2025 Baja SAE Design Review Briefing (DRB)

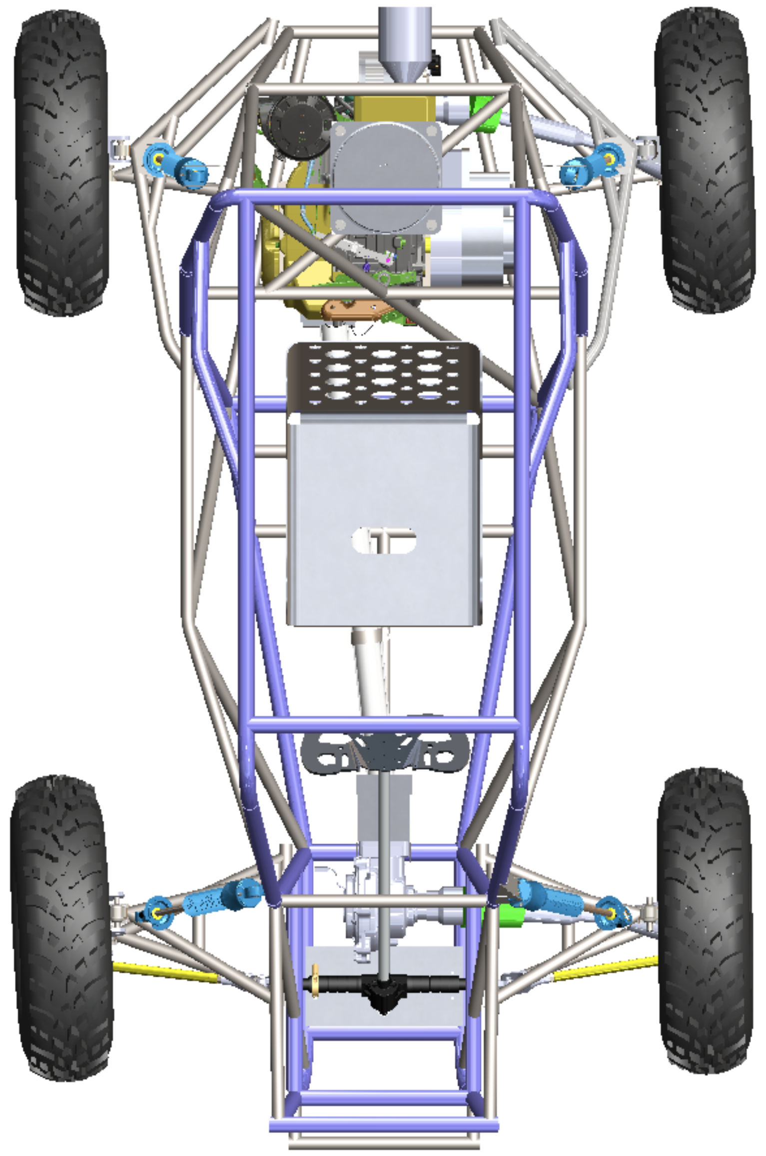
School Name

University of California, Irvine

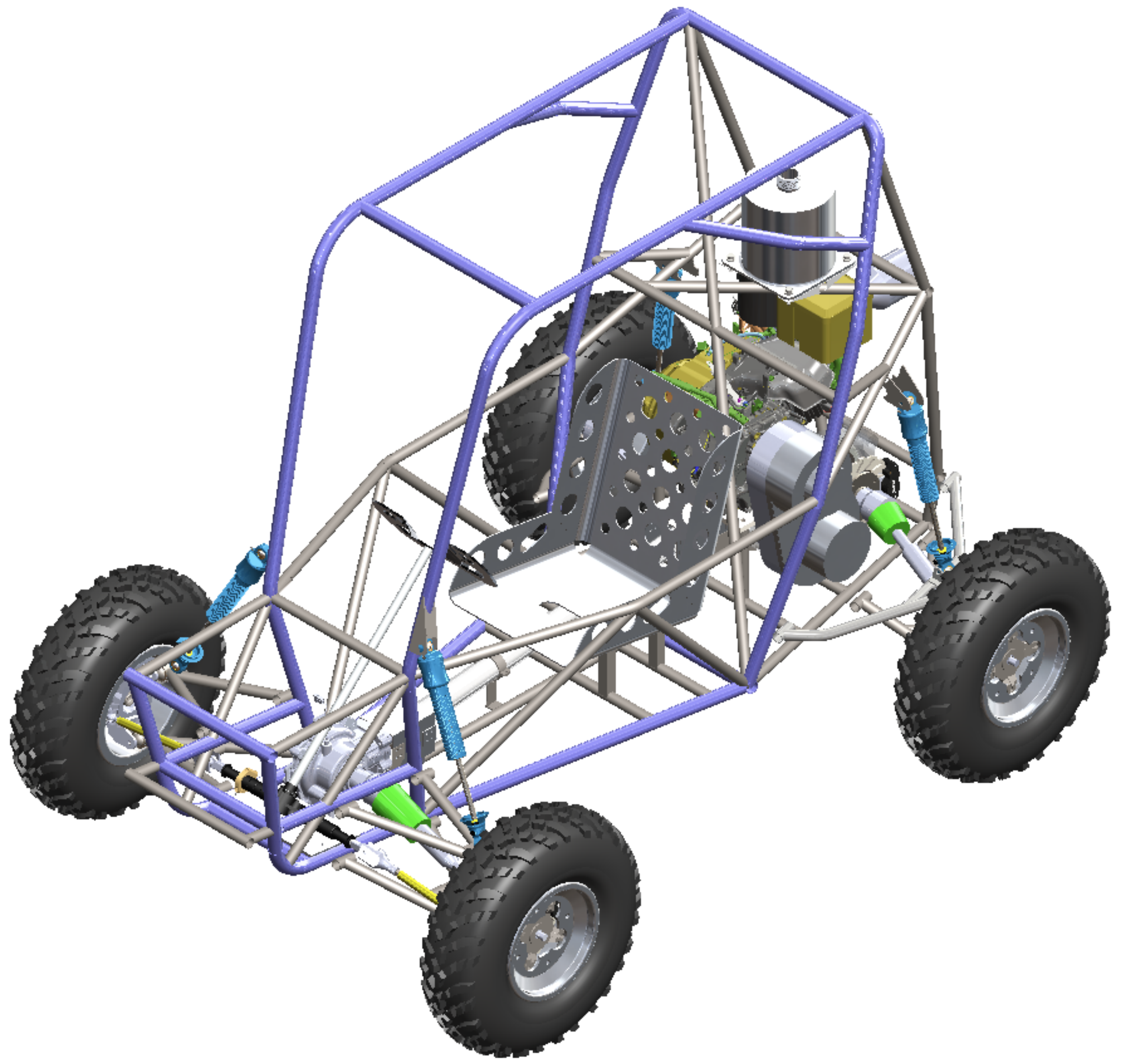
2025 Car Number(s)

2025 Vehicle: “Corsair”

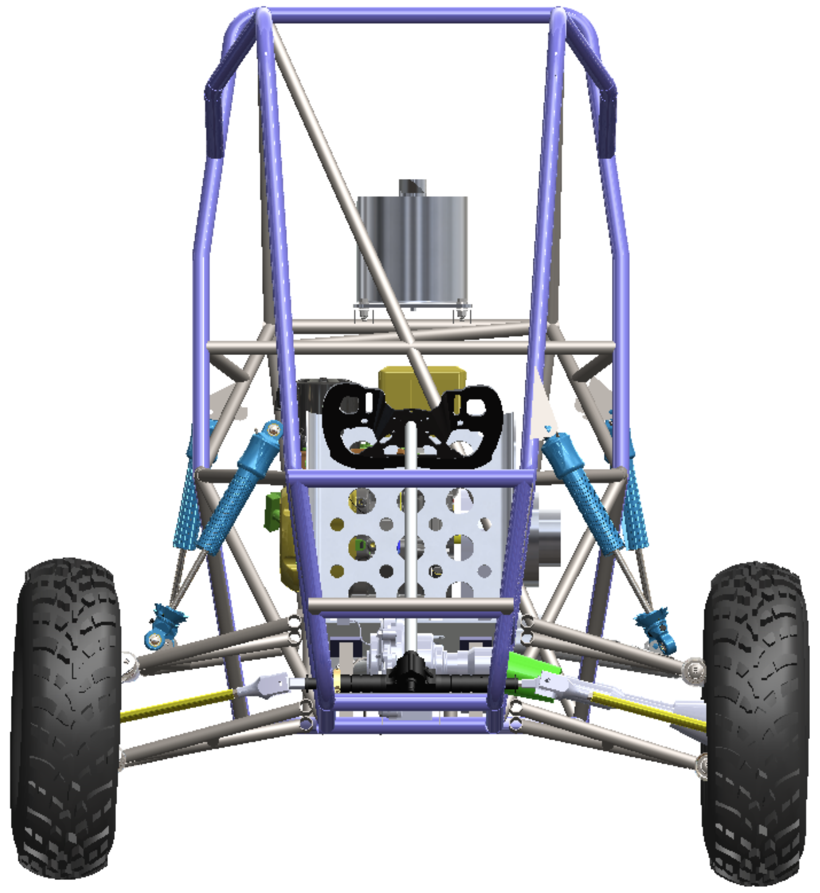
Corsair Master CAD



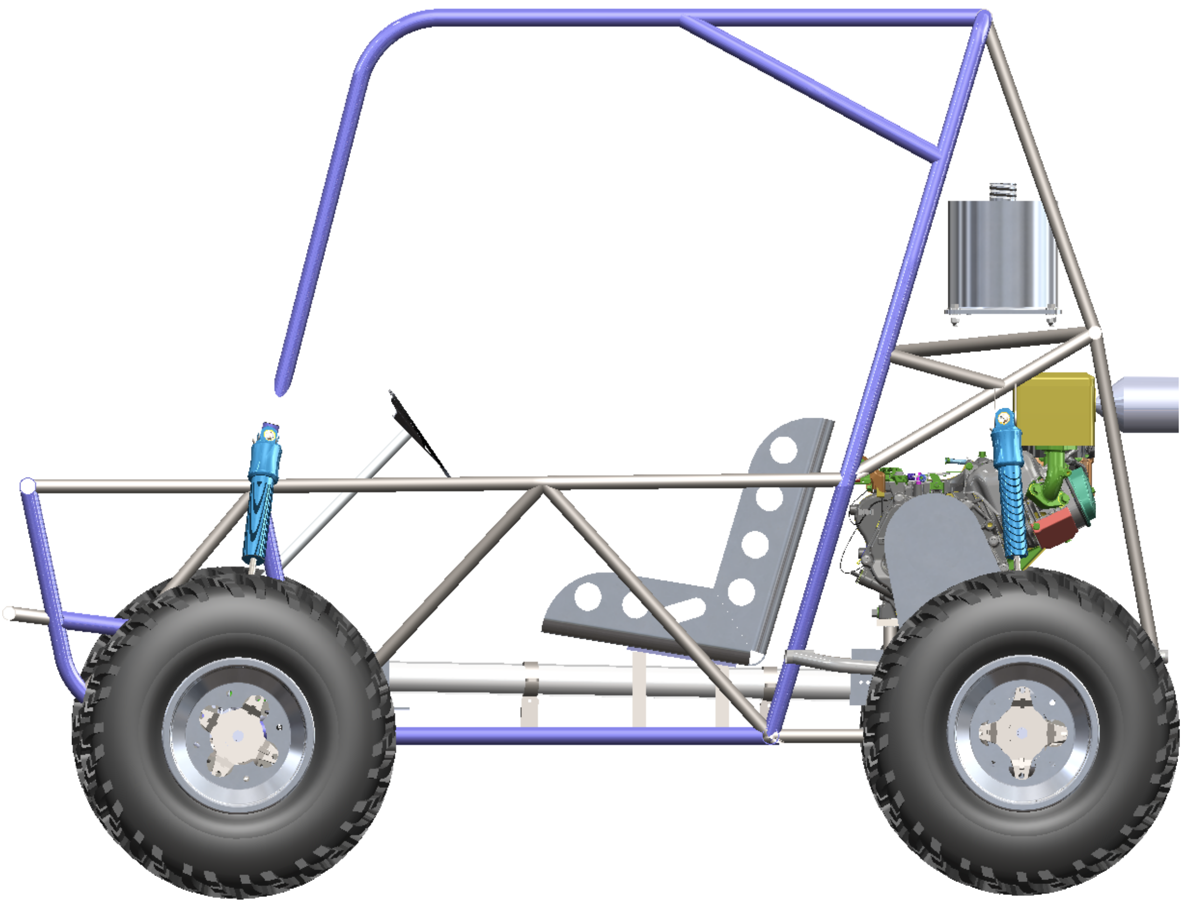
Top View



Isometric View



Front View



Side View

Team Goal

Competition History to Team Goals

Event Results	2023 California: (ABR23) "Rogue"	2024 California: (ABR24) "Scoundrel"	2025 Arizona: (ABR25) "Corsair"
Business Presentation	39th	15th	Top 20
Cost Event	58th	39th	Top 20
Design	41st	15th	Top 20
Acceleration	31st	33rd	Top 20
Hill Climb	48th	36th	Top 20
Maneuverability	DNF	17th	Top 20
Suspension	42nd	30th	Top 20
Endurance	46th	36th	Top 20
Overall	56th	30th	Top 20

Worsen Needs Work Improved

Goals For 2025 Competition	Steps To Success
q Pass Tech Inspection q Complete all events q Score consistently across all events* q Become a **competitive top 20 team***	- Maximize scores on dynamic events ○ Overall system weight reduction ○ Improve key component durability and subsystem reliability ○ Refined vehicle with subsystem packaging - Maximize scores on static events

Dynamic Events	Points
Acceleration	70
Hill Climb or Traction	70
Land Maneuverability	70
Suspension or Rock Crawl	70
Endurance	400
Total	**680**

Static Events	Points
Design Evaluation	150
Cost Evaluation	100
Business Presentation	70
Total	**320**

Fig. 1 Competition Score Breakdown

Fig 2. 2023 Team at Washougal, OR

Fig 3. 2024 Team at Gorman, CA

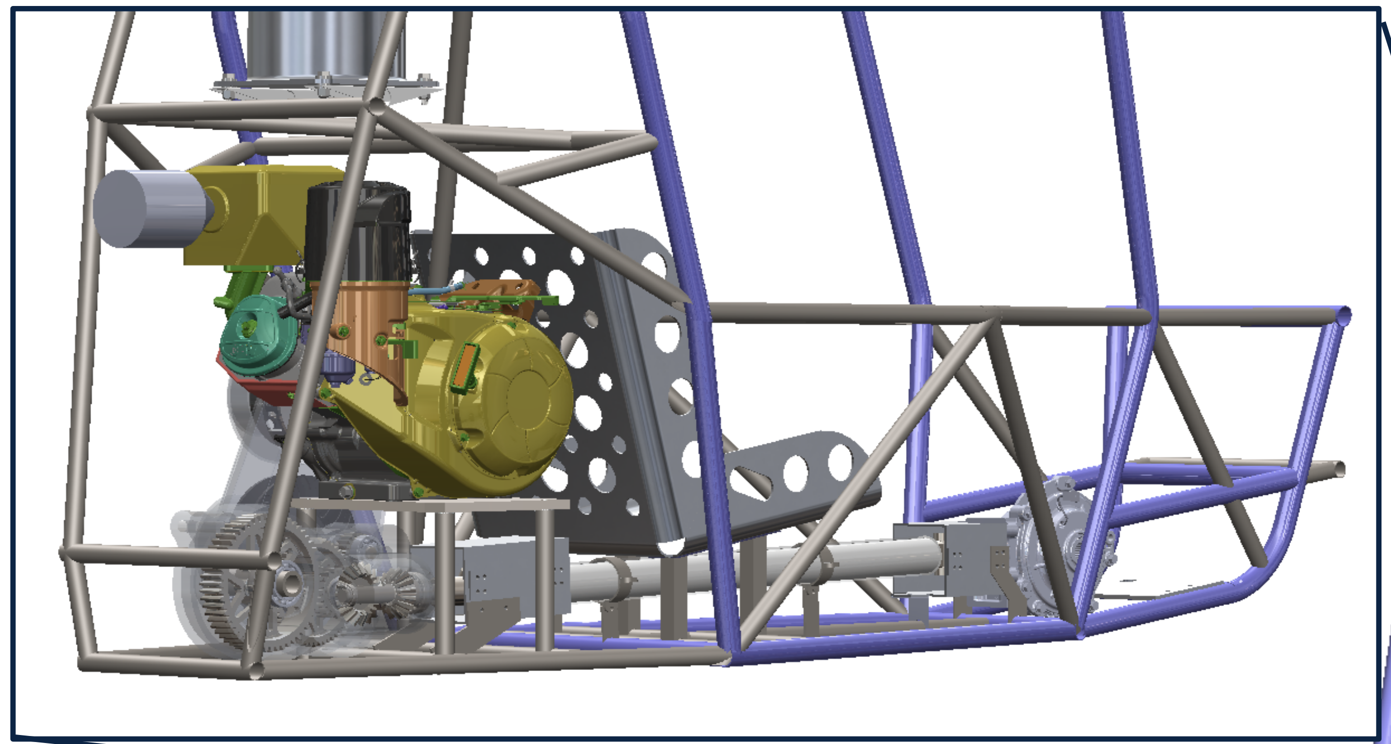
System Design

Subsystem Specification and Integration

Table 1: System Direction Design

Sub-Team	Major Subsystem Changes
Chassis and Body	- Optimize chassis size using more accurate human models
Powertrain (Transmission)	- Custom Transfer case for rear power delivery - CVT Tuning
Powertrain (Driveline)	- Custom driveshaft for weight reduction
Suspension and Steering	- Introduce front rake to absorb front impacts
Brakes and Human Interface	- Introduce rear inboard brakes to lower sprung weight - Lower seat height for CoG
Overall System ABR24 Weight 700 lbs w/o driver ABR25 Weight Goal: 500 lbs w/o driver ~ 30% Weight Reduction	

Fig. 1 Driveline/Transmission Integration



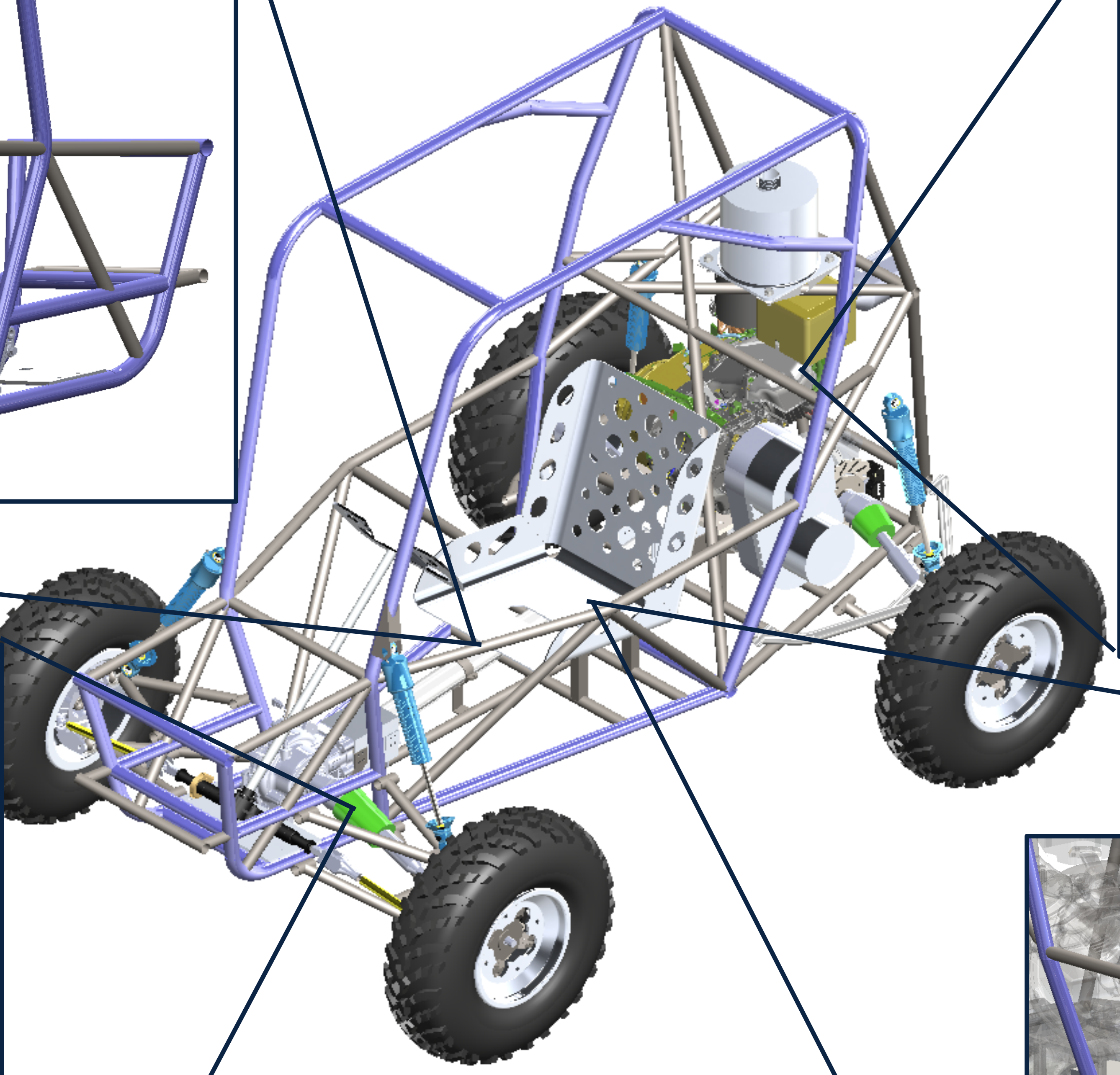
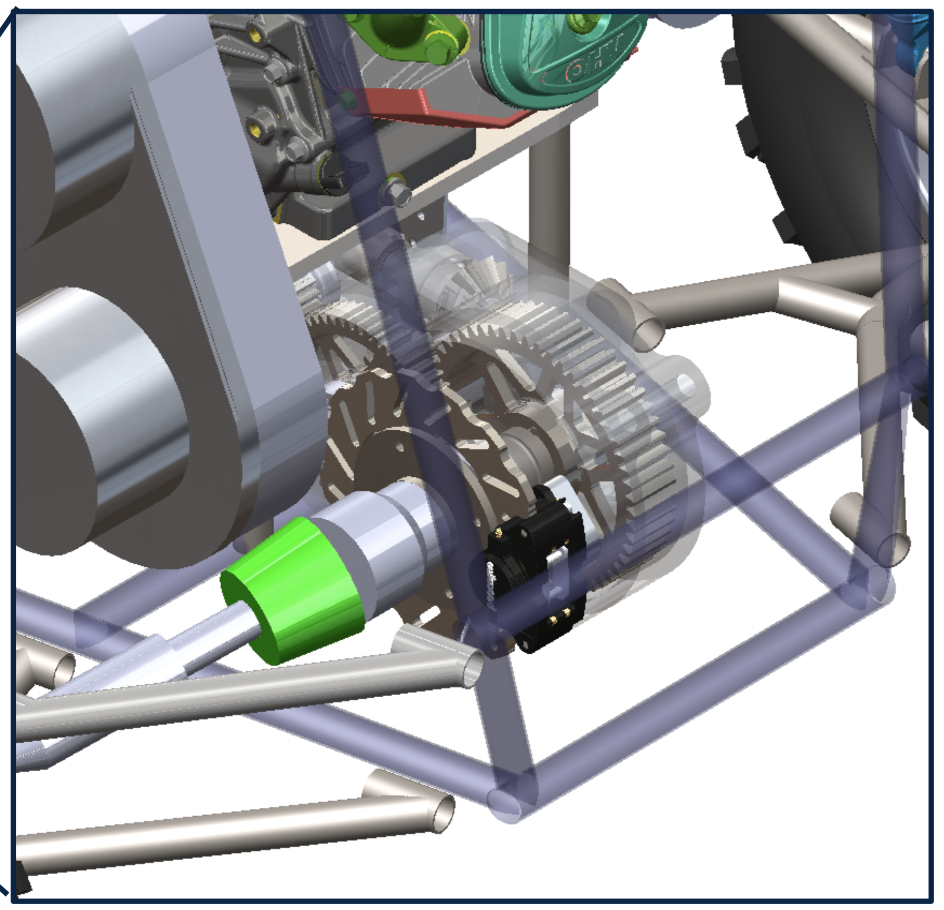


Fig. 3 Transmission/Brakes/Driveline Integration



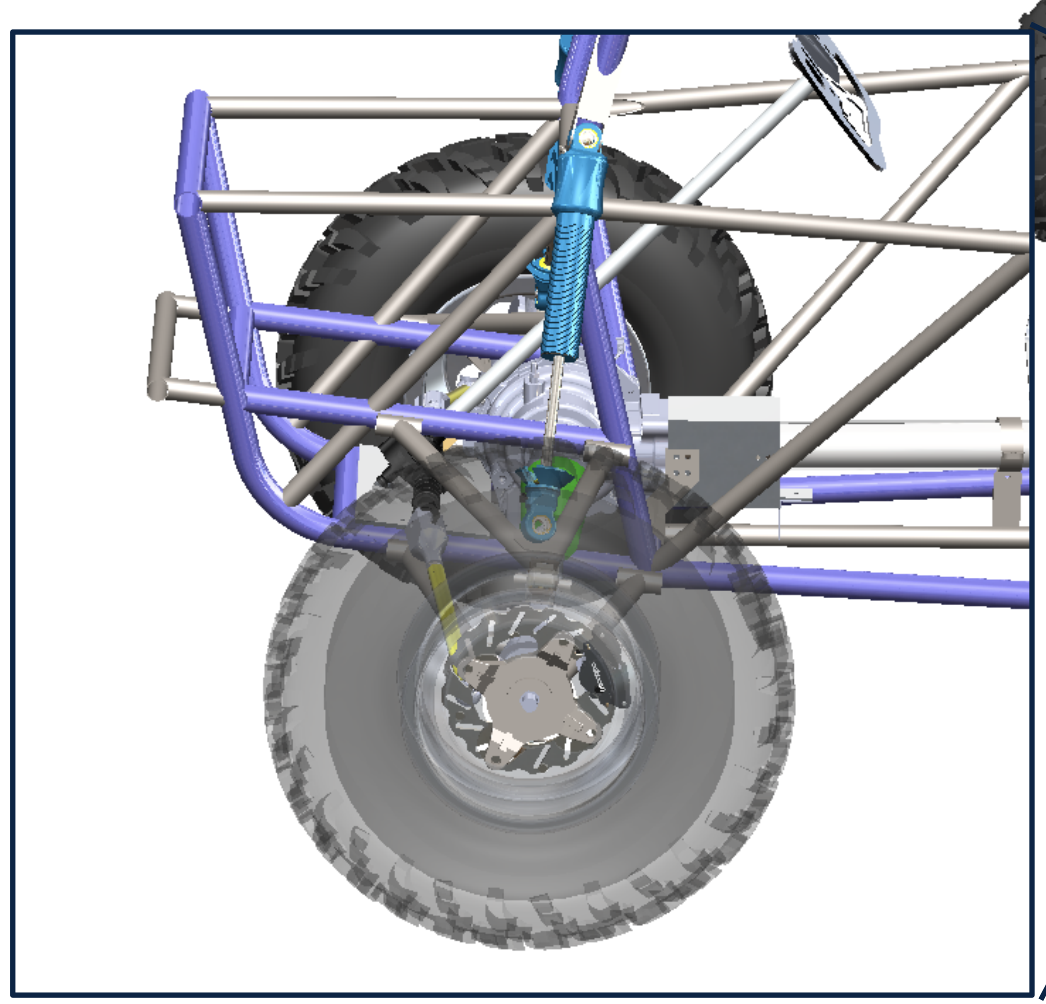


Fig. 2 Chassis/Suspension Integration

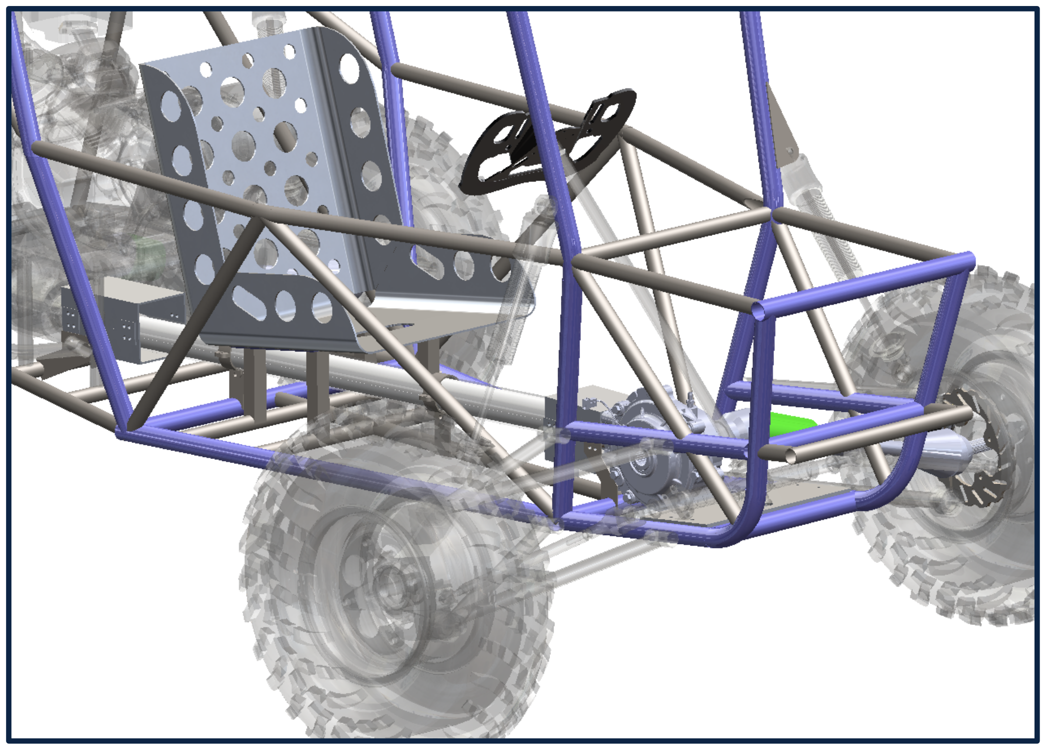


Fig. 4 Human Interface/Chassis/Driveline Integration

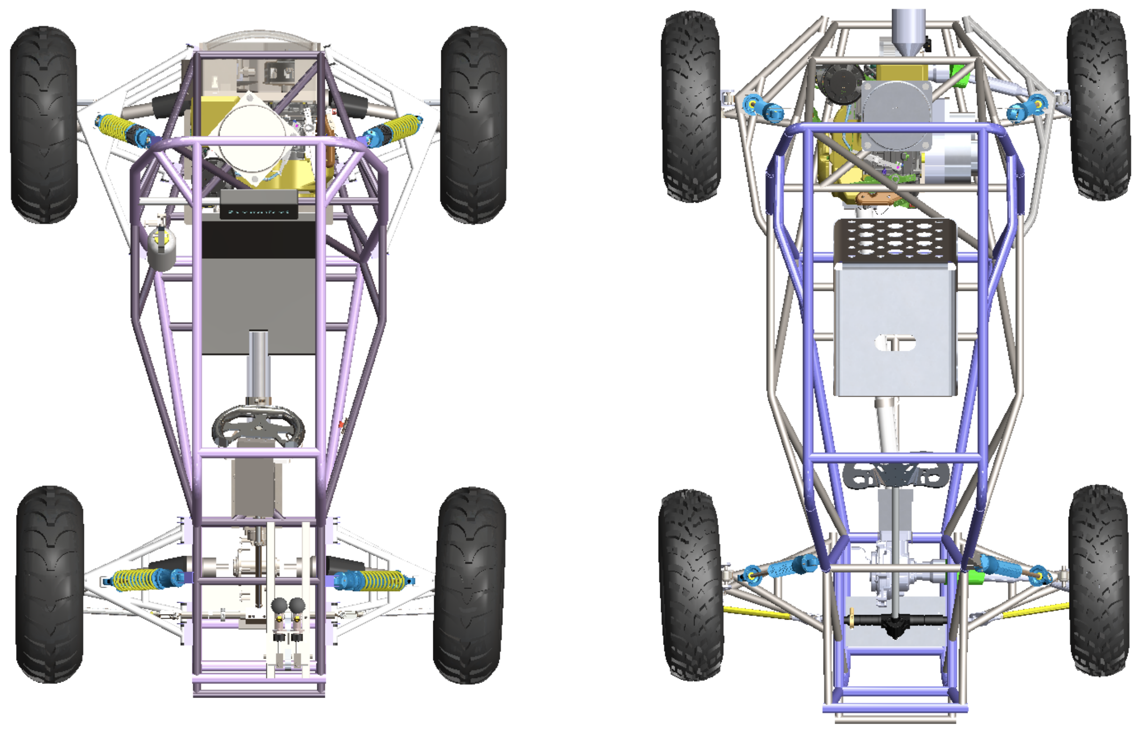
System Weight Study

Lightest 4WD Baja Car Yet

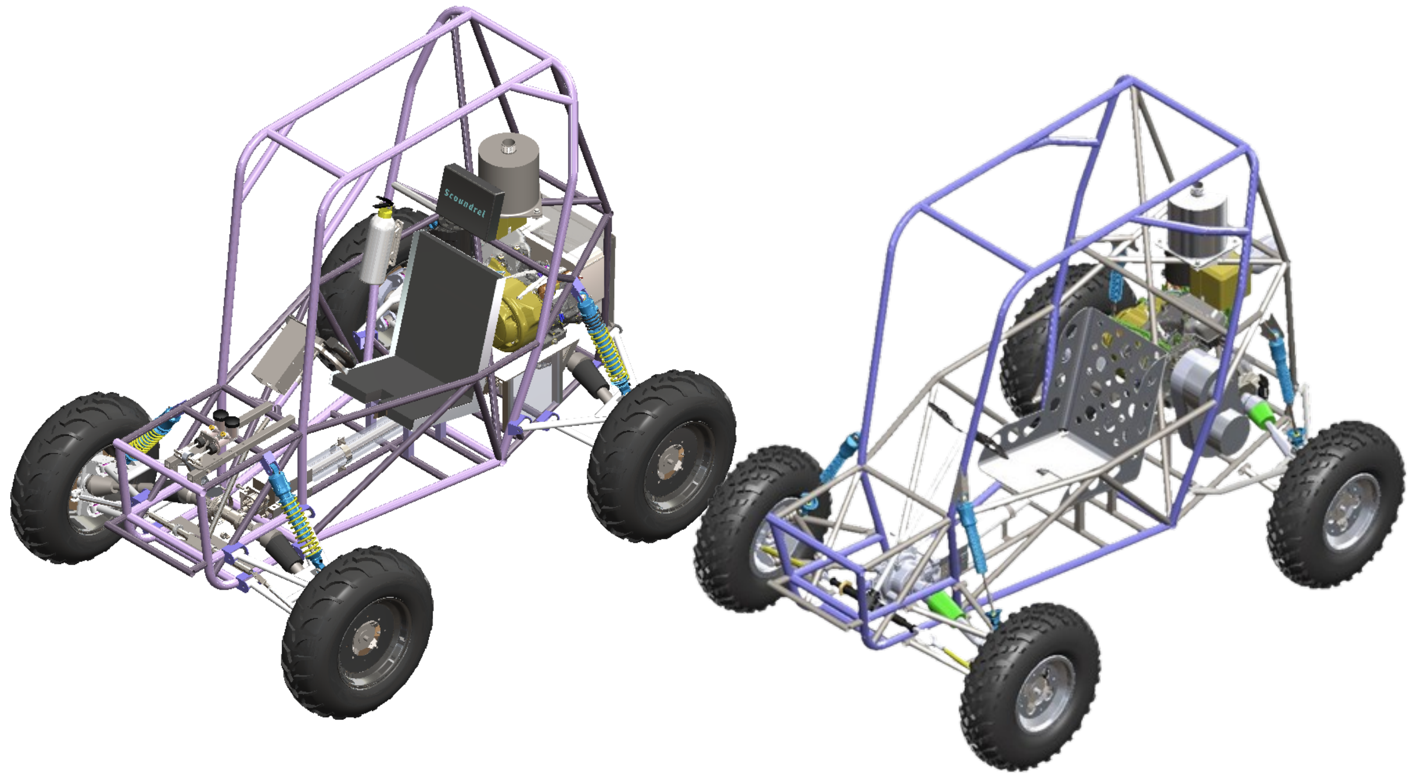
Table 1: System Weight Results

Sub-Team	ABR24 Weight w/o driver (lbs)	ABR25 Weight w/o driver (lbs)	ABR25 Weight Reduction %
Brakes / HI	65.6	40.8	**37.8%**
Chassis/Body	108.6	97.3	**10.4%**
Powertrain	306.9	148.6 (Trans.) 100.3 (Drive.)	**18.8%**
Suspension and Steering	229.5	166.	**27.6%**
Total	**710.5**	**558.1**	**21.4%**

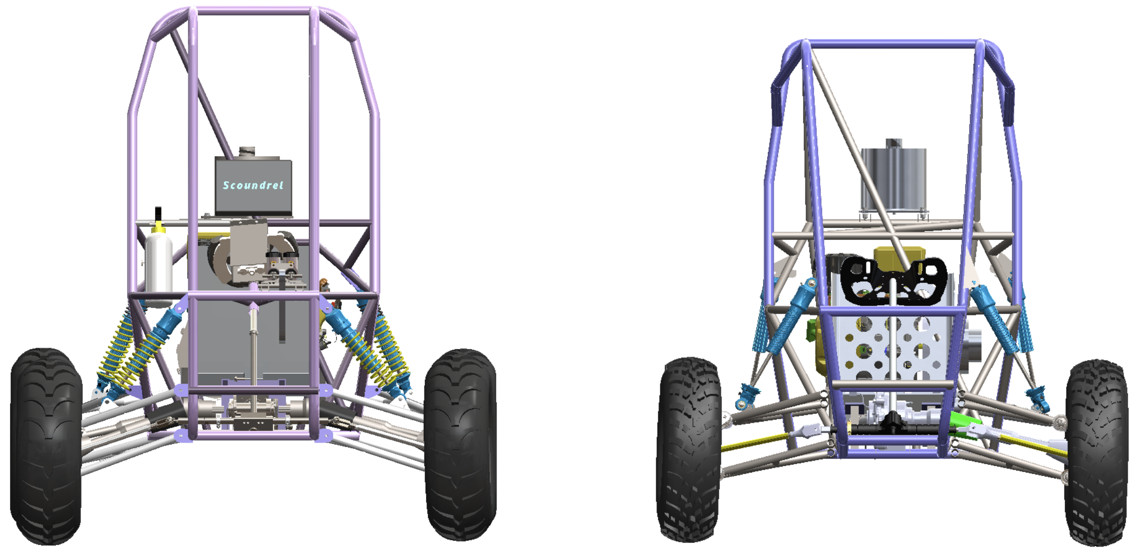
Fig 1: Organized Excel Spreadsheet tracking all subsystem weights



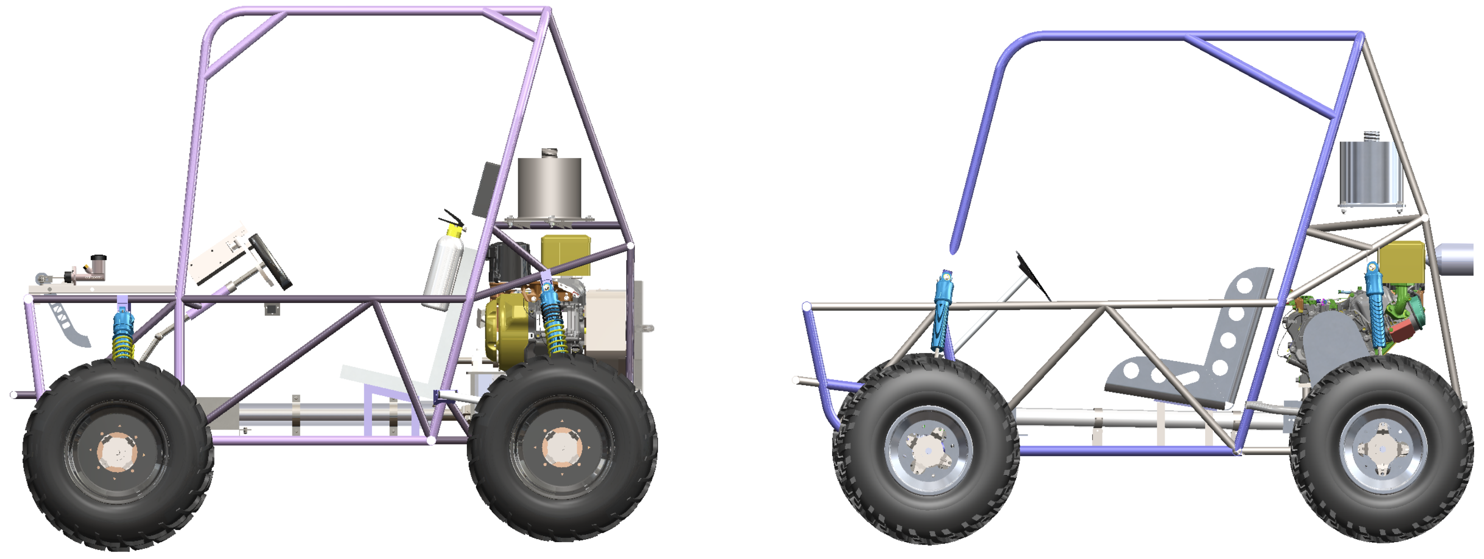
Top View: ABR24 & ABR25 (TW 59" -> 55")



Iso View: ABR24 & ABR25



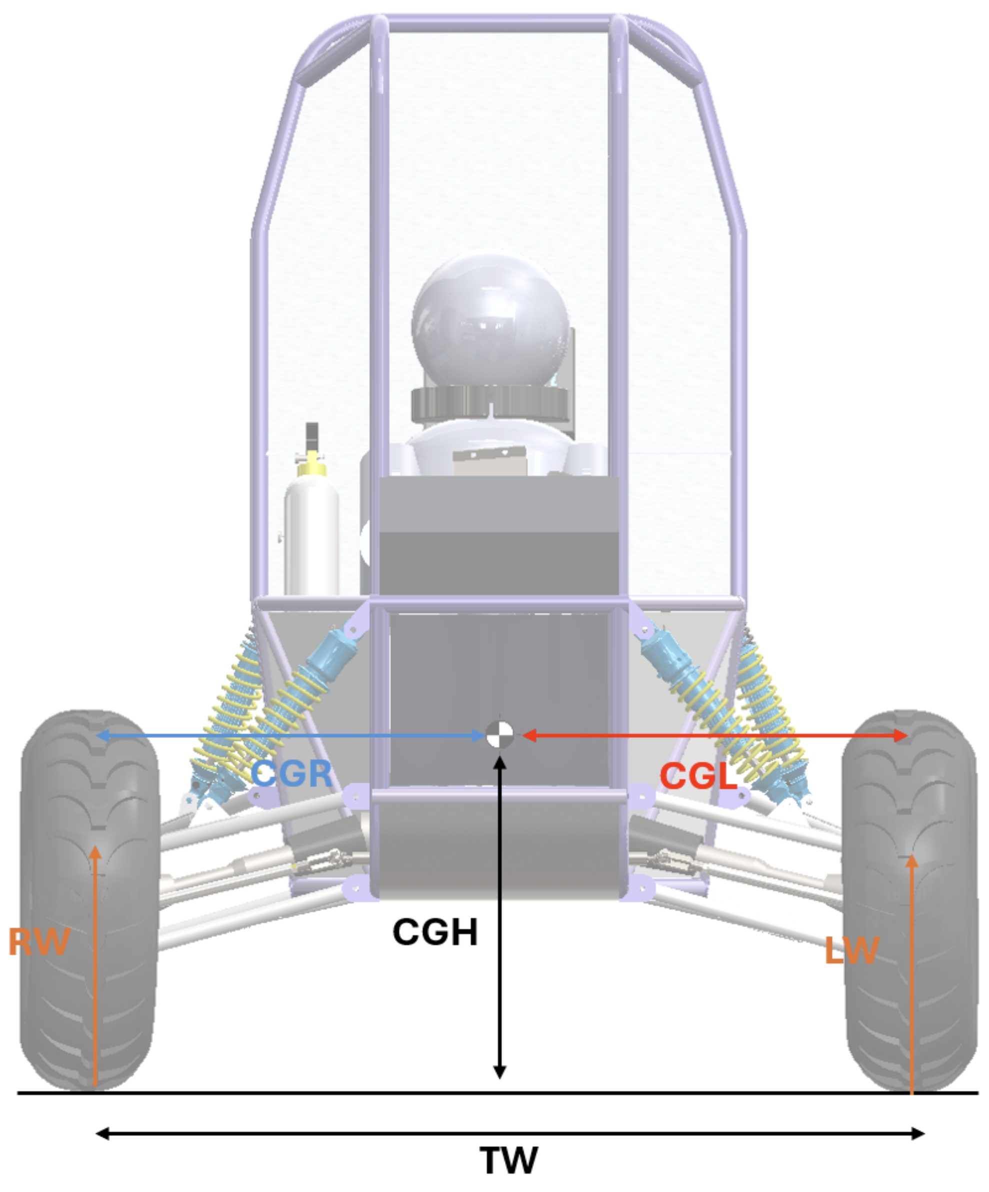
Front View: ABR24 & ABR25 (Height 67" -> 62")



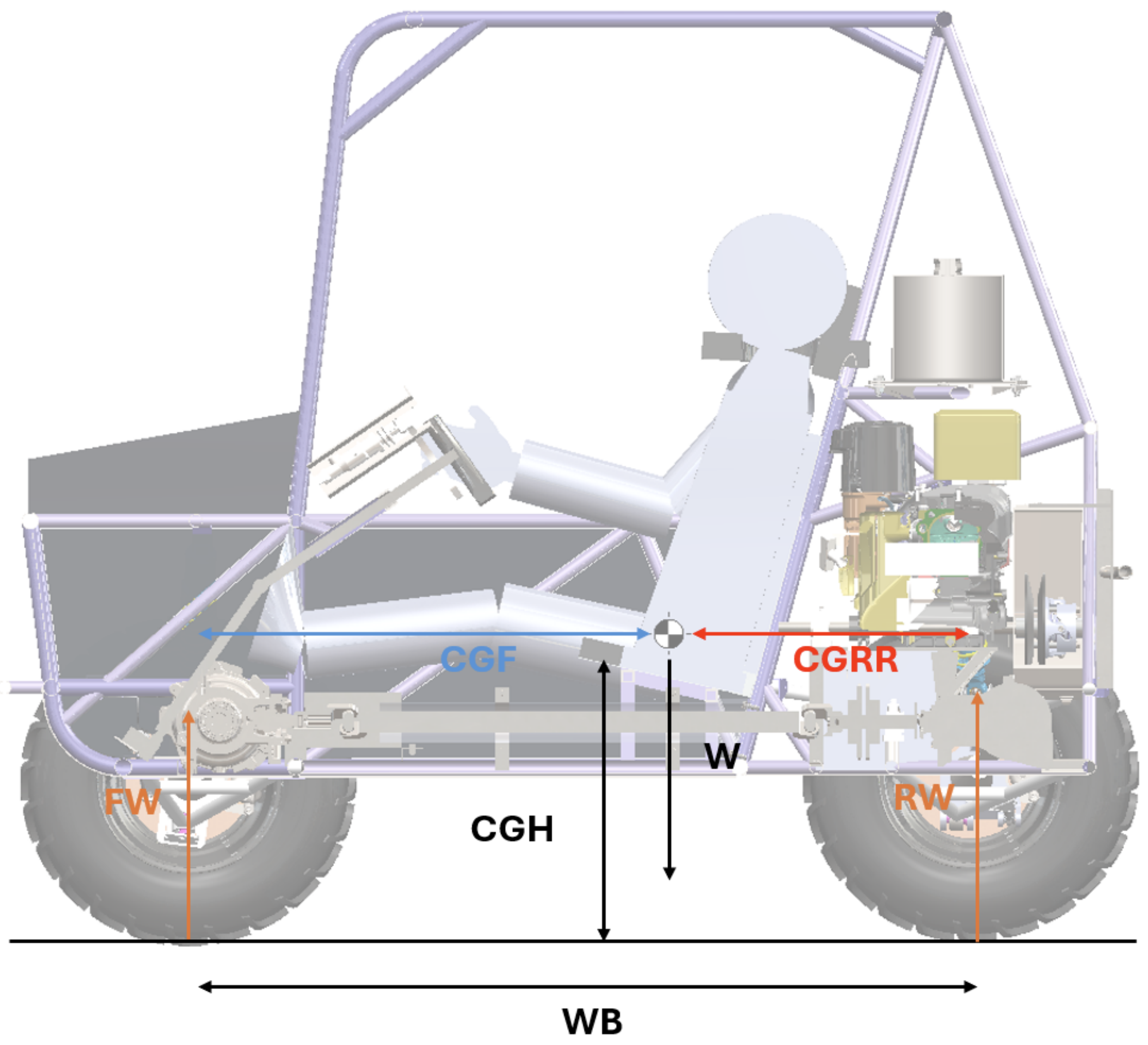
Side View: ABR24 & ABR25 (WB 56" -> 56.5")

Weight and Balance Sheet

Weight Sheet and Corsair Targets



Front CoG View



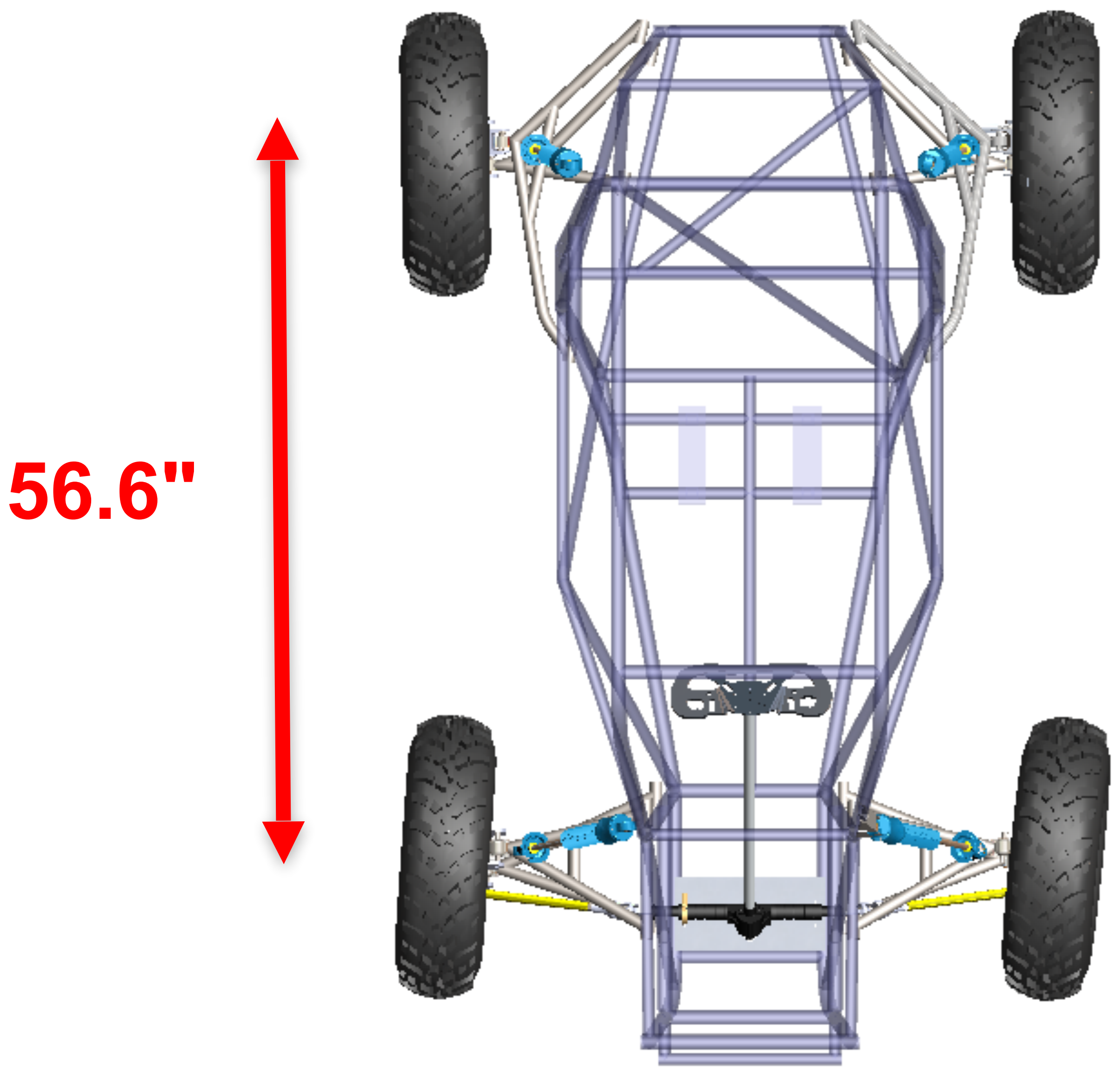
Side CoG View

Parameter	Value	Unit	Equation Used
Weight (W)	850	lbf	
CG Height (CGH)	21.7	in	
CG from Front Axle (CGF)	34.3	in	
CG from Rear Axle (CGR)	21.6	in	=WB-CGF
CG from Left (CGL)	26	in	
CG from Right (CGR2)	26	in	=TW-CGL
Wheelbase (WB)	56	in	
Track Width (TW)	52	in	
Front Weight (FW)	329.4	lbf	=W-RW
Rear Weight (RW)	520.6	lbf	=W*CGF/WB
Left Weight (WL)	425	lbf	=W-WR
Right Weight (WR)	425	lbf	=W*CGL/TW
Weight Split Front%-Rear% (WSF-WSR)	38.75%	61.25%	=FW/W, =RW/W
Weight Split Left%-Right% (WSL-WSR2)	50.00%	50.00%	=WL/W, =WR/W

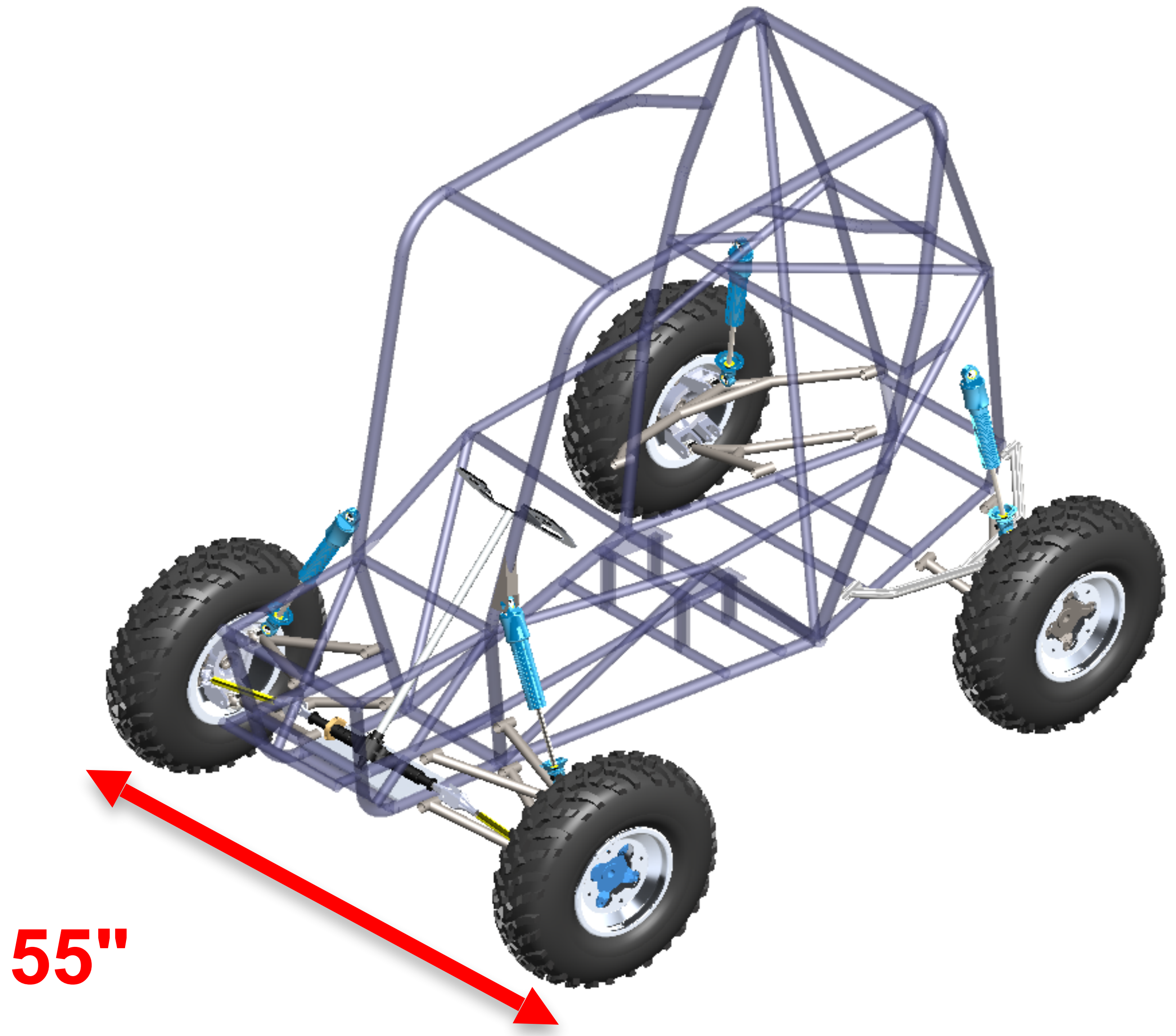
How this applies: Roll moment

Parameter	Scoundrel	Corsair
Front Roll Center	7.8 in	6.3 in
Rear Roll Center	7.5 in	6.8 in
CoG Height	21.7 in	Undefined
Ride Height	12 in	11 in

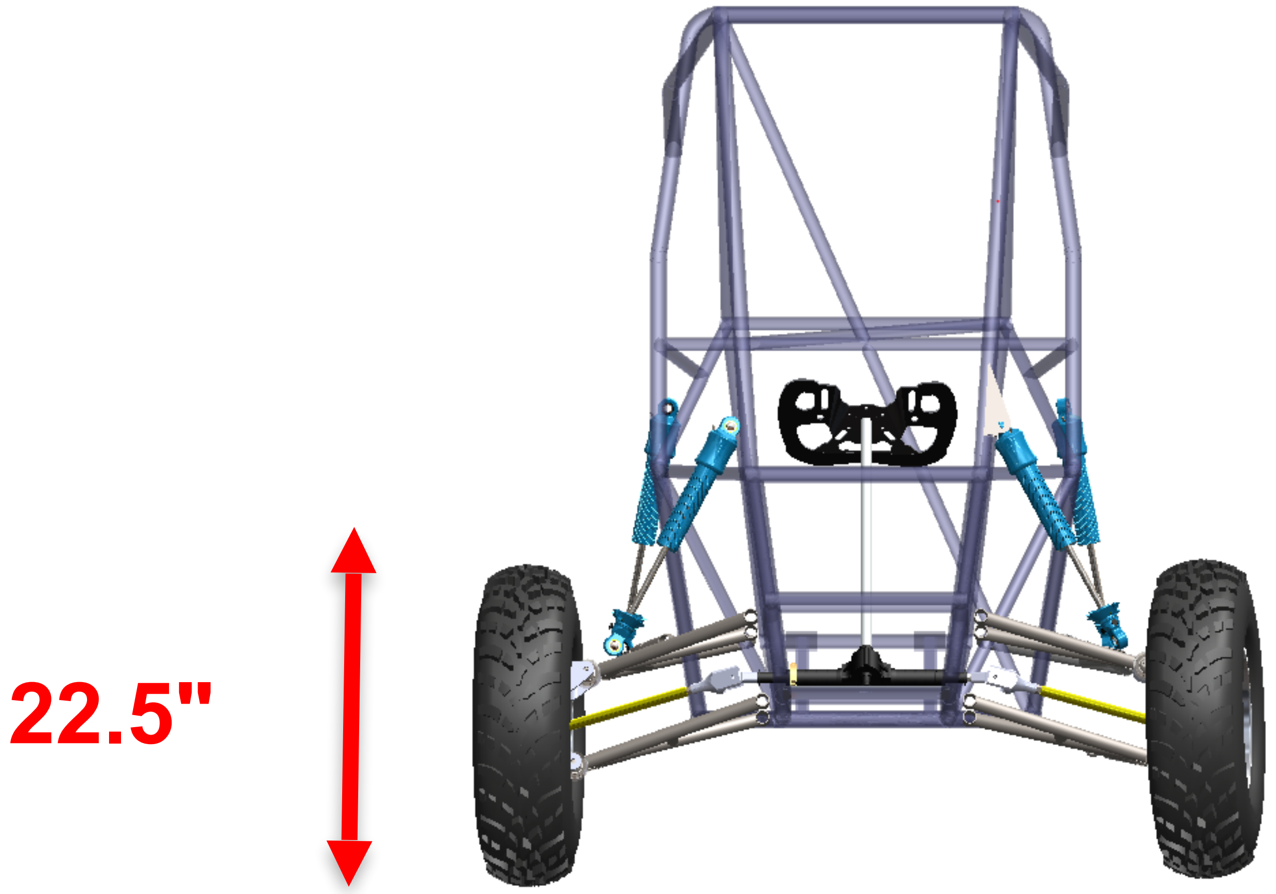
SUSPENSION AND STEERING



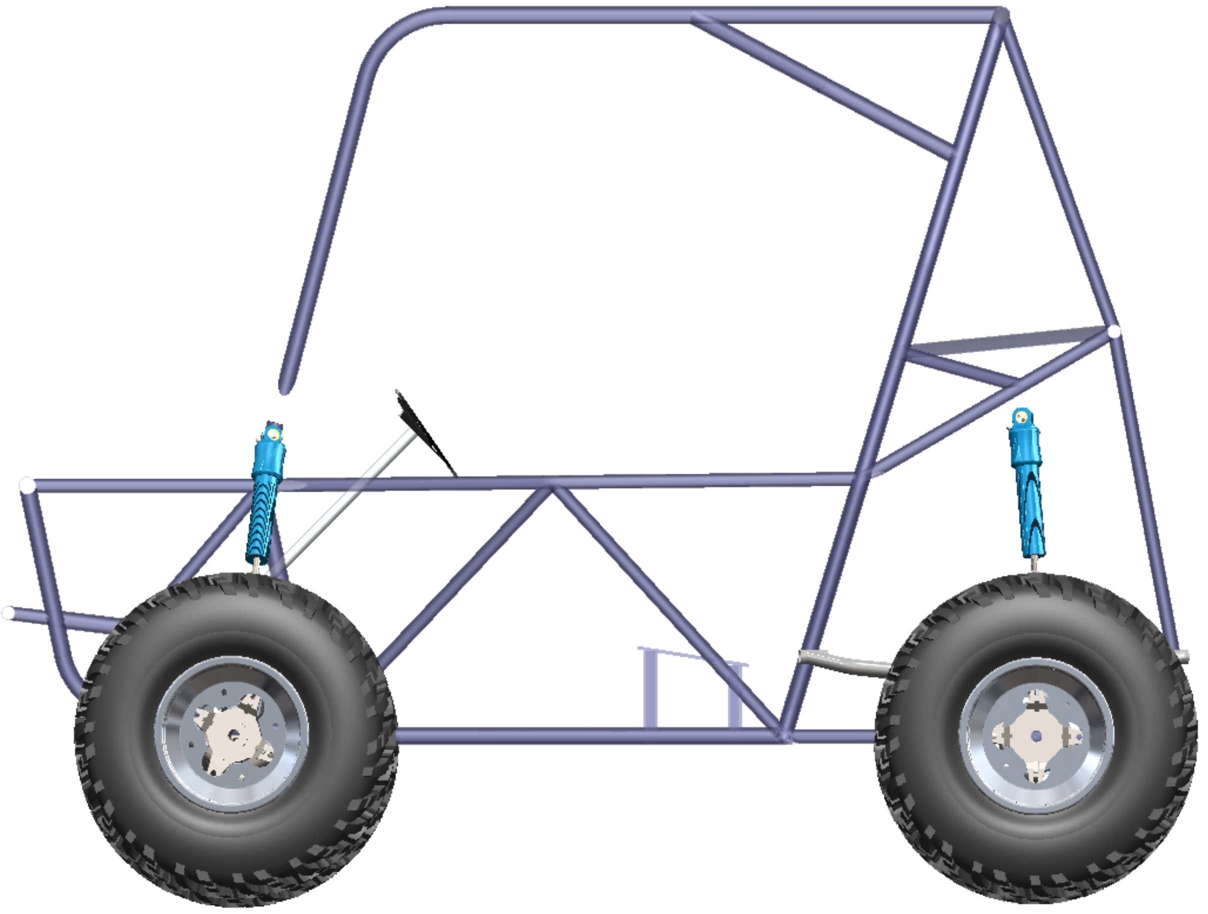
Top View



Isometric View



Front View

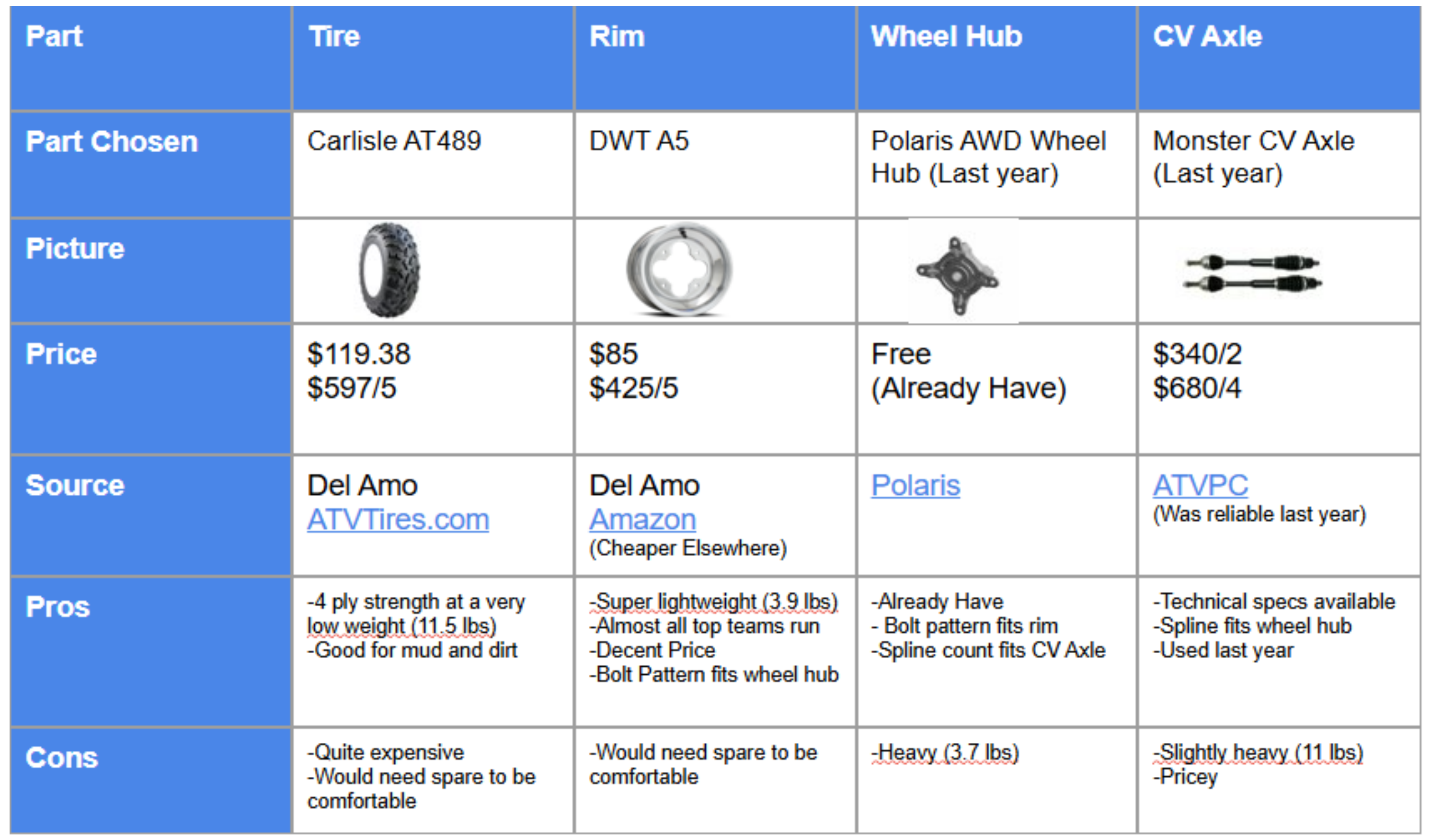


Side View

SUSPENSION AND STEERING

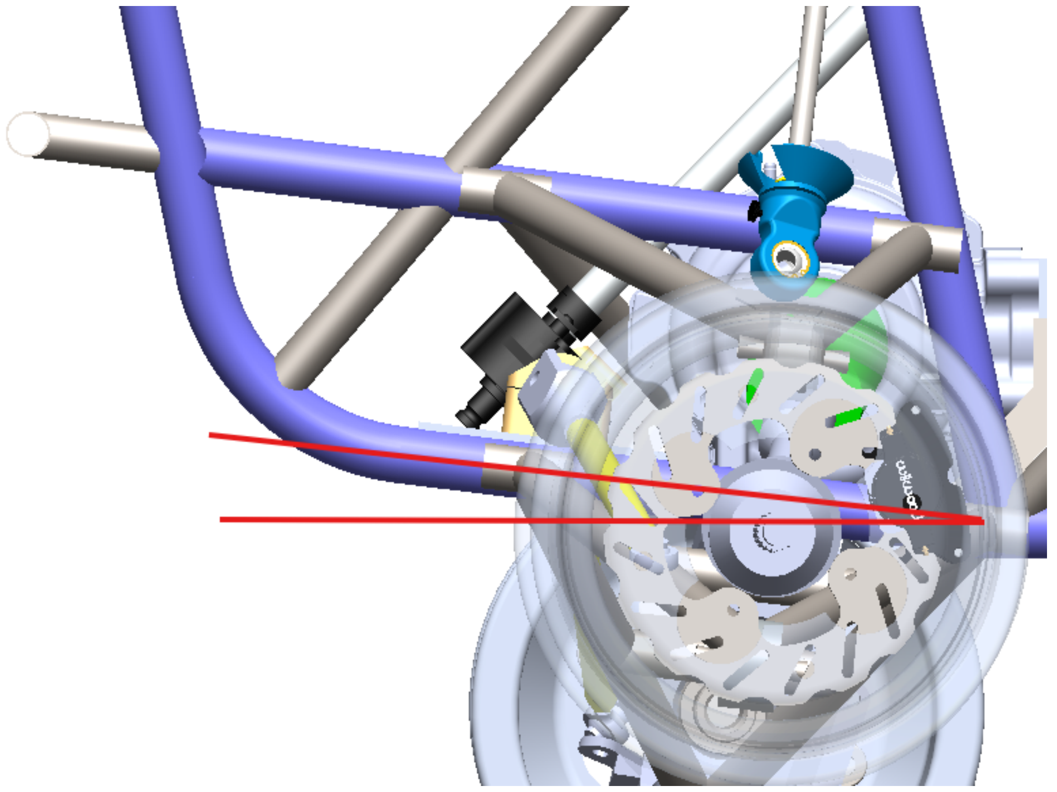
Meeting System Goals

Overall 2025 System Goals	Why	How
Reduce Weight	- Overall goal for this years car	- **Choosing a lighter wheel/cv axle assembly** - Switch to aluminum front uprights - Reducing control arm wall thickness and OD
Introduce Front Control Arm Rake/ Wheel Recessional Travel	- Allows us to get over obstacles with less initial speed (logs, rocks) - Most of our recoveries from endurance were because of this, and that's what got us DQ'ed. - Increased driver comfort - All the top teams do this	- Include inclination in our kinematic suspension analysis - Collaborate with **chassis** to introduce an inclination in the toe box.
Stronger Steering System	- Rack extension failure on Scoundrel - Steering arm failure on Scoundrel - Rack mount had lots of flex - Steering wheel popped out during endurance	- Source a rack and pinion that fits our needs better. - Better rack and pinion mounting, mounting includes braces for less bending - Stronger steering arm - Add shaft collars to steering column components to hold in place.

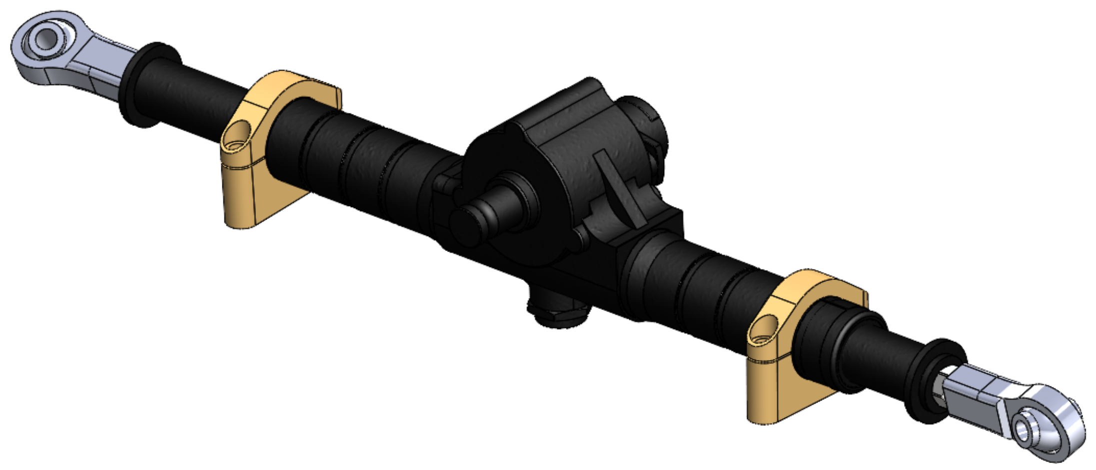


Part	Tire	Rim	Wheel Hub	CV Axle
Part Chosen	Carlisle AT489	DWT A5	Polaris AWD Wheel Hub (Last year)	Monster CV Axle (Last year)
Picture				
Price	$119.38 $597/5	$85 $425/5	Free (Already Have)	$340/2 $680/4
Source	Del Amo ATVTires.com	Del Amo Amazon (Cheaper Elsewhere)	Polaris	ATVPC (Was reliable last year)
Pros	-4 ply strength at a very low weight (11.5 lbs) -Good for mud and dirt	-Super lightweight (3.9 lbs) -Almost all top teams run -Decent Price -Bolt Pattern fits wheel hub	-Already Have - Bolt pattern fits rim -Spline count fits CV Axle	-Technical specs available -Spline fits wheel hub -Used last year
Cons	-Quite expensive -Would need spare to be comfortable	-Would need spare to be comfortable	-Heavy (3.7 lbs)	-Slightly heavy (11 lbs) -Pricey

Weight Savings:
53 lbs rotating unsprung mass
30% weight reduction



7 degrees of Front Suspension Rake



Rack and Pinion mounts further apart to reduce bending moment arm

SUSPENSION AND STEERING

Suspension, Steering, and Shocks

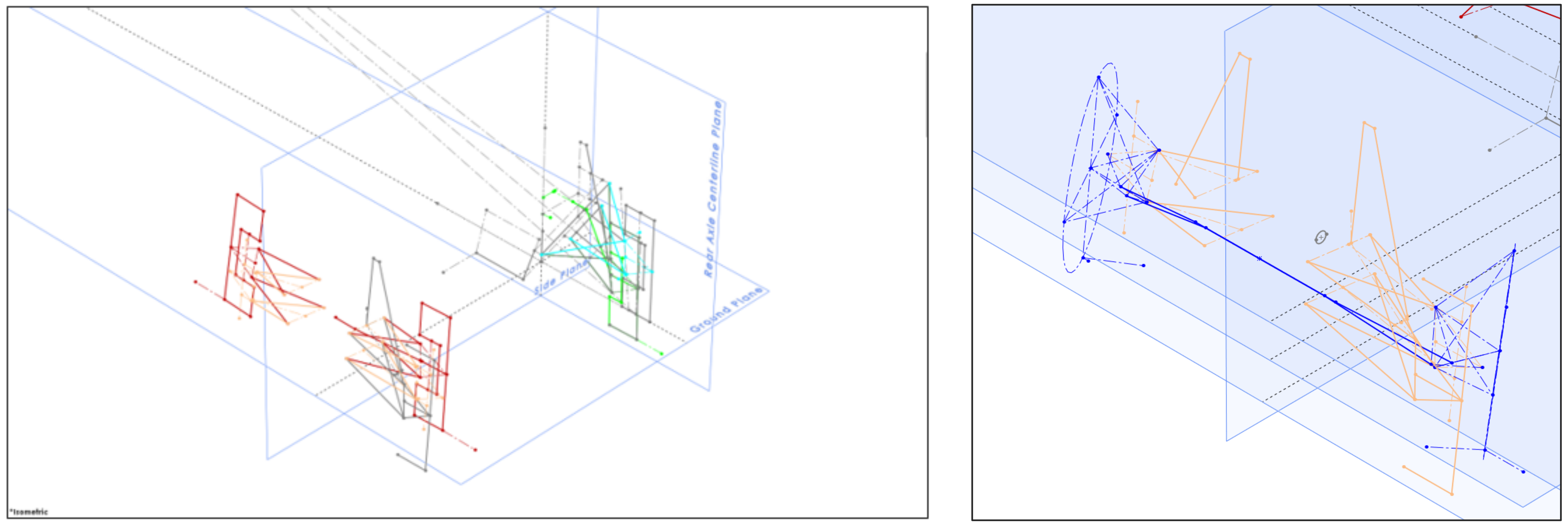


Fig 1: Suspension and Steering Kinematics & Shock Mounting determined using Solidworks

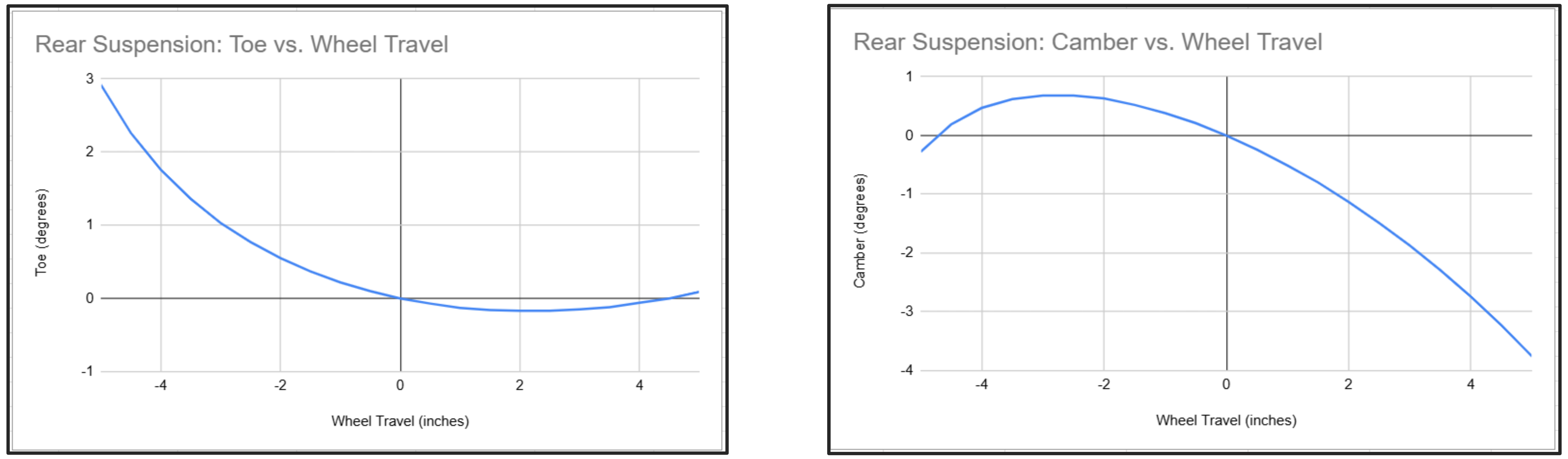
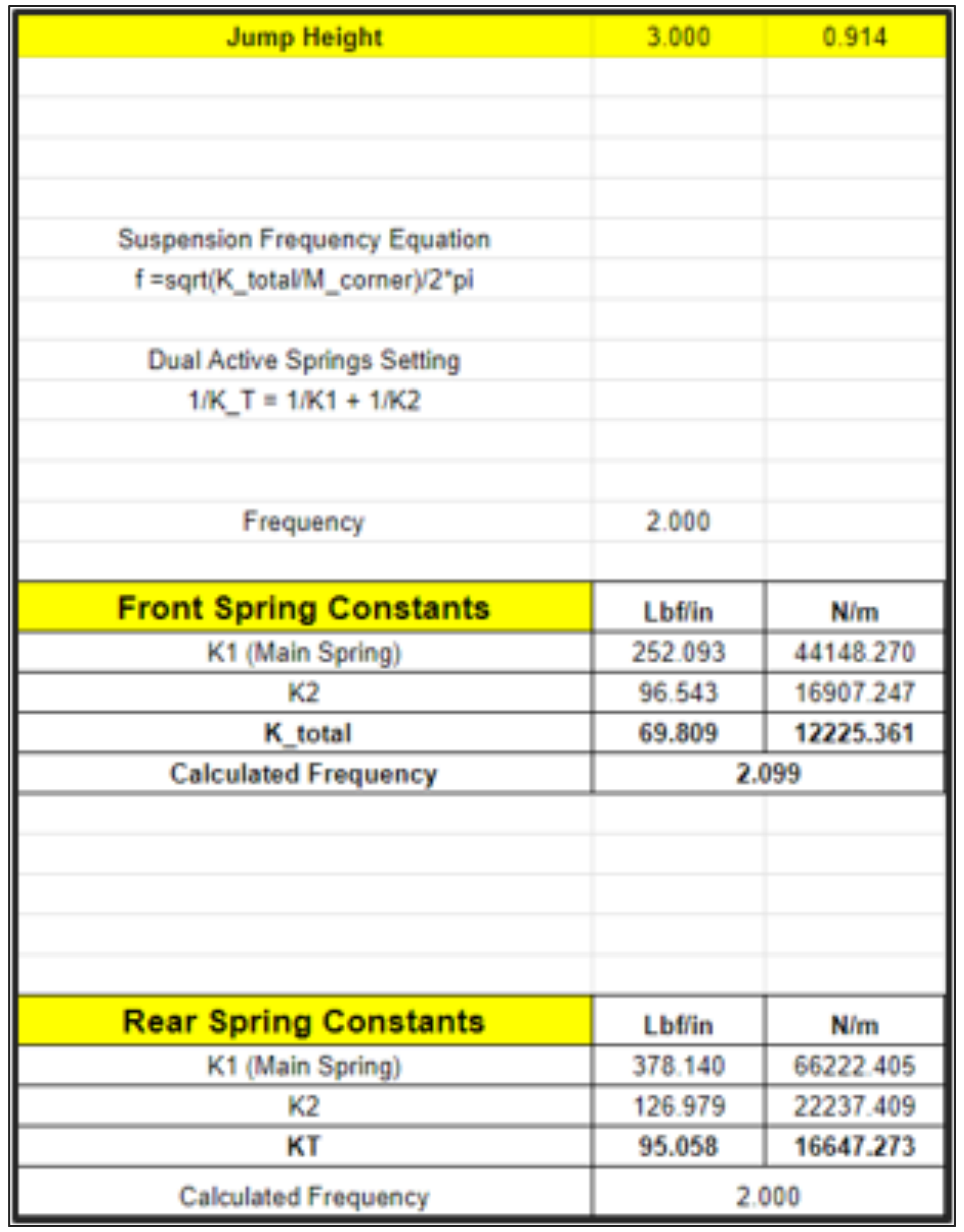


Fig 2: Camber and Toe Gain Graphs generated with Solidworks motion analysis to verify requirements are met

Fig 3: AFCO 63 Series 7" Stroke Increased Motion Ratio vs Scoundrel

Rear Springs	LbF/in	Length (in)
K1	255	9
K2	180	5
Front Springs	LbF/in	Length (in)
K1	170	9
K2	100	5



Jump Height	3.000	0.914
Suspension Frequency Equation		
f =sqrt(K_total/M_corner)/2*pi		
Dual Active Springs Setting		
1/K_T = 1/K1 + 1/K2		
Frequency	2.000	
Front Spring Constants	**Lbf/in**	**N/m**
K1 (Main Spring)	252.093	44148.270
K2	96.543	16907.247
K_total	**69.809**	**12225.361**
Calculated Frequency	**2.099**	
Rear Spring Constants	**Lbf/in**	**N/m**
K1 (Main Spring)	378.140	66222.405
K2	126.979	22237.409
KT	**95.058**	**16647.273**
Calculated Frequency	2.000	

Fig 4: Spring Rate Calculator used to determine spring rates

SUSPENSION AND STEERING

Design of Custom Components

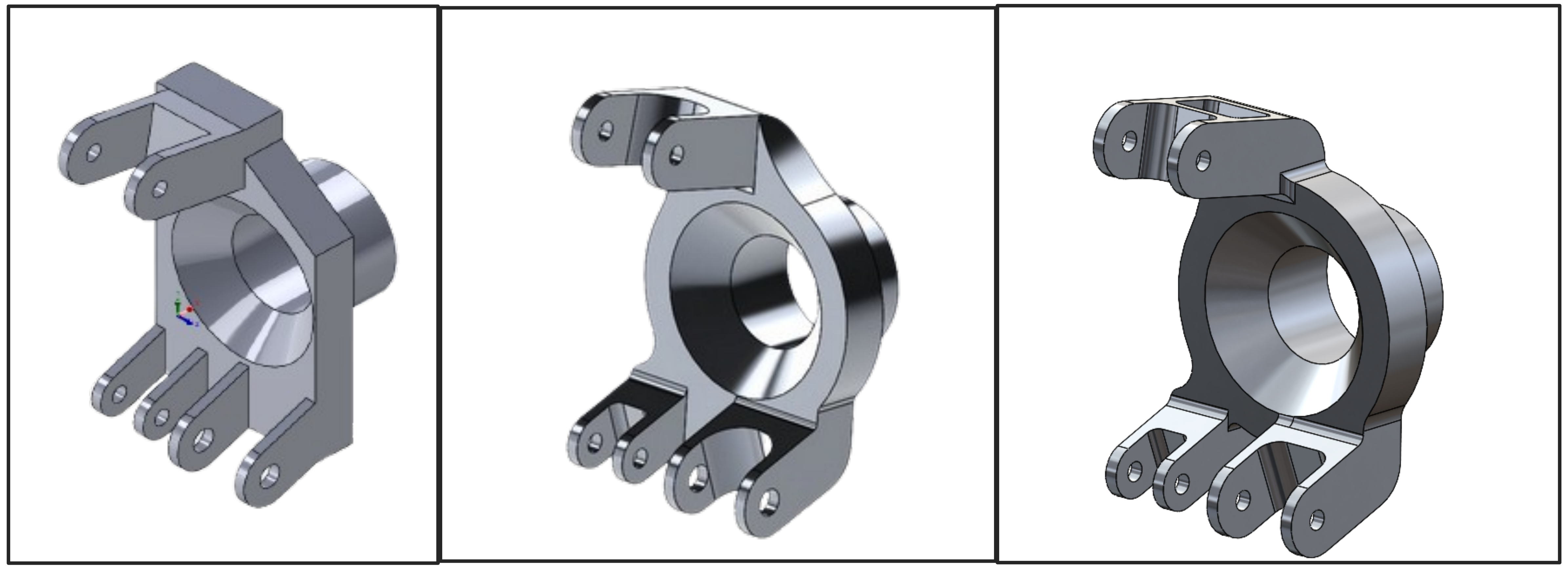

V1 V2 V3

Fig 1: Rear Upright Iterations

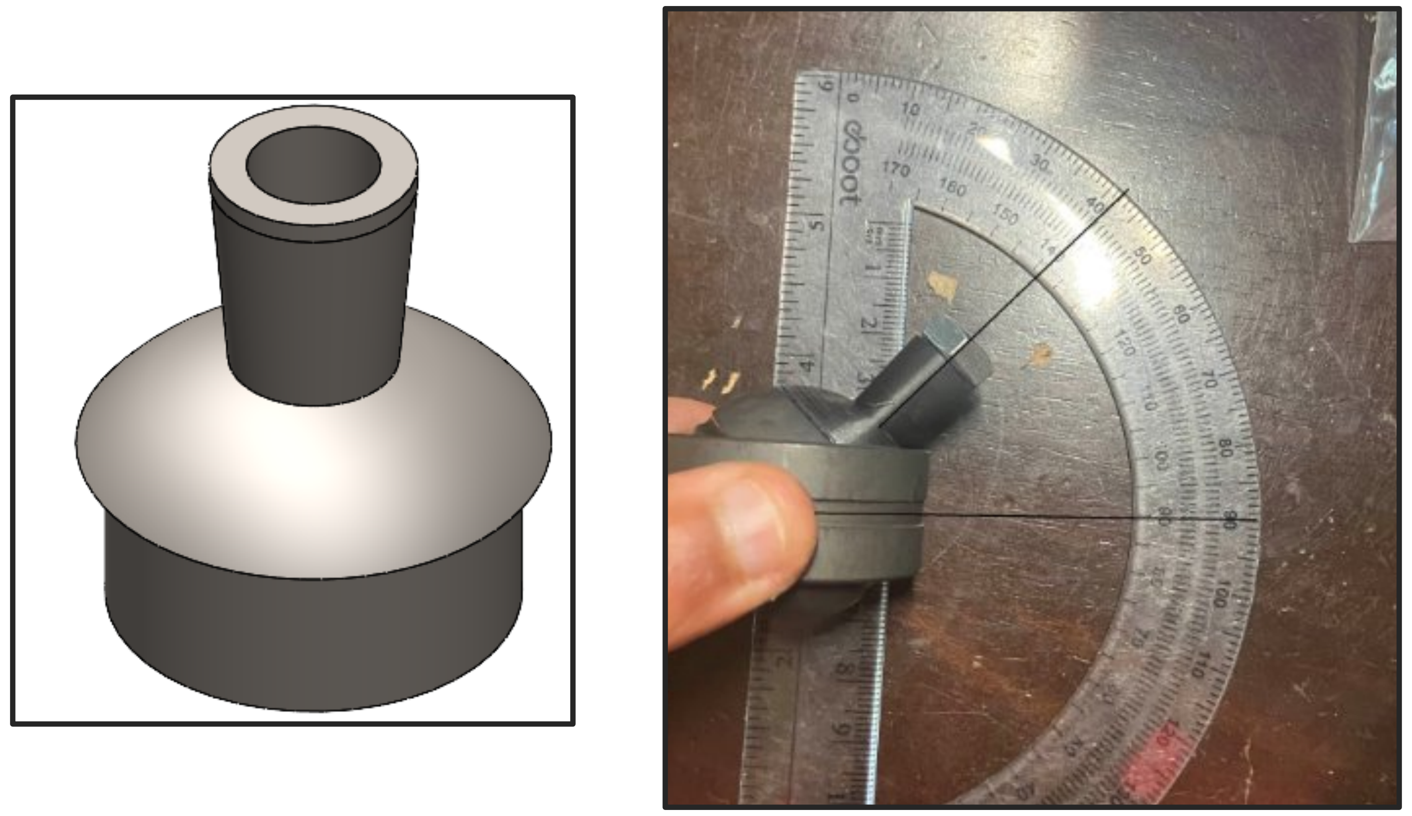


Fig 3: Custom Misalignment Spacer (42°)

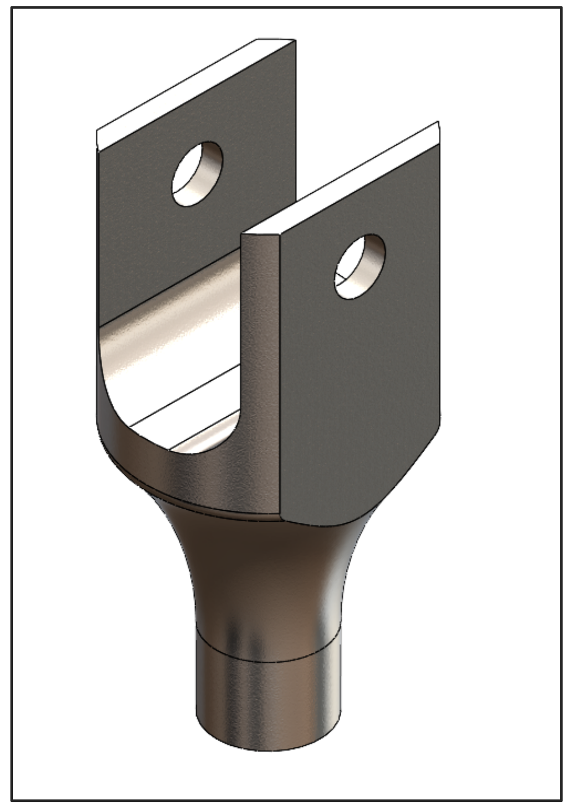


Fig 5: Tie Rod Clevis

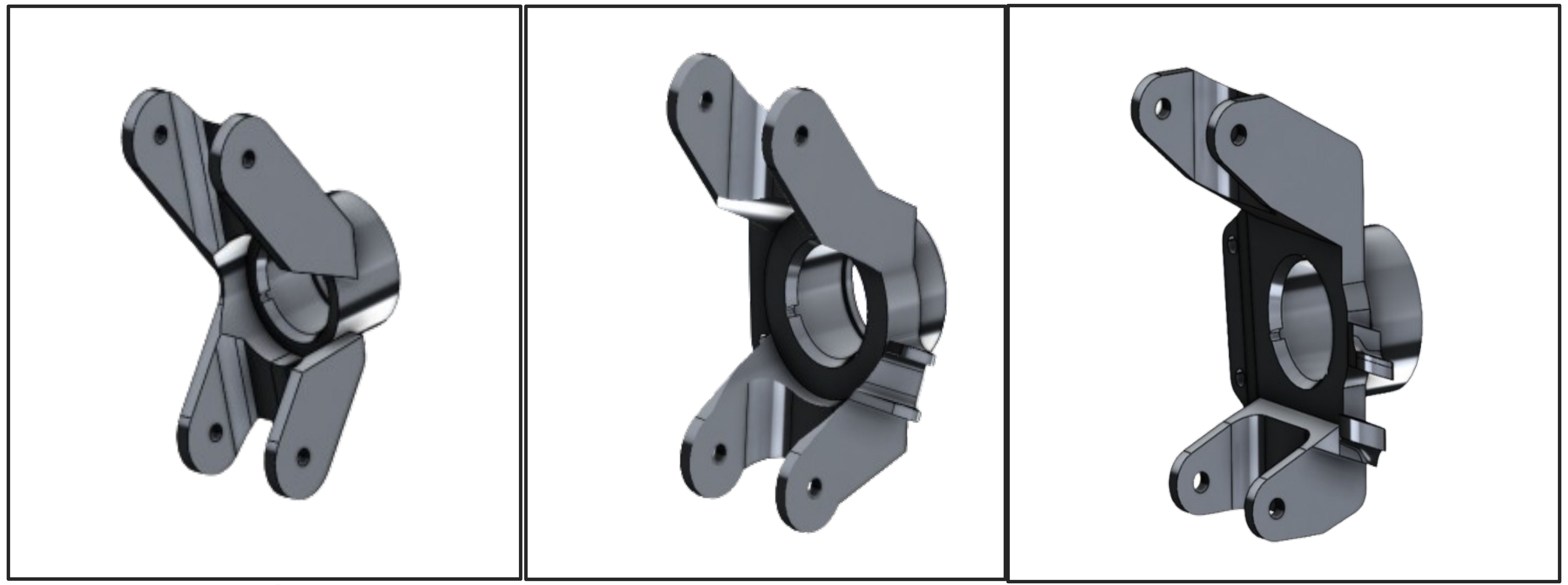

V1 V2 V3

Fig 2: Front Upright Iterations

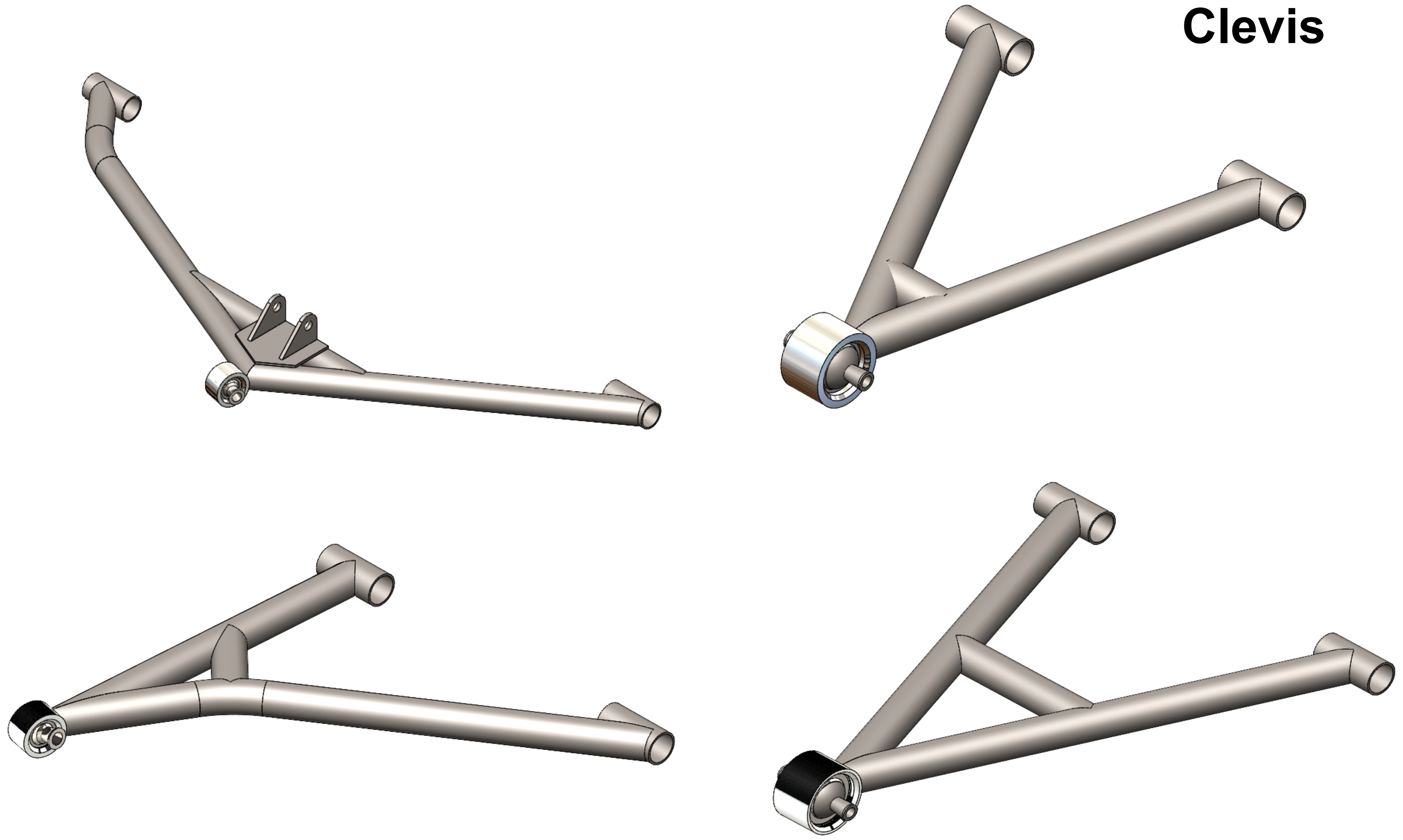
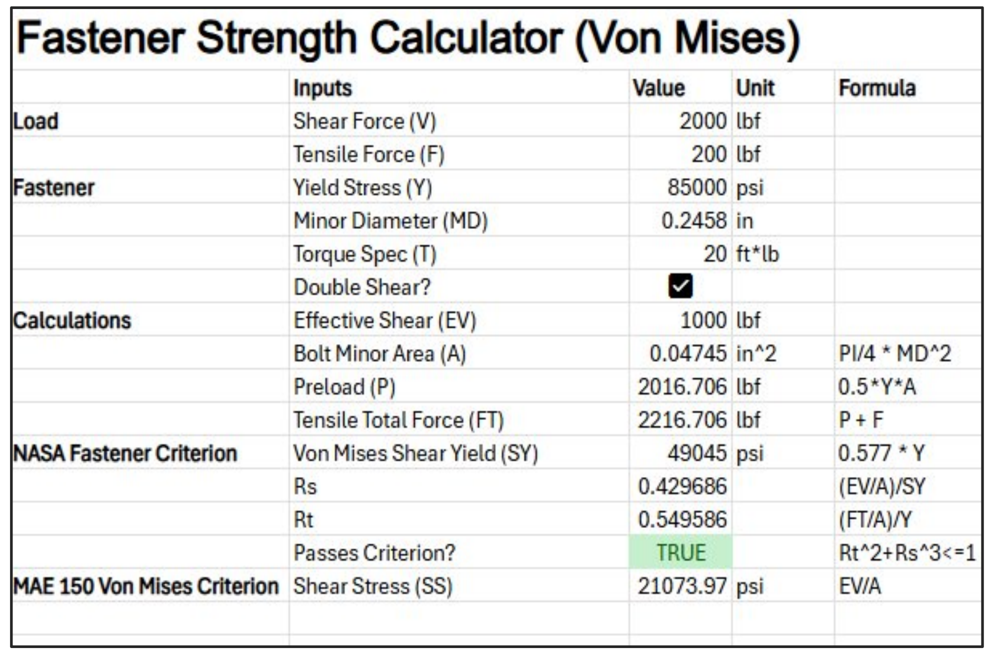


Fig 4: Control Arms (1" OD 0.065" WT)

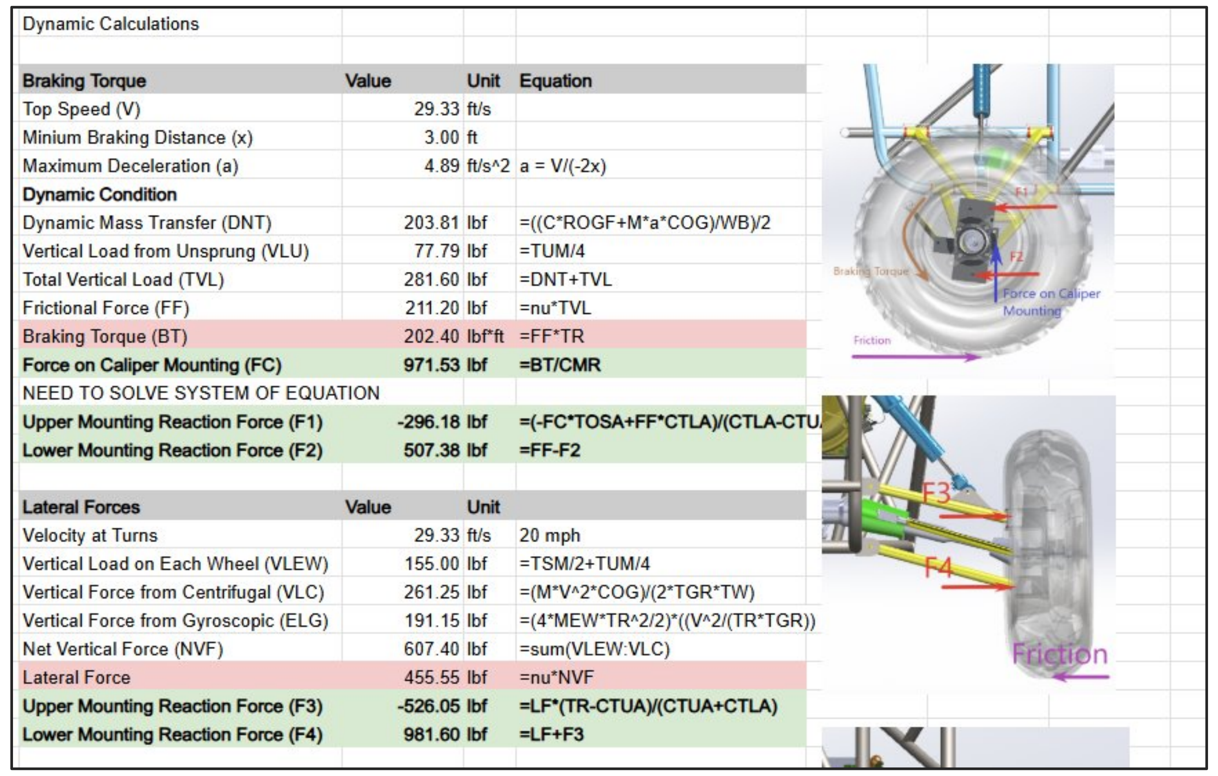
SUSPENSION AND STEERING

FEA of Custom Components



Fastener Strength Calculator (Von Mises)

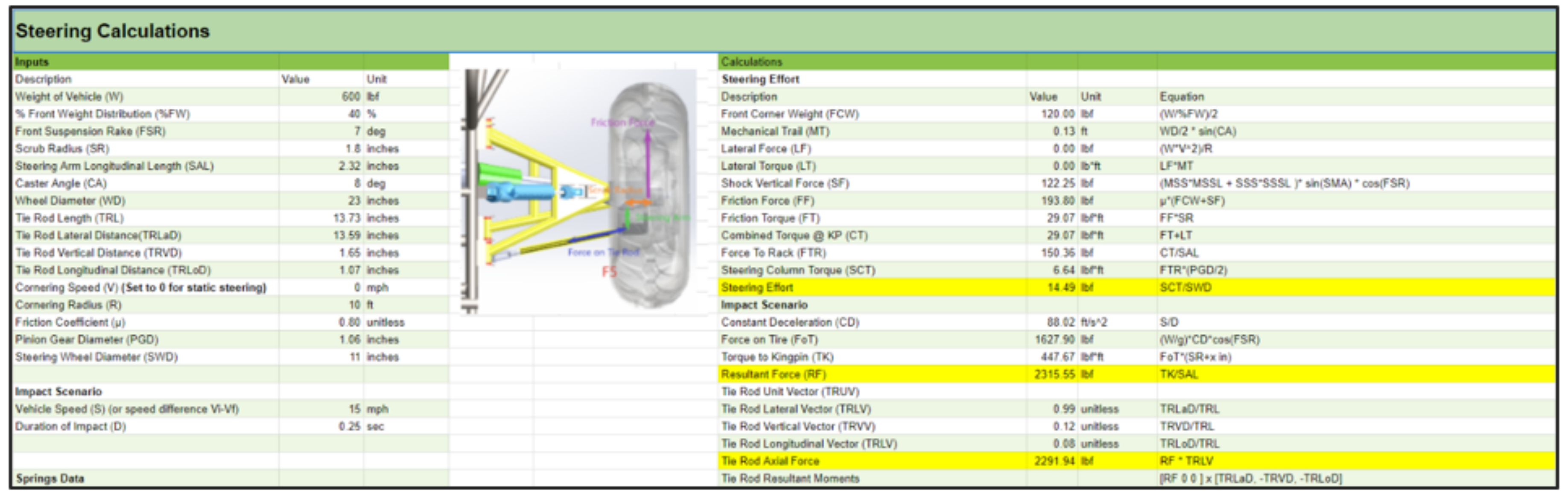
	Inputs	Value	Unit	Formula
Load	Shear Force (V)	2000	lbf	
	Tensile Force (F)	200	lbf	
Fastener	Yield Stress (Y)	85000	psi	
	Minor Diameter (MD)	0.2458	in	
	Torque Spec (T)	20	ft*lb	
	Double Shear?	☑		
Calculations	Effective Shear (EV)	1000	lbf	
	Bolt Minor Area (A)	0.04745	in^2	PI/4 * MD^2
	Preload (P)	2016.706	lbf	0.5*Y*A
	Tensile Total Force (FT)	2216.706	lbf	P + F
NASA Fastener Criterion	Von Mises Shear Yield (SY)	49045	psi	0.577 * Y
	Rs	0.429686		(EV/A)/SY
	Rt	0.549586		(FT/A)/Y
	Passes Criterion?	TRUE		Rt^2+Rs^3<=1
MAE 150 Von Mises Criterion	Shear Stress (SS)	21073.97	psi	EV/A



Dynamic Calculations

Braking Torque	Value	Unit	Equation
Top Speed (V)	29.33	ft/s	
Minium Braking Distance (x)	3.00	ft	
Maximum Deceleration (a)	4.89	ft/s^2	a = V/(-2x)
Dynamic Condition			
Dynamic Mass Transfer (DNT)	203.81	lbf	=((C*ROGF+M*a*COG)/WB)/2
Vertical Load from Unsprung (VLU)	77.79	lbf	=TUM/4
Total Vertical Load (TVL)	281.60	lbf	=DNT+TVL
Frictional Force (FF)	211.20	lbf	=nu*TVL
Braking Torque (BT)	202.40	lbf*ft	=FF*TR
Force on Caliper Mounting (FC)	**971.53**	**lbf**	**=BT/CMR**
NEED TO SOLVE SYSTEM OF EQUATION			
Upper Mounting Reaction Force (F1)	**-296.18**	**lbf**	**=(-FC*TOSA+FF*CTLA)/(CTLA-CTU**
Lower Mounting Reaction Force (F2)	**507.38**	**lbf**	**=FF-F2**

Lateral Forces	Value	Unit	
Velocity at Turns	29.33	ft/s	20 mph
Vertical Load on Each Wheel (VLEW)	155.00	lbf	=TSM/2+TUM/4
Vertical Force from Centrifugal (VLC)	261.25	lbf	=(M*V^2*COG)/(2*TGR*TW)
Vertical Force from Gyroscopic (ELG)	191.15	lbf	=(4*MEW*TR^2/2)*((V^2/(TR*TGR))
Net Vertical Force (NVF)	607.40	lbf	=sum(VLEW:VLC)
Lateral Force	455.55	lbf	=nu*NVF
Upper Mounting Reaction Force (F3)	**-526.05**	**lbf**	**=LF*(TR-CTUA)/(CTUA+CTLA)**
Lower Mounting Reaction Force (F4)	**981.60**	**lbf**	**=LF+F3**

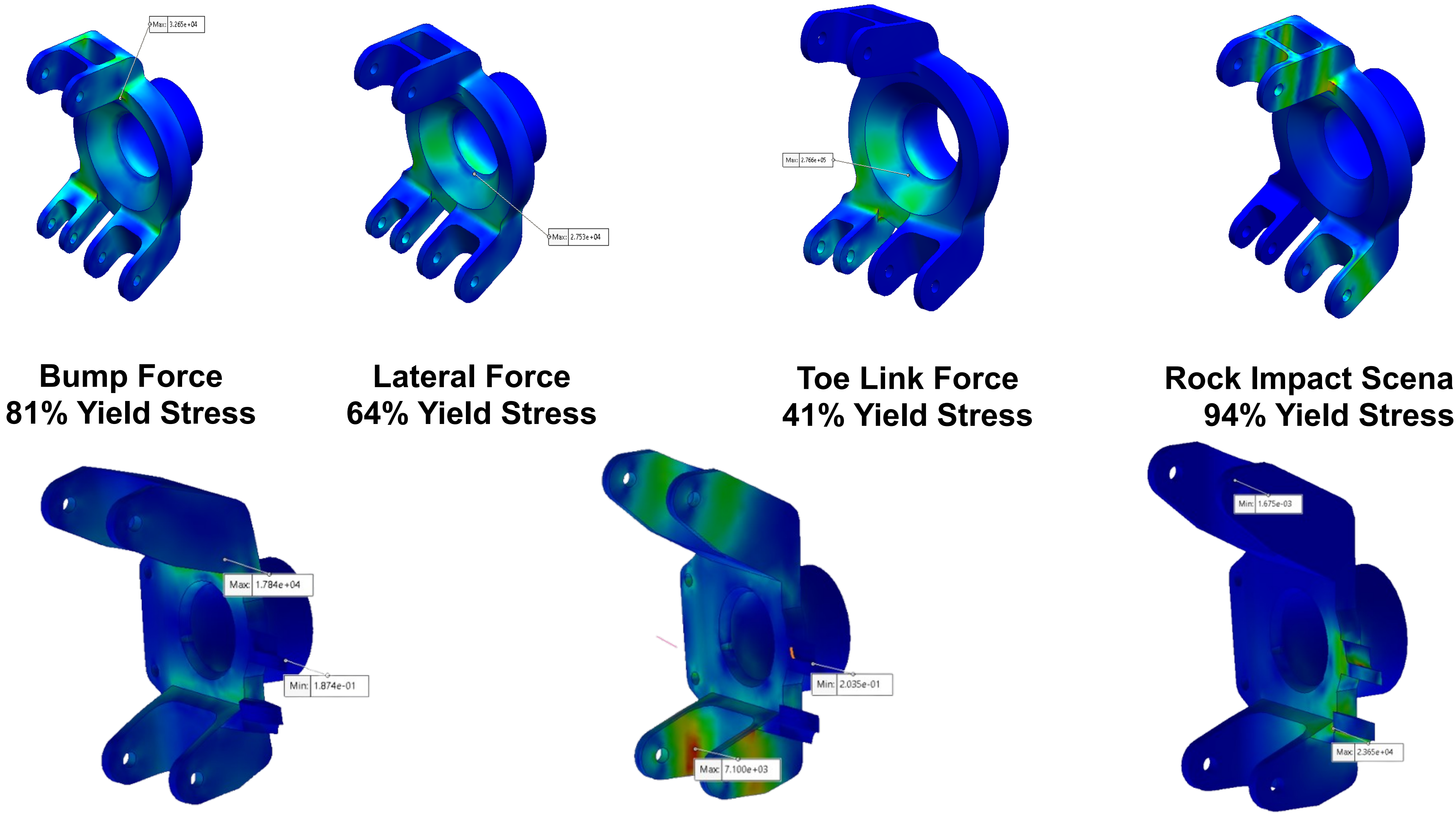


Steering Calculations

Inputs		
Description	Value	Unit
Weight of Vehicle (W)	600	lbf
% Front Weight Distribution (%FW)	40	%
Front Suspension Rake (FSR)	7	deg
Scrub Radius (SR)	1.8	inches
Steering Arm Longitudinal Length (SAL)	2.32	inches
Caster Angle (CA)	8	deg
Wheel Diameter (WD)	23	inches
Tie Rod Length (TRL)	13.73	inches
Tie Rod Lateral Distance(TRLaD)	13.59	inches
Tie Rod Vertical Distance (TRVD)	1.65	inches
Tie Rod Longitudinal Distance (TRLoD)	1.07	inches
Cornering Speed (V) **(Set to 0 for static steering)**	0	mph
Cornering Radius (R)	10	ft
Friction Coefficient (μ)	0.80	unitless
Pinion Gear Diameter (PGD)	1.06	inches
Steering Wheel Diameter (SWD)	11	inches
Impact Scenario		
Vehicle Speed (S) (or speed difference Vi-Vf)	15	mph
Duration of Impact (D)	0.25	sec
Springs Data		

Calculations			
Steering Effort			
Description	Value	Unit	Equation
Front Corner Weight (FCW)	120.00	lbf	(W/%FW)/2
Mechanical Trail (MT)	0.13	ft	WD/2 * sin(CA)
Lateral Force (LF)	0.00	lbf	(W*V^2)/R
Lateral Torque (LT)	0.00	lb*ft	LF*MT
Shock Vertical Force (SF)	122.25	lbf	(MSS*MSSL + SSS*SSSL)* sin(SMA) * cos(FSR)
Friction Force (FF)	193.80	lbf	μ*(FCW+SF)
Friction Torque (FT)	29.07	lbf*ft	FF*SR
Combined Torque @ KP (CT)	29.07	lbf*ft	FT+LT
Force To Rack (FTR)	150.36	lbf	CT/SAL
Steering Column Torque (SCT)	6.64	lbf*ft	FTR*(PGD/2)
Steering Effort	14.49	lbf	SCT/SWD
Impact Scenario			
Constant Deceleration (CD)	88.02	ft/s^2	S/D
Force on Tire (FoT)	1627.90	lbf	(W/g)*CD*cos(FSR)
Torque to Kingpin (TK)	447.67	lbf*ft	FoT*(SR+x in)
Resultant Force (RF)	2315.55	lbf	TK/SAL
Tie Rod Unit Vector (TRUV)			
Tie Rod Lateral Vector (TRLV)	0.99	unitless	TRLaD/TRL
Tie Rod Vertical Vector (TRVV)	0.12	unitless	TRVD/TRL
Tie Rod Longitudinal Vector (TRLV)	0.08	unitless	TRLoD/TRL
Tie Rod Axial Force	2291.94	lbf	RF * TRLV
Tie Rod Resultant Moments			[RF 0 0] x [TRLaD, -TRVD, -TRLoD]

Fig 1: Calculators used to determine loadings



Bump Force
81% Yield Stress

Lateral Force
64% Yield Stress

Toe Link Force
41% Yield Stress

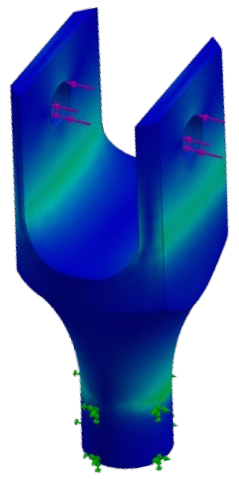
Rock Impact Scenario
94% Yield Stress

Bump Force
41% Yield Stress

Lateral Force
74% Yield Stress

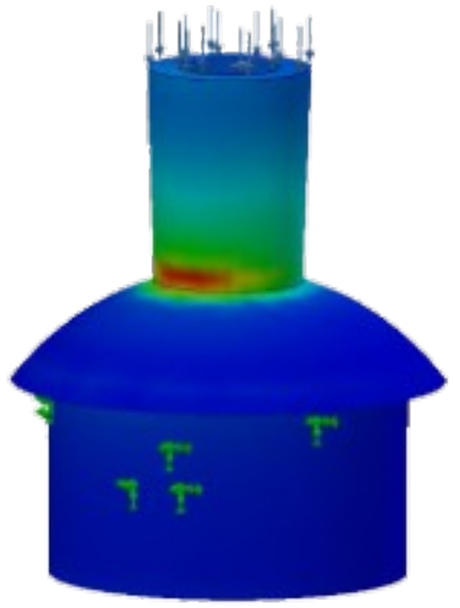
Steering Arm Force
60% Yield Stress

Fig 2: Upright FEA, 6061 T6 Aluminum



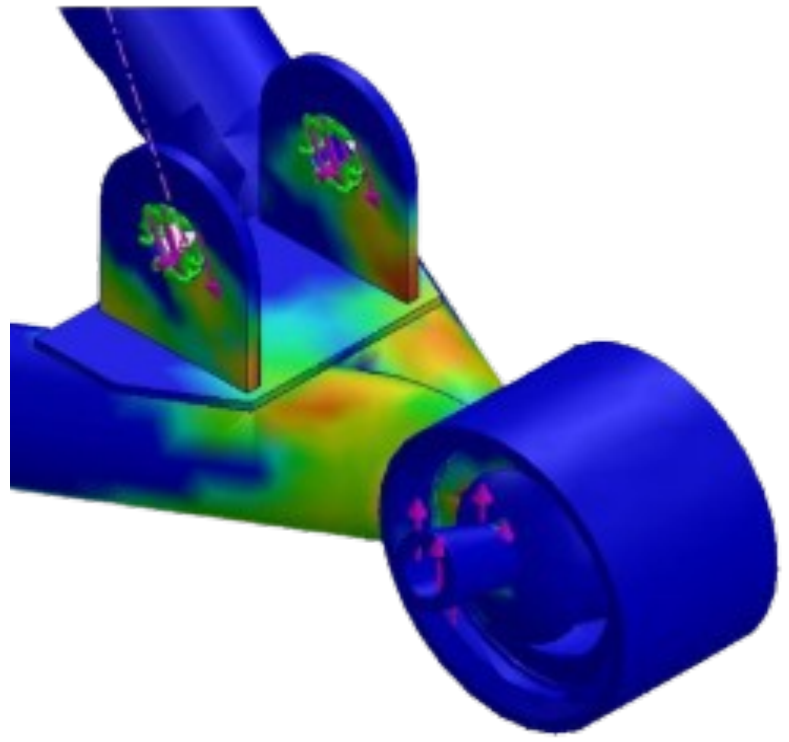
Tie Rod Force
48% Yield Stress

Fig 3: Tie Rod Clevis FEA
1020 Steel



Bump Force
72% Yield Stress

Fig 4: Misalignment Spacer FEA,
630 Stainless

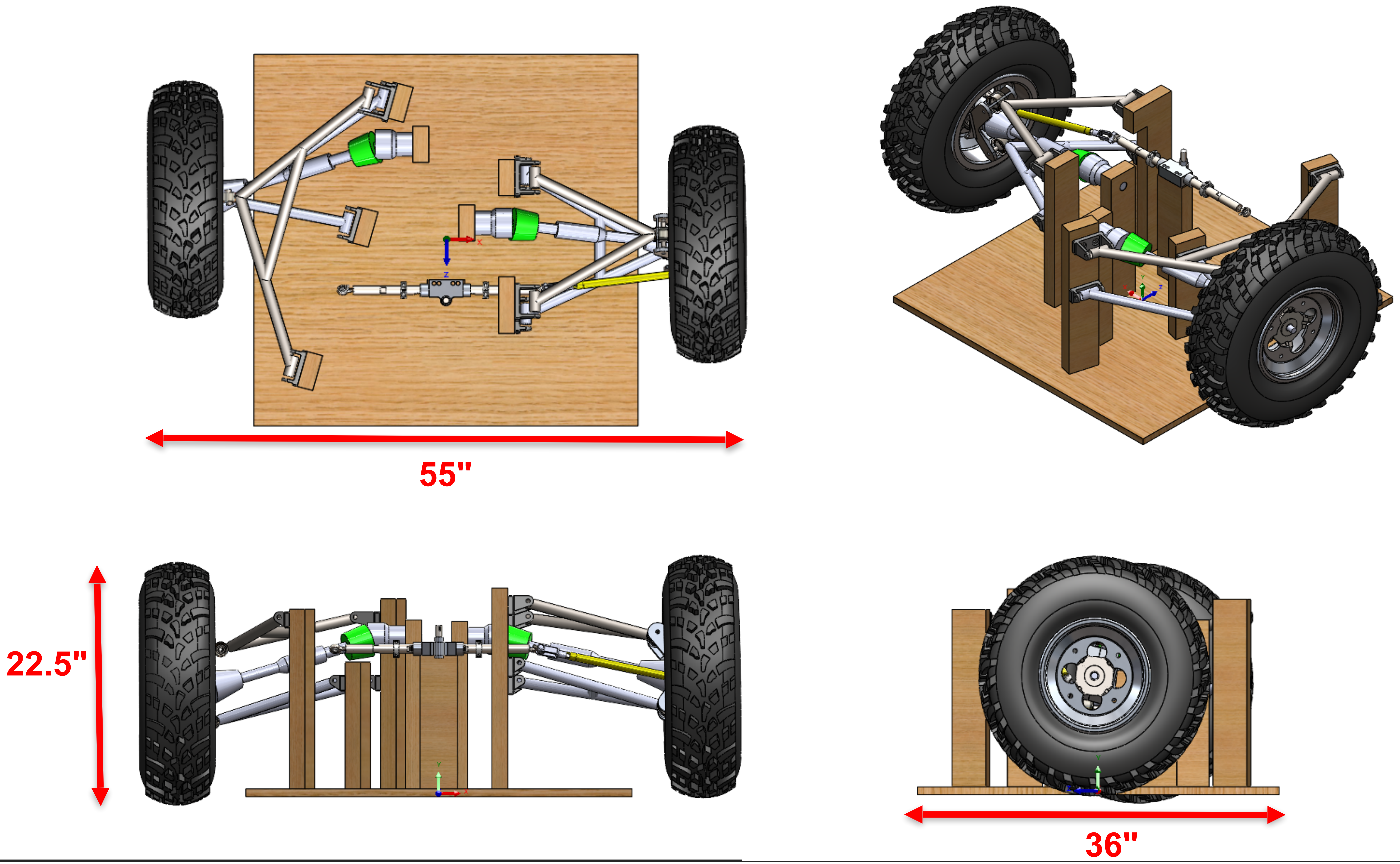


Bump Force
80% Yield Stress

Fig 5: Control Arm FEA, 4130
Chromoly Steel

SUSPENSION AND STEERING

Suspension Prototype



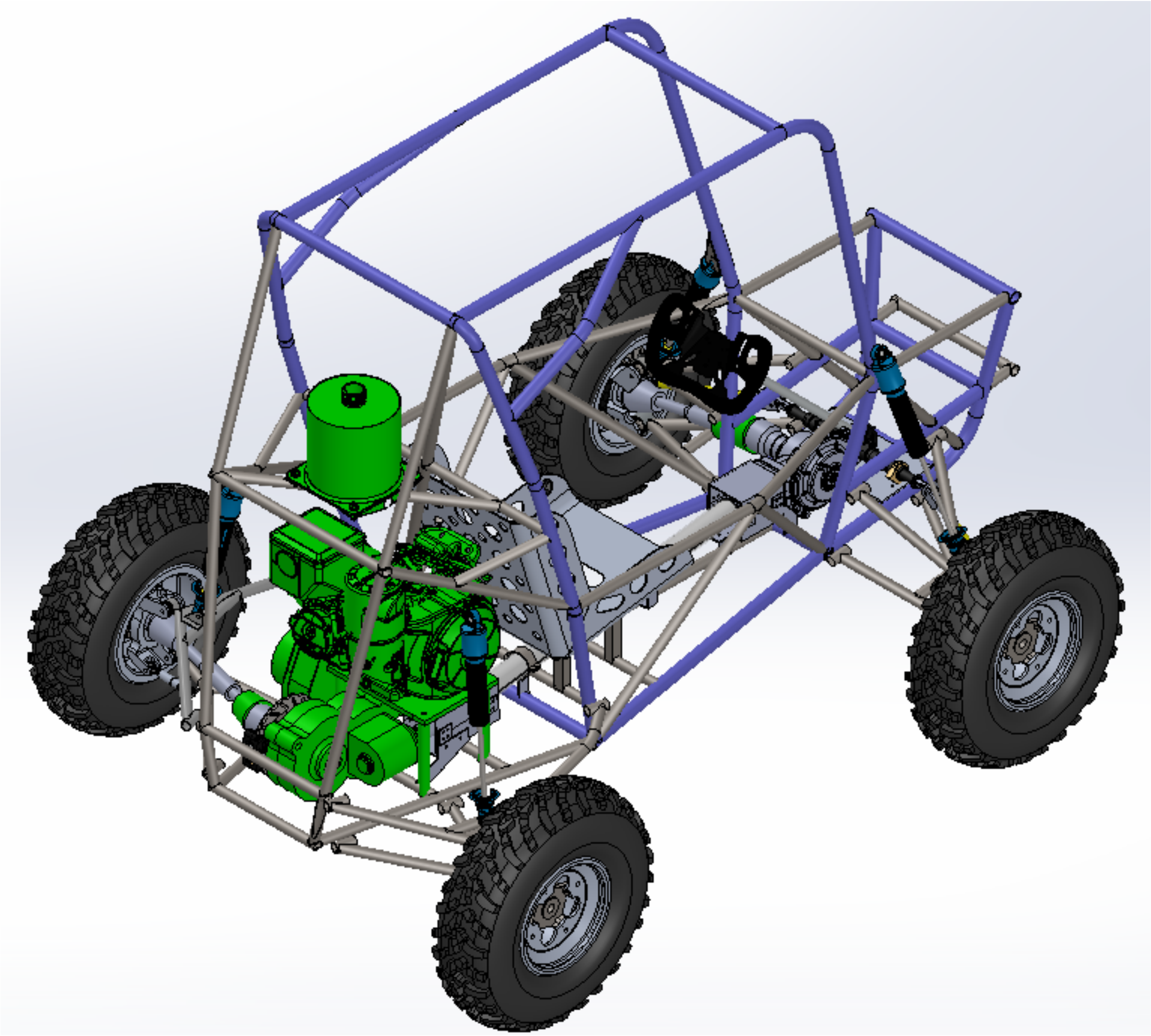
Suspension Prototype Goals

Verify:
Toe Gain
Camber Gain
Wheel Vertical Travel
Wheel Recessional Travel

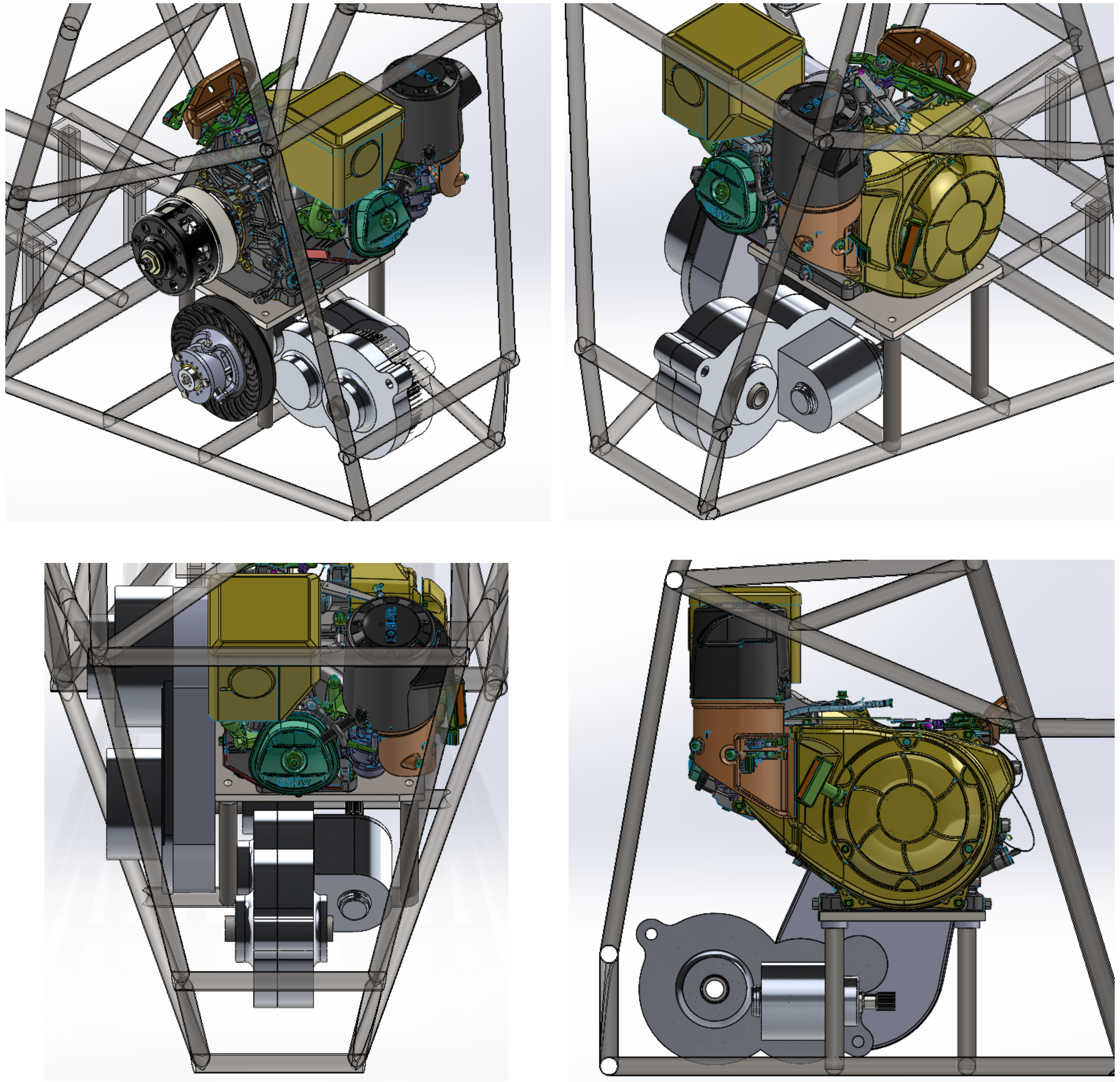
Steering Geometry
  - Wheel turning angles
  - Ackermann %

CV Axle articulation
Misalignment Spacers Max Angle
Manufacturing Tolerances

POWERTRAIN (TRANSMISSION)



Corsair Powertrain Transmission Subassembly



Transmission Packaging in Chassis

POWERTRAIN (TRANSMISSION)

Requirements

Description	Requirement	Reason
Vehicle Acceleration to complete 100 ft	< 4.5 s	Time to Place within top 20-25 teams
Top Speed	> 28 mph	Ensure sufficient torque and speed
Torque at Rear Wheels	> 597.2 ft-lb	Calculated to complete traction event
Overall Ratio (Rear)	32.28	Calculated to complete traction event
Transfer Case Ratio	8.28	Calculated to complete traction event
Transfer Case Weight	45.8 lbs	30% Reduction (From old transfer case + Differential)

Design Changes

	Scoundrel 2024	Corsair 2025
Transmission Weight	220.3 lbs	148.6 lbs (32.5% Reduction)
Peak Torque at Rear Wheels (2WD)	543.5 ft-lbs	604.58 ft-lbs (11.2% Increase)
Total Reduction (From CVT to Wheels)	7.5	8.3
Overall Ratio (Rear)	29.38	32.28
Hill Climb Angle	45°	76°

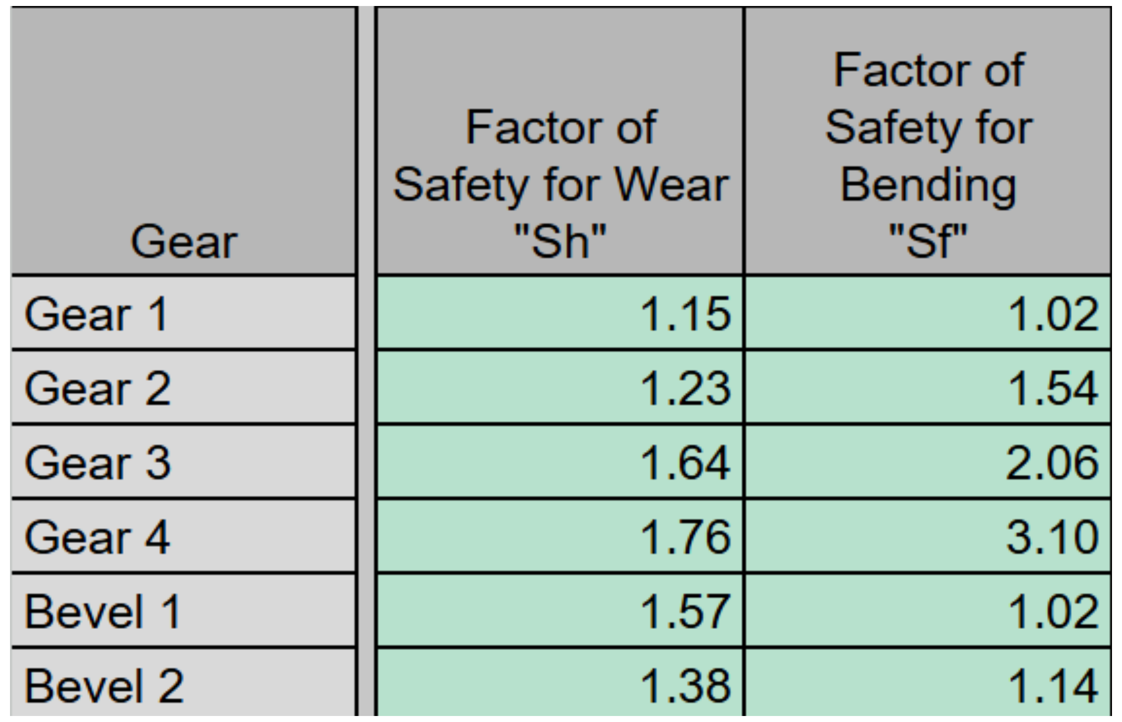
Main System Requirements:

1. Ensure all components can withstand aggressive and unpredictable off-road racing conditions
2. Increase torque delivery to wheels to complete all dynamic Baja SAE events
3. Decrease powertrain weight by 30% from previous years' vehicle, for a new total vehicle weight of ~650 lbs

POWERTRAIN (TRANSMISSION)

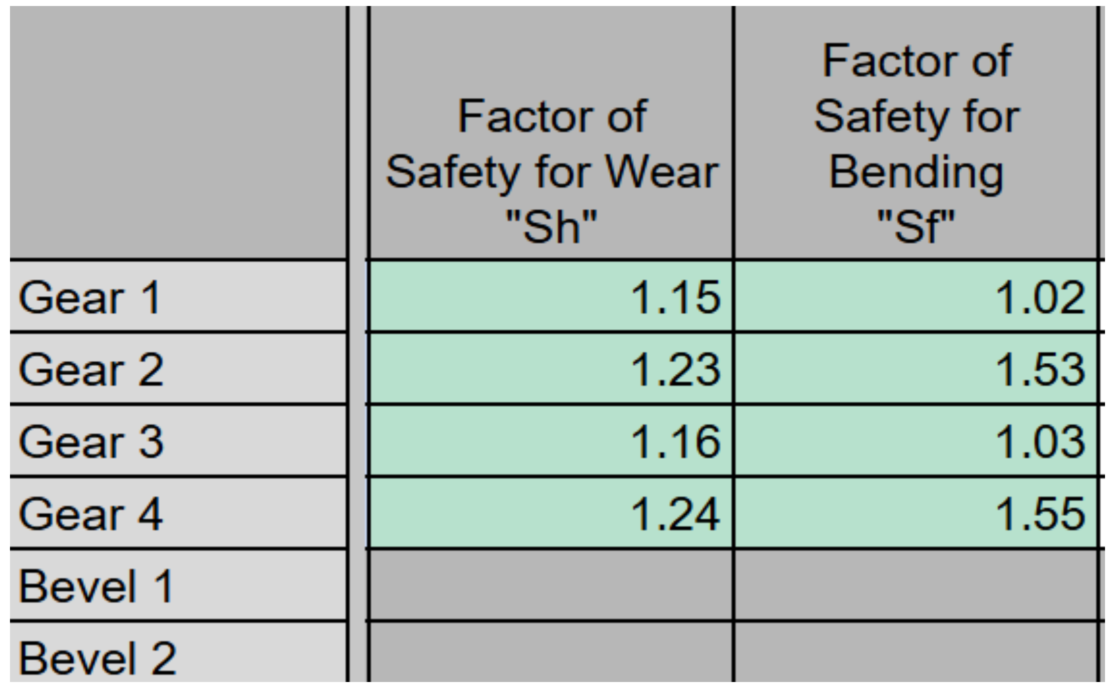
ANSI/AGMA 2001—D04 Gear Design

Transfer Case Gear Specifications			
	Teeth	Diametral Pitch (teeth/in)	Face Width (in)
Gear 1	19	10	0.875
Gear 2	55	10	0.875
Gear 3	19	8	1.4375
Gear 4	55	8	1.4375
Bevel 1	19	6	0.6875
Bevel 2	15	6	0.6875



Gear	Factor of Safety for Wear "Sh"	Factor of Safety for Bending "Sf"
Gear 1	1.15	1.02
Gear 2	1.23	1.54
Gear 3	1.64	2.06
Gear 4	1.76	3.10
Bevel 1	1.57	1.02
Bevel 2	1.38	1.14

AWD Factors of Safety



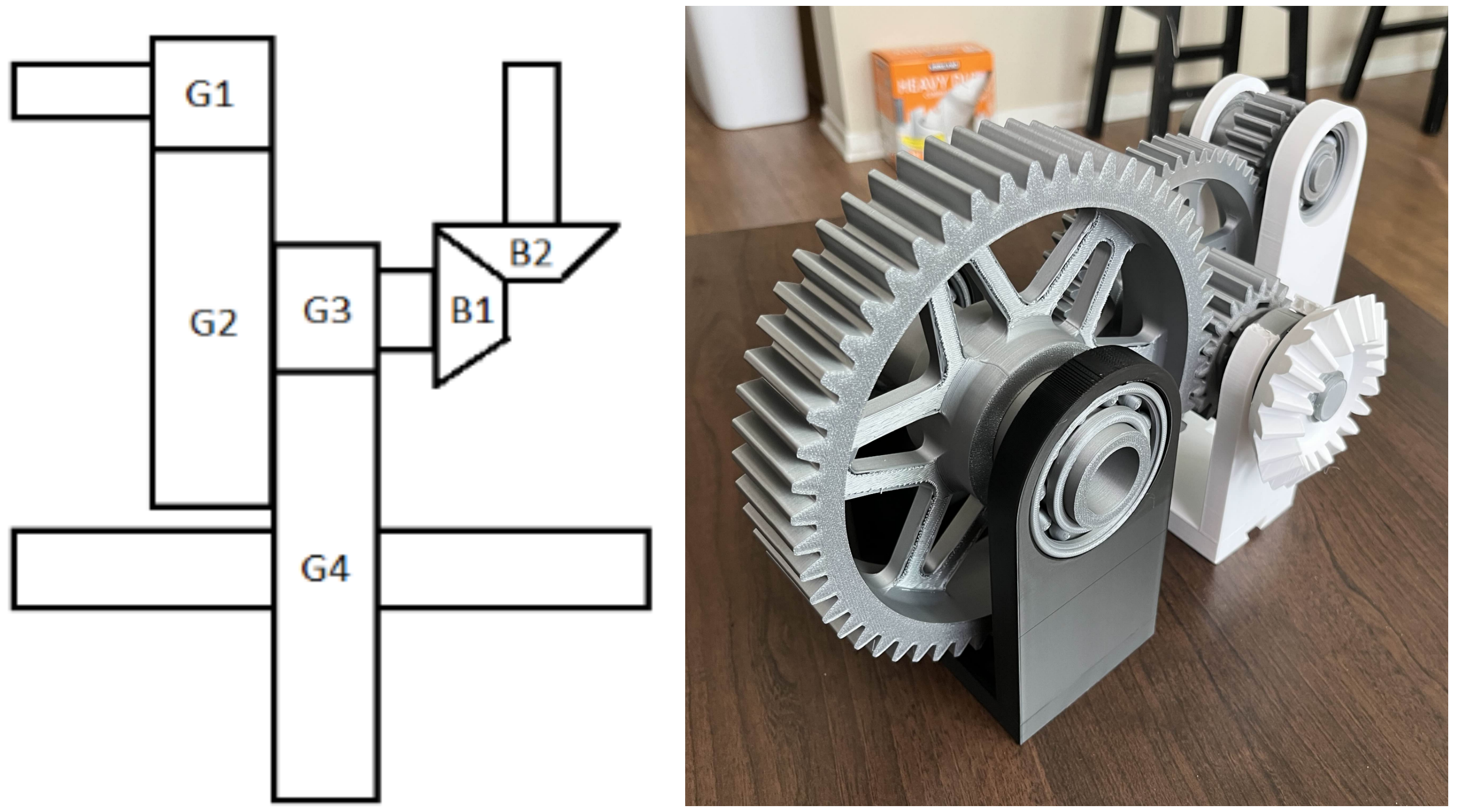
	Factor of Safety for Wear "Sh"	Factor of Safety for Bending "Sf"
Gear 1	1.15	1.02
Gear 2	1.23	1.53
Gear 3	1.16	1.03
Gear 4	1.24	1.55
Bevel 1		
Bevel 2		

RWD Factors of Safety

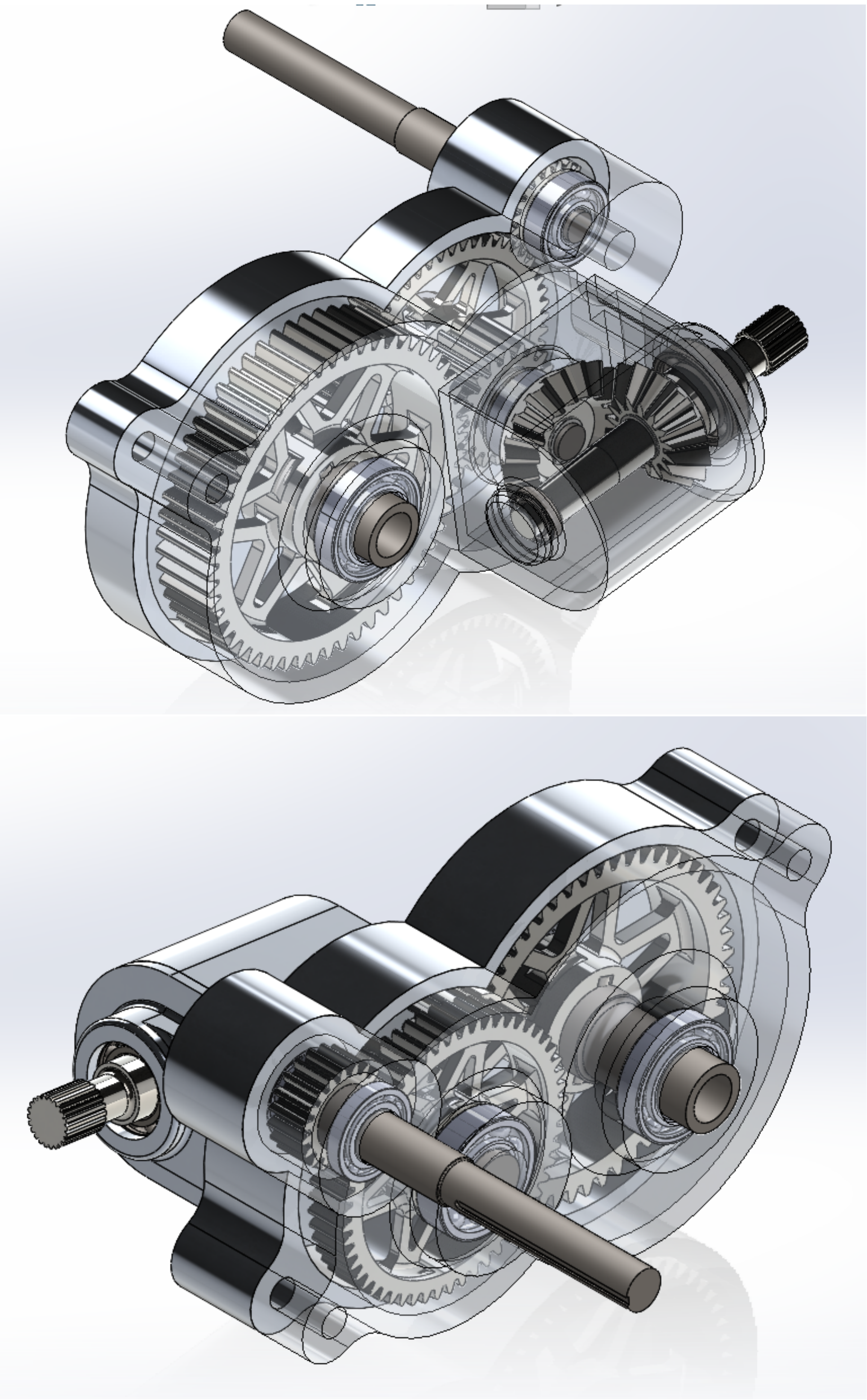
*AGMA FOS are calculated in addition to a 1.75 shock load factor

Transfer Case Design

	Material
Gears	Grade 2 Carburized and Hardened 8620 Steel
Shafts	4340 Steel
Housing	6061 Aluminum

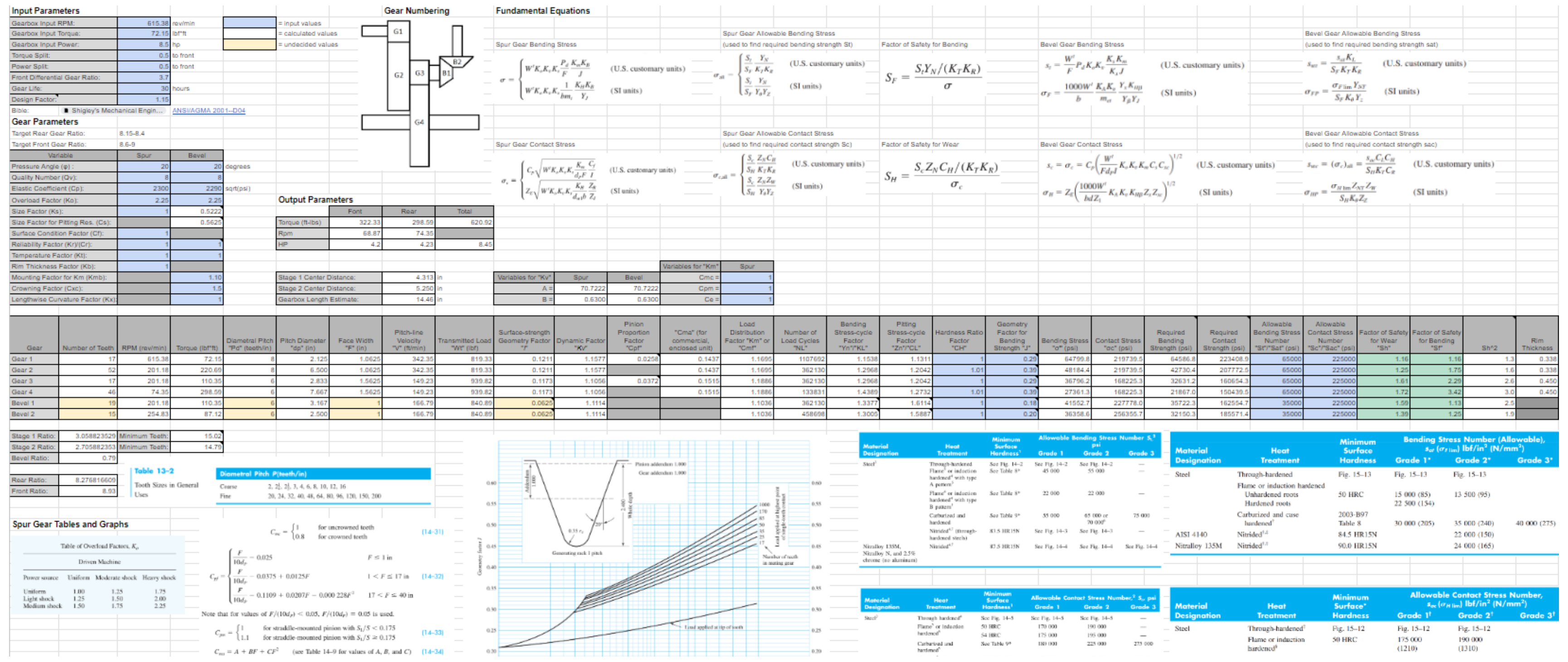


Gear Layout and 3D Printed Proof of Concept

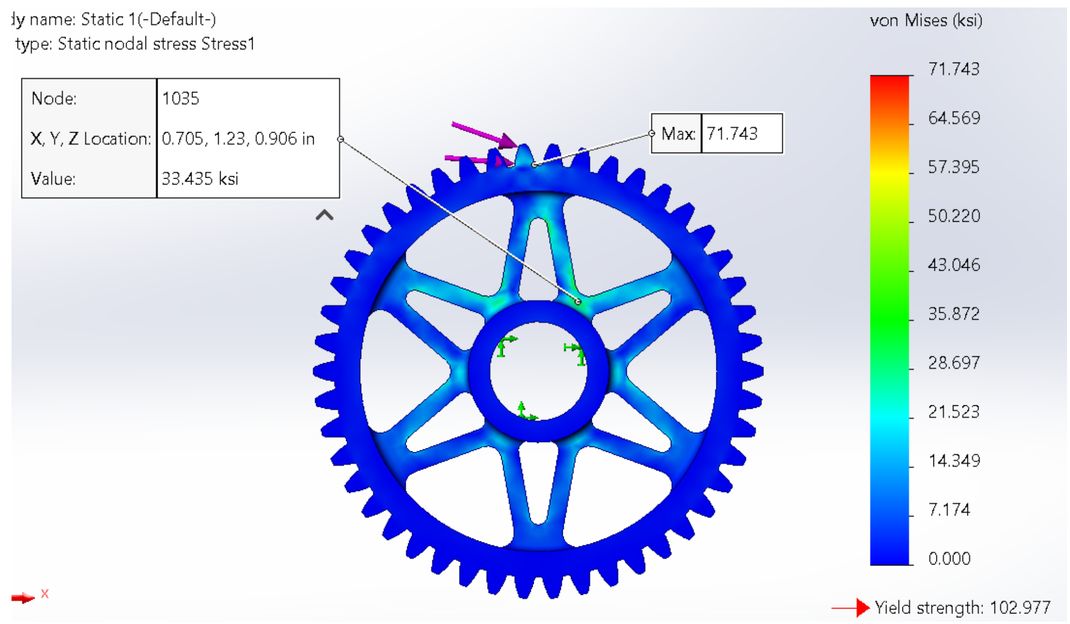


Transfer Case Design

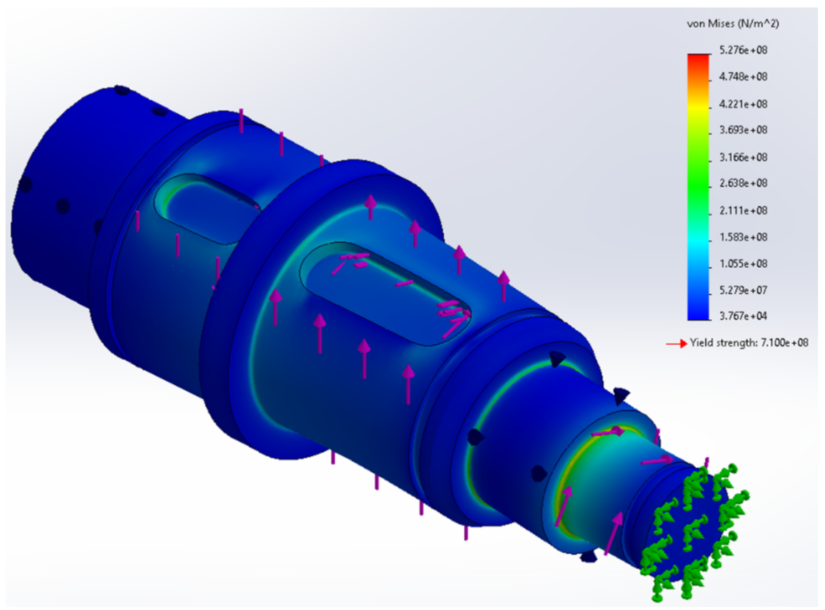
Transfer Case Calculations and FEA



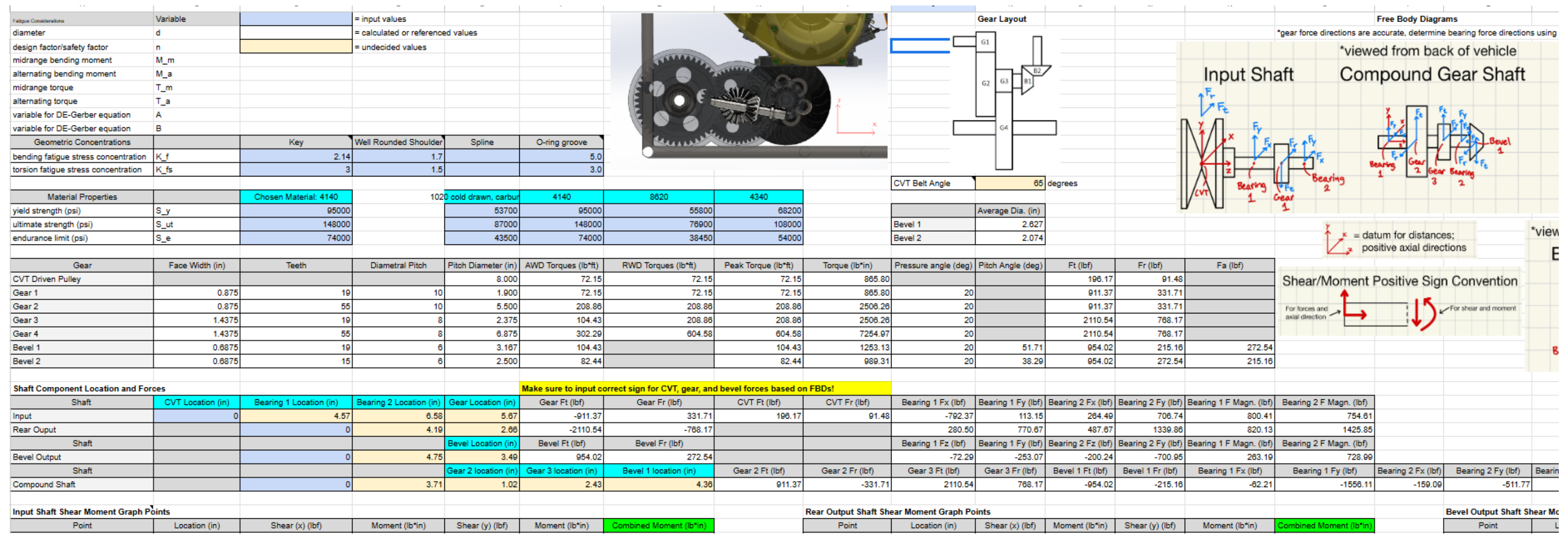
AGMA 2001—D04 Calculations



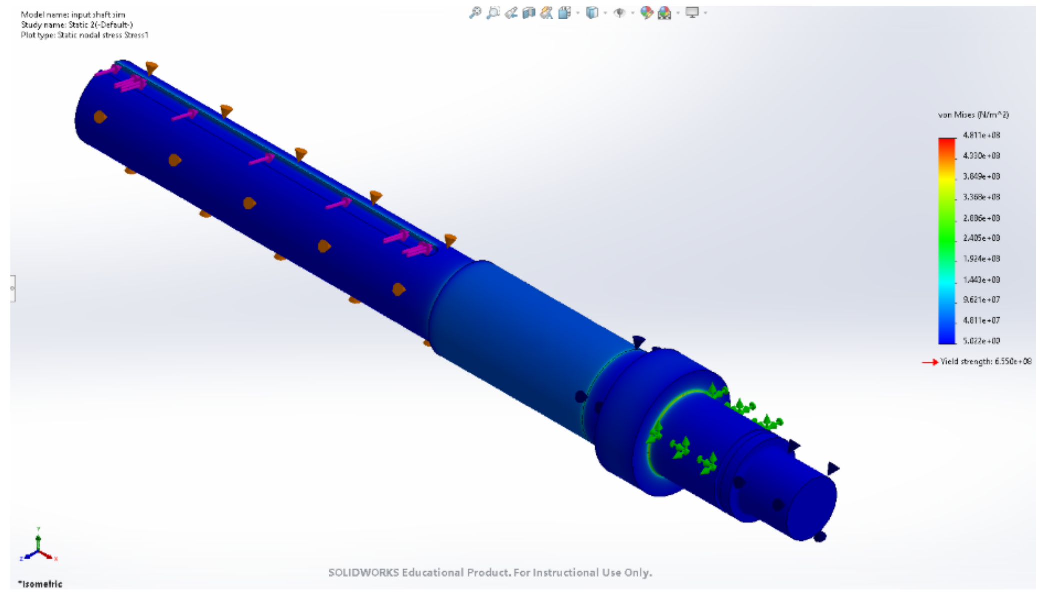
Gear Webbing Analysis



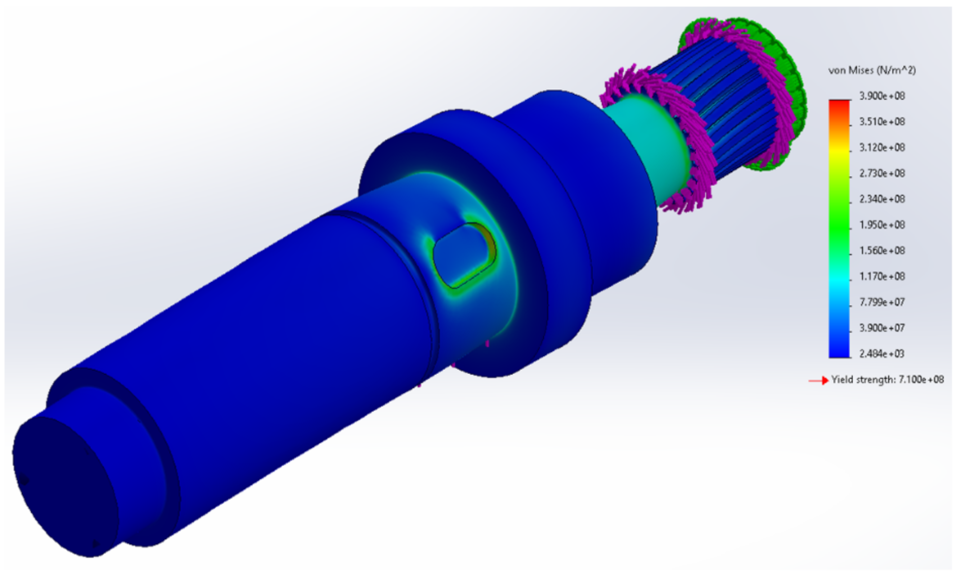
Compound Shaft FEA



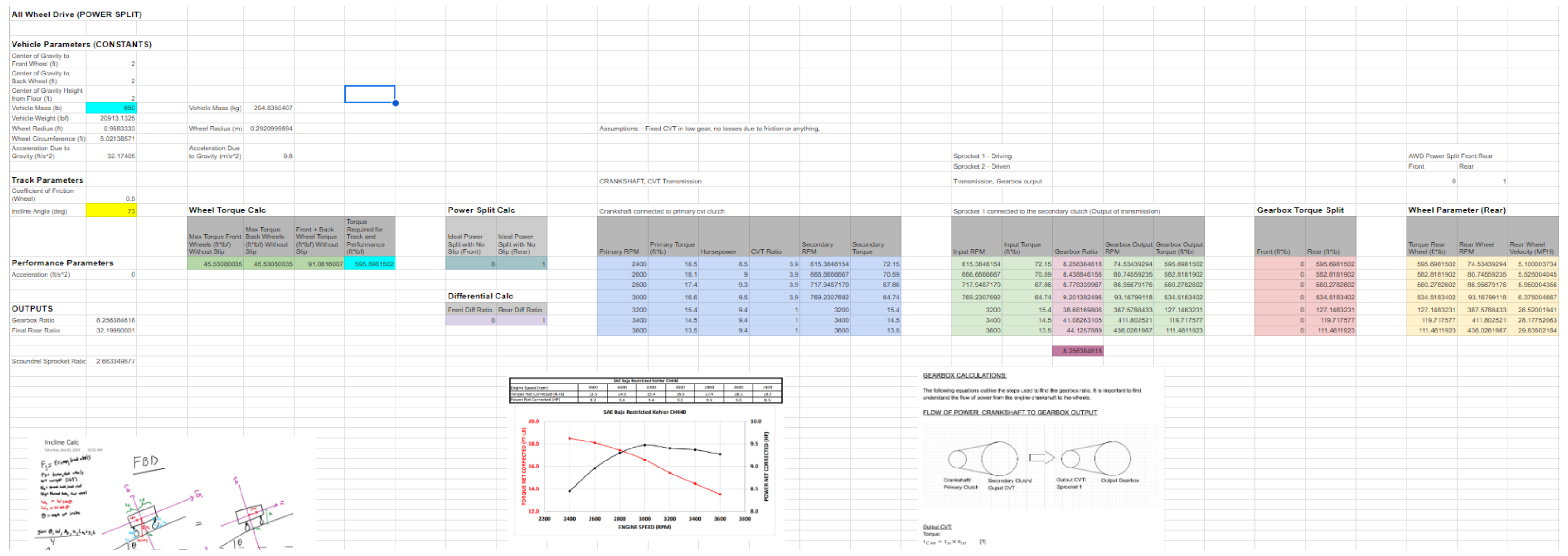
Shaft Calculations



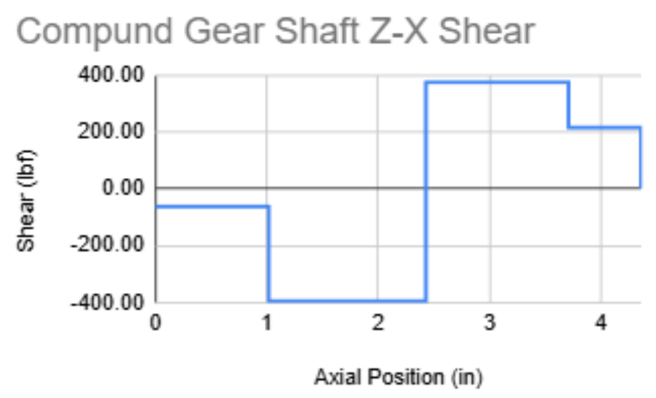
Input Shaft FEA

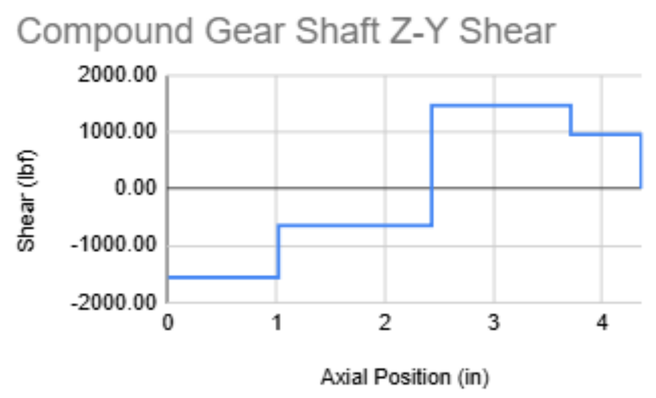


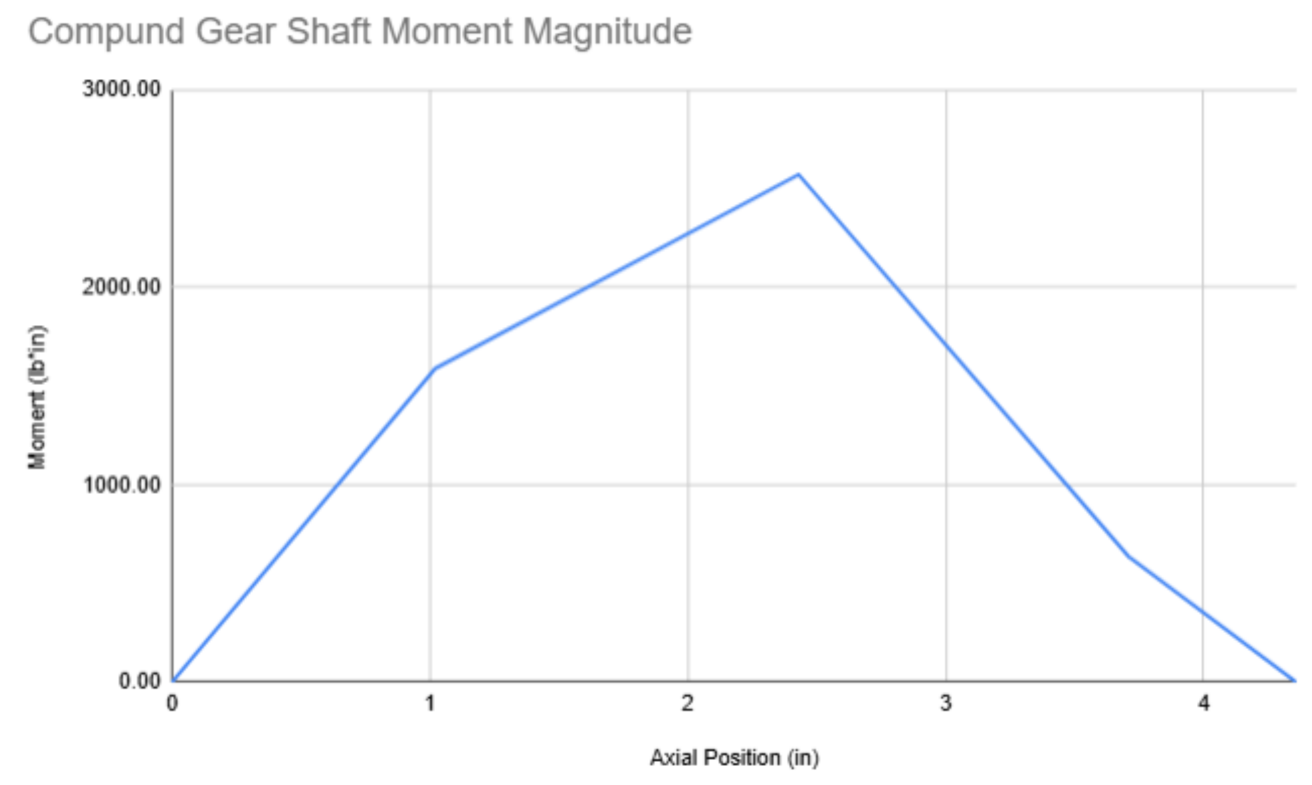
Driveshaft Output FEA

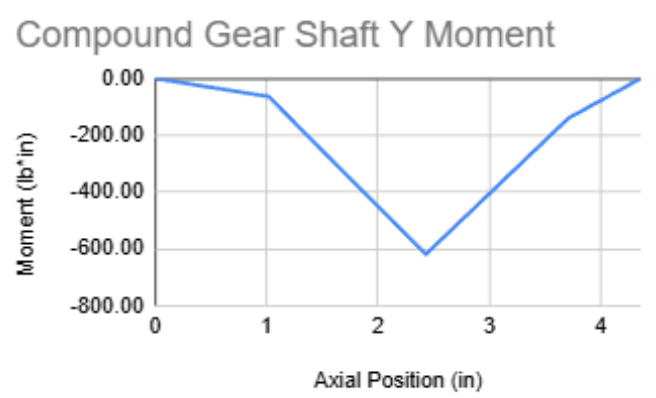


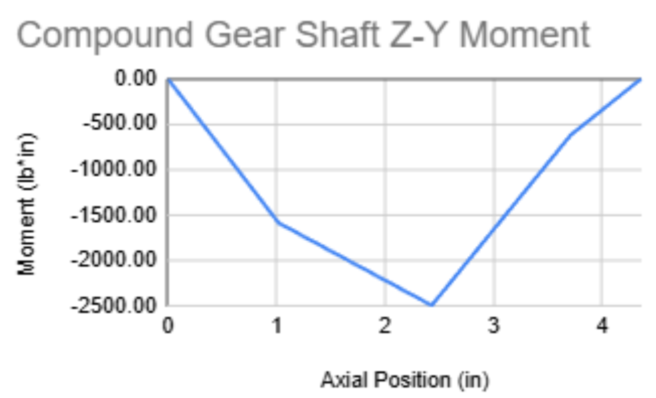
Performance/Ratio Calculations


Compund Gear Shaft Z-X Shear


Compound Gear Shaft Z-Y Shear


Compound Gear Shaft Moment Magnitude


Compound Gear Shaft Y Moment


Compound Gear Shaft Z-Y Moment

POWERTRAIN (DRIVELINE)

Component	Scoundrel	Corsair
Guarding	Carbon Steel Hard to disassemble	6061 Aluminum Designed for manufacturing
Driveshaft	2" OD Unknown thickness	1.25” OD 0.083" wall thickness
Differentials	Reliable front differential Rear differential lost traction	Front Differential: Polaris Sportsman - On Demand 4WD

POWERTRAIN (DRIVELINE)

Driveshaft Calculations

Chromoly Steel (4130) 1.25” Diameter, 0.083" Wall Thickness Shaft

	Transmission Output Value	Driveshaft Maximum Value
Torque (lbf*ft)	82.4	505.7
Critical Speed (RPM)	269.3	6395.2

16% of torque capacity
4% of RPM capacity

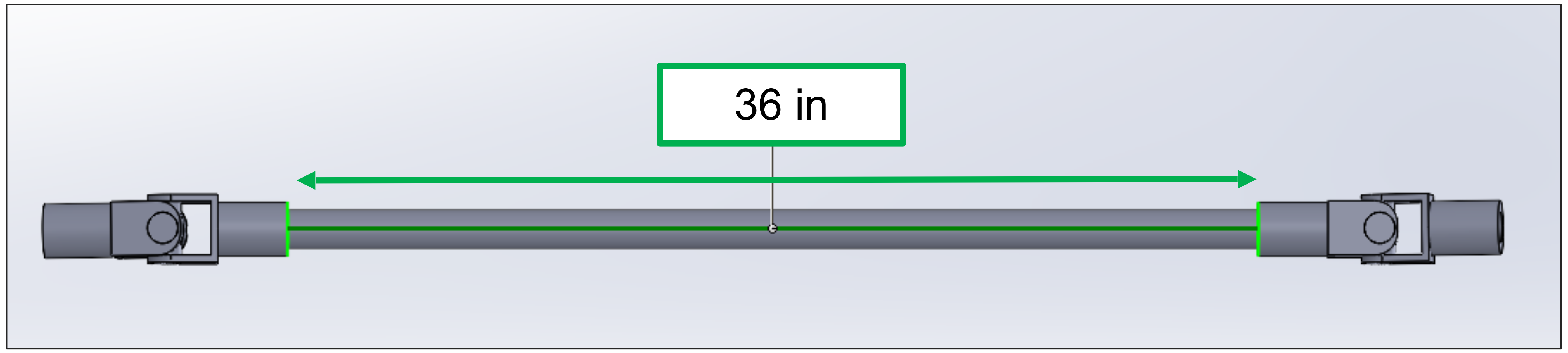
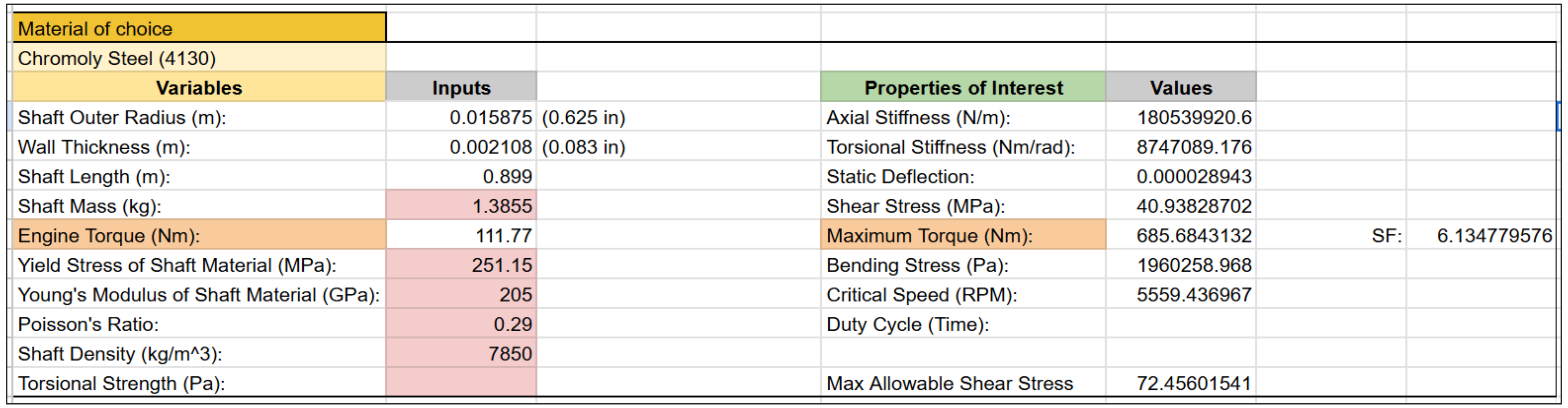


Fig 1: Driveshaft Extension Length



Material of choice						
Chromoly Steel (4130)						
Variables	**Inputs**		**Properties of Interest**	**Values**		
Shaft Outer Radius (m):	0.015875	(0.625 in)	Axial Stiffness (N/m):	180539920.6		
Wall Thickness (m):	0.002108	(0.083 in)	Torsional Stiffness (Nm/rad):	8747089.176		
Shaft Length (m):	0.899		Static Deflection:	0.000028943		
Shaft Mass (kg):	1.3855		Shear Stress (MPa):	40.93828702		
Engine Torque (Nm):	111.77		Maximum Torque (Nm):	685.6843132	SF:	6.134779576
Yield Stress of Shaft Material (MPa):	251.15		Bending Stress (Pa):	1960258.968		
Young's Modulus of Shaft Material (GPa):	205		Critical Speed (RPM):	5559.436967		
Poisson's Ratio:	0.29		Duty Cycle (Time):			
Shaft Density (kg/m^3):	7850					
Torsional Strength (Pa):			Max Allowable Shear Stress	72.45601541		

Fig 2: Driveshaft Calculator used to determine diameter and wall thickness

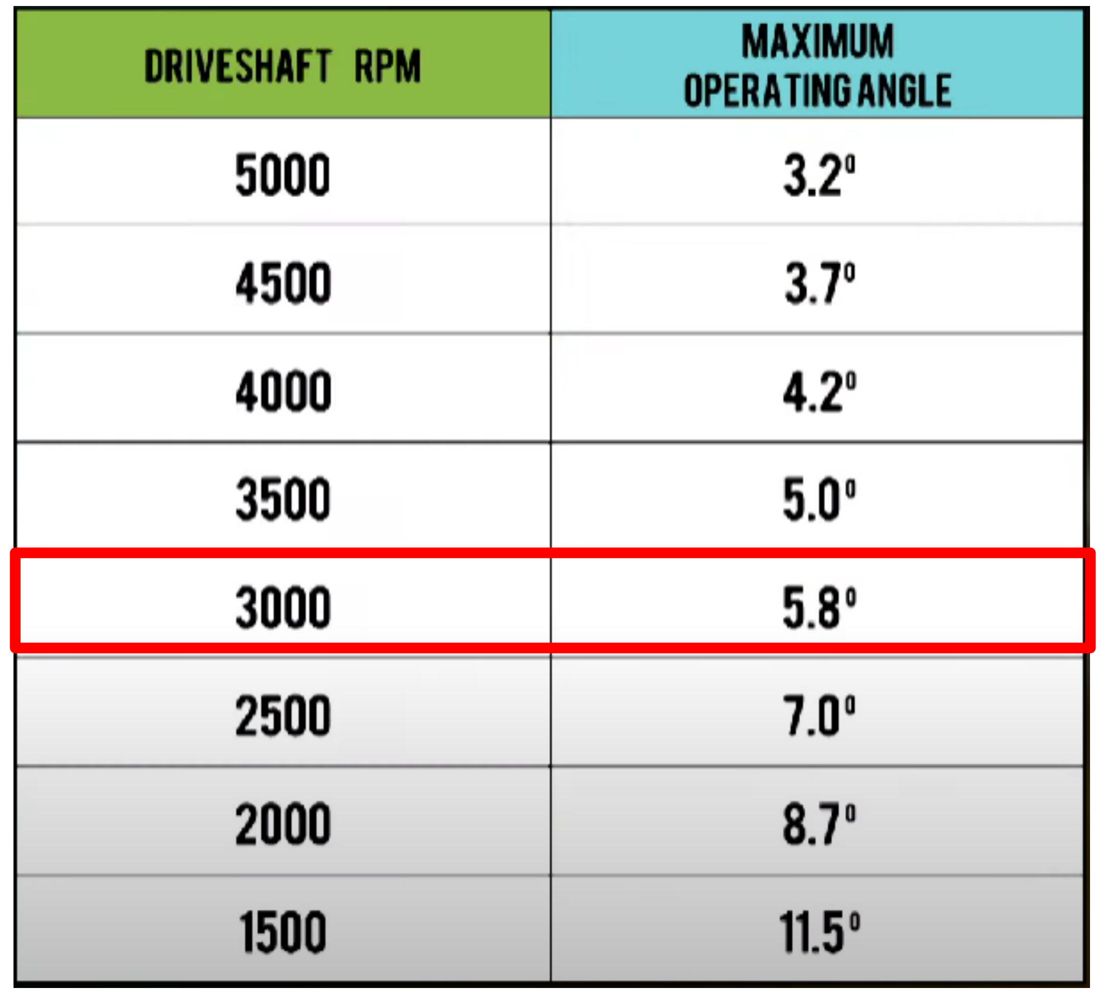
POWERTRAIN (DRIVELINE)

U-Joint Phasing

Side View Working Angle:
0.7°

Top View Working Angle:
5.75°

Estimated Driveshaft RPM:
270



DRIVESHAFT RPM	MAXIMUM OPERATING ANGLE
5000	3.2°
4500	3.7°
4000	4.2°
3500	5.0°
3000	5.8°
2500	7.0°
2000	8.7°
1500	11.5°

Fig 1: Operating Angle Verification, table taken from Autodata Training

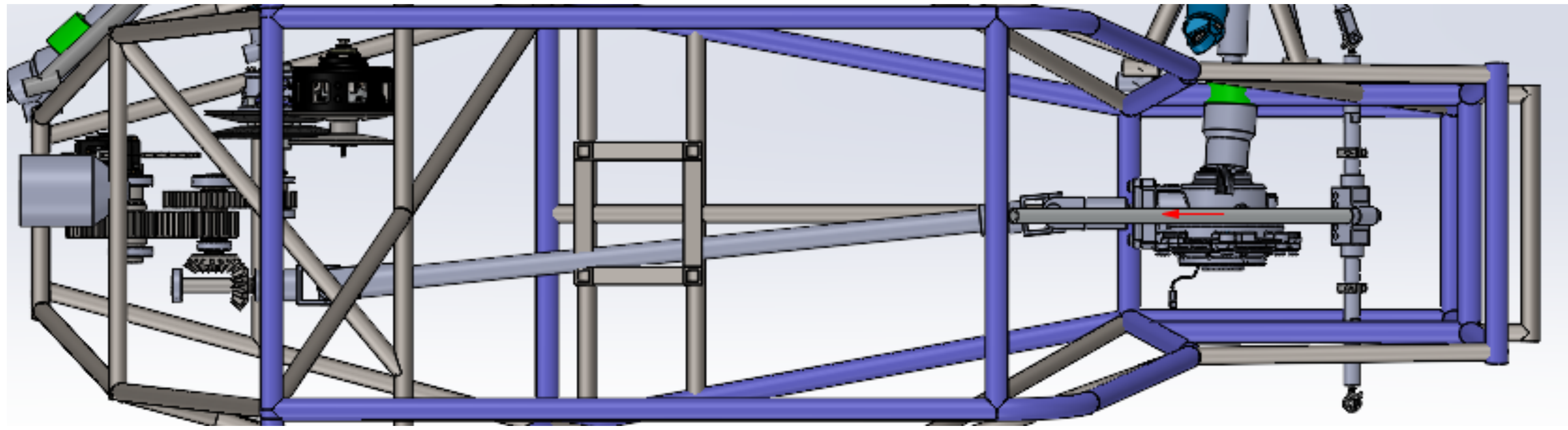


Fig 2: Corsair Top View

Driveline Clearance

Scoundrel: 6.4” from bottom member

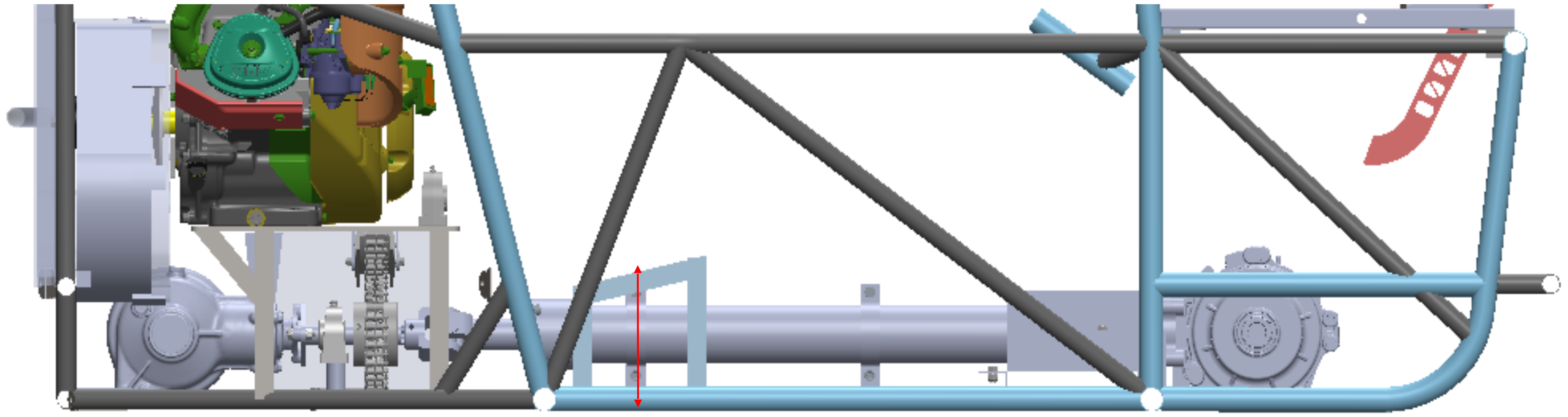


Fig 3:Scoundrel Side View

Corsair: 5.4” from bottom member

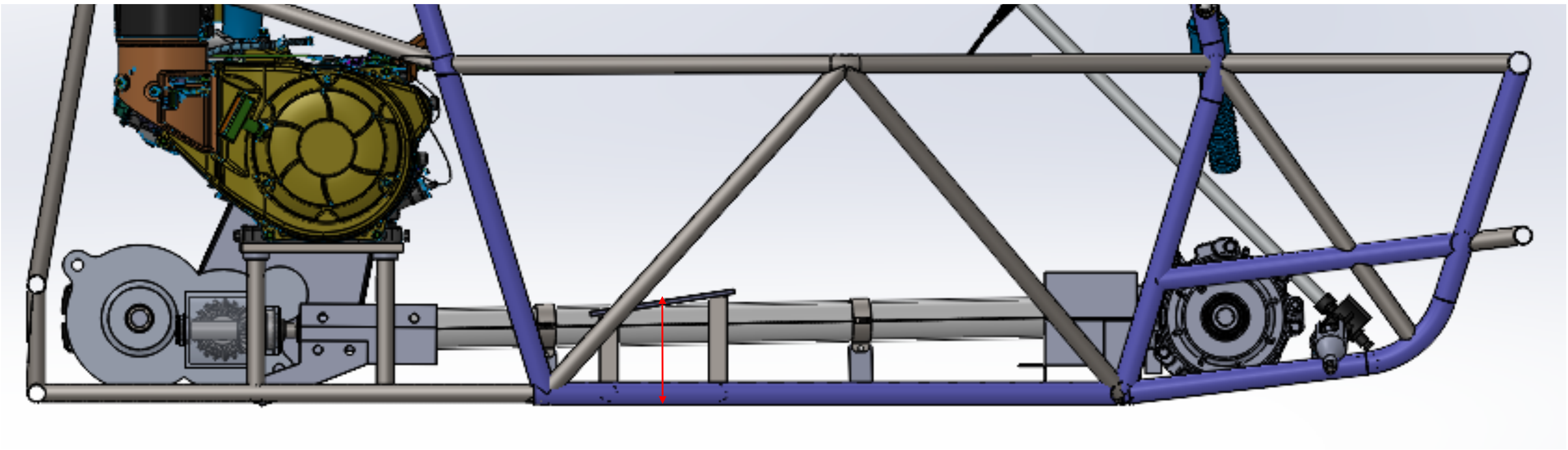


Fig 4: Corsair Side View

POWERTRAIN (DRIVELINE)

Yoke Guards

- ~60% weight reduction

Driveshaft Guarding

- 1" diameter reduction

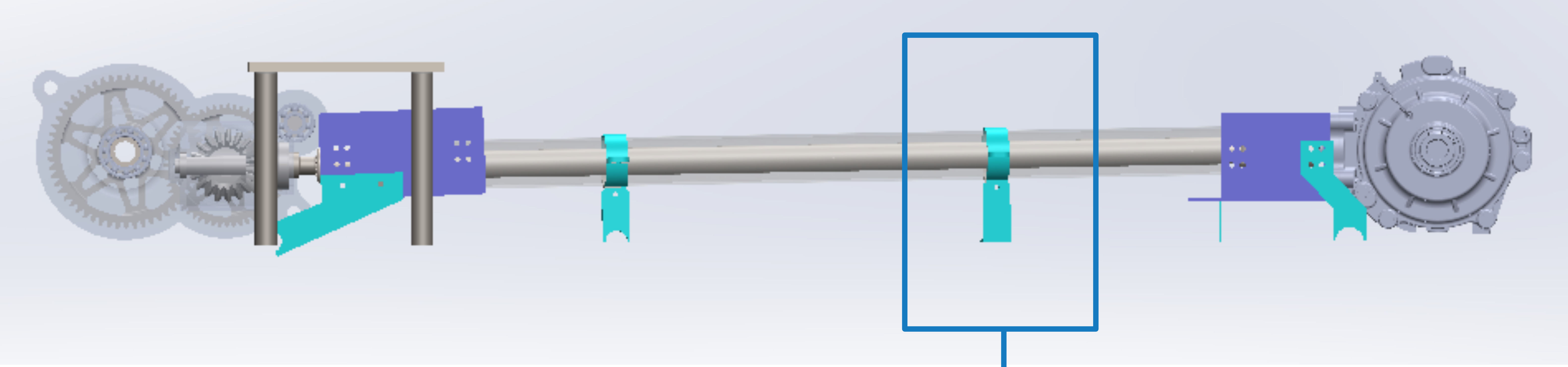


Fig 1: Driveline Guarding

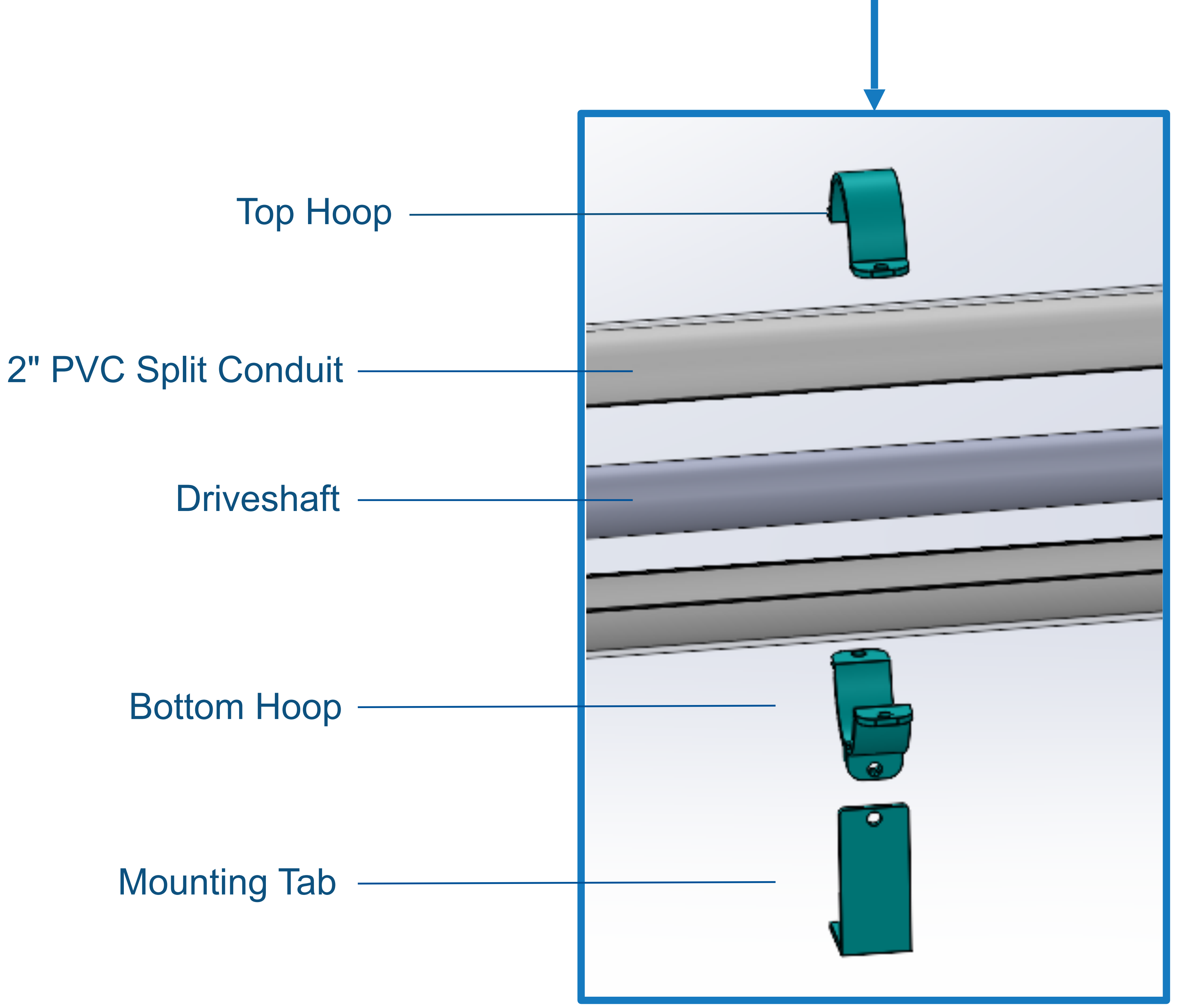


Fig 2: Expanded and Exploded View

POWERTRAIN (DRIVELINE)

Driveline Subsystem Prototype

Testing Goals:

- Vibration testing
- Constant velocity verification
- Test at low (idle simulation), medium (typical driving speeds), high (peak operational range) speeds

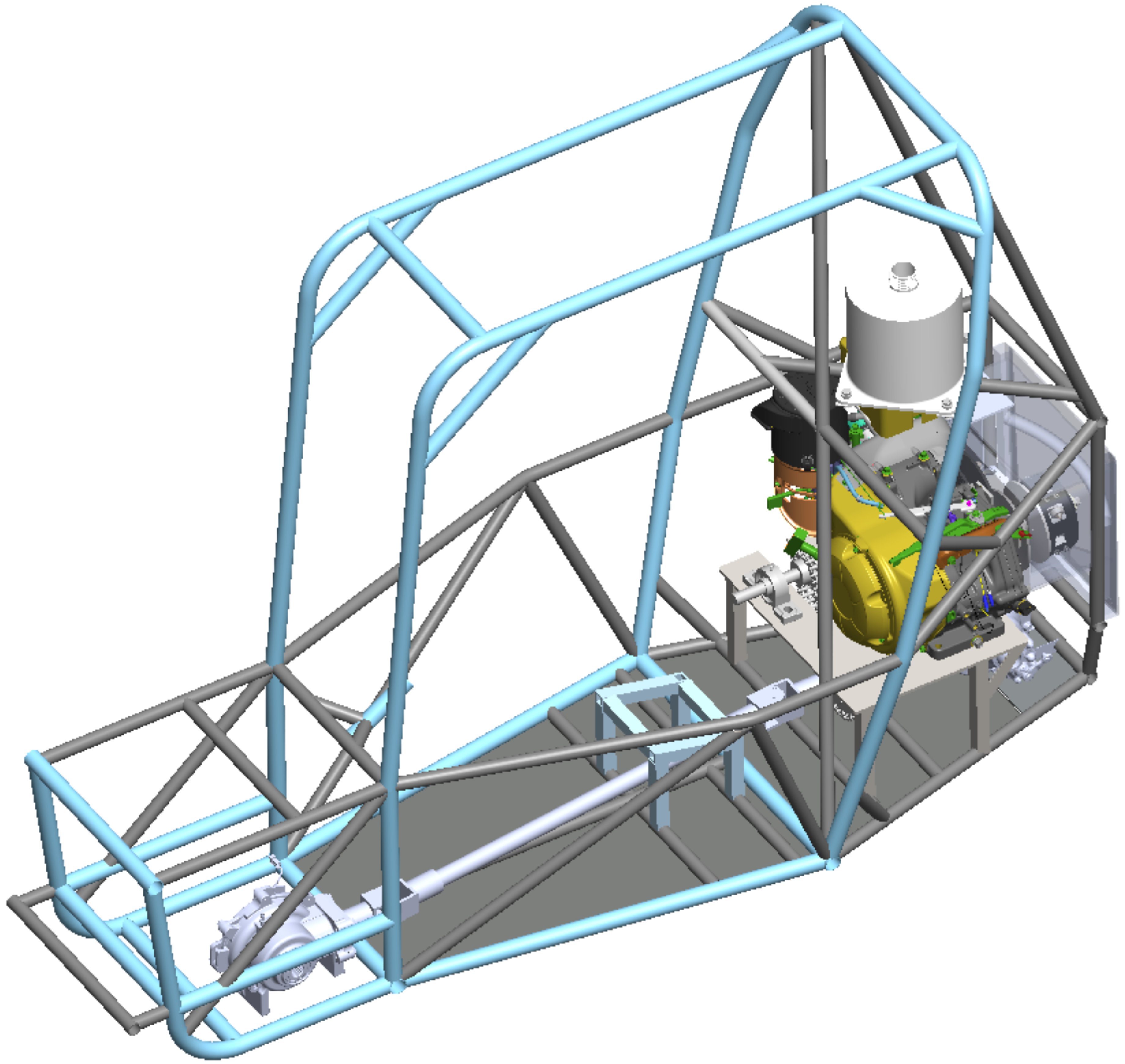


Fig 1: Scoundrel with New Driveline Geometry, Isometric View

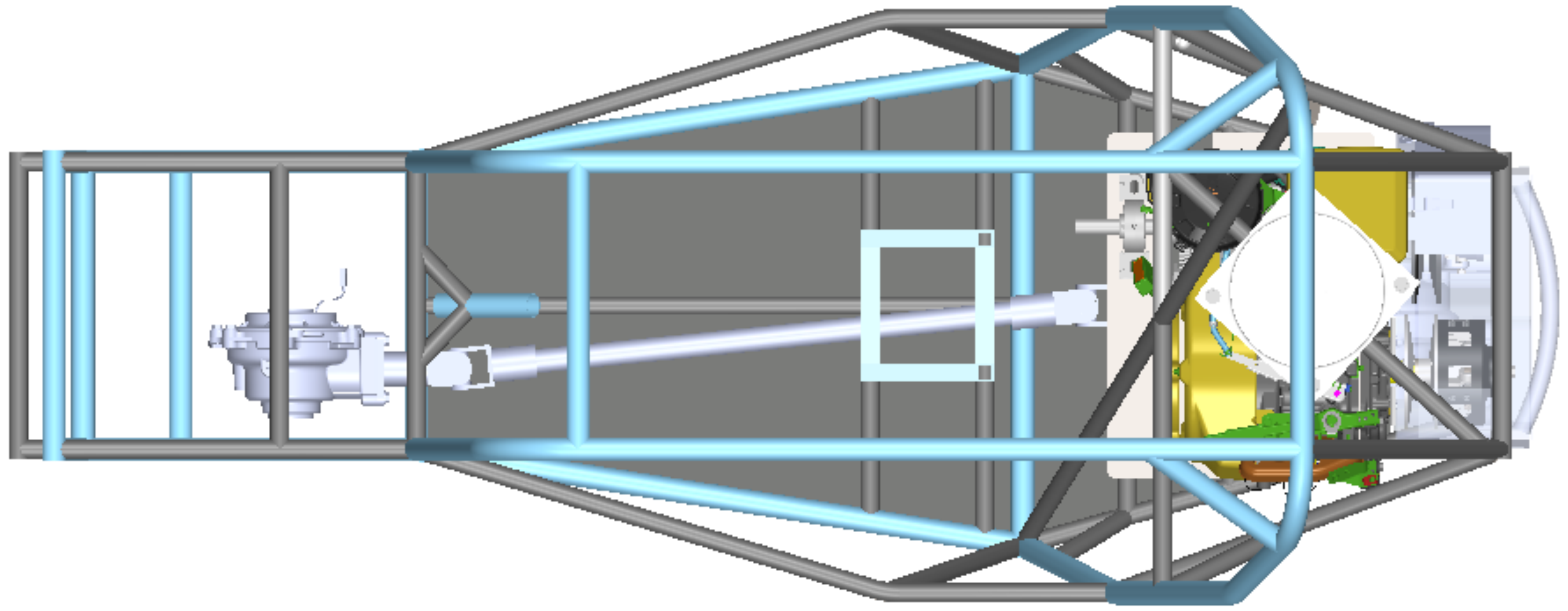
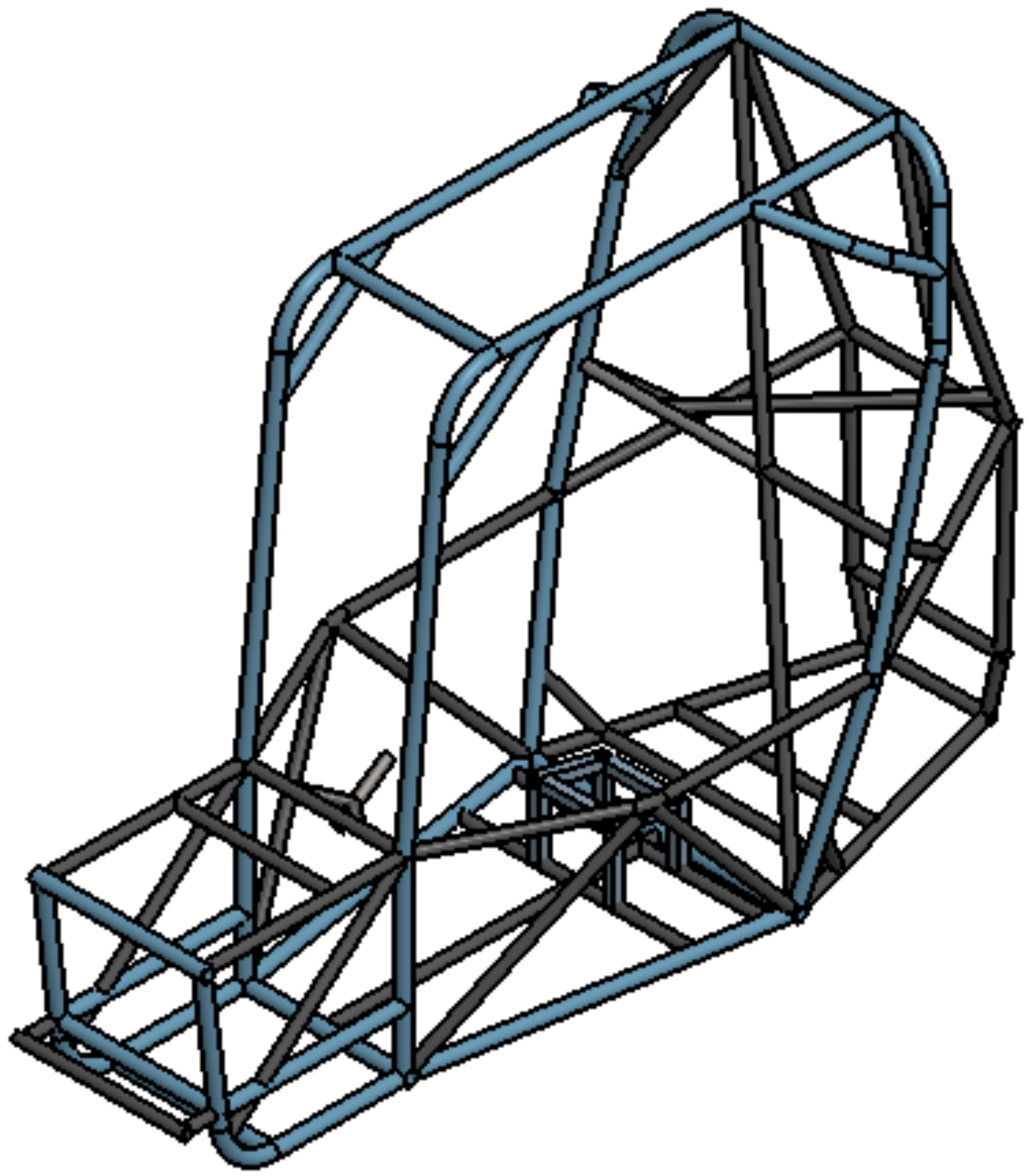


Fig 2: Top View

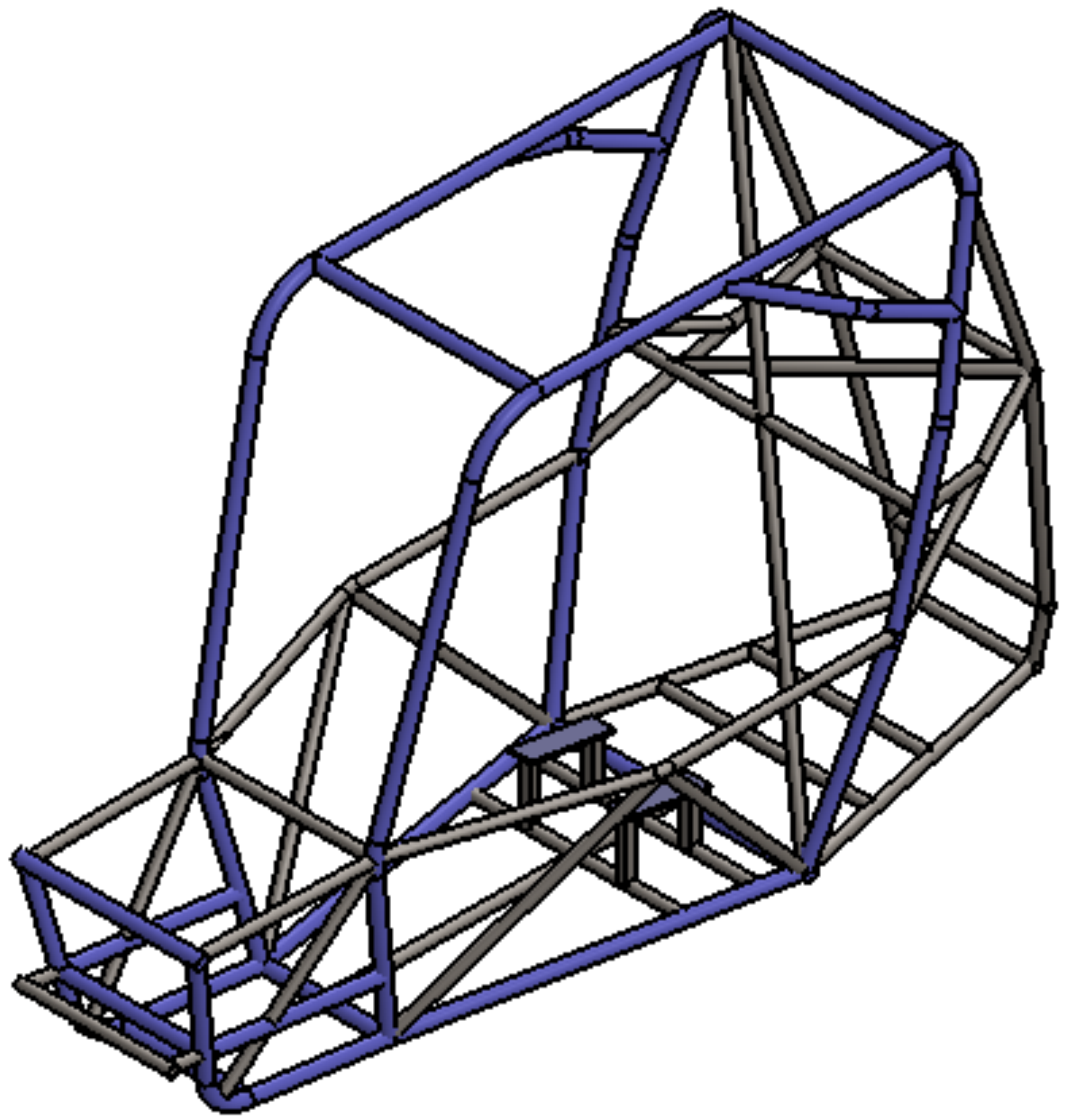
CHASSIS - Frame

Subsystem Goals

Subsystem Goal	Reason	Approach
Weight Reduction	Overall system goal	Reduce unnecessary members; simplify seat mount
Optimized Driver Accommodation	Prevent excess overhead clearance	Reduce chassis profile by designing around designated drivers
Maintain Ease of Manufacturability	Reduce manufacturing time and error	Focus on simplicity and manufacturing constraints: minimize multi-planar bends; improve manufacturing capabilities



Scoundrel
87.47 lbs
66 members
120.6 ft total length of tubing

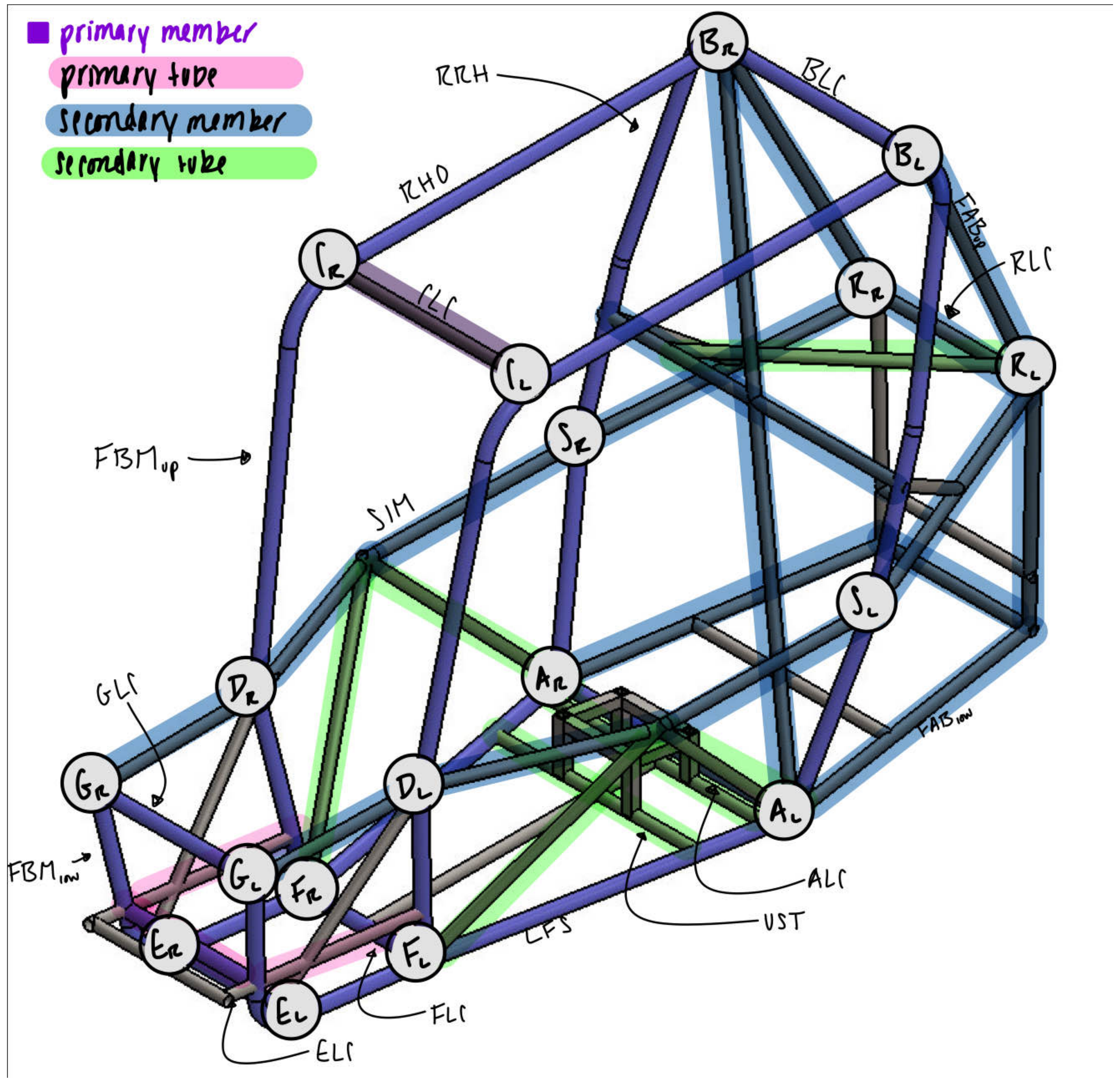


Corsair
80.69 lbs
59 members
118.7 ft total length of tubing

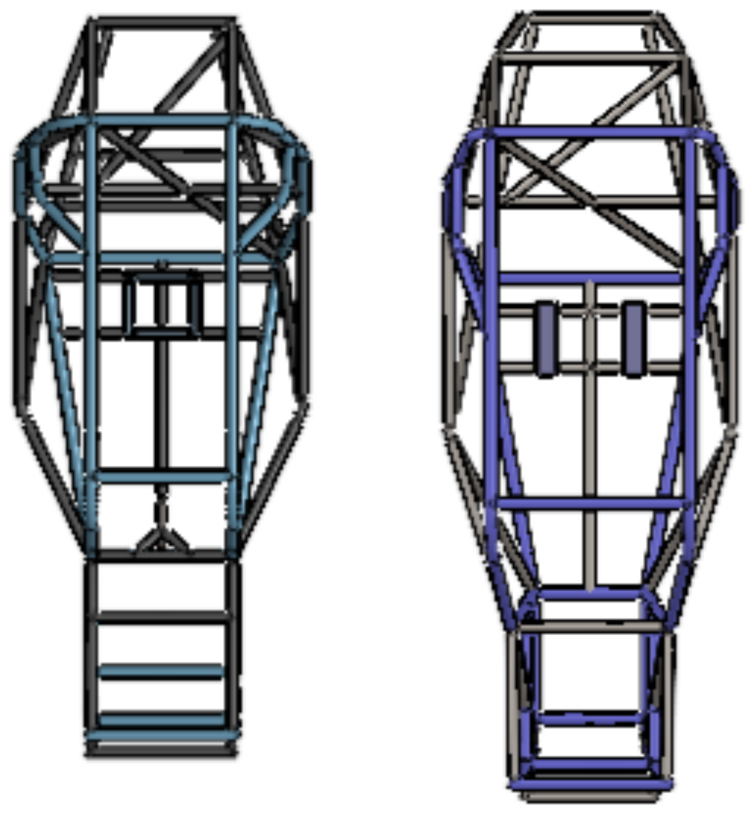
10.4% reduction in weight

CHASSIS - Frame

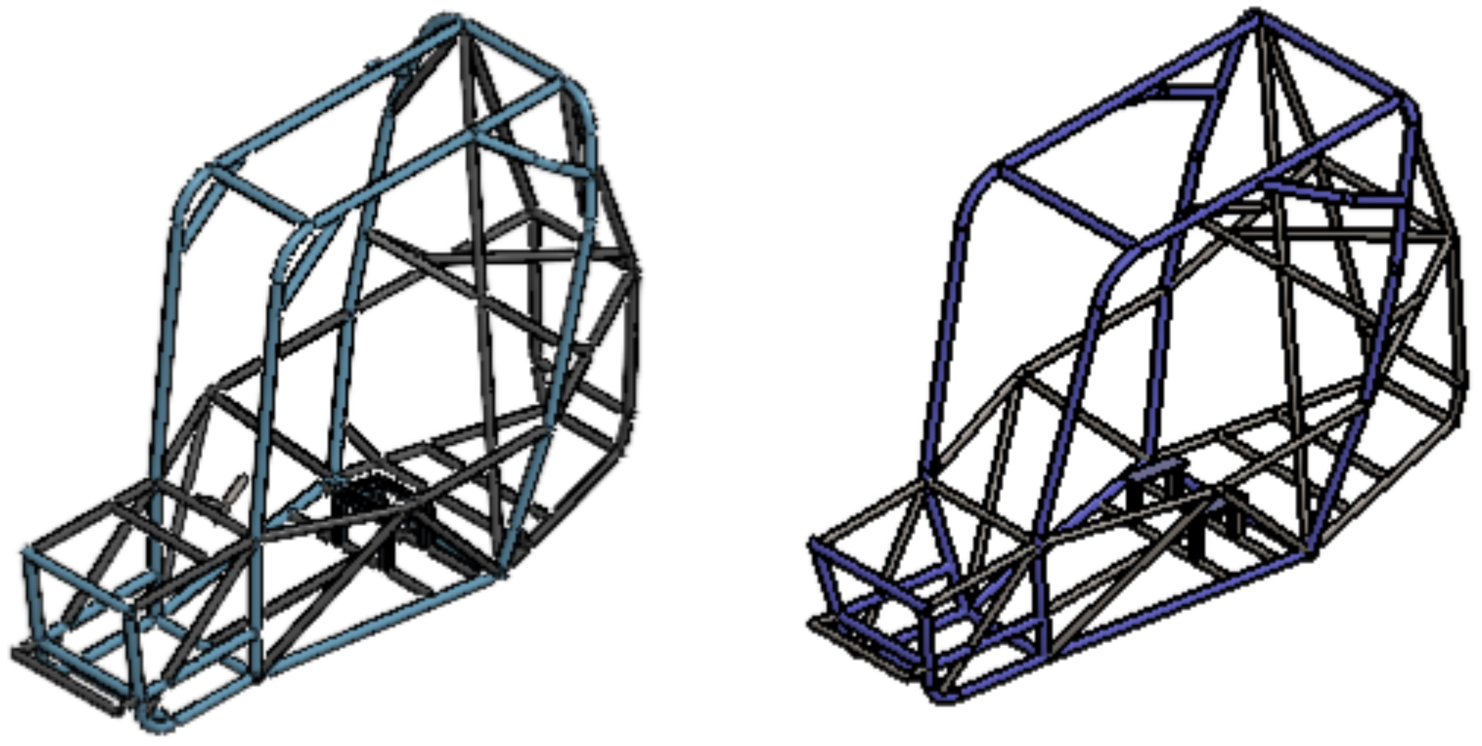
Frame Design



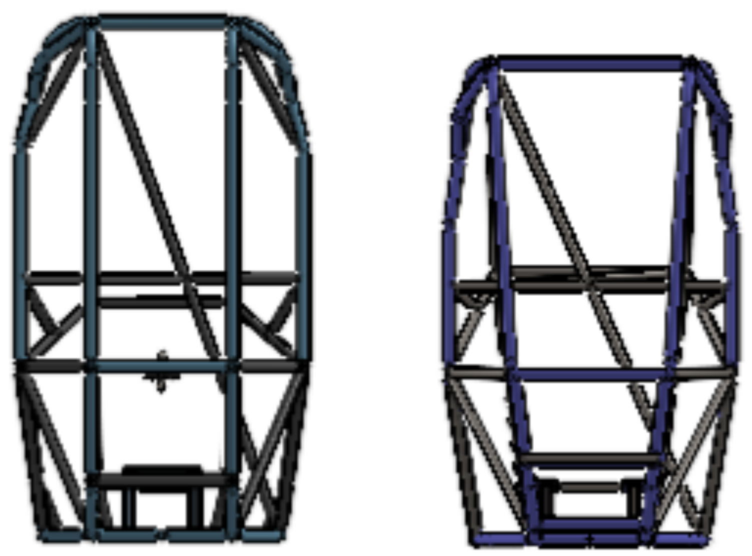
Corsair Frame w/ Named Point and Member Classification Requirements



Top View: Scoundrel & Corsair

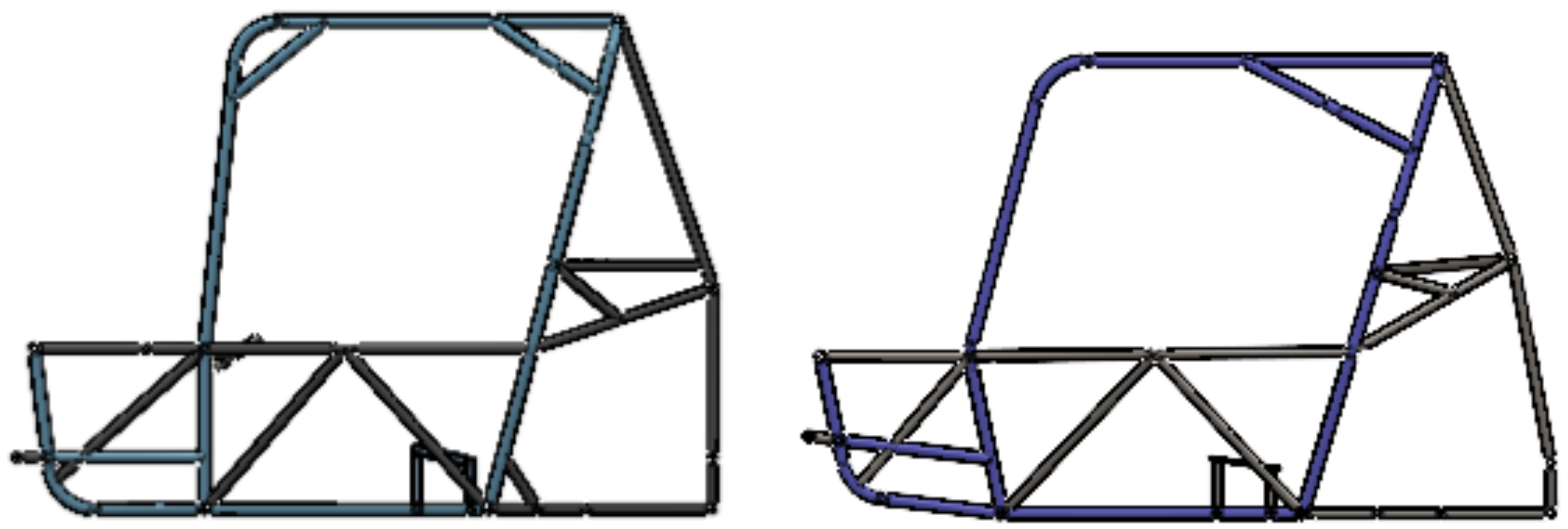


Iso View: Scoundrel & Corsair



Front View: Scoundrel & Corsair

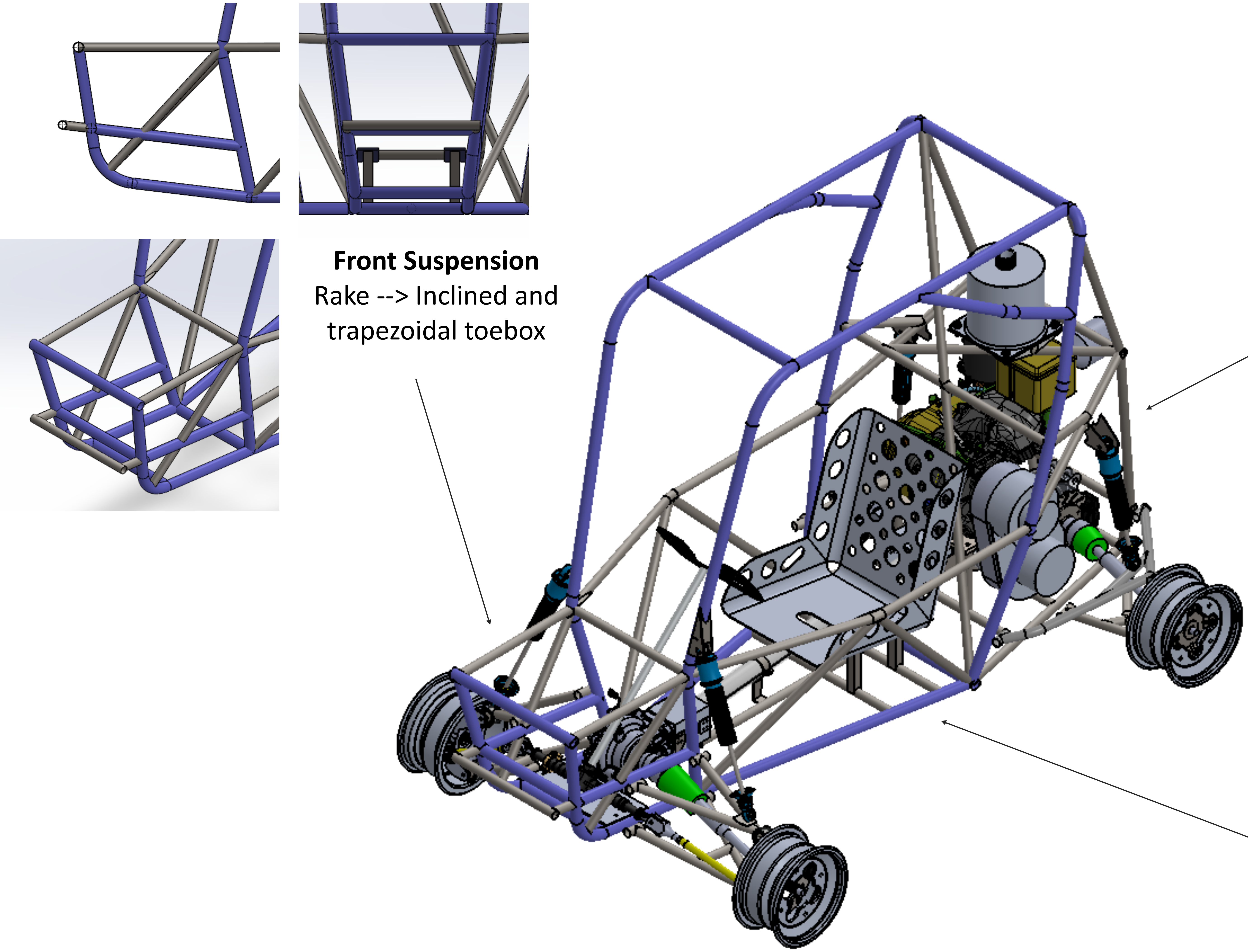
Frame Height: 56.9" --> 50.75"



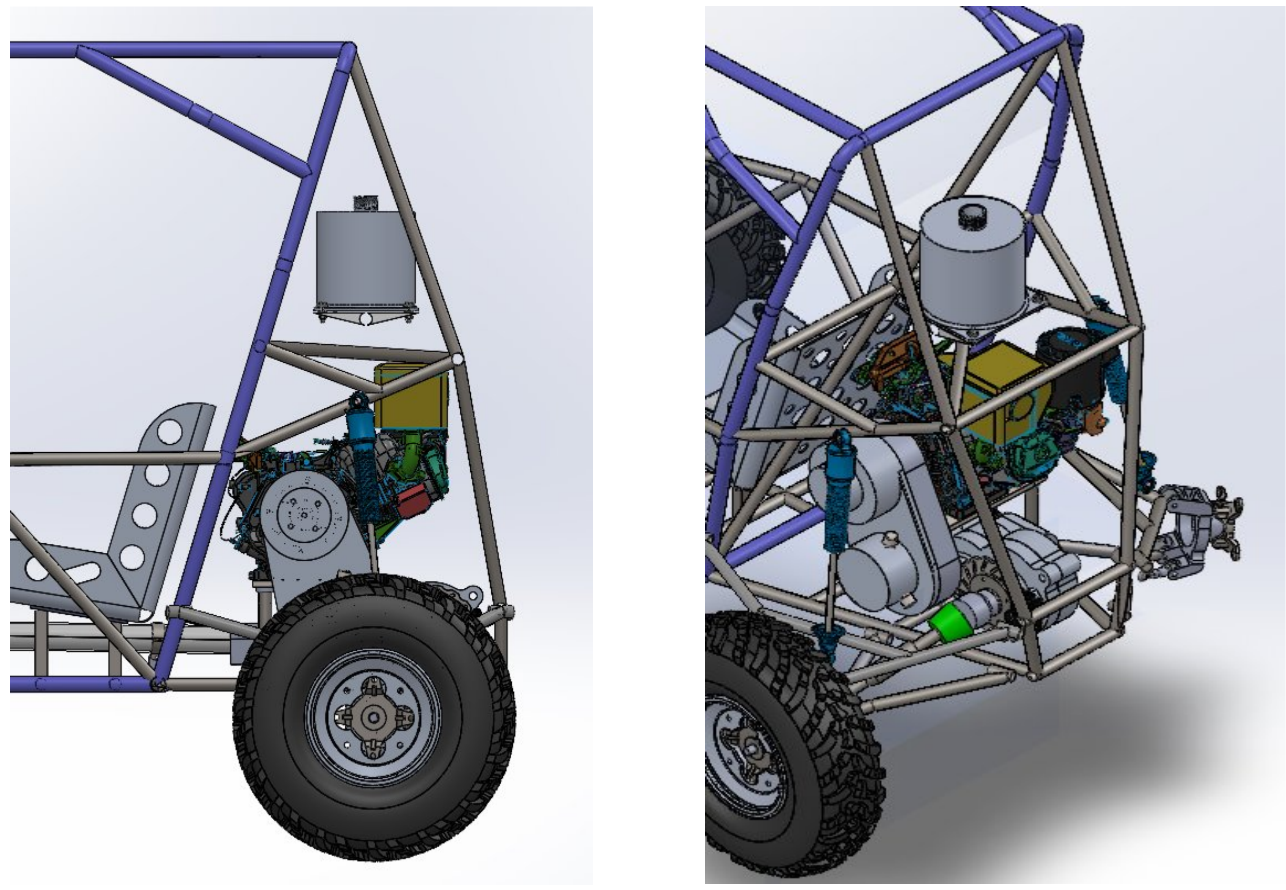
Side View: Scoundrel & Corsair

CHASSIS - Frame

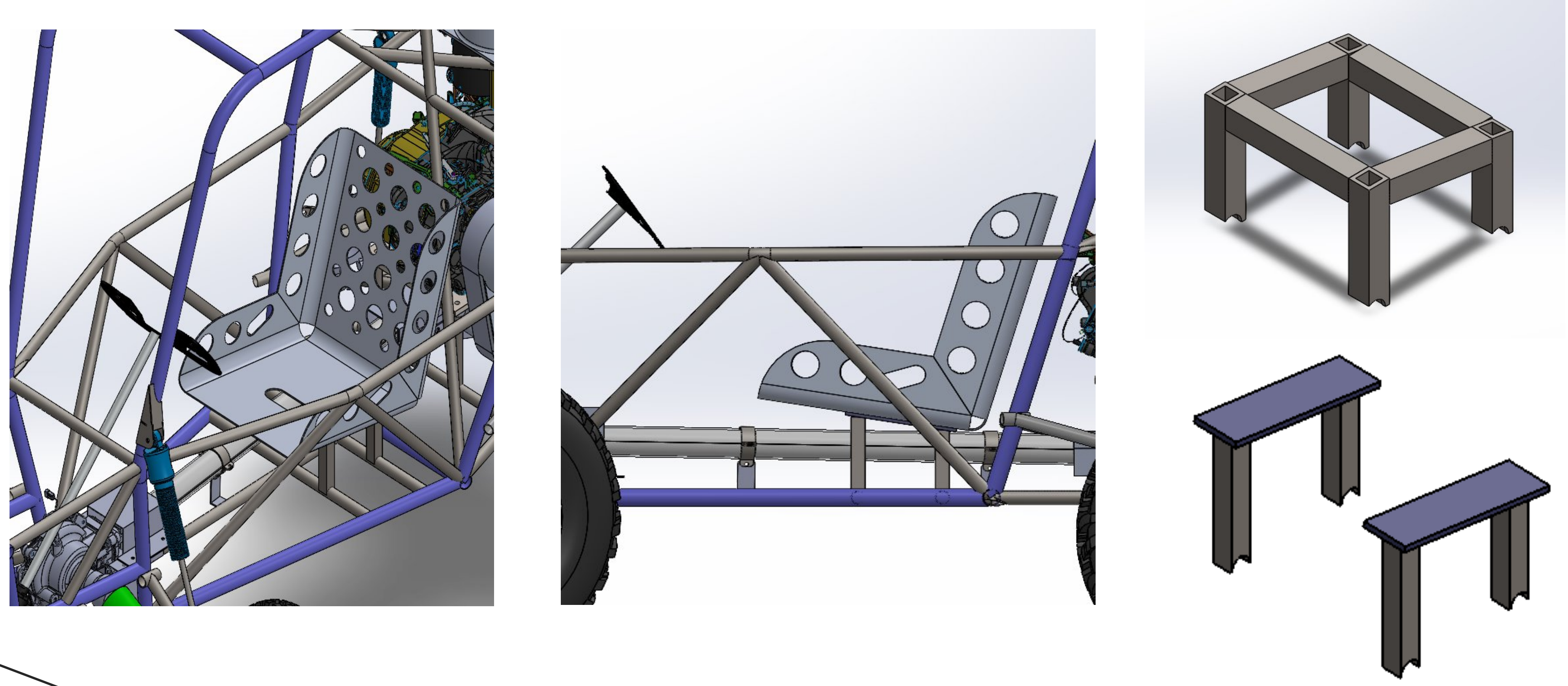
Subsystem Integration



Front Suspension
Rake --> Inclined and
trapezoidal toebox



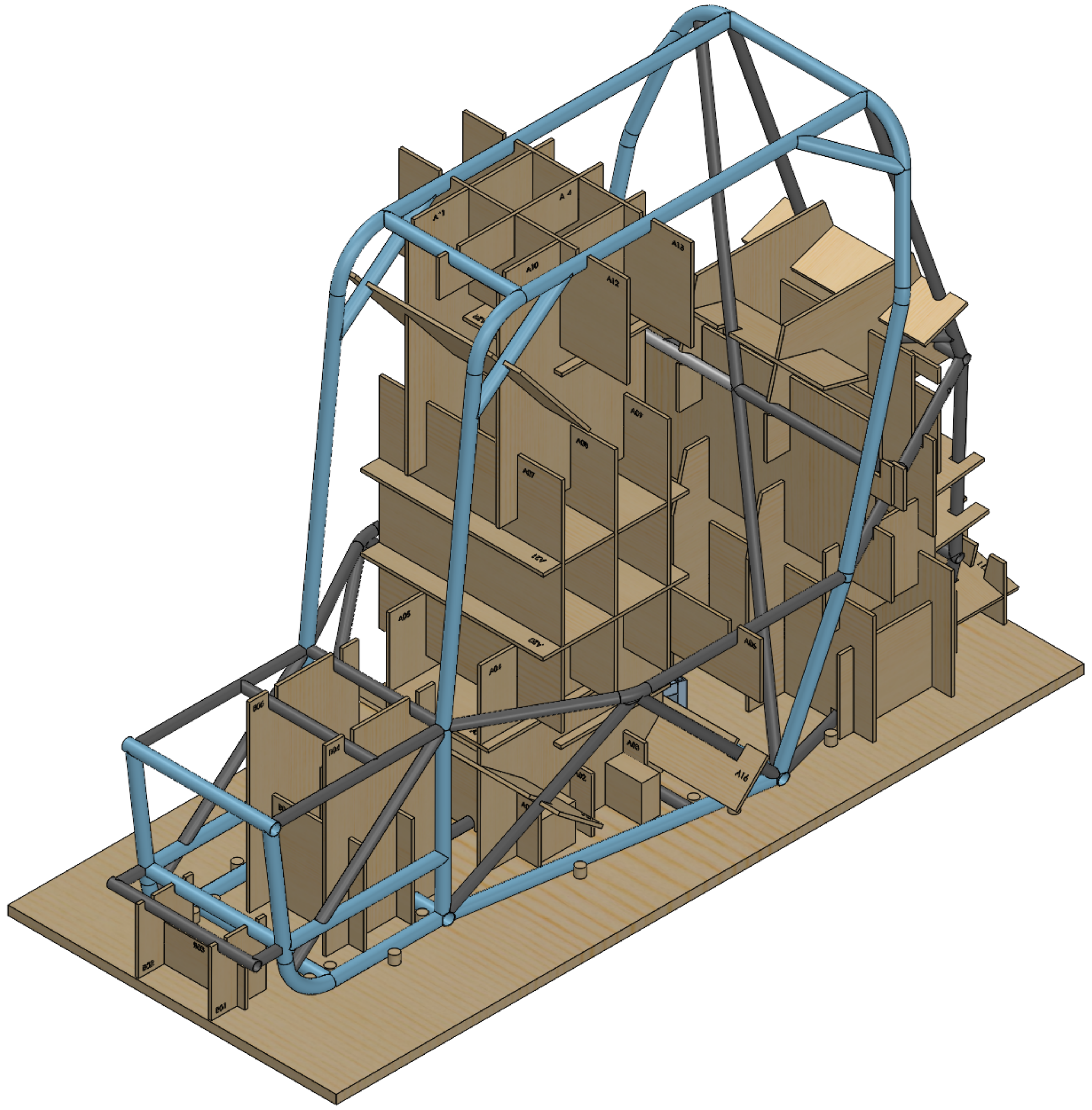
Transmission
Transfer case packaging --> lengthened rear



Driveline / HI
Raised and angled driveshaft --> Modified seat mount

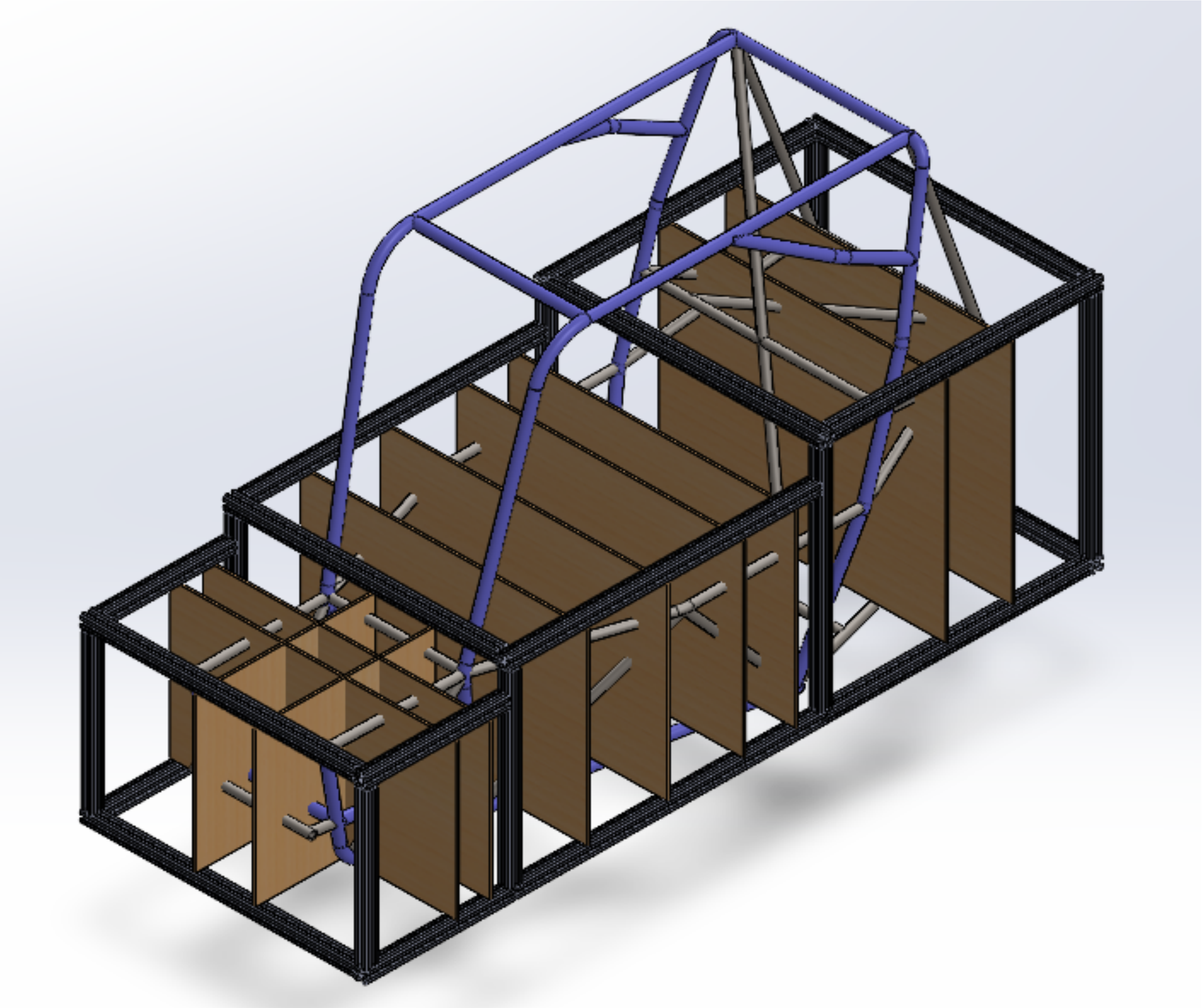
CHASSIS - Frame

Welding Jigs



Scoundrel

Ritsumeikan University FSAE



Corsair Preliminary 3D Jig Idea

CHASSIS - Body

Subsystem Goals

Description	Requirement	Reason
Weight	<11 lbs	- Scoundrel's weight = ~15.5 lbs
Flexural Strength	TBD	- Bending Strength + Stiffness = Impact Strength
Fiber-to-Resin Ratio	60:40 +/- 5%	- Measure of our manufacturing process quality and efficacy
Failure Modes (Sandwich Panels)	Cohesive Failure	- Measure of our manufacturing process quality and efficacy

Fall Deliverables

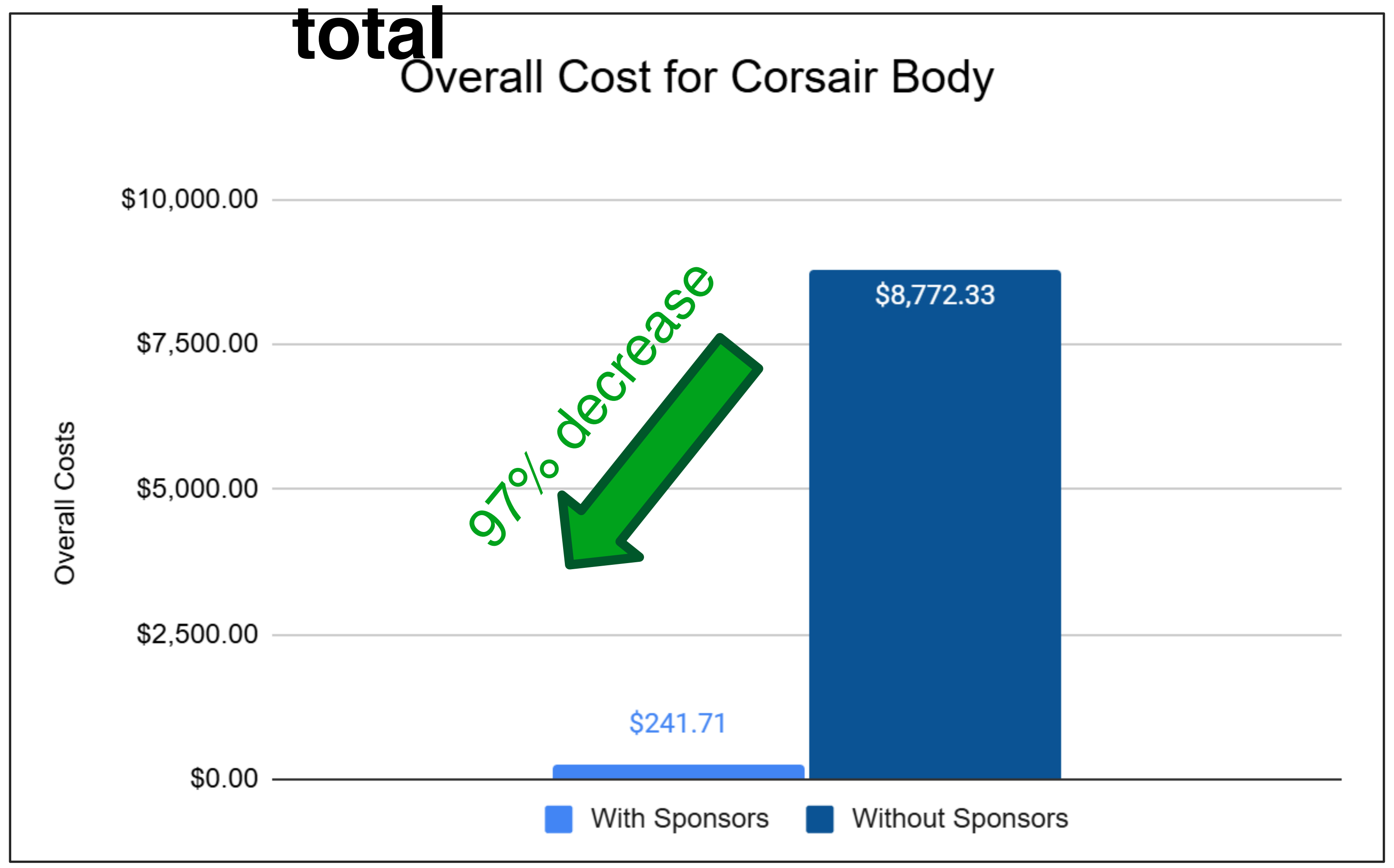
Deliverables	"Definition of Success"	% Completed
Materials Justification	- Completed technical report with all relevant calculations and mech tests.	60%
Tooling Molds	- Fully 3D printed and sanded molds.	20%
Phase 1 Manufacturing	- Fully manufactured and trimmed body panels.	40%
Phase 2 Preparation	- Completed skidplate research/FEA and prototype sandwich panel.	70%
Car Livery Design	- Completed conceptual design for car aesthetic.	
Body CAD Modeled	- Fully 3D modeled racecar body and integrated into master CAD.	30%

CHASSIS - Body

Cost Reduction Strategies

***Manufacturing Costs**	Scoundrel – Total Costs	Corsair – Fixed Costs	Corsair – Variable Costs	Corsair – Total Costs	Overall
Body Panels	$55.50	$141.71	$60	$136.97	+ 247%
Skidplate	$251.02		$40	$104.74	- 58%
Overall	**$306.52**	**-**	**-**	**$241.71**	**- 21%**

1 Sponsorships: 5 total



2 Standard Operating Procedure (SOP)


Resin Infusion Standard Operating Procedure (SOP)
~ UCI Baja Racing

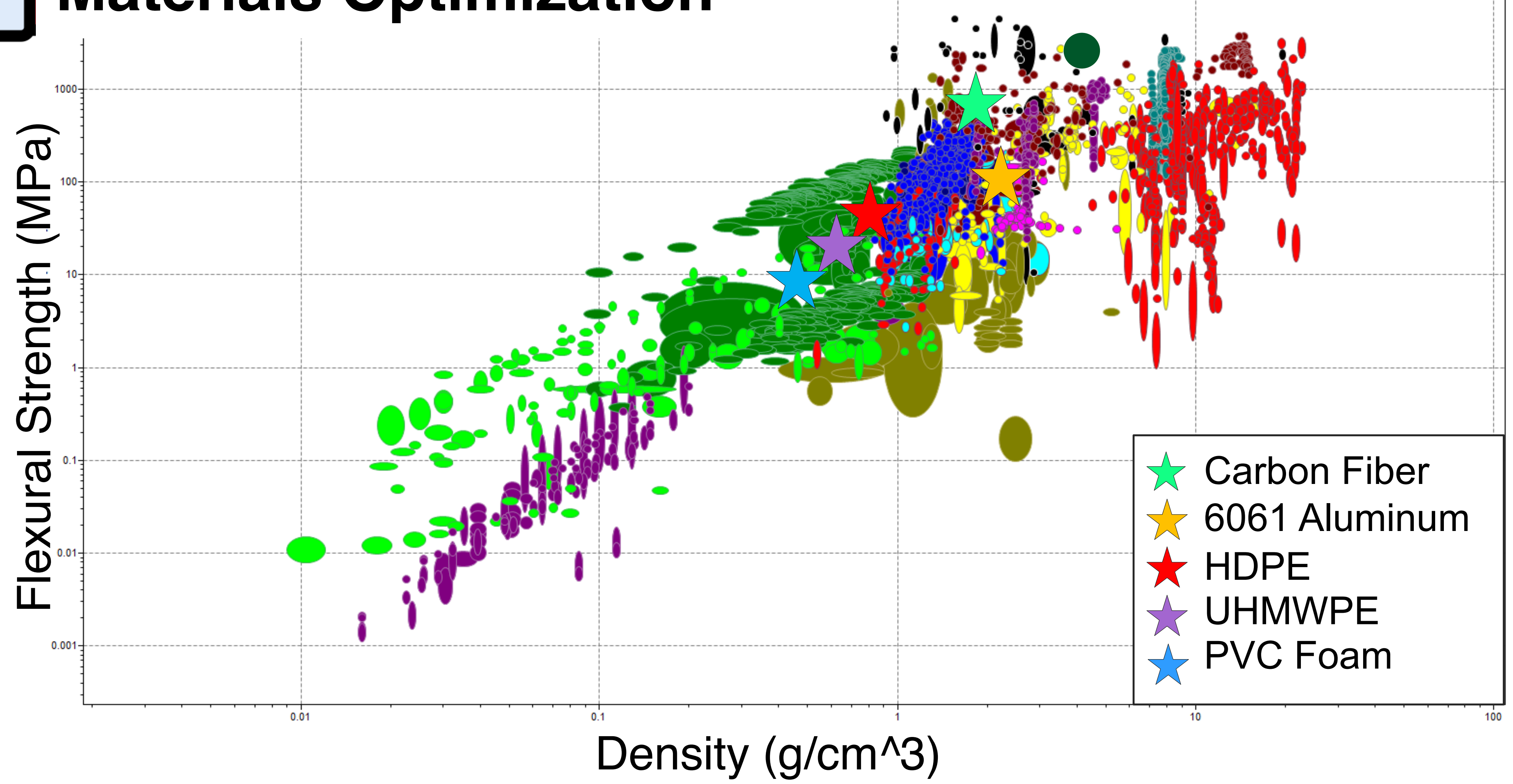
*Nosecone and Number Panels excluded for simplicity

CHASSIS - Body

Weight Reduction Strategies

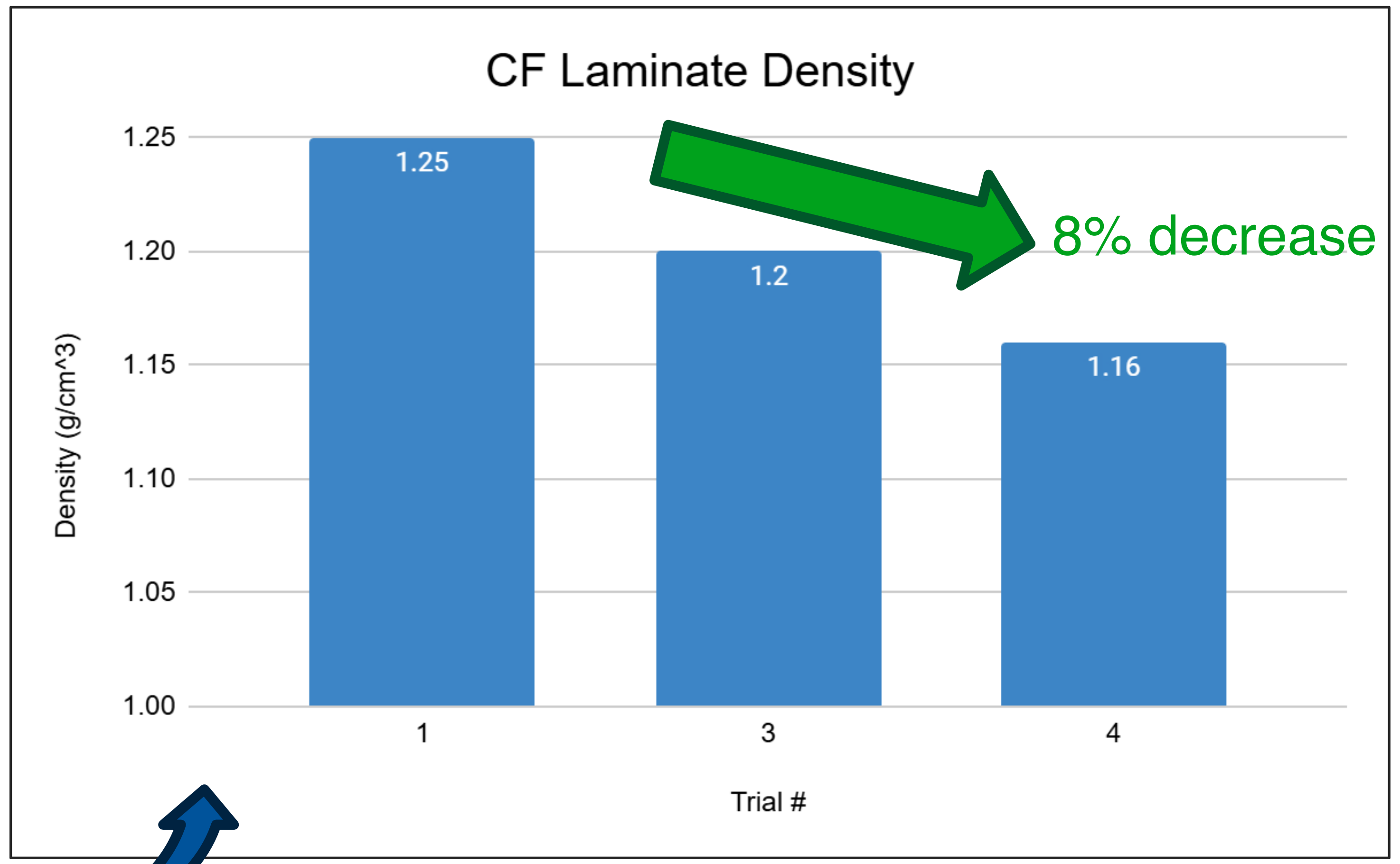
***Weight Reduction**	Scoundrel	Materials	Corsair	Materials	% Change
Body Panels	3.59 lbs	HDPE	3.78 lbs	CF	+ 5%
Skidplate	10.78 lbs	UHMPWE / 6061 Al	6.5 lbs	CF/GF + PVC Foam Core	- 40%
Overall	**14.37 lbs**	**-**	**10.28 lbs**	**-**	**- 28%**

1 Materials Optimization



2 Process Validation

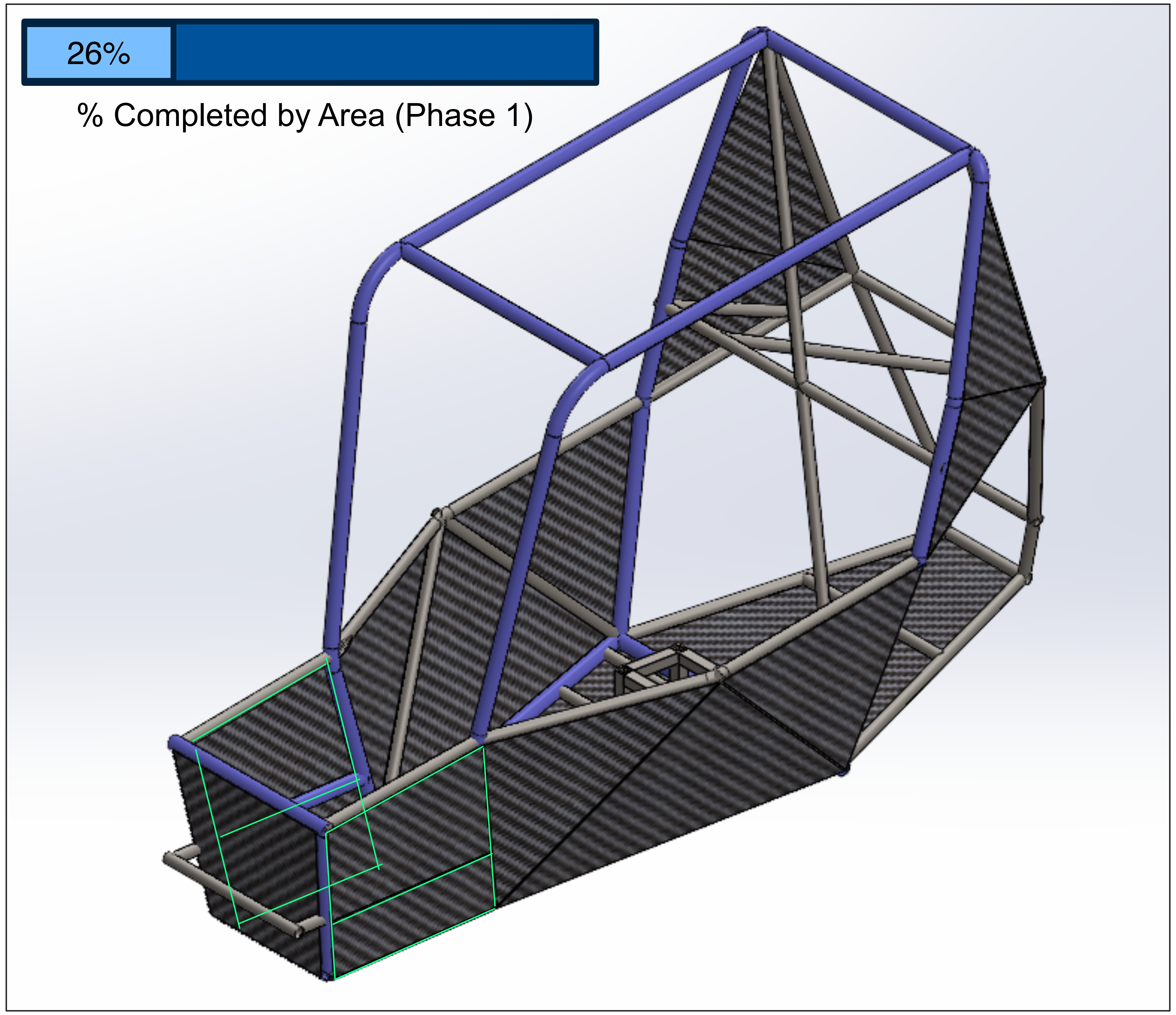
Resin Infusion Test Panel



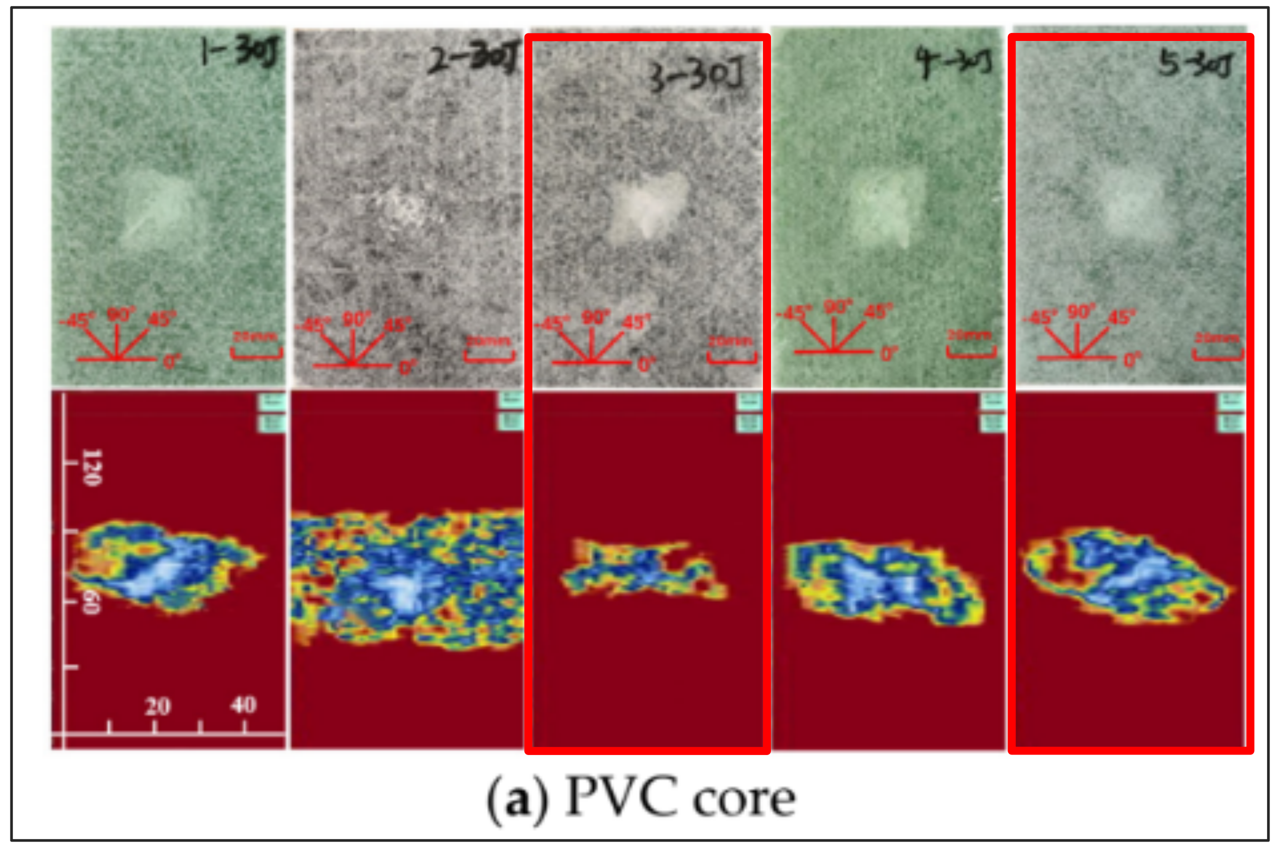
*Nosecone and Number Panels excluded for simplicity

CHASSIS - Body

Manufacturing Progress

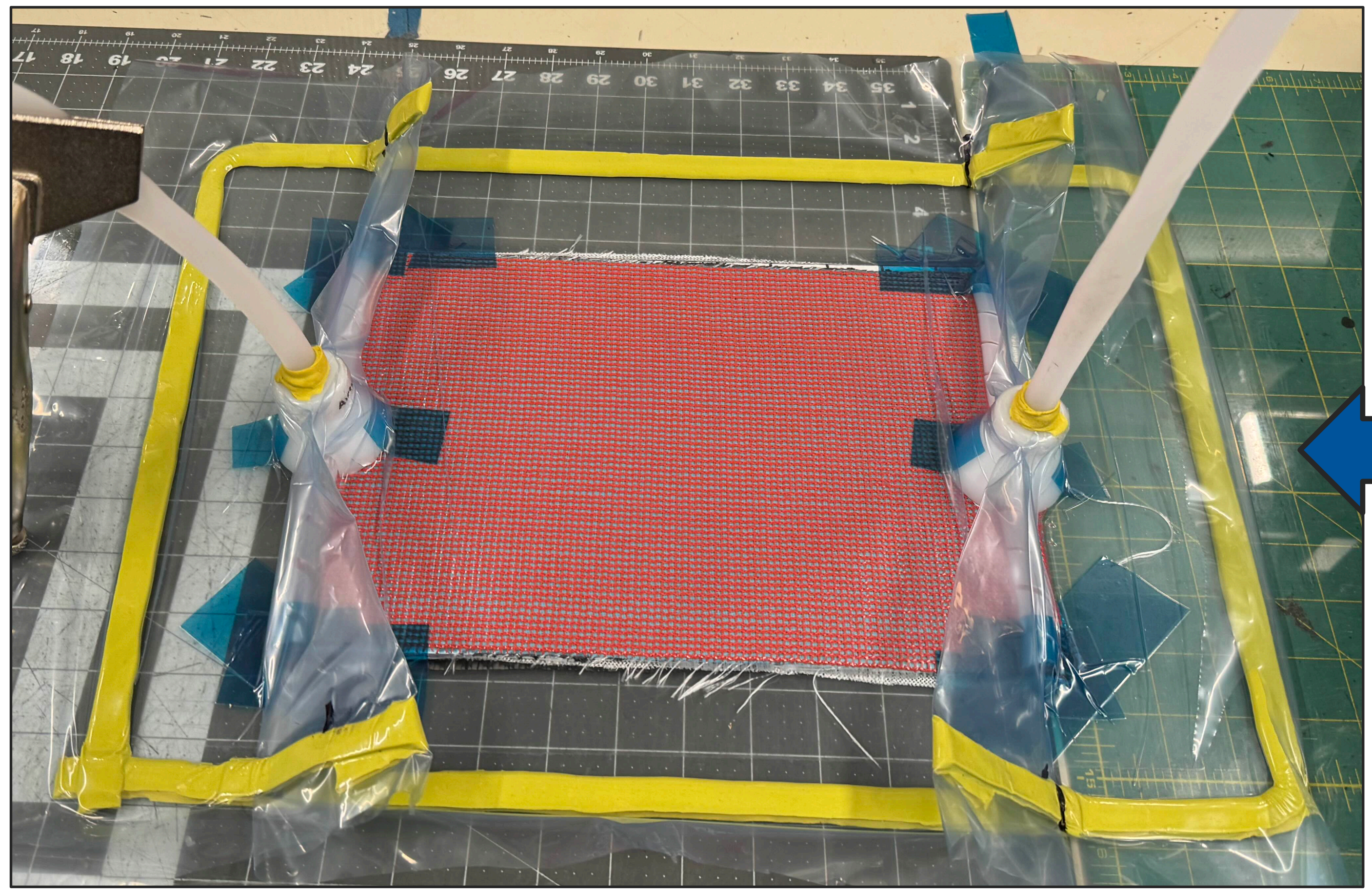


Master Body Assembly
(Finished Parts in Green)

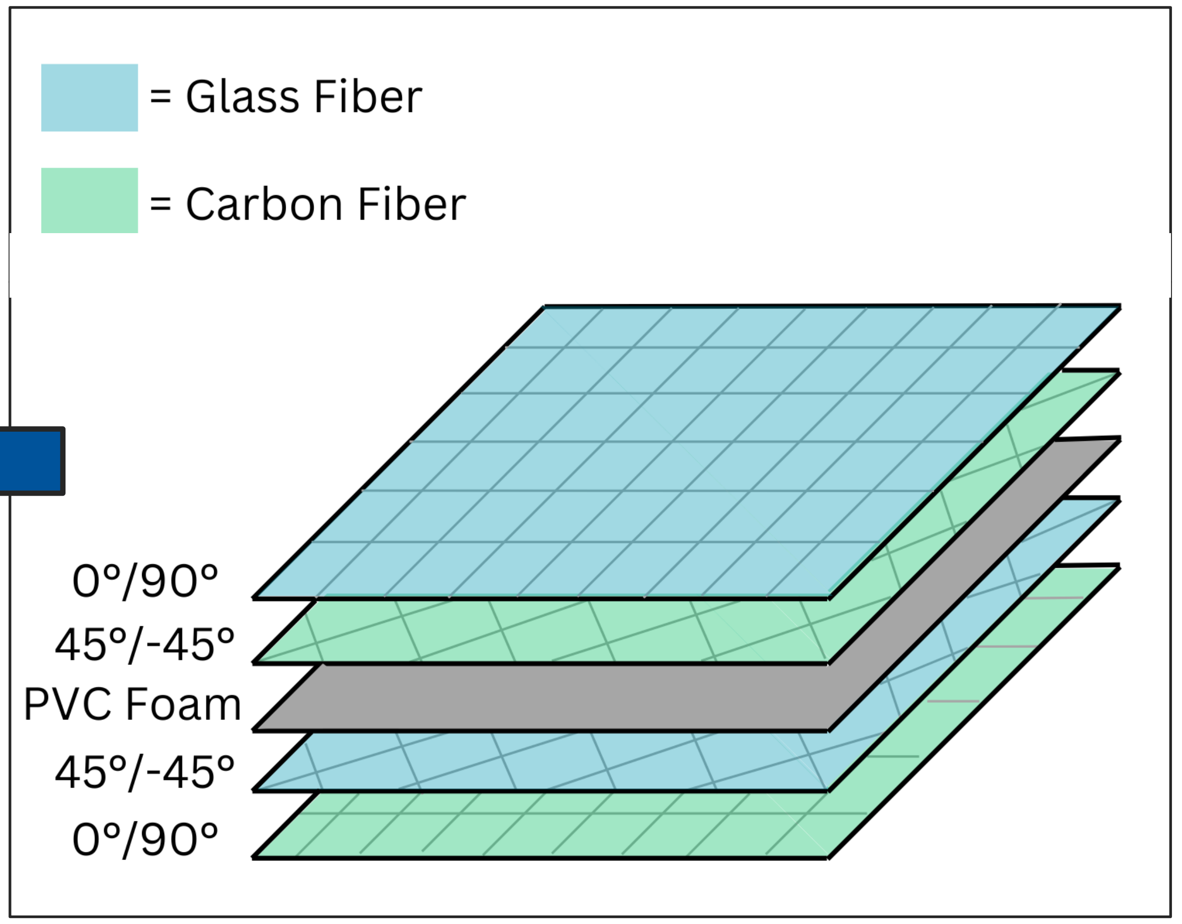


(a) PVC core

Literature: Impact Test Results (30 J)



Resin Infusion of Hybrid Sandwich Panel



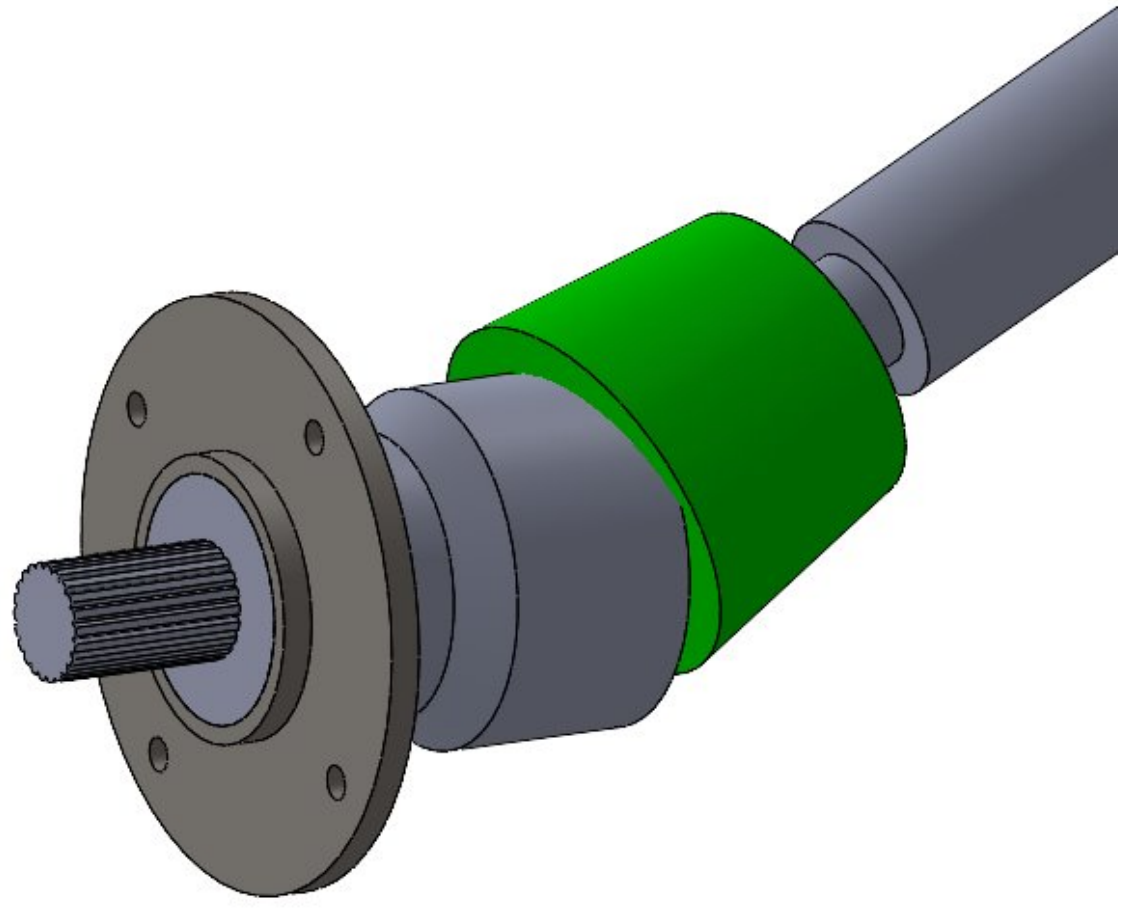
Laminate Stack-up Diagram
Made by UCI Baja Racing

Journal of Dynamic Behavior of Materials (2018) 4:359–372 https://doi.org/10.1007/s40870-018-0163-5
Cai, Y.; Wang, X.; Ouyang, F.; Chen, Q.; Zhu, Z.; Fan, K.; Ding, F. Study on the Mechanical Properties of a Carbon-Fiber/Glass-Fiber Hybrid Foam Sandwich Structure. Materials 2024, 17, 2023. https://doi.org/10.3390/ma17092023

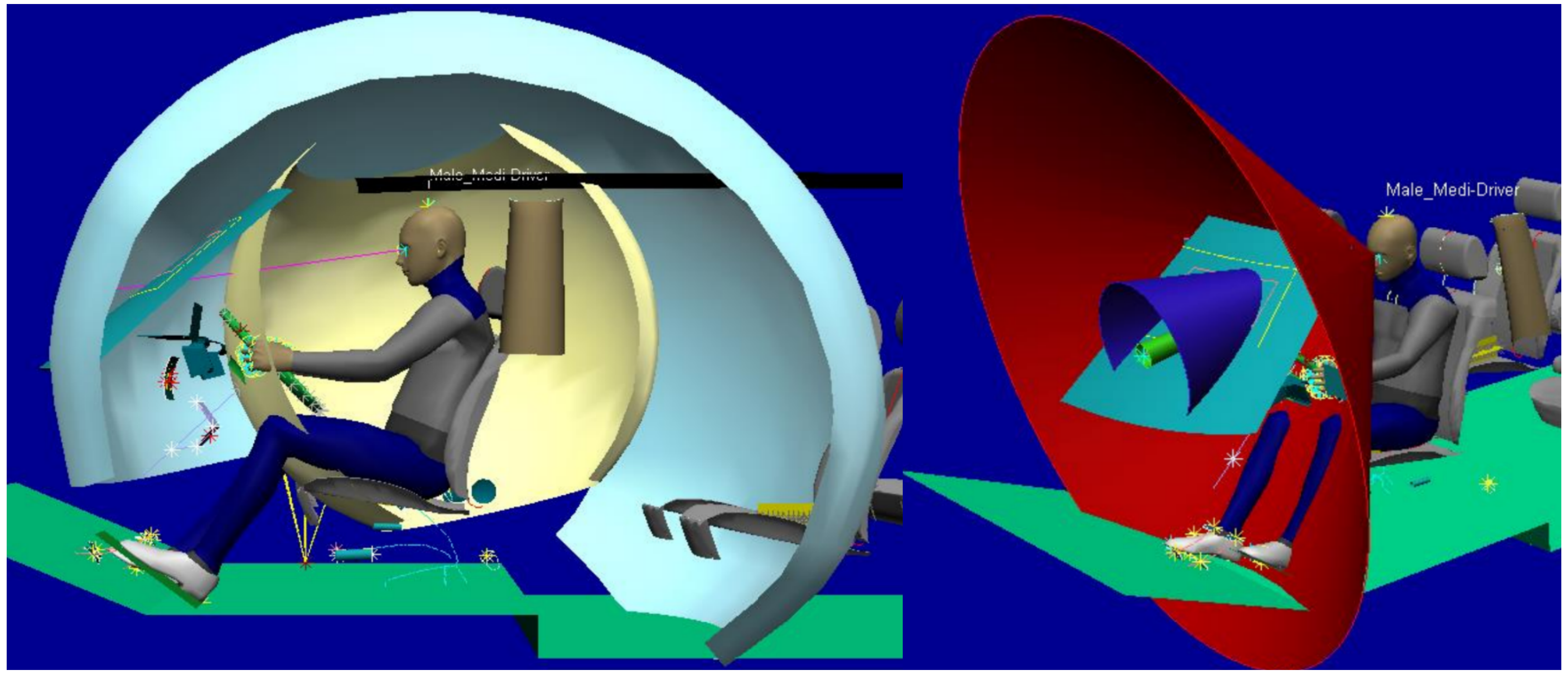
BRAKES AND HUMAN INTERFACE

System Goals

Goal	Reason	Plan
Weight Reduction	• Overall team goal • Competitive teams had lighter cars • Improved handling and acceleration	• Cutting brake removal • Smaller calipers and rotors • Rear inboard brake
Reliability	• Lost a caliper on Rogue • Kill switch failure • Short brake lines on Scoundrel	• Subsystem prototype • • Static and dynamic testing
Driver Comfort	• Driver feedback • • High center of gravity	• Implementation of RAMSIS • Steering wheel display • Adjustable pedals



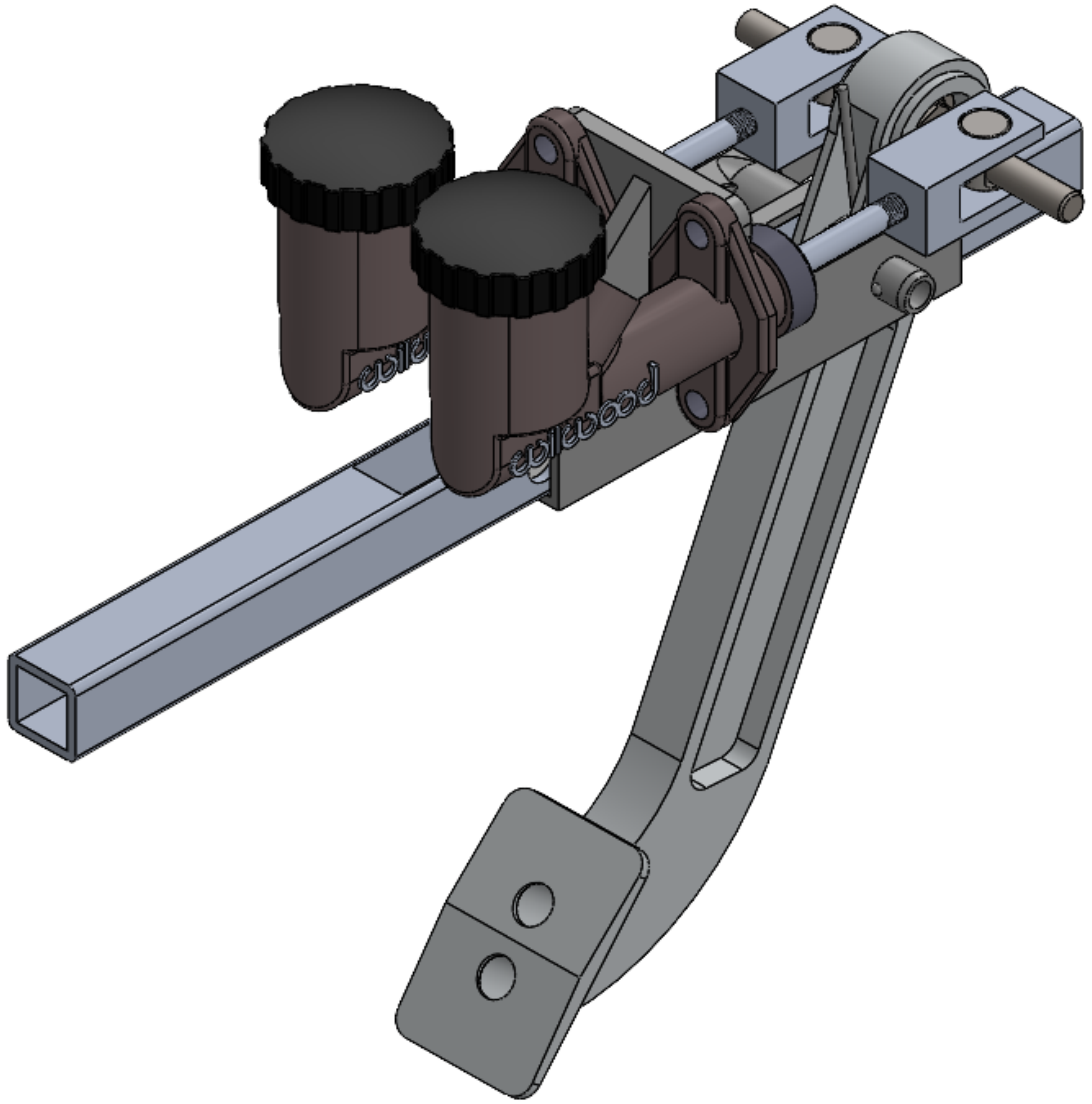
Rotor Mount on CV Axle



RAMSIS

BRAKES AND HUMAN INTERFACE

Brake Pedal Assembly

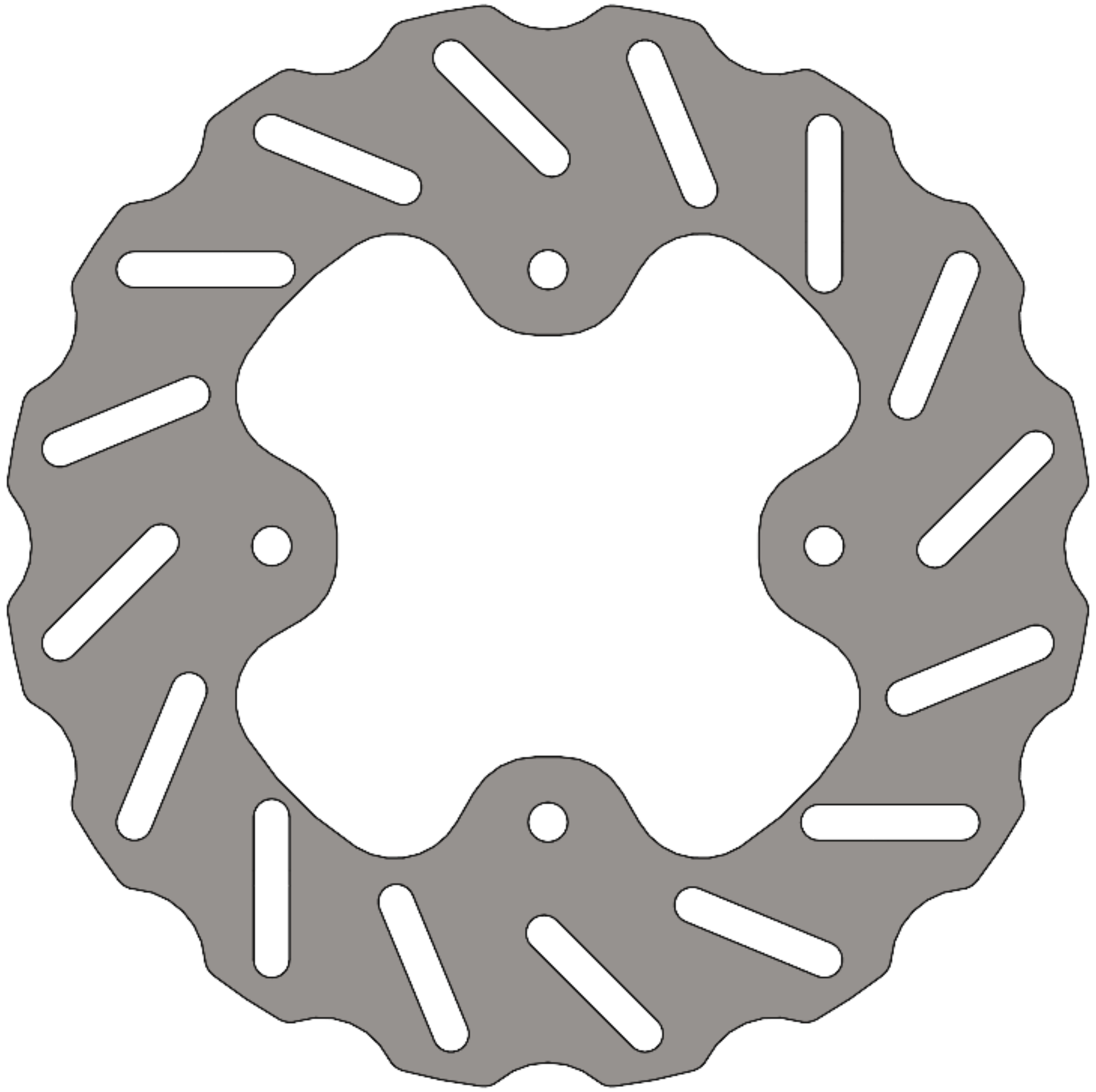


Isometric View

Scoundrel:	Corsair:
• Larger and heavier assembly (12.17 lbs) • Non-adjustable • Difficult to manufacture • Lack of a return spring for the pedal	• Smaller and lighter assembly (4.82 lbs) • ~60% reduction in weight • Two adjustable pedal positions for different drivers • Easy to manufacture using square tubing • Torsion spring used as return spring

BRAKES AND HUMAN INTERFACE

Brake Rotor



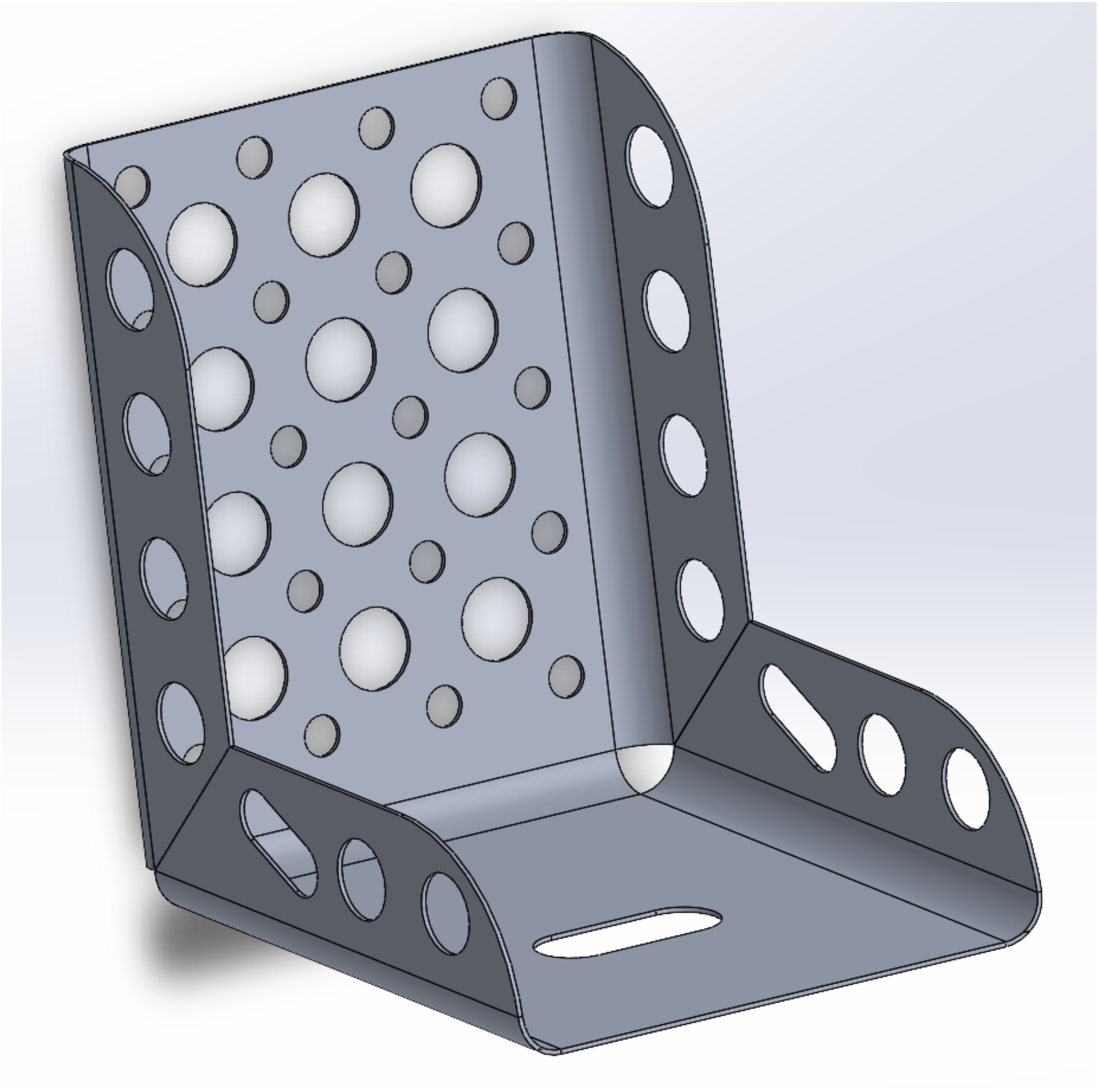
Brake Rotor

Brake Caliper

Scoundrel:	Corsair:
• Larger and heavier calipers and rotors • Total weight: ~22 lbs • Drilled for off-gassing • Treated for corrosion resistance which is unnecessary • Purchased off the shelf	• Smaller and lighter calipers and rotors • Total weight: ~8 lbs • ~64% reduction in weight • Slotted at 45 degrees and scalloped for maximum debris removal • Manufacturing ourselves

BRAKES AND HUMAN INTERFACE

Driver Seat

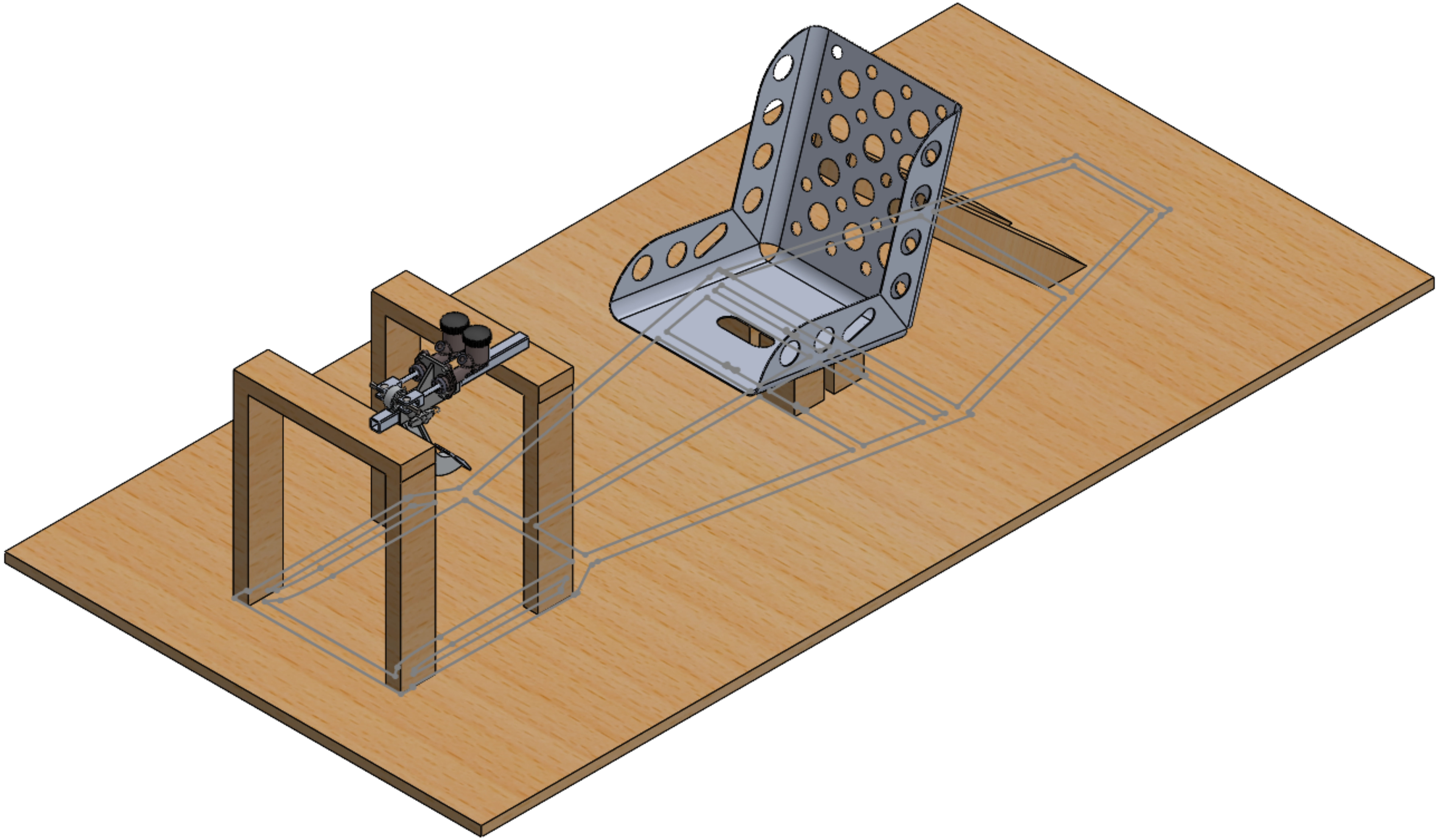


Seat

Scoundrel:	Corsair:
• • Seat back angle of 15 degrees • • Seat bottom angle of 5 degrees • • Total weight: ~7 lbs • • No weight reduction efforts • • Bolsters offered little to no support as they bent	• • Increased seat back angle (17 degrees) • • Increased seat bottom angle (9 degrees) • • Total weight: ~6 lbs • • ~14% reduction in weight • • Flanged holes for weight reduction and rigidity • • Large side and thigh bolsters

BRAKES AND HUMAN INTERFACE

Subsystem Prototype CAD



Brakes Verification:

- Verify brake line manufacturing and bleeding process
- Verify calipers apply sufficient pressure to immobilize the rotor

Human Interface Verification:

- Verify driver comfort and fitment into seat
- Verify comfortable pedal distance for drivers
-
- Verify seat and pedal assembly rigidity

Operations and Outreach Updates

Complete:

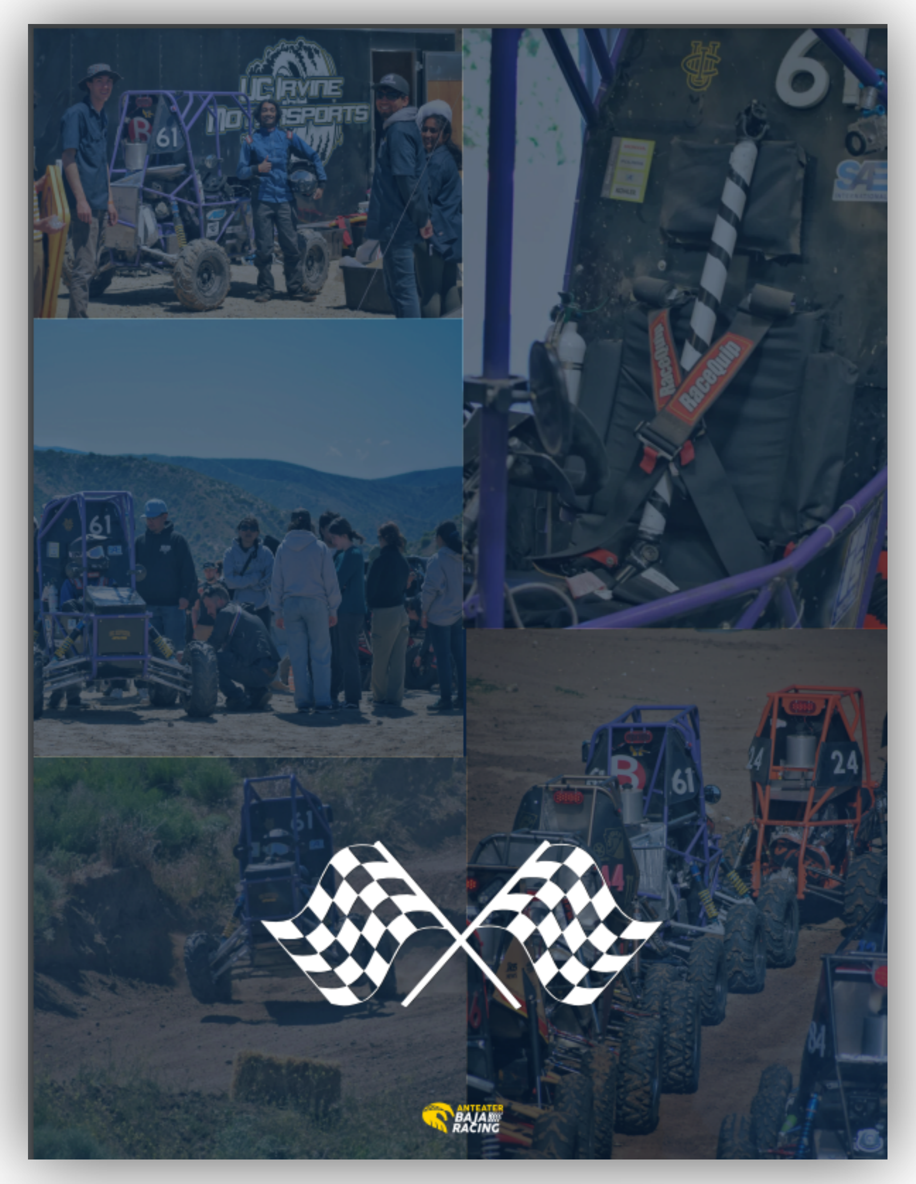
Marketing, Logistics, and Sponsorships:

Category	Details
Sponsorships	- Connected with Sponsors. - Gene Haas Foundation responded. - Secured RedBull Sponsorship. - ZotFunder is live.
UROP proposal	- Completed and submitted Proposal. - Results : Pending
Current Website Updated	- Added full team roster. - Uploaded new images. - Faculty advisor page added. - Home page updated.
Official Purchase Order Doc	- Standard procedure - Updated format - Discord reactions as updates

UNIVERSITY OF CALIFORNIA, IRVINE

ANTEATER BAJA RACING

PRESENTS 2024-2025 SPONSORSHIP DECK



UCI ZotFunder

Anteater Baja Racing 2024-25

Operations and Outreach Updates

Going forward:

Comp, Logistics, and Media:

Process	**Timeline**	**Deliverable/ Milestone**
RFP : Review and Submission – official deadline	Dec 10 - Dec 13	Final RFP reviewed and approved – PMs Submit by 13th
Recruitment: Chassis and Media team	Dec 13 – Dec 15	Flyers and forms, announcements for winter recruitment
Merch: T-shirt & more	Dec 15 – Jan 5	Finalize designs, arrive early winter quarter