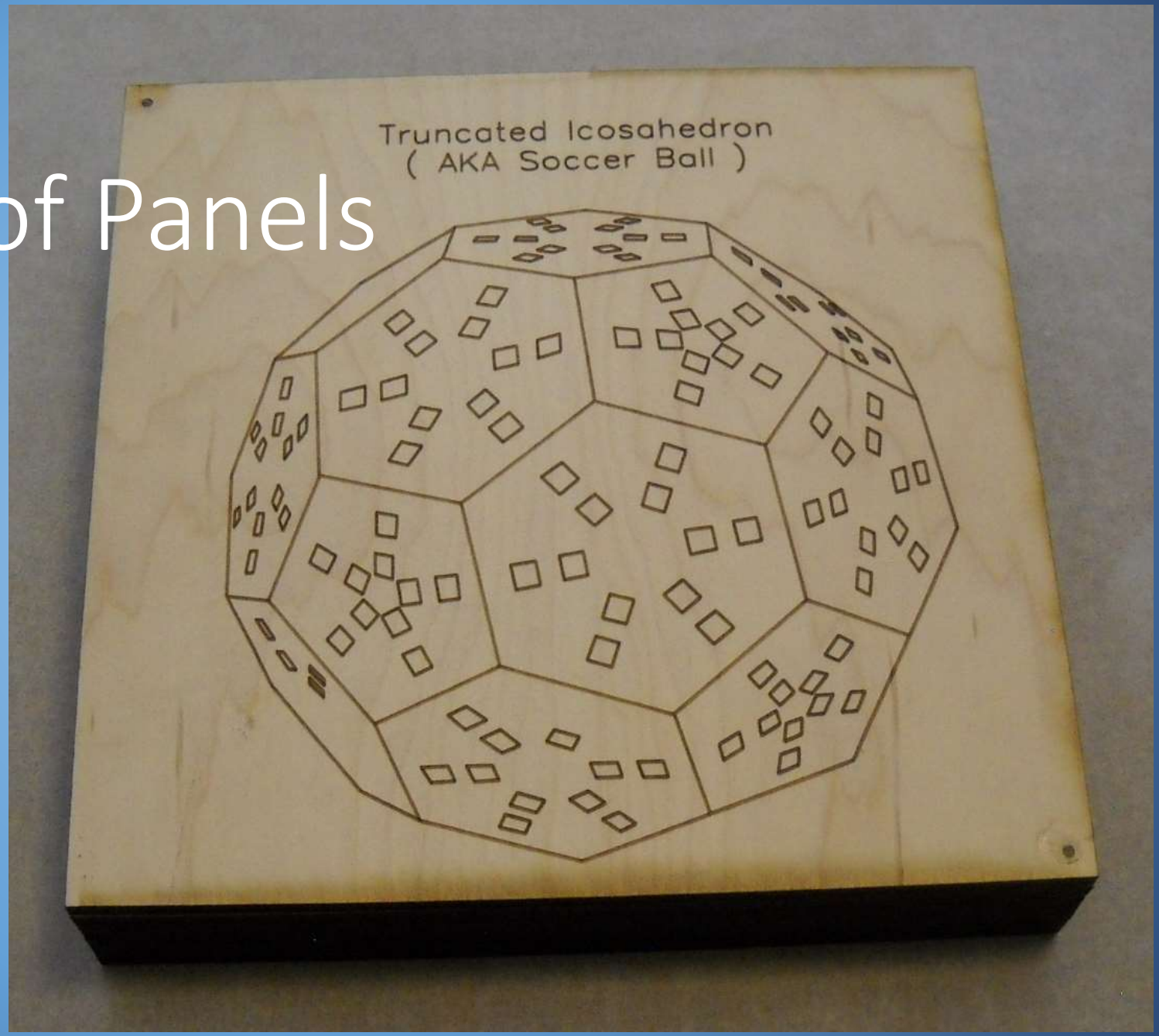
  Note: The thickness is important because the square holes in each piece are just wide enough to accommodate a 0.210 thick piece of material.

  Note: The puzzle can be scaled to thicker or thinner wood by making the size of the square holes in the pieces match the thickness of the wood.

- The panels / kit are then held together with round toothpicks
  - The toothpicks are installed in the 0.077 holes, then scored and broken off flush with the surface. Then, the ends of the toothpicks are super-glued to hold them in place

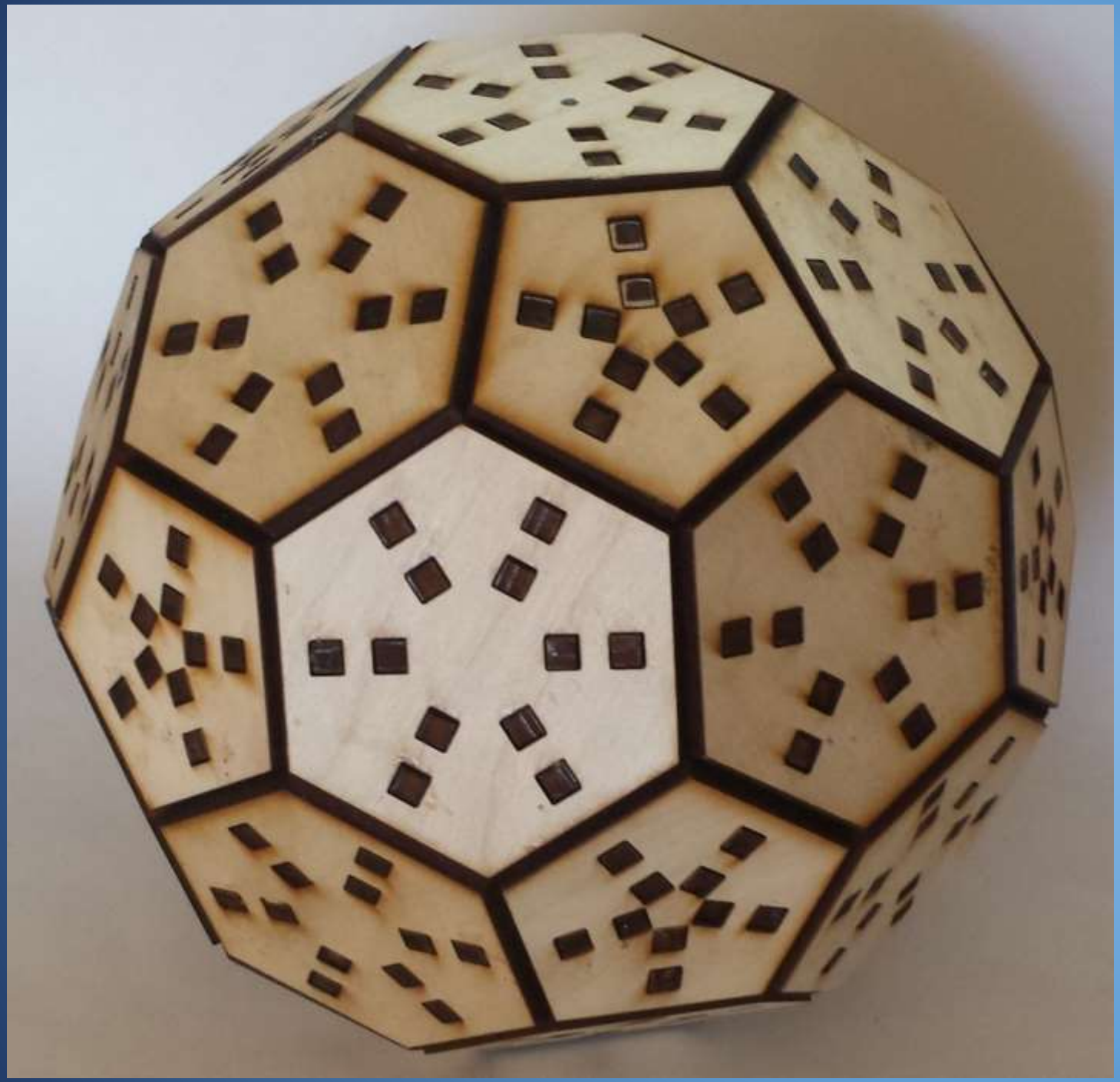
Assembled Kit of Panels

Held together with round toothpicks in the corners



Assembly Instructions

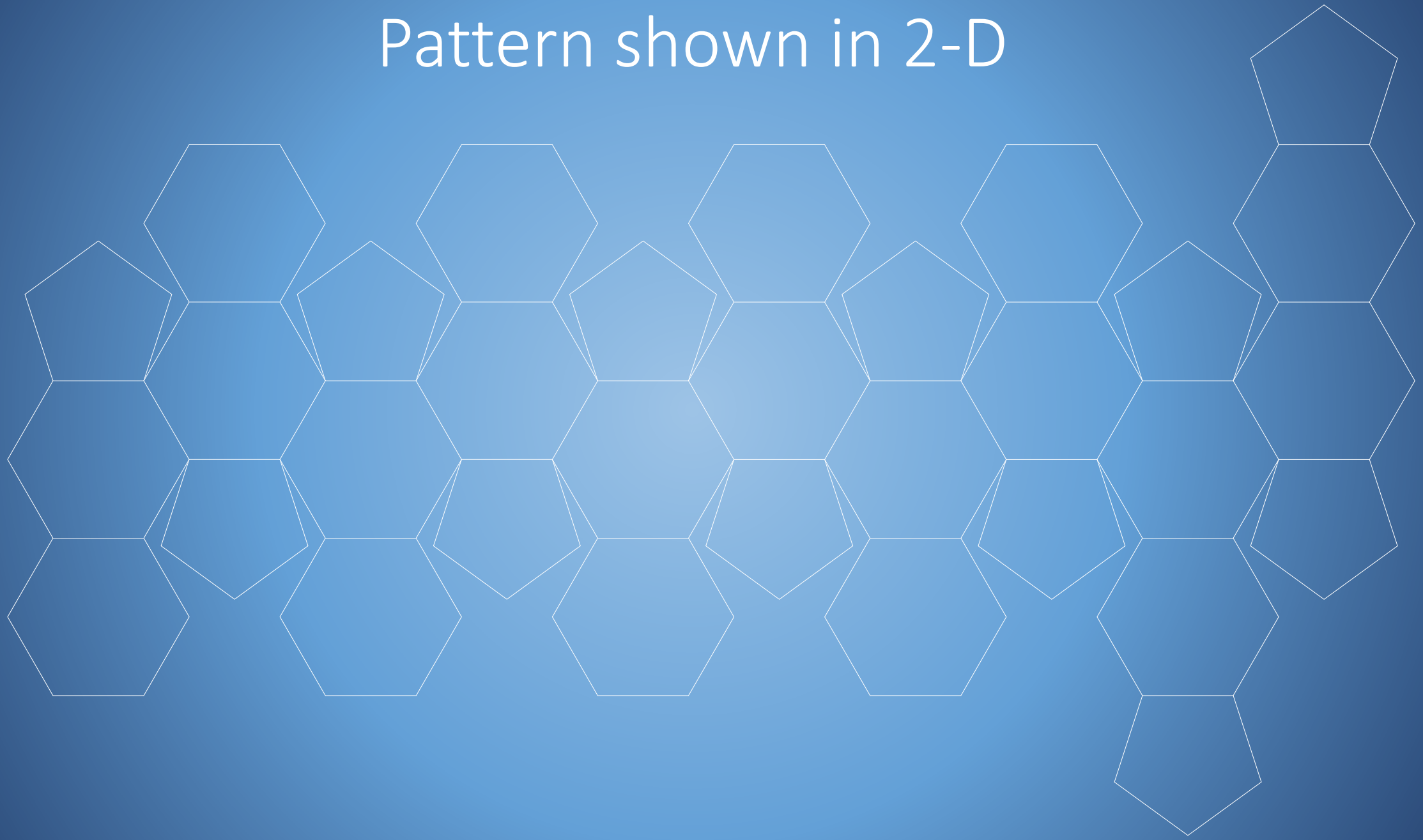
- 5 of the panels contain the 122 pieces needed to assemble the Truncated Icosahedron
- For assembly, there are two basic / simple rules
  - 1) Each hexagon is surrounded alternately by three hexagons and three pentagons
  - 2) Each pentagon is surrounded by five hexagons
- If you put two pentagons edge to edge, you messed up (I've done it)
- If you put more than three pentagons around a hexagon, you messed up (I've done it)
- If you put more than three hexagons around a hexagon, you messed up (Yup, done that too)



Puzzle Assembly Rules

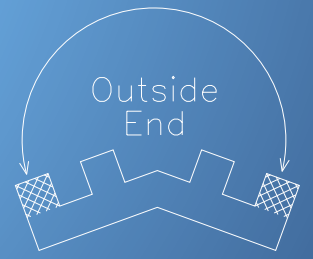
- 1) Each hexagon is surrounded alternately by three hexagons and three pentagons
- 2) Each pentagon is surrounded by five hexagons

Pattern shown in 2-D

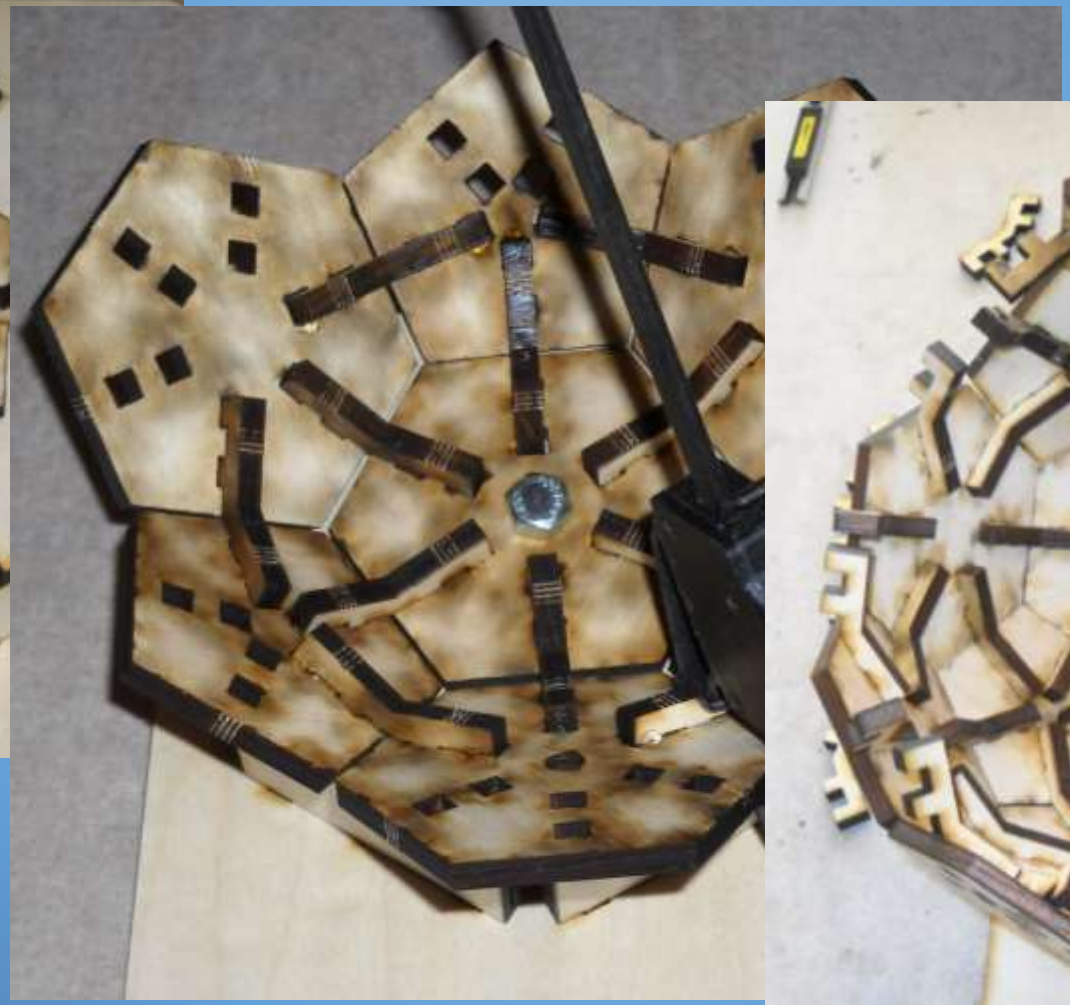


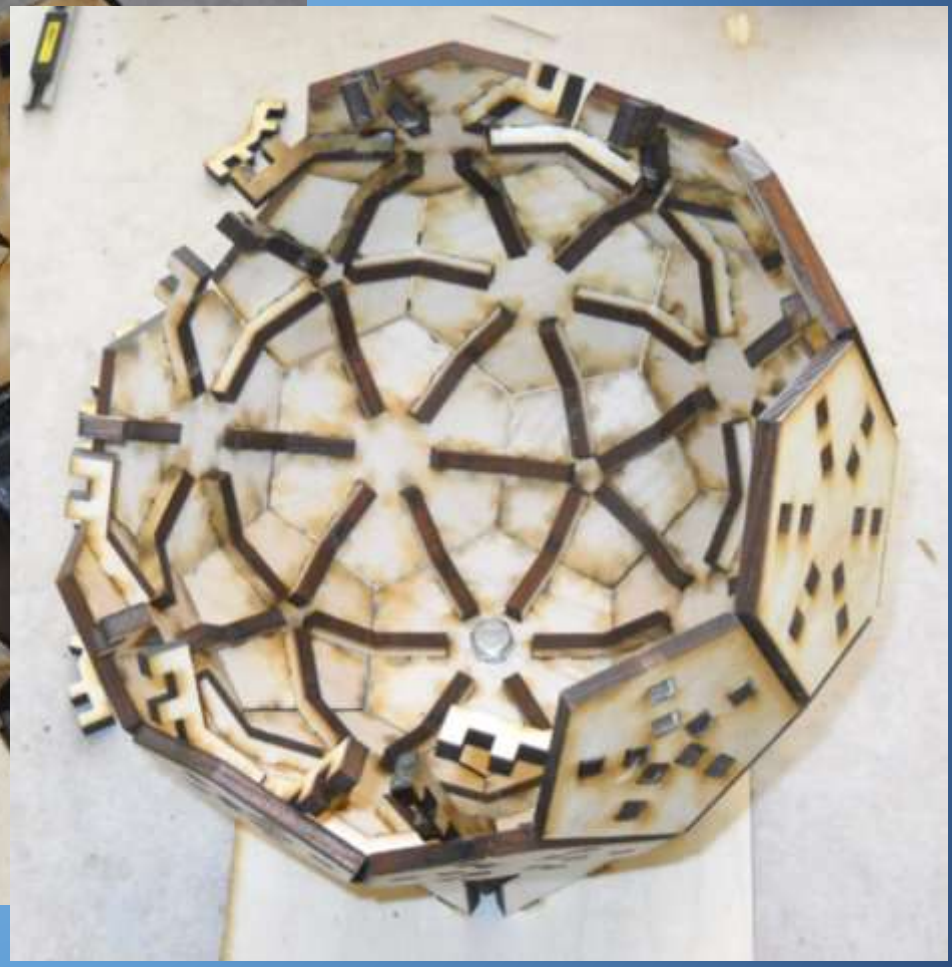
Assembly hints and tips

- Push the pieces out of the panels
- Do not get into a hurry.
- Before you glue in a panel, make sure it follows the two rules.
- Assemble no more than one layer at a time and allow the glue to dry before continuing.
- Only put glue on the outside end of the tab during assembly
  - Why?
    - This provides some flexibility during assembly
    - Tabs are 140 degrees. Actual angle between panels is:
      - 138.2 between two hexagons
      - 142.6 between hexagon and pentagon
- Don’t fret, don’t get in a hurry, it all goes together



What it looks like going together





Note: Stand is included in file

Finished

It is difficult to get all six tabs into the last piece. (Not impossible but difficult)

I wanted to make this one a display piece that people could open and see inside.

Rather than have people struggle with getting all six taps to mate up, I cut three of the six in half.

(That’s my story and I’m stickin’ to it.)