



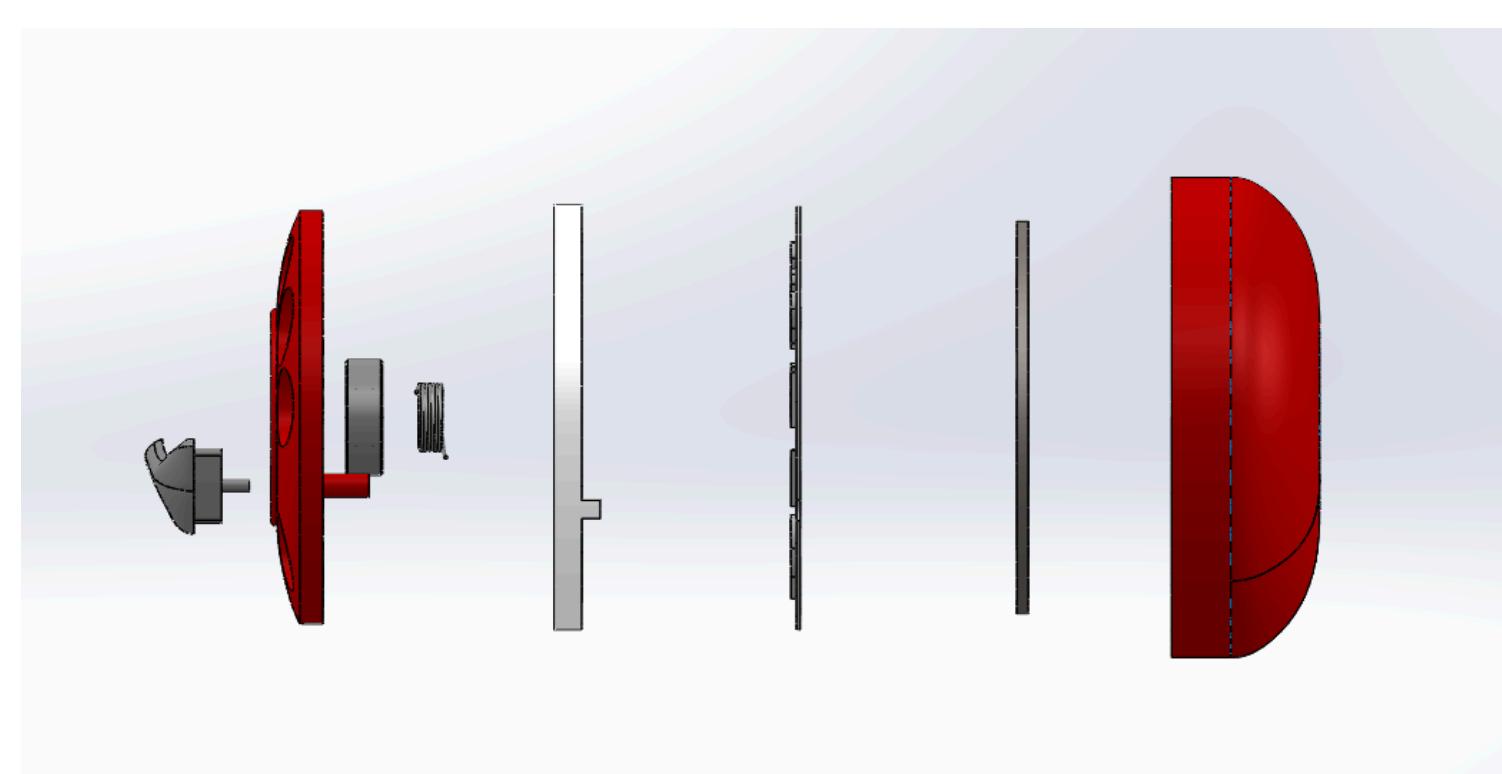
Idea

- Rotary Phone
- Including the Rotary Mechanism
- Mechanically complex w/ challenging molds



Design

- CAD in SolidWorks
 - Mold Design using Mold Tools
 - Lathe, mill, and 5-axis machining



Production

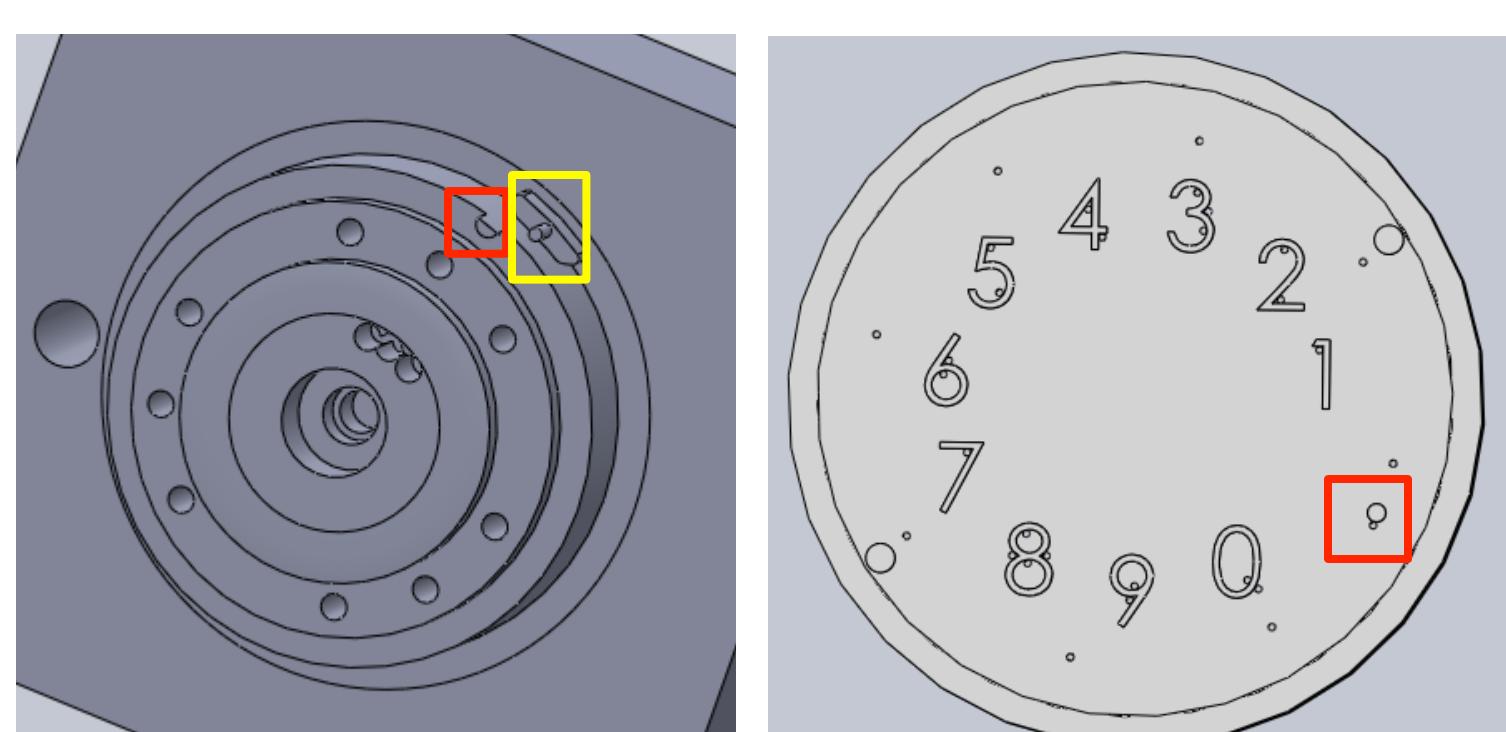
- Over 50 Completed YoYos
- Rotary Mechanism works
- High inertia creates a stable and satisfying spin



Tooling

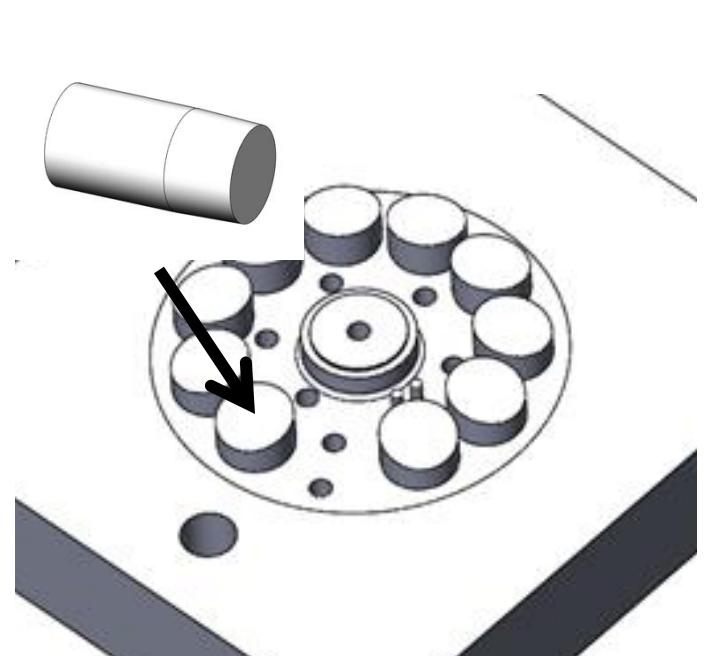
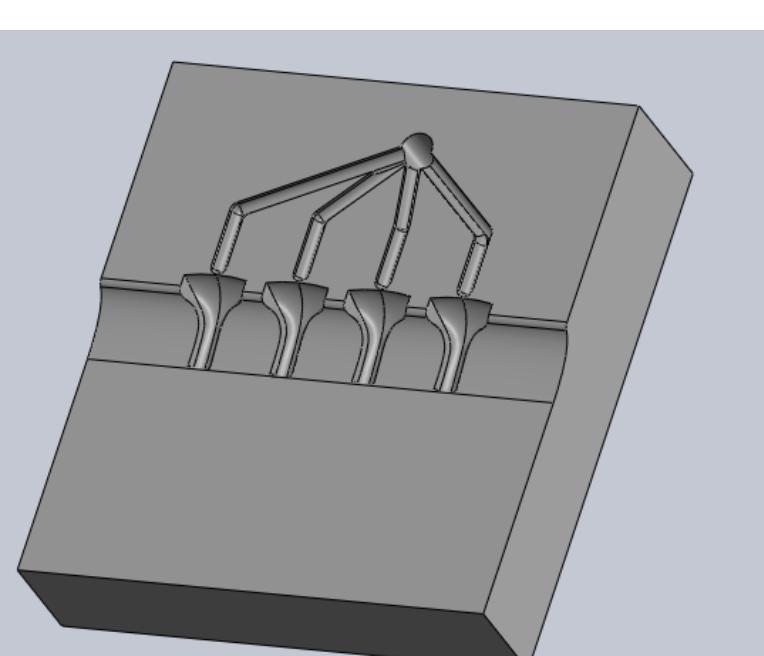
Considerations:

- Alignment of parts
- Ease of rework for press fits
- Machinability



Number Pad:

- (Red): alignment pin for number pad
- (Yellow): finger stop press fit



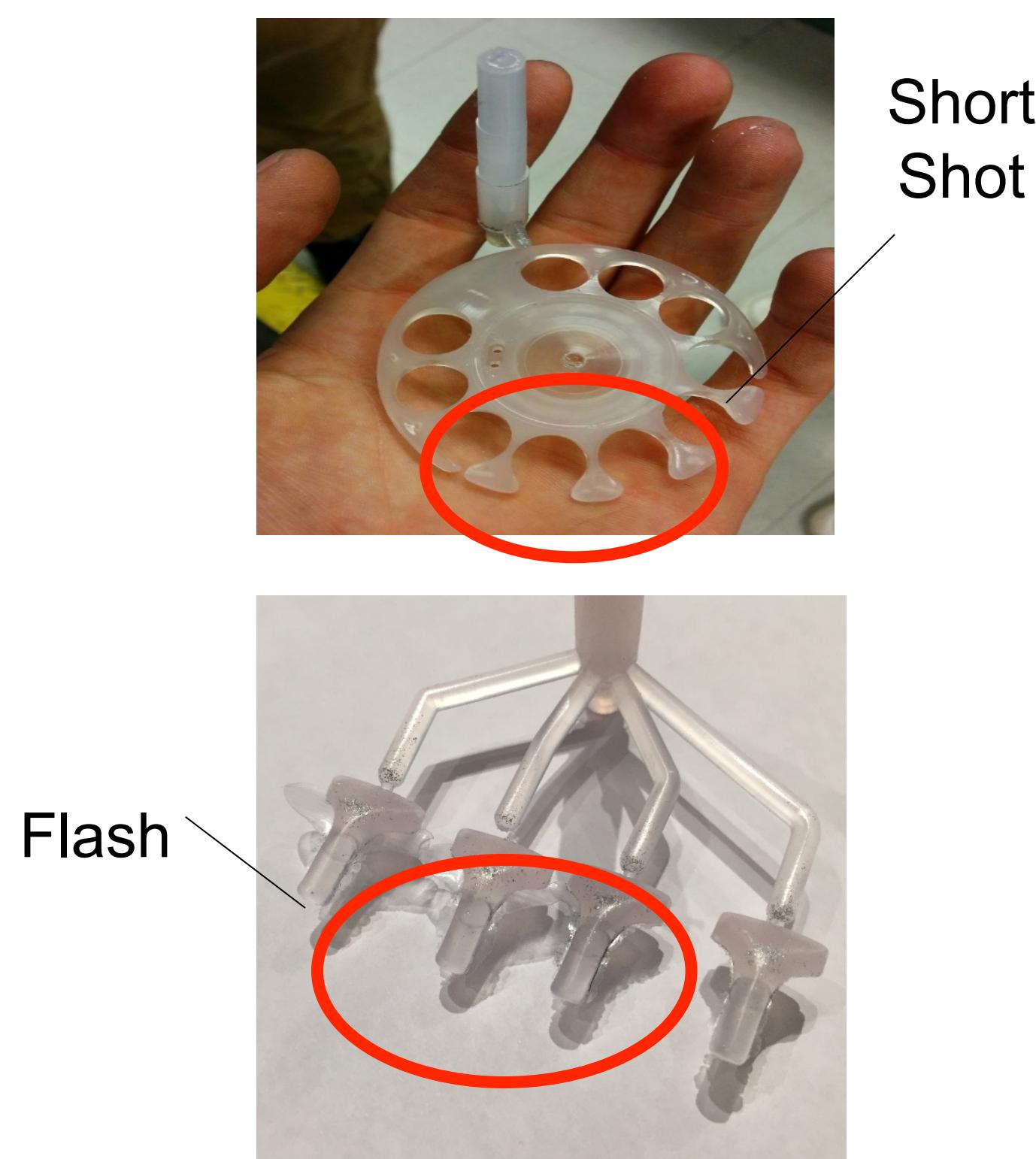
Finger Stop:

- Multiple-part finger stop cavity mold for faster production.

Dial:

- Pins turned separately, pressed into mold.

IM Optimization



Initial Injection Molding

- Short Shot
- Flash

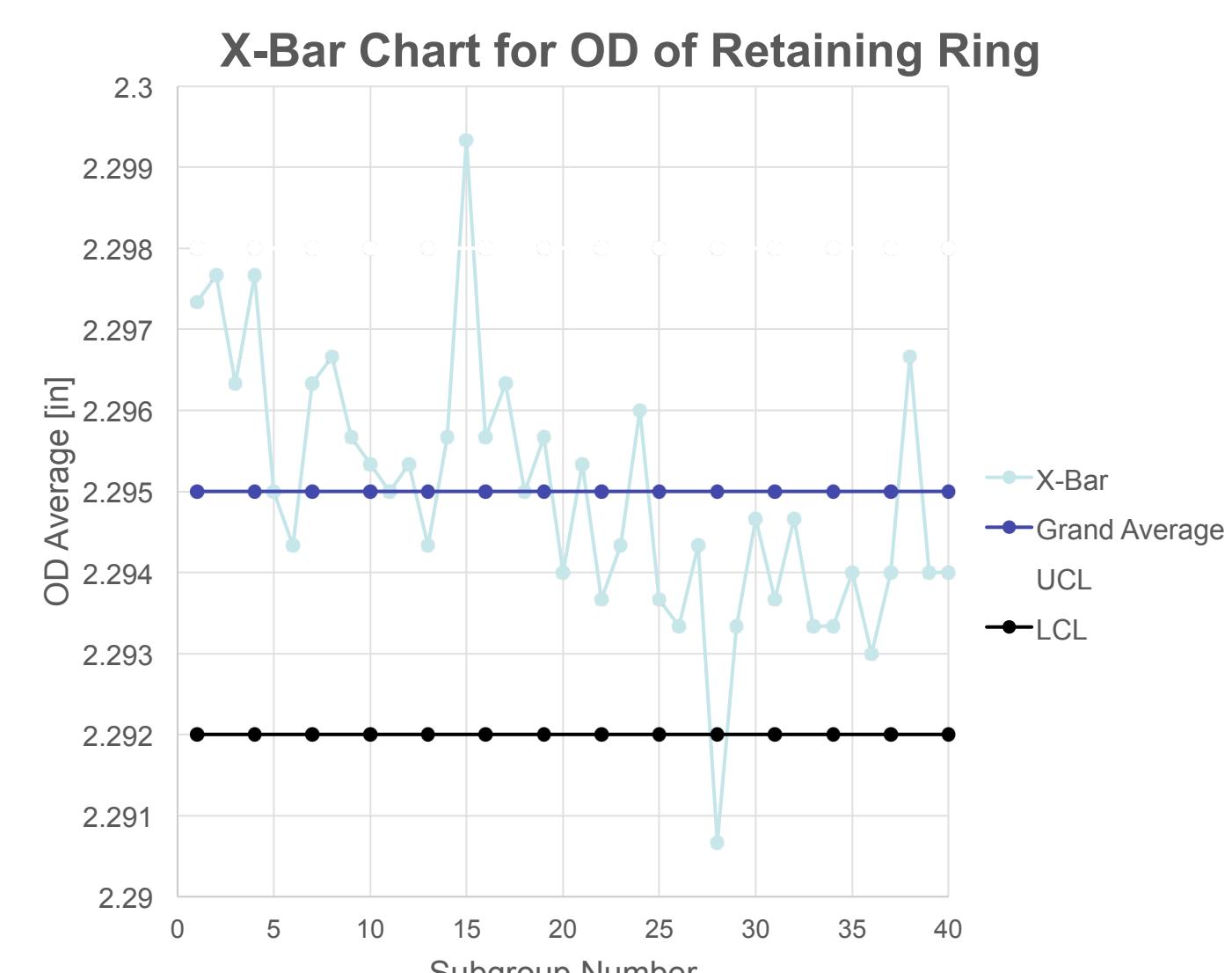
Adjust Parameters:

- Increase shot size – no more short shot
- Adjust injection pressure as needed

Other Considerations:

- Dishing
- Sink
- Sturdiness of IM Machines (Boy and Engel)

Production Results – Retaining Ring



$$Cp = 0.75$$

Specification Limits Unrealistic

Cost Analysis

Our YoYo was expensive!

- Hardware made it expensive

$$C = F + V \cdot N$$

Total Cost = Fixed Cost + Variable Cost * Number

Cost @ 1million YoYos: \$17.40 per

Cost @ 1,000 YoYos: \$35.28 per

Cost @ 100 YoYos: \$205.08 per

Assembly



- Took over 4 hours!
- Expected given torsion spring fit
- Included unlimited buffers
- Springs had to be re-worked

Problems

Finger Stop Collision with Dial



Solutions: Sink dial down and manually pull finger stop up.

Lessons Learned

- Create the design early to maximize time to test, iterate, and manufacturing
- Fits between parts will vary between iterations of molds
- Time to scale from one working prototype to many final parts takes much longer than the time it takes to get to one prototype