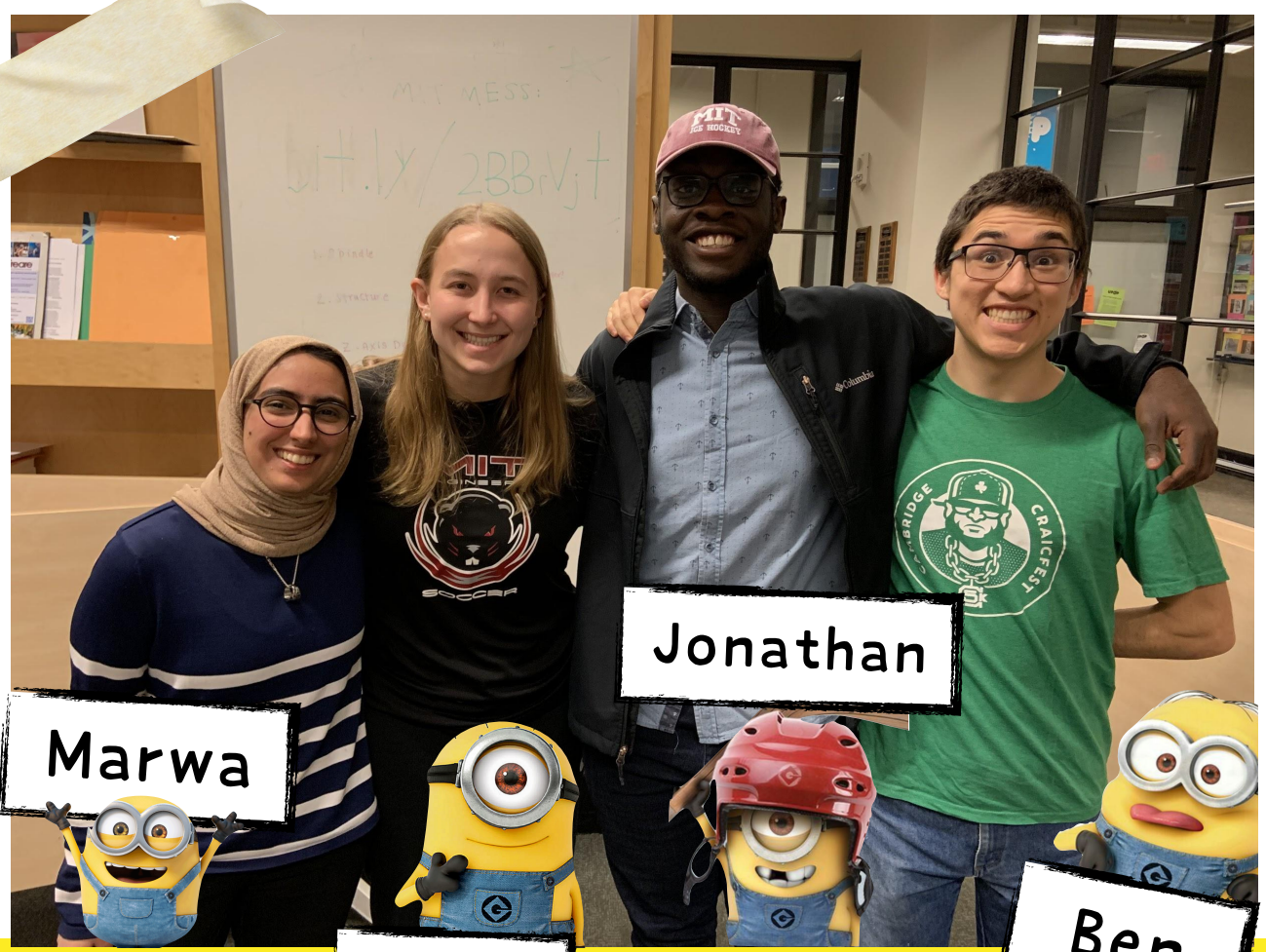
Team Minion

FINAL PRESENTATION

Marwa AlAlawi | Ben Gutierrez | Lily Mueller | Jonathan Sampson

2.008 Spring 2019

Meet the Minions!



Design

Goggle Dome
Thermoformed

Minion Eye
Laser Cut

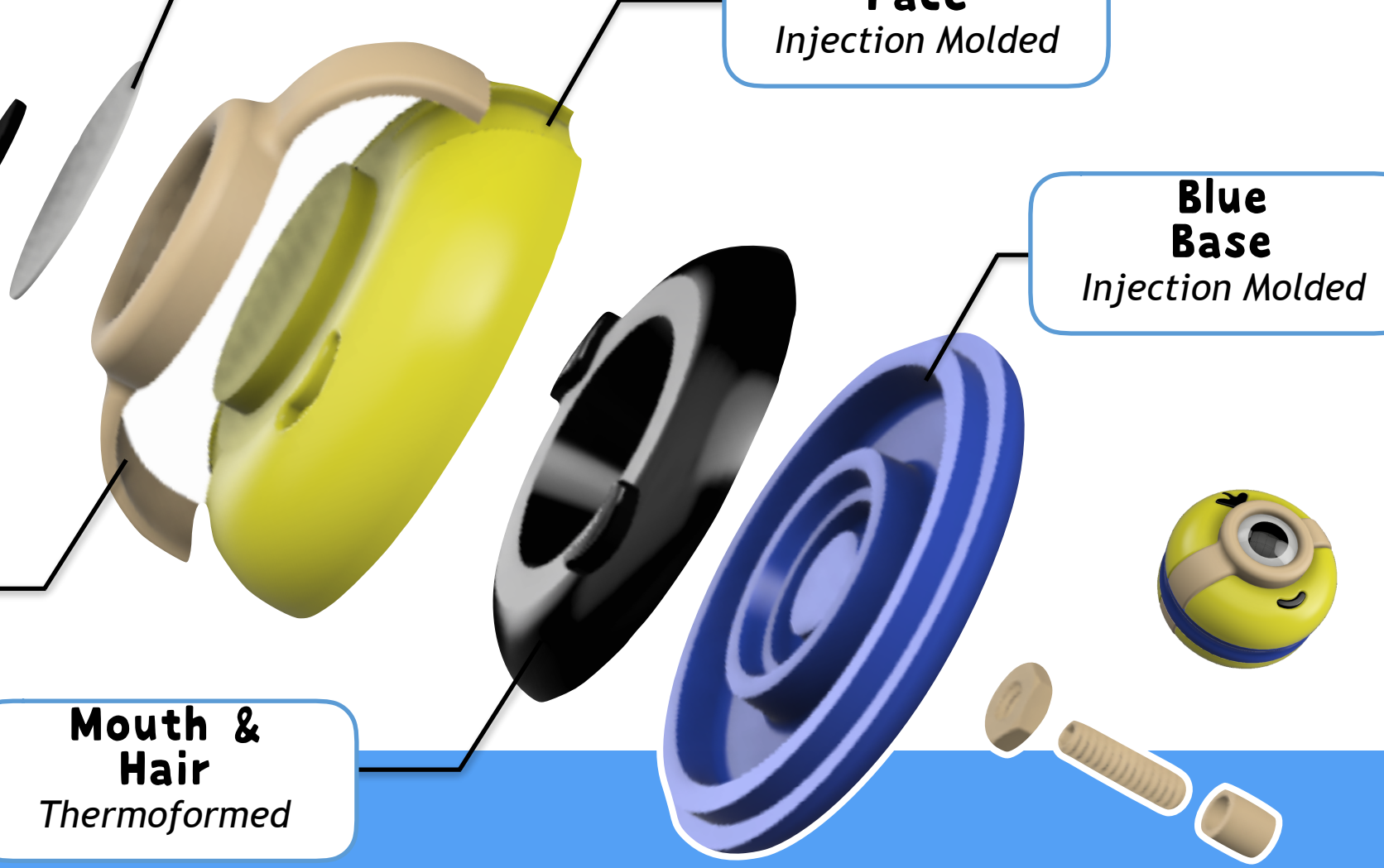
Minion Goggle
Injection Molded

Mouth & Hair
Thermoformed

Eye Sclera
Punched Plastic

Yellow Face
Injection Molded

Blue Base
Injection Molded

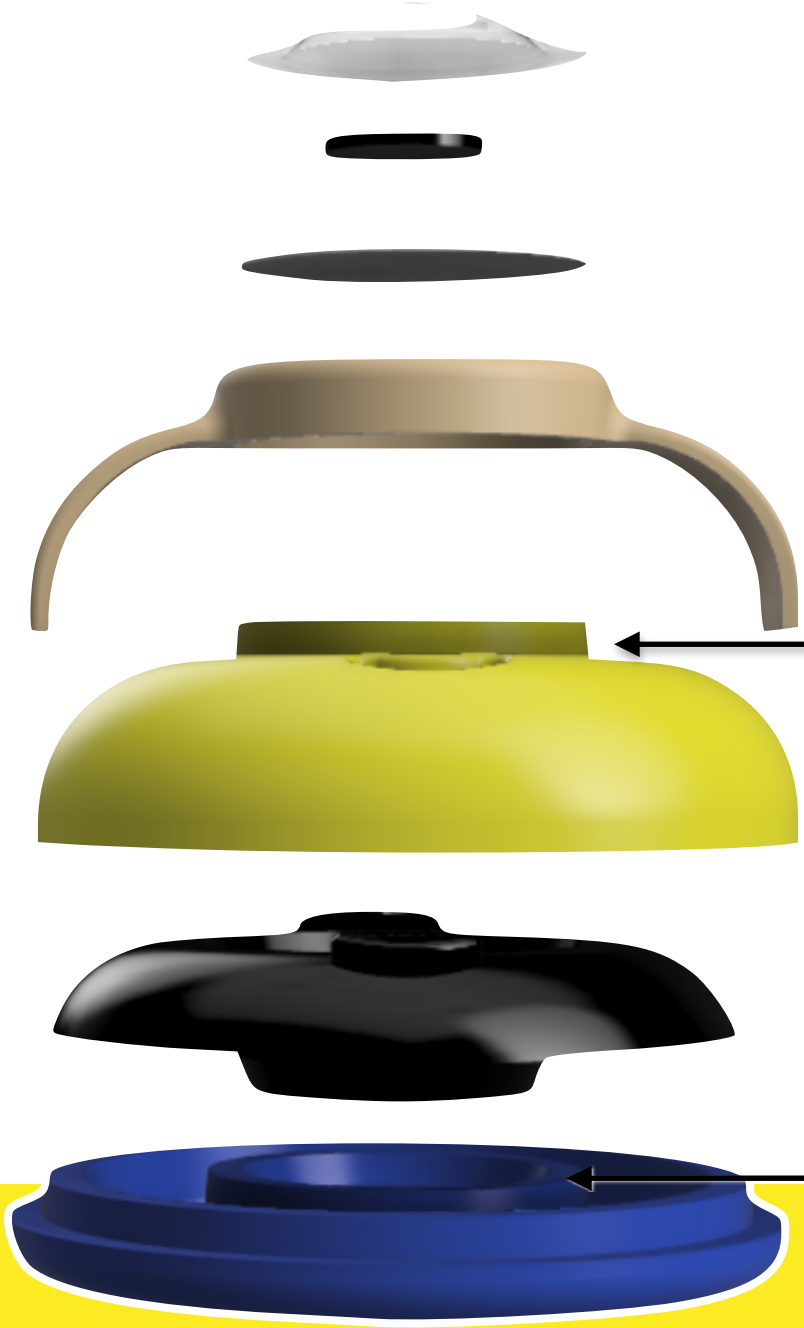


Design

1.5% *Shrinkage*

3% *Shrinkage*

1.5% *Shrinkage*

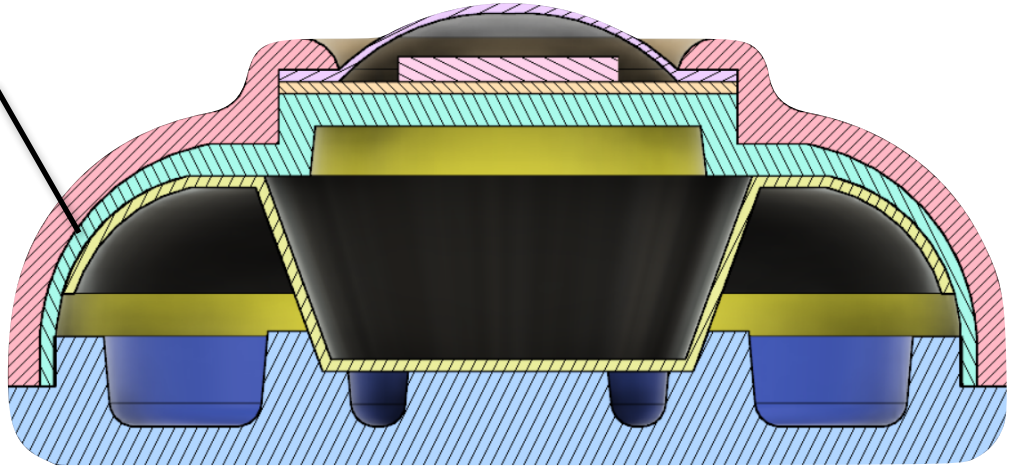


5 Degree Draft Angle

5 Degree Draft Angle

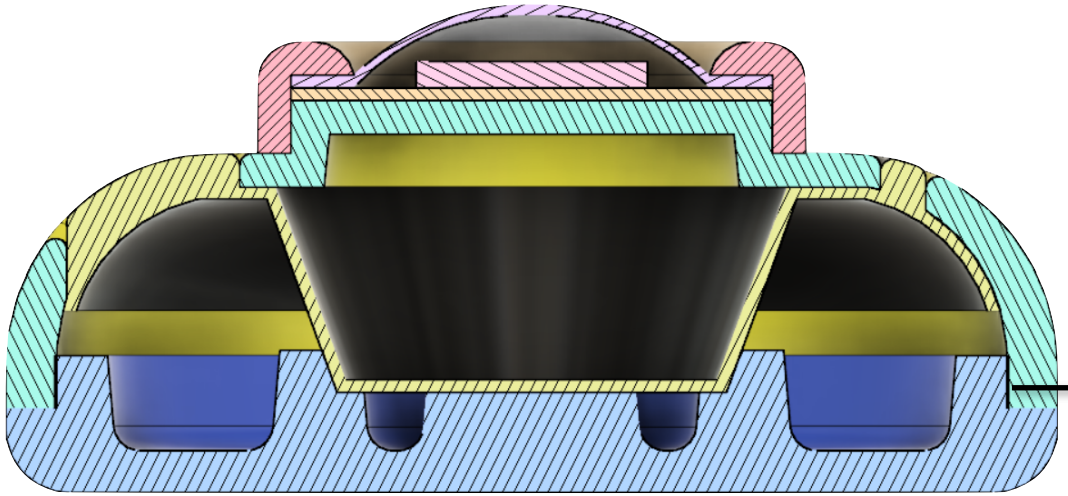
Design

Goggle to Yellow Face
0.01” Overlap



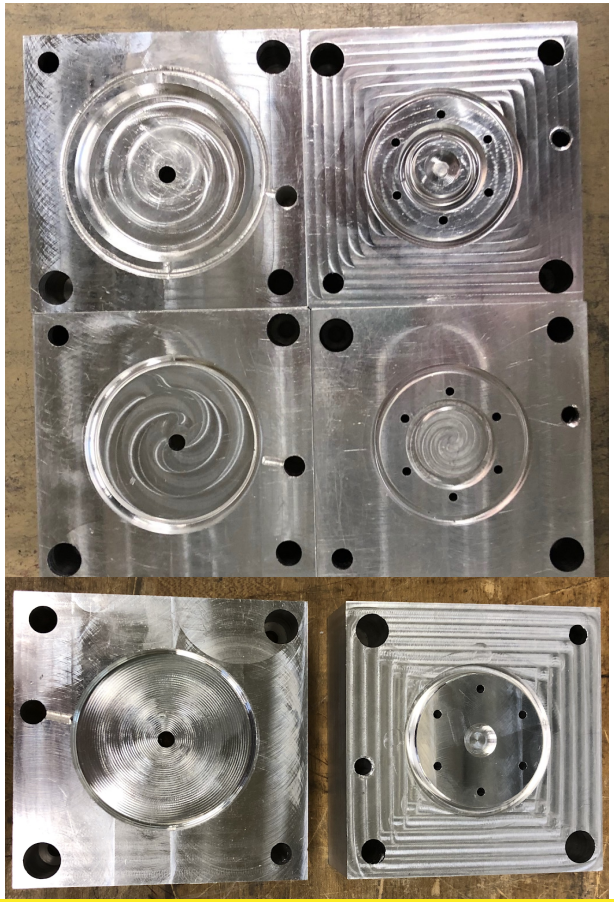
Strap Cross Section

Blue Base to Yellow Face
0.015” Overlap

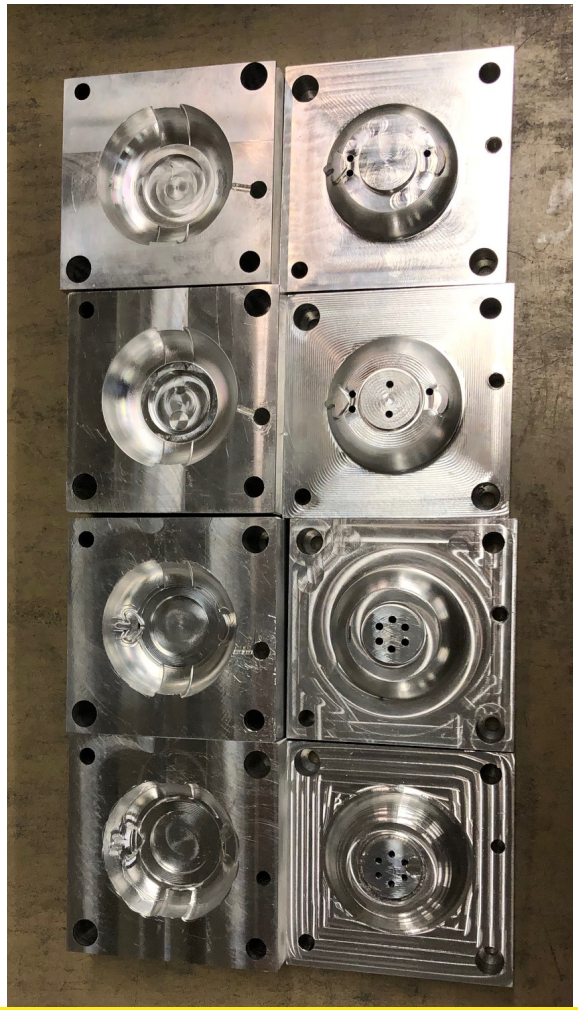


No Strap Cross Section

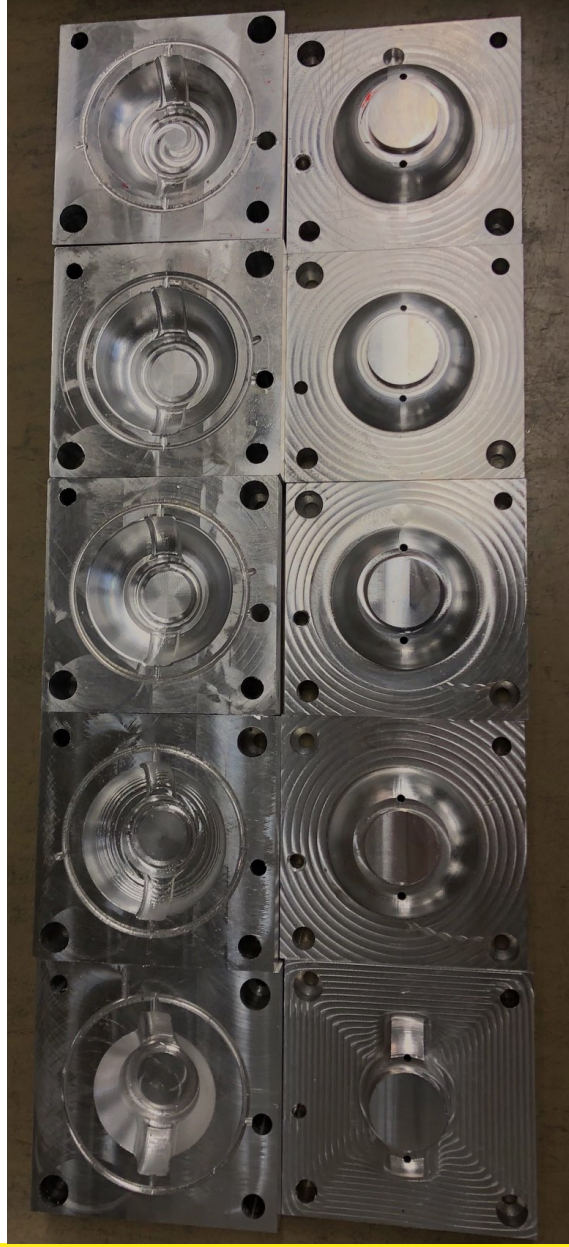
Mold Making



Blue Base
3 Molds

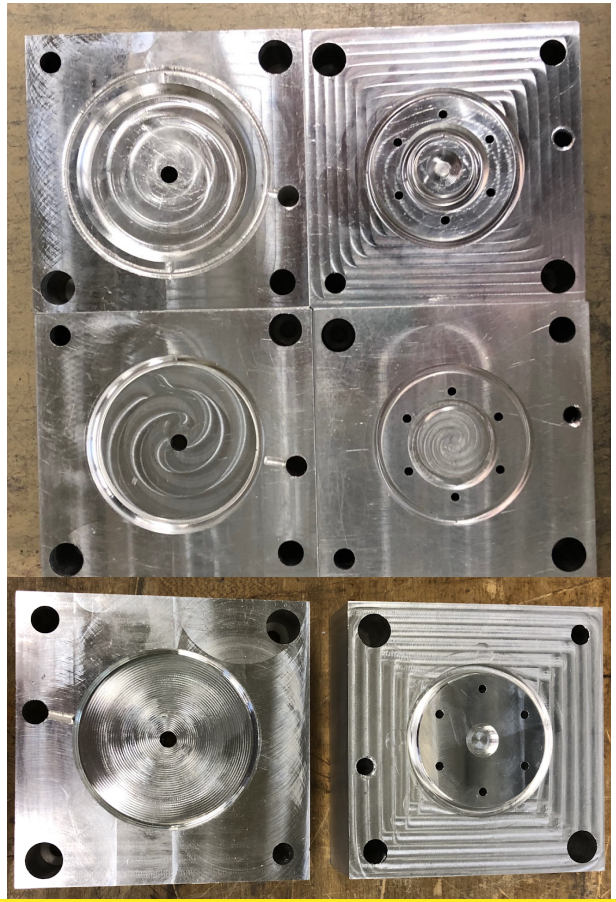


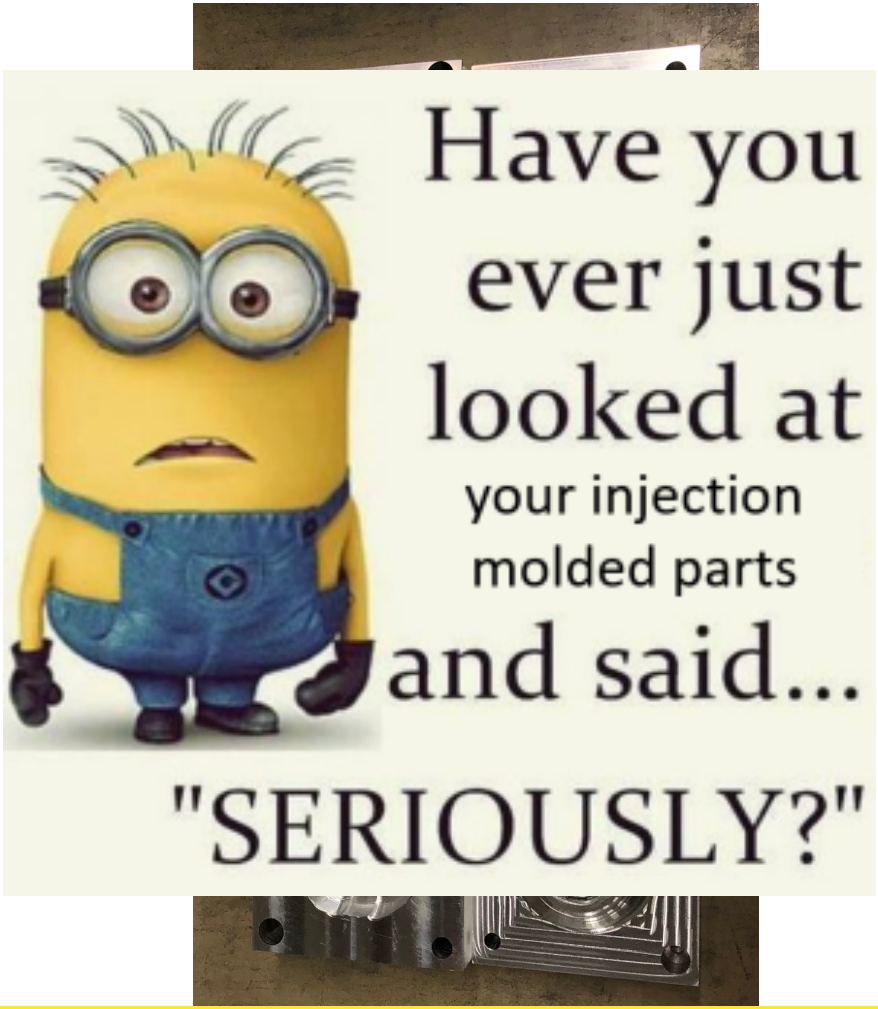
Yellow Face
4 Molds

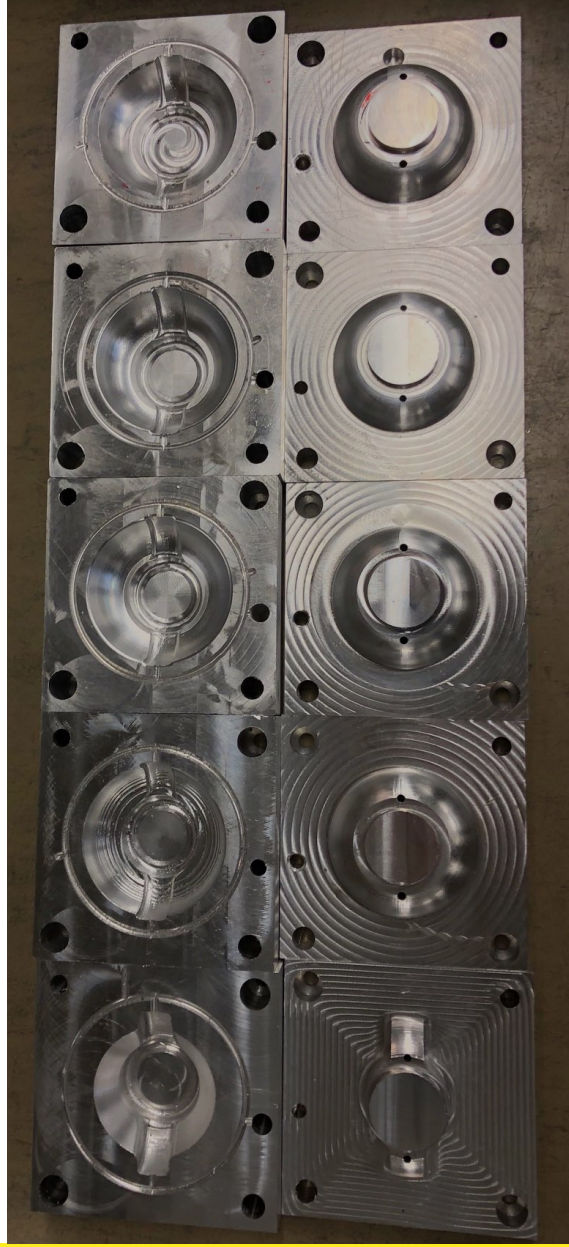


Goggle
5 Molds

Mold Making







Blue Base
3 Molds

Yellow Face
4 Molds

Goggle
5 Molds

Mold Making

Curved Surface Parting Plane

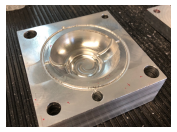
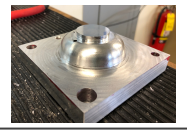
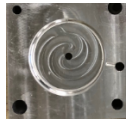
Curved parting surface helped molds ***align***

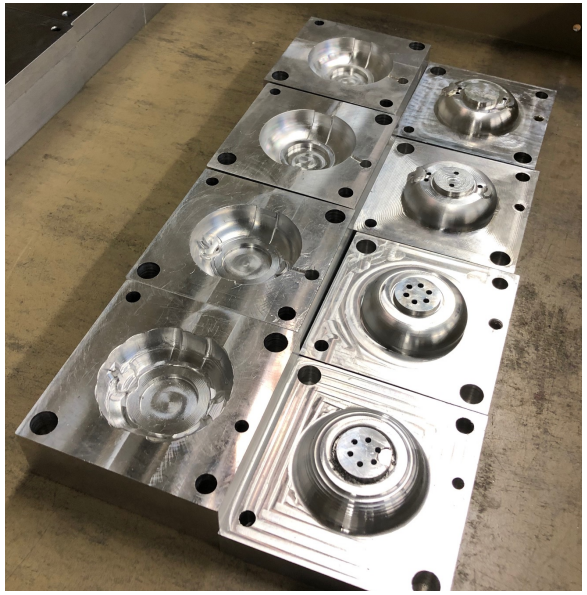
Mold Making

Material Removal Rate

$$MRR = v * t_o * w$$
$$v = \pi * D * N$$

Faster feed rates allow ***high quality*** surface finish without the wait

Part	New Feed Rate (in/min)	Old Toolpath Time (min)	New Toolpath Time (min)
 	52.3	286	84
 	90.3	117	39
 	52.3	51	15



Process Capability

Part	Mfg. Proc.	Crit. Dim.	Mean	St. Dev	c_p	c_{pk}
Black Hair	TF	0.53”	0.527”	0.0042”	**0.802**	**0.581**
Blue Body	IM	2.290”	0.290”	0.0030”	**0.563**	**0.509**
Yellow Face	IM	1.163”	1.164”	0.00088”	**1.890**	**1.633**
Goggle	IM	1.143”	1.143”	0.0017”	**0.968**	**0.922**

Process Capability

Rate

- blue body thickness and cooling time
- assembly bottleneck
  - eye parts, goggle, and clear dome

Cost

- 19 total parts… (7 per yo-yo half)
  - use of laser cutter

Quality

- surface finishing pass: 0.002”
- thermoform punch symmetry

Flexibility

- parallel thermoform die production
- thermoforming vs. overmolding

Lessons Learned

DFM

- features on core side of mold
- curved parting planes

Machining

- increased feed rate

Rapid Prototyping

- parallel production

Thank you!