

Team 28: FSAE Advanced Aerodynamic Package

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Project Objective

To improve the aerodynamic performance of the FSAE race car through the addition of an undertray/diffuser, side elements, and the modification of the existing front and rear aerodynamic components.

Engineering Specifications

Measurable E-Specs	Unit	Value
Max Time to Attach/Detach	min	10/7
Max Running Water/Oil Temperature	°F	210/275
Max Wing Deflection	in/lbf	0.02
Max Weight	lbs	35
Min Downforce	lbf	400

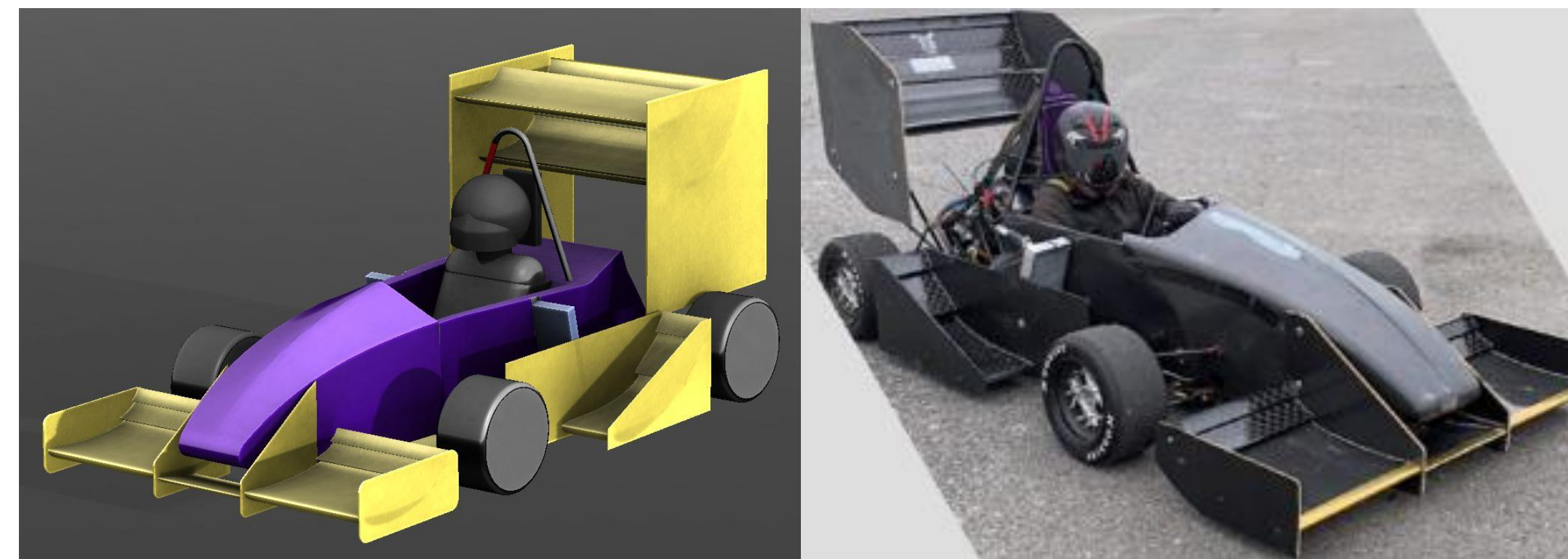
Safety

- Components cannot obstruct driver egress
- No sharp leading edges
- Front wing mounts must fail in crash
- Proper PPE during manufacturing

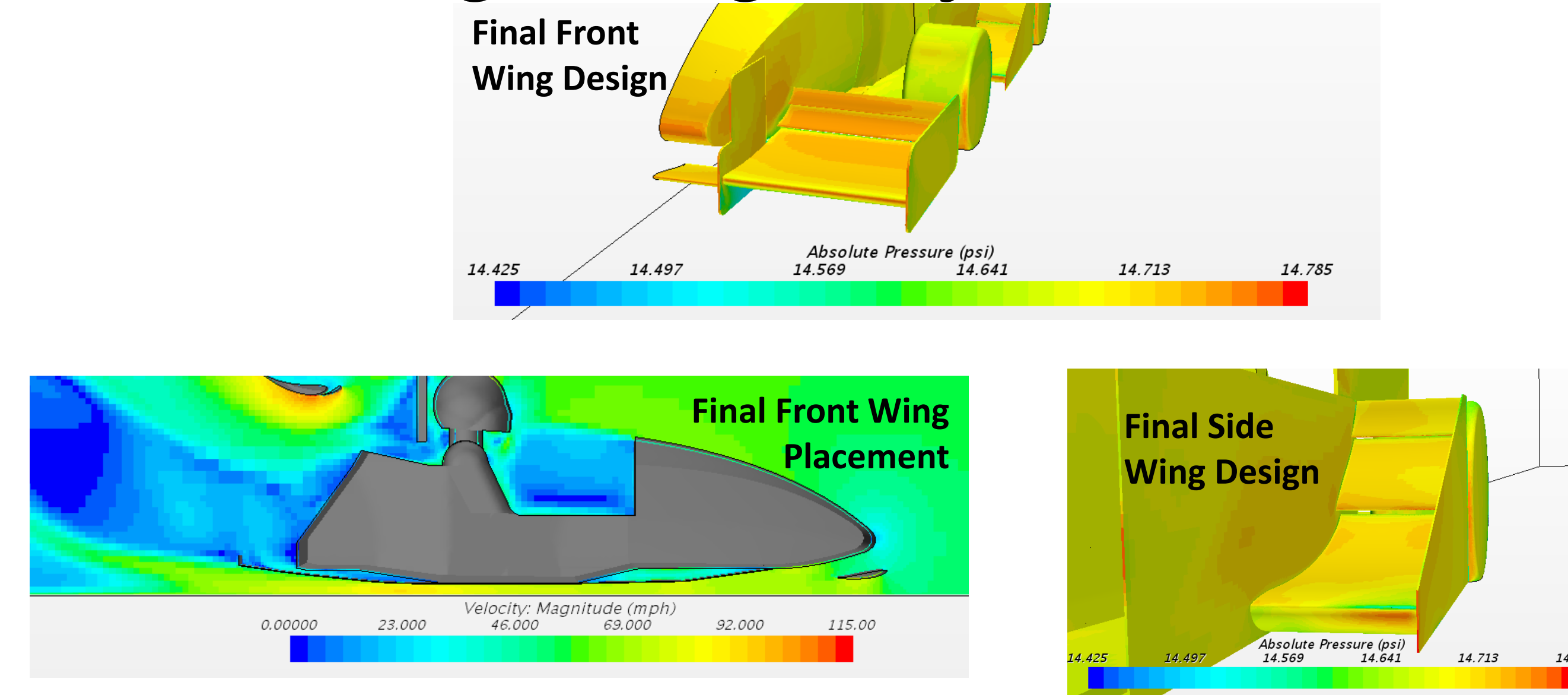
Material Selection

Component	Material
Endplates/Wing Ribs	0.25" DragonPlate Sandwich Foam
Internal Wing Spars	0.75" Carbon Tube
Internal Airfoil Core	2" Expanded Polystyrene
Exterior Airfoil Skin	2x2 Twill Carbon Composite
Undertray	Custom Carbon Fiber/ Foam Plate

Embodiment

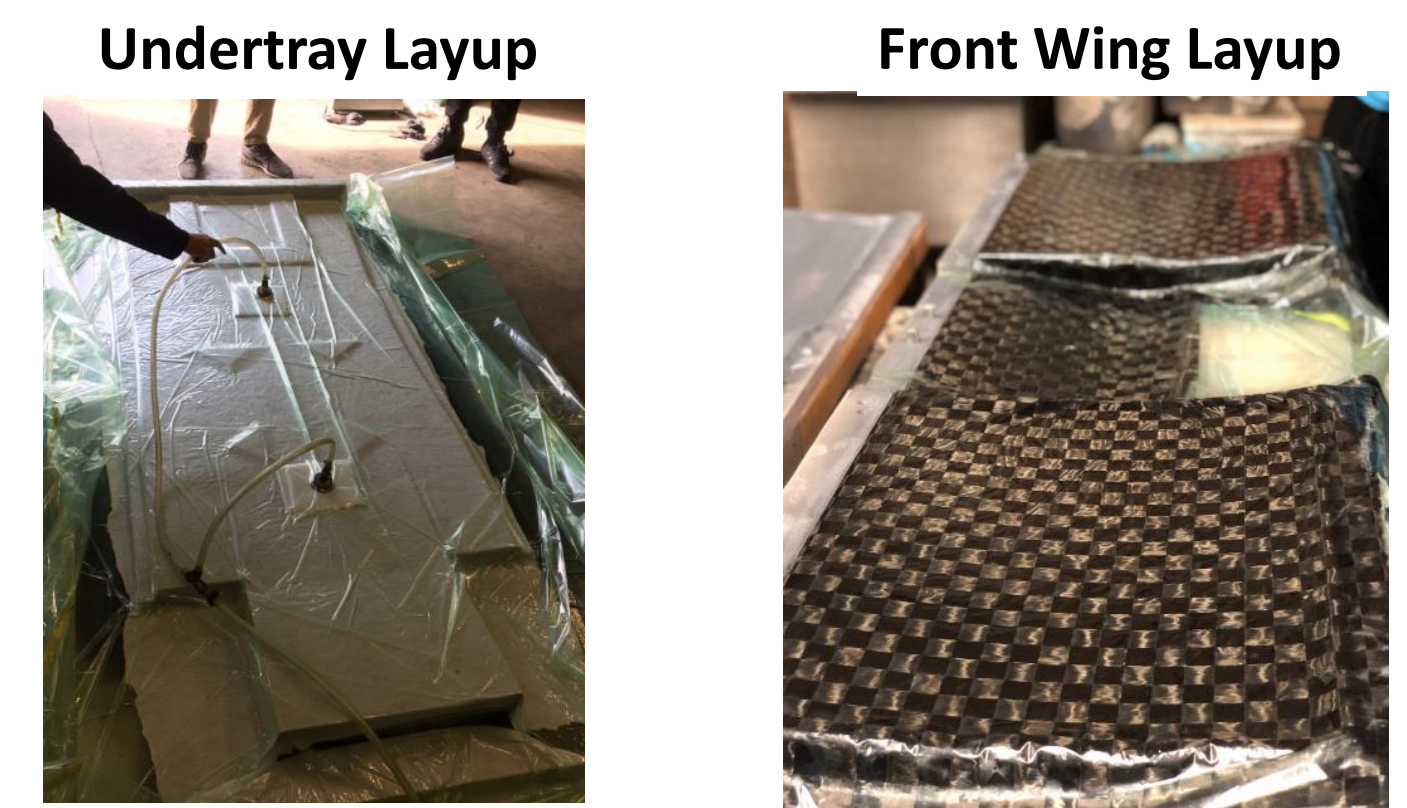


Engineering Analysis: 3D CFD

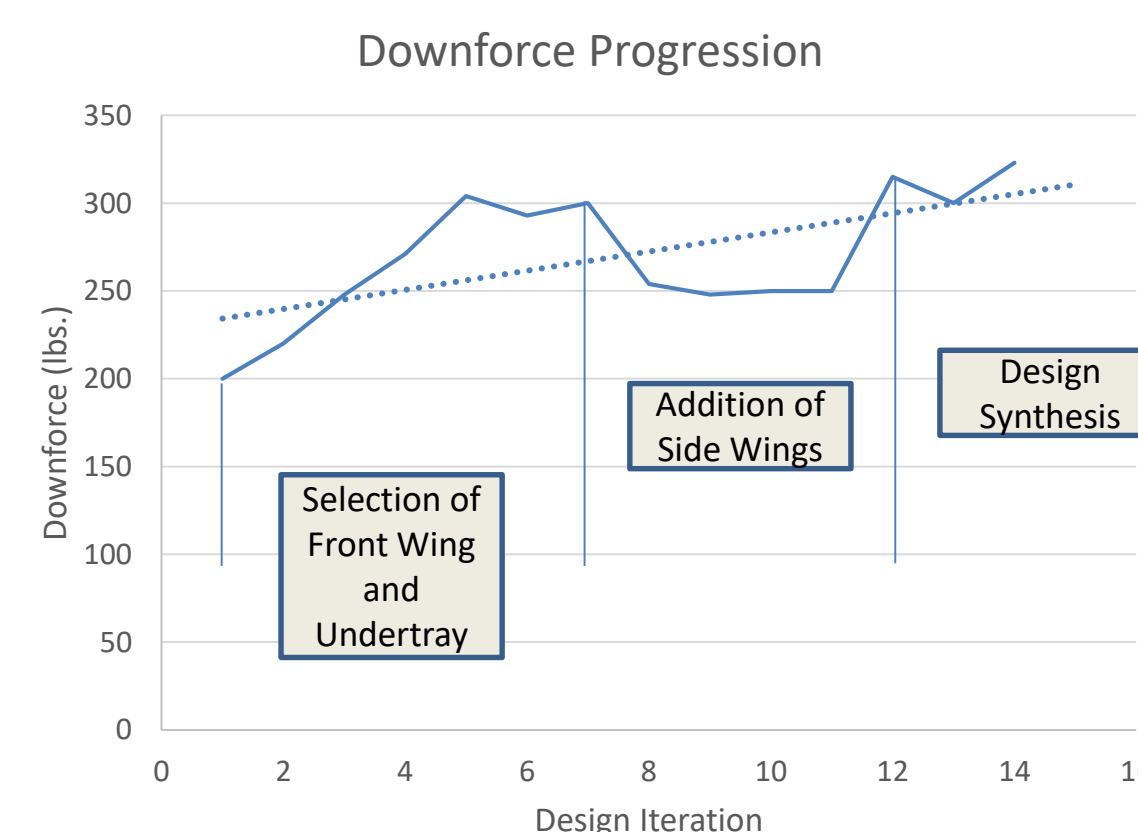
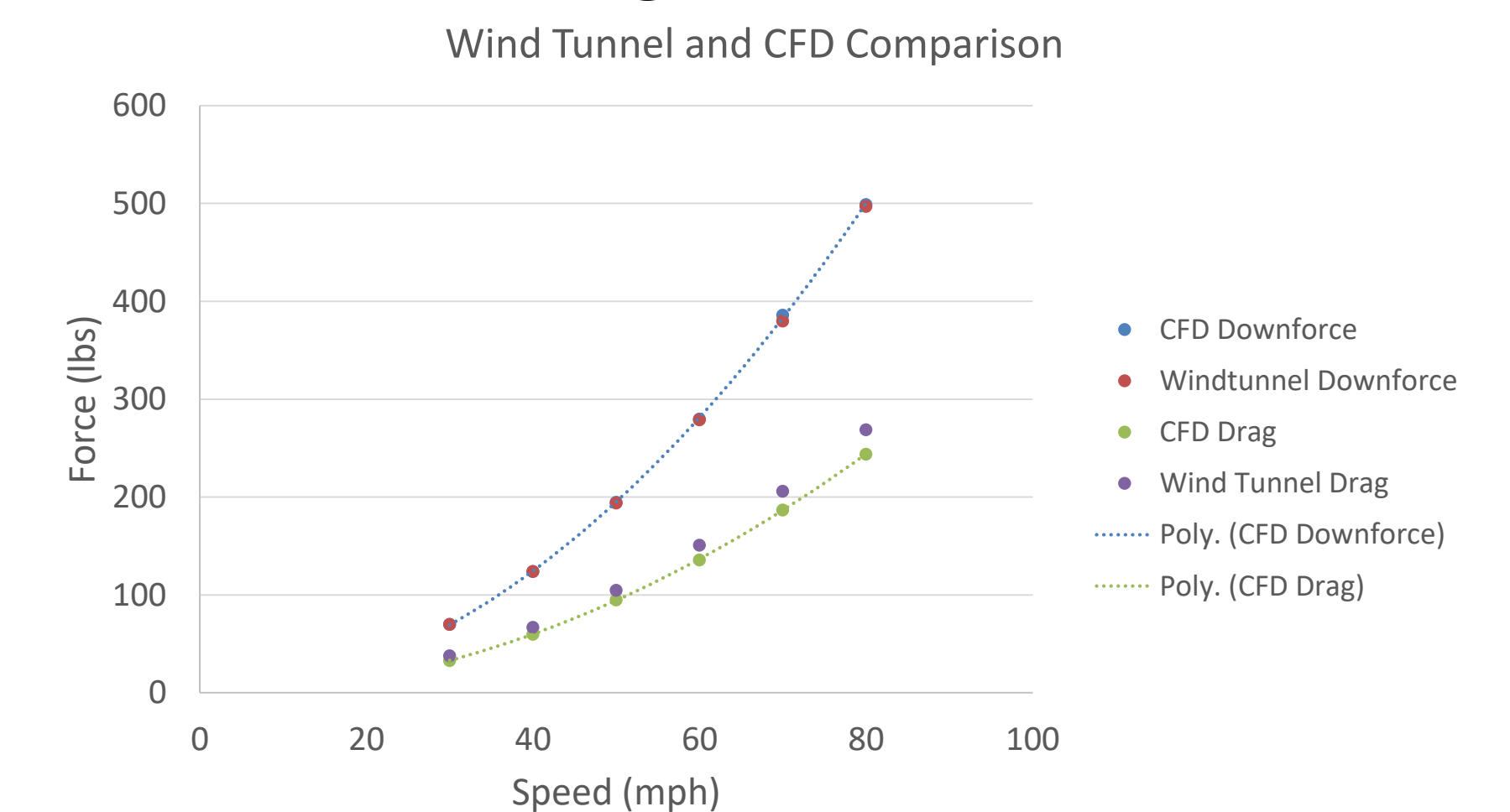


Manufacturing

- Waterjet cut endplates, wing ribs, and airfoil cores
- CNC mill wing and undertray molds
- Vacuum bag/ wet layup of wings and undertray
- Weld steel mounts to car chassis

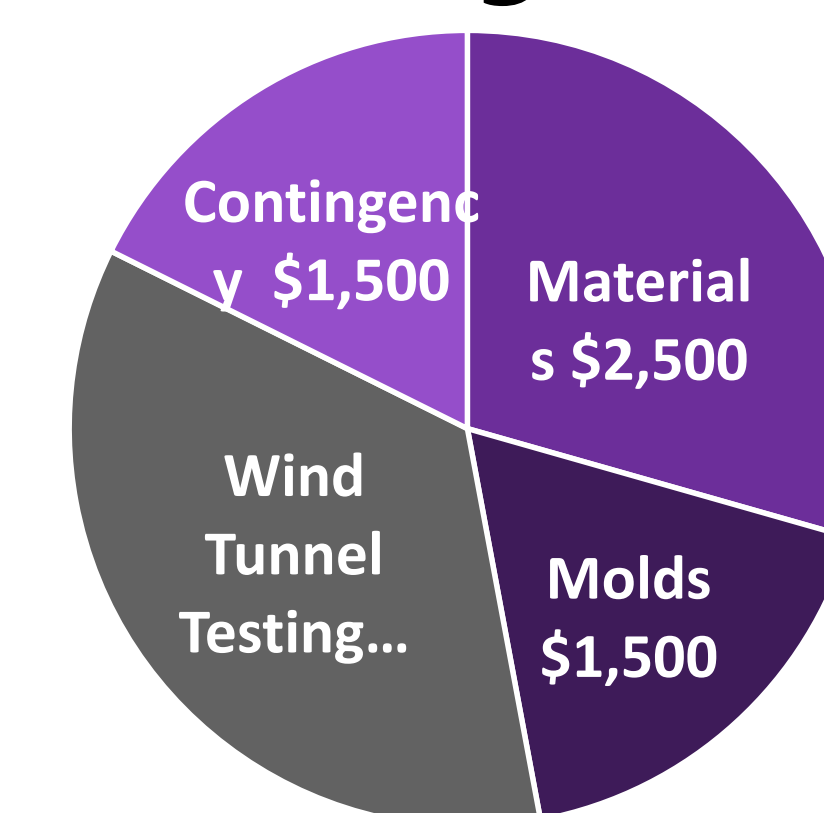


Testing Results



Design Iteration	Total Car Downforce (lb)	Results					
		Undertray DF (lb)	Front Wings DF (lb)	Rear Wings DF (lb)	Side Wings DF (lb)	Drag (lb)	Radiator Flow Rate (lb/s)
2018 Car	200	NA	76.7	127	NA	121	5.32
Iteration 1	220	2.8	89.9	126	3.74	137	1
Iteration 2	248	28	90	130	5.2	136	1.14
Iteration 3	271	62	73	124	12	125	7
Iteration 4	304	60	73.6	133	16.6	132	8.2
Iteration 5	293	40	86	136	13.4	136	6.6
Iteration 6	300	54	98	117	15.2	135	7.2
Iteration 8	254	35	90	103.4	11.3	130	3.8
Iteration 9	248	22	75	129	7.6	142	6.54
Iteration 10	250	11	87	105	20	120	5.1
Iteration 11	250	6	115	90	>15	120	6
Iteration 12	316	30	120	132	18	136	7.8
Iteration 13	300	42	113	99	23	124	6.8
Iteration 14	323	39.6	112.6	127.4	29.6	140.6	6.7

Budget



Concept Generation & Selection
(August-September)

Analysis
(October - December)

Build
(January - March)

Test
(April)

Compete
(May 8th-11th)