

Introduction

Customers

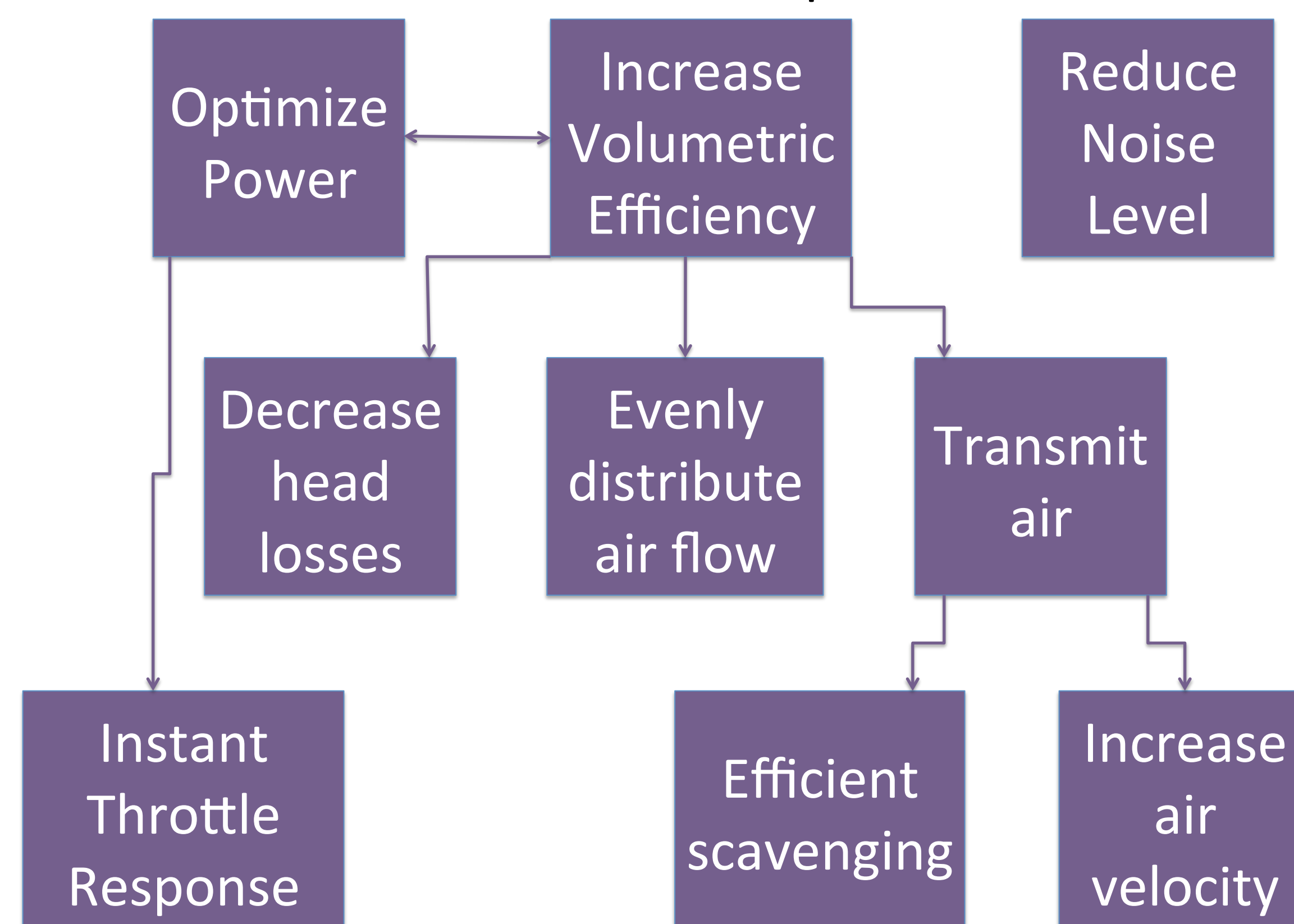
- Primary: TigerRacing, FSAE
- Secondary: Mechanical Engineering Department, other competing teams

Project Objectives

- Select an engine and design an intake and exhaust system to optimize the power output and improve overall volumetric efficiency
- Test and analyze intake and exhaust prototypes
- Comply with FSAE standards
- Stay within budget of \$7500
- Use these designs for 2014 FSAE car

Engineering Specification

Functional Decomposition



Engine Selection

Honda CBR-600RR	
No. of Cylinders	4
Stroke	4
Compression ratio	12.2:1
Engine Displacement	599cc
Peak HP	111.05hp @ 13,500 rpm
Peak Torque	46.48 lbs. - ft. @ 10,750 rpm
Max RPM	15,000
Valve Overlapping Period	26°

Assembly

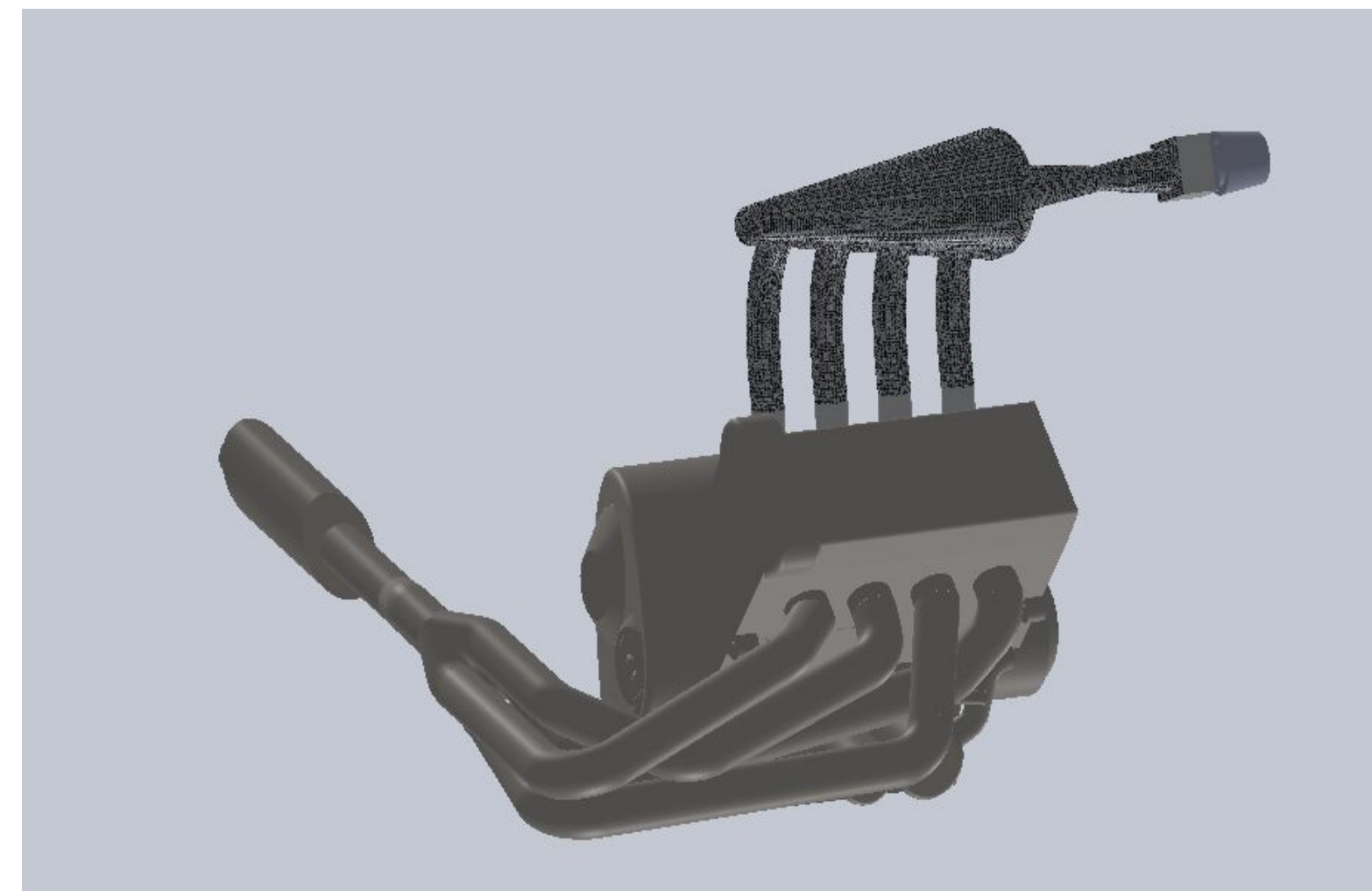


Fig. 1 Power Plant Assembly

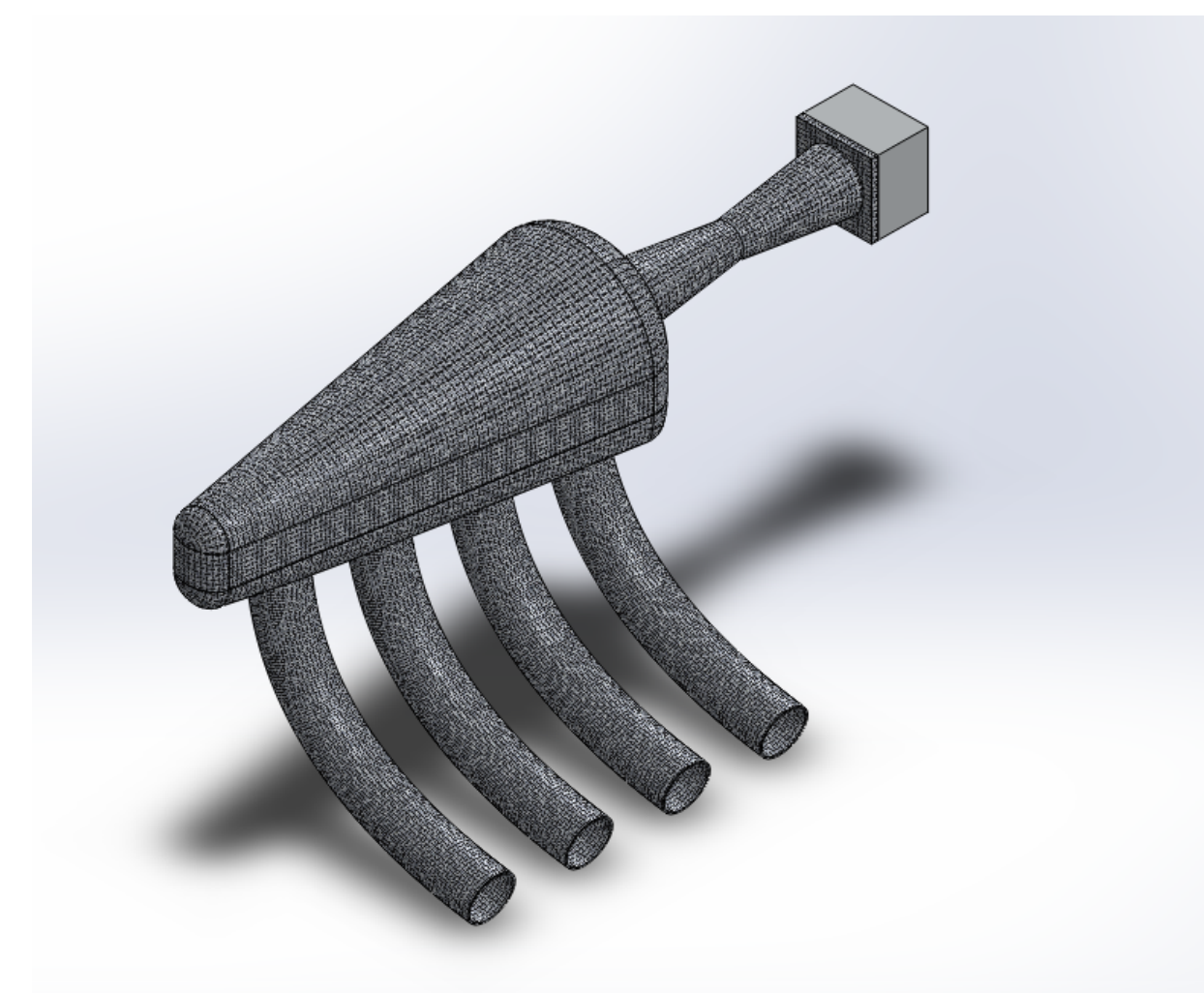


Fig. 2 Intake Assembly

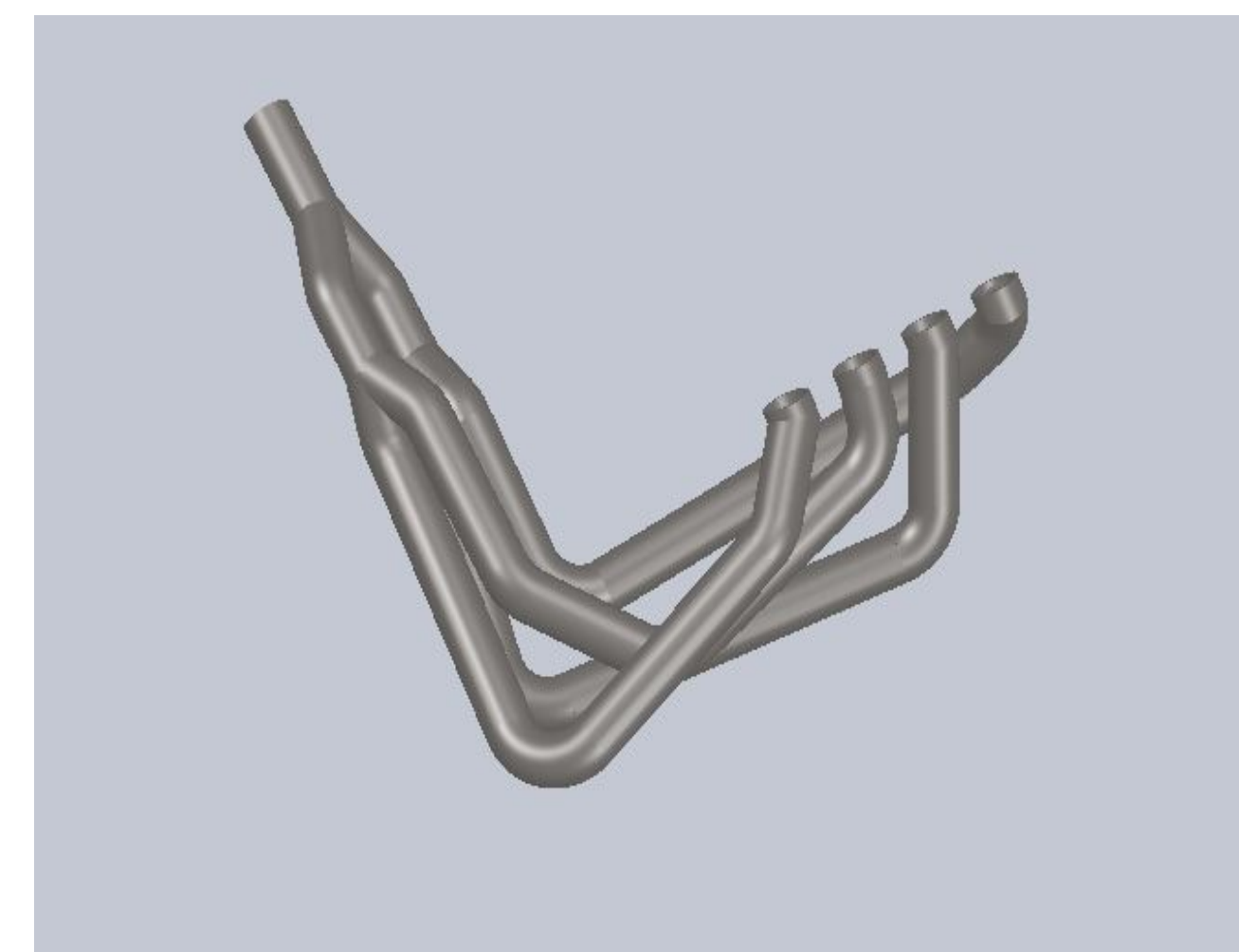


Fig. 3 Exhaust Assembly

Budget Breakdown

2014 Power Plant Budget			
System	Component	Source	Cost
Intake	Air Filter	K&N	\$30.00
	Restrictor	In House	\$50.00
	Plenum/Runners	Realize, Inc	\$700.00
	Injectors	Vendor	\$300.00
	Throttle Body	Vendor	\$150.00
Engine	Honda CBR 600RR	Vendor	\$1,400.00
	PC V	PC	\$370.00
	Ignition Module	PC	\$355.00
	Pressure Sensor	PC	\$220.00
Exhaust	Piping	Vendor	\$600.00
	Muffler	Vendor	\$300.00
	Approximate	Subtotal	\$4,475.00
	20% Contingency		\$895.00
	Approximate	Total	\$5,370.00

Testing Plans

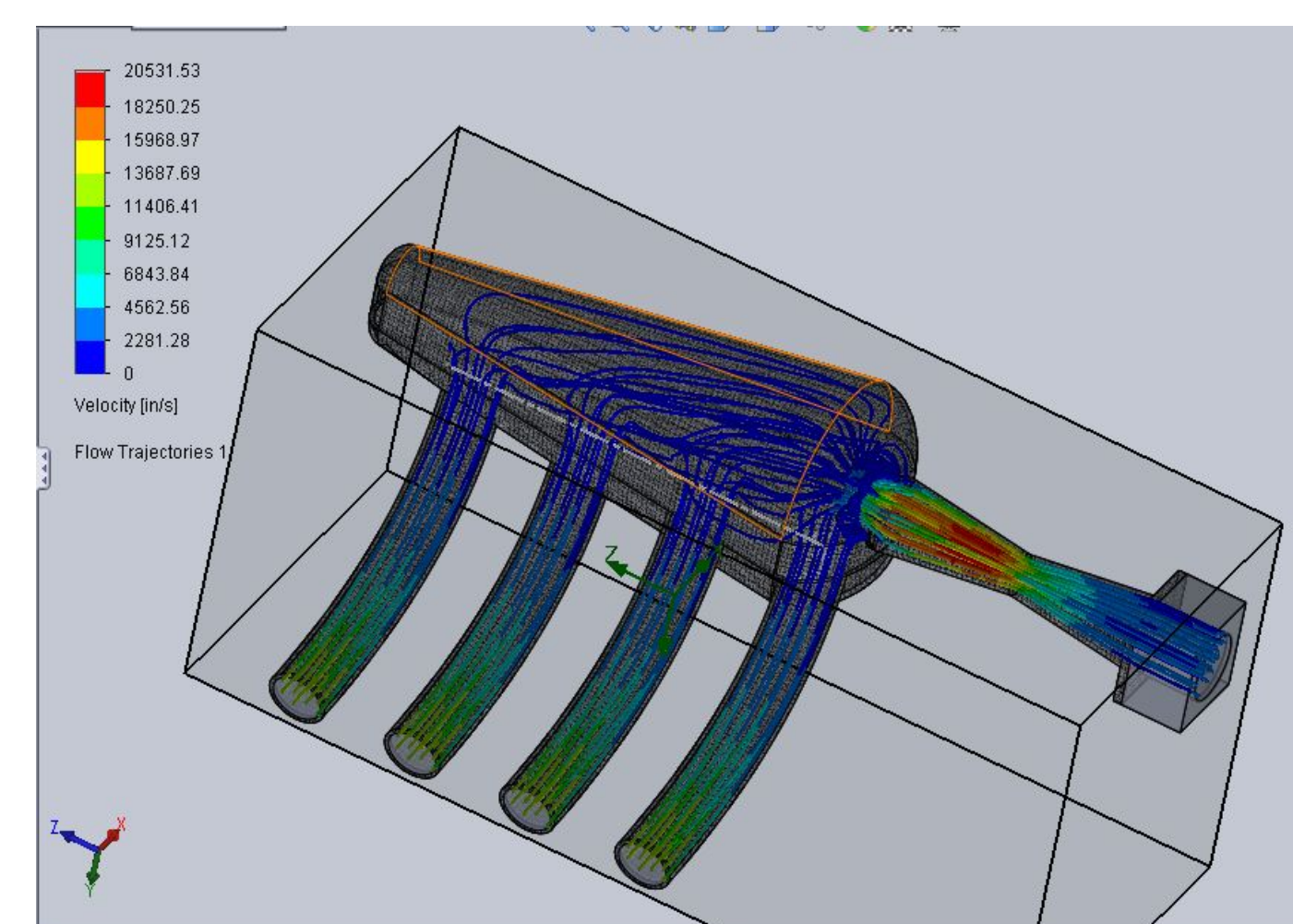


Fig. 4 Intake CFD Simulation

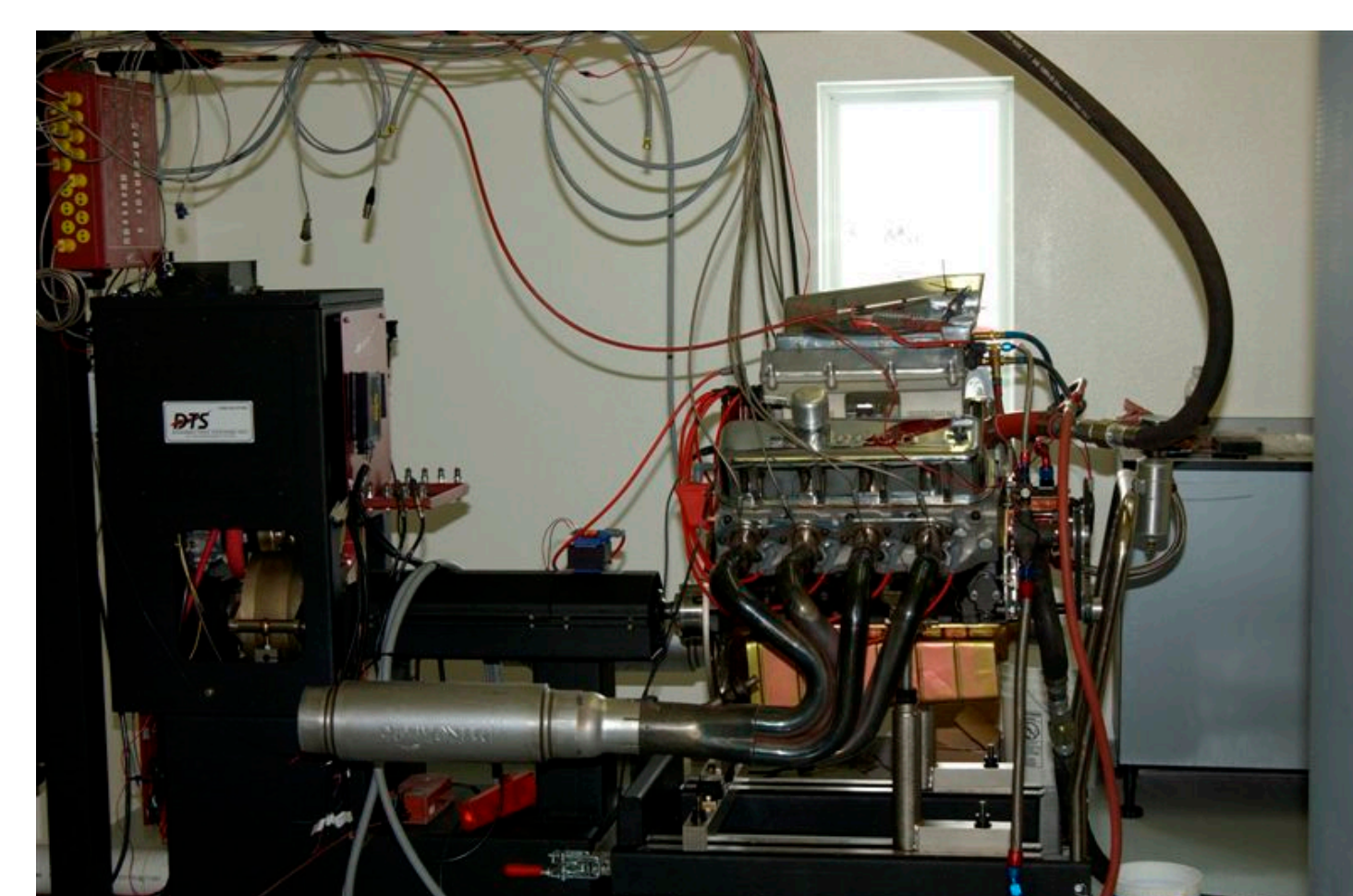


Fig. 5 Engine Dyno Setup¹

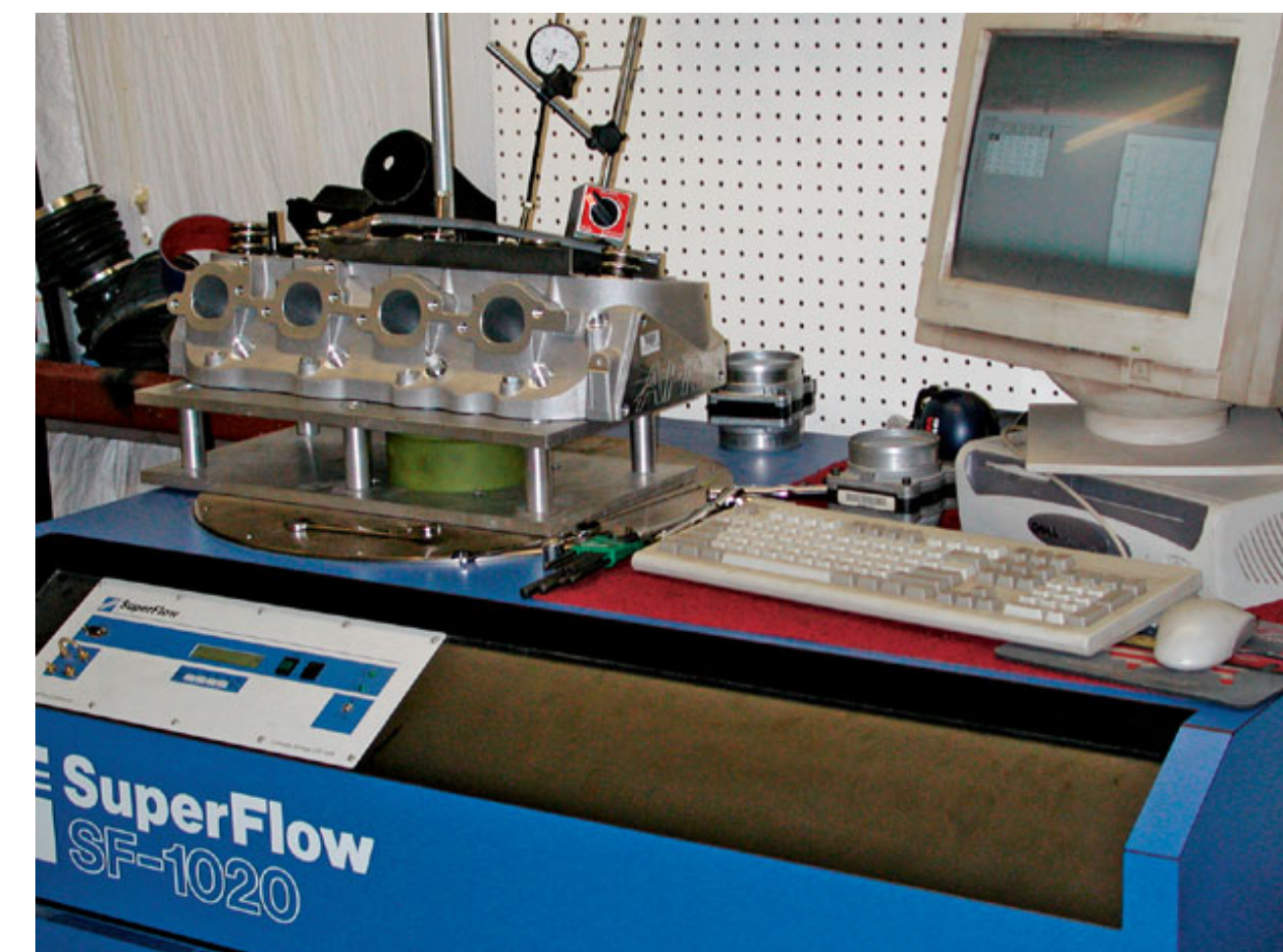


Fig. 6 Flow bench Setup²

Safety Considerations

FSAE Rules

- Entire system must remain within the safety envelope
- Engine
 - Displaced volume < 600cc
 - 4 stroke engine
- 20mm restrictor
- Single throttle body
- Exhaust exit must be pointed away from driver
- Exhaust noise level below 110dB

Factor of Safety for bolts and fasteners on mounts

Milestones

- Finalize designs
- Finish CFD and FEA
- Design and fabricate Jig
- Manufacture intake and exhaust
- Perform flow bench and engine dyno testing
- Present final prototype