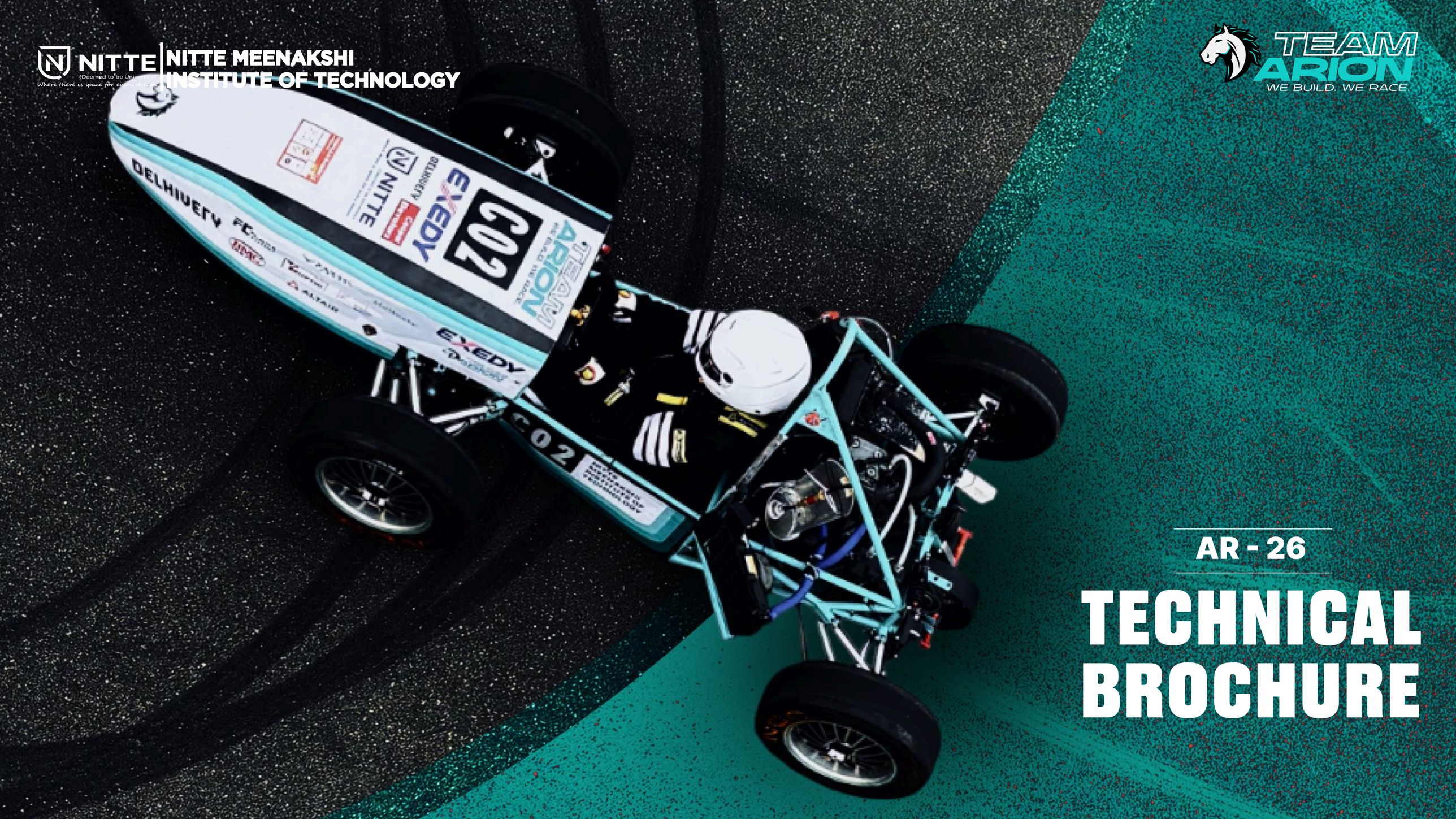
NITTE | NITTE MEENAKSHI INSTITUTE OF TECHNOLOGY

(Deemed to be University)

Where there is space for every dream

TEAM ARION

WE BUILD. WE RACE.



AR - 26

TECHNICAL BROCHURE

SUBSYSTEM 01

Chassis

The AR-26 Chassis Has Been Redesigned With A Strong Focus On Lightweight Engineering, Structural Rigidity, And Improved Strength-To-Weight Ratio.

High Efficiency

Good Performance

Robust And Durable

CHASSIS

FRAME

Structural Architecture:

- The AR-26 chassis has been redesigned with a strong focus on lightweight engineering, structural rigidity, and improved strength-to-weight ratio.

Structural Performance:

- 4130 steel frame construction
- Frame weight reduced by 30%
- Removal of unnecessary structural members
- Improved strength-to-weight ratio
- Optimized structural efficiency

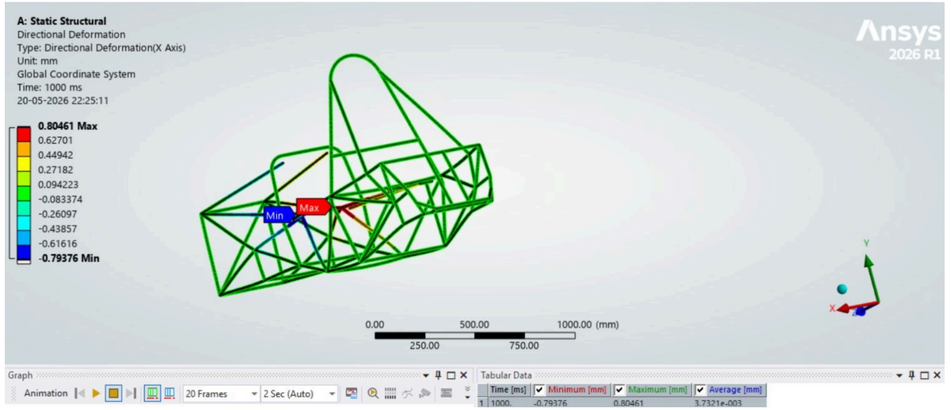


Fig: Frame simulation Image

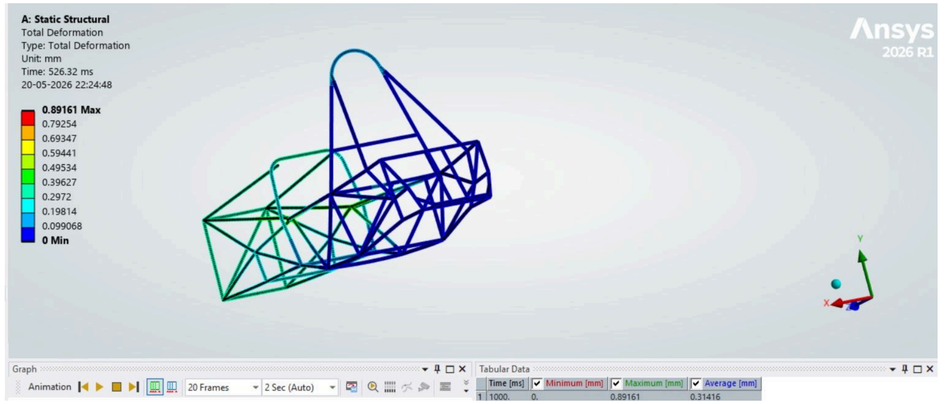


Fig: Frame simulation Image

SUBSYSTEM 02

Powertrain

The AR-26 Powertrain Subsystem Has Been Redesigned With A Focus On Lightweight Engineering, Improved Efficiency, And Optimized Drivetrain Performance.

High Efficiency

Good Performance

Robust And Durable

POWERTRAIN

ENGINE - KTM DUKE 390

Basis of selection:

- Meets displacement limit and has an over-square geometry suitable for restricted intake.
- Provides required torque for short acceleration zones typical in Formula Bharat layouts.
- Compact external dimensions reduce chassis packaging conflicts.

Characteristic	Over-Square	Square	Under-Square
Bore to Stroke Ratio	Bore > Stroke	Bore = Stroke	Bore < Stroke
RPM Capability	High	Moderate	Low
Power Output	High	Balanced	Moderate
Torque Characteristics	Lower Torque	Balanced Torque	High Torque
Thermal Efficiency	Moderate	Moderate	Higher (at low RPM)
Piston Speed	Lower	Moderate	Higher
Typical Application	Sport/Racing Bikes	Commuter Bikes	Cruisers, Utility
Examples	KTM Duke 390	Honda Unicorn	Royal Enfield Classic 350

Table : Comparison of Engine Bore-Stroke Configuration

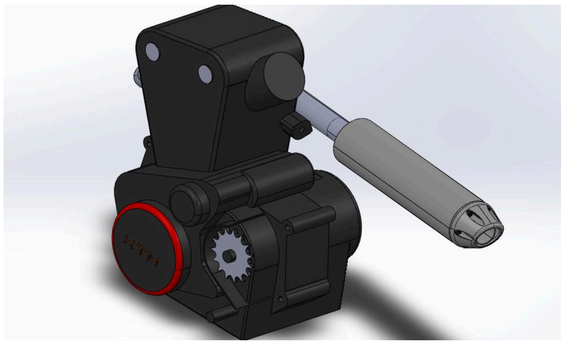


Fig: CAD model of KTM engine

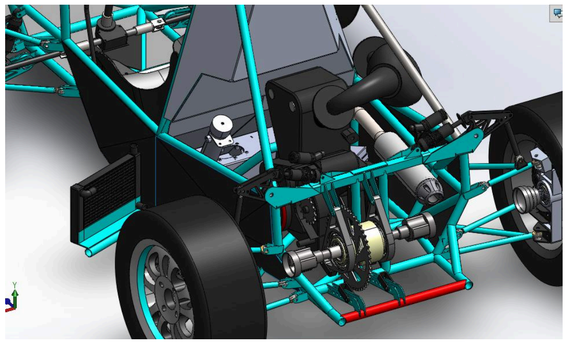


Fig: Packing of engine

Why this Engine?

- Proven performance under a 20 mm restrictor (existing FS/FB data).
- Simplifies tuning and diagnostics due to wide documentation and spares support.
- Lower mass compared to twin-cylinder options → reduced rear-biased weight distribution.

POWERTRAIN

CUSTOM EXHAUST UNIT

Features:

- A newly designed exhaust system replaces the OEM setup to improve packaging and reduce weight.
- Highlights
  - Reduced weight
  - Improved packaging
  - Optimized exhaust flow

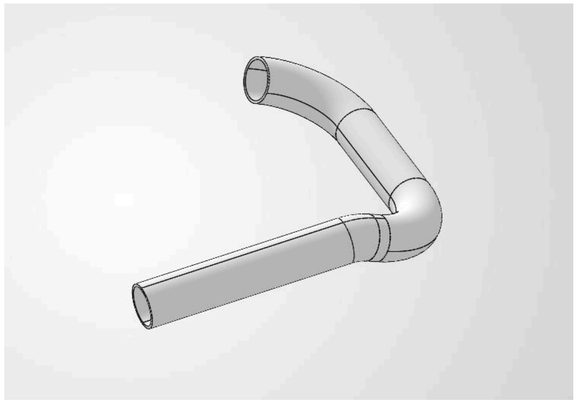


Fig: Custom Bend-pipe

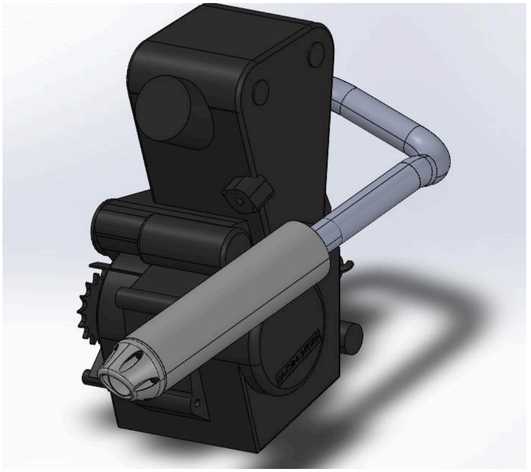


Fig: Mounting of exhaust

CUSTOM SPOOL DIFFERENTIAL

Features:

- A custom spool differential has been implemented to ensure equal torque distribution to both rear wheels.
- Highlights
  - Equal torque delivery
  - Improved drivetrain efficiency
  - Increased reliability

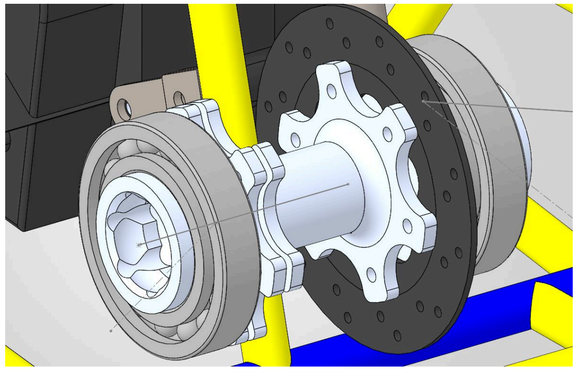


Fig: Custom Spool

POWERTRAIN

IN-HOUSE DESIGNED DRIVESHAFTS

Features :

- The AR-26 utilizes hollow lightweight driveshafts designed for improved strength-to-weight ratio and reduced rotational mass.
- Highlights
  - Hollow shaft construction
  - Lightweight high-strength steel
  - Reduced rotational mass

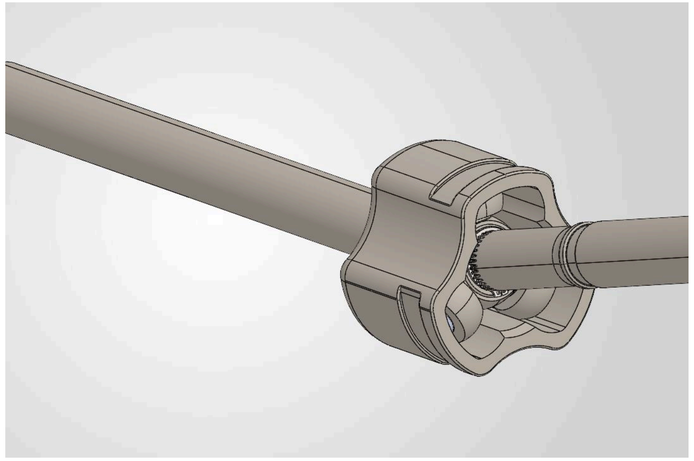


Fig: Driveshafts

CARBON FIBER AIR INTAKE

Features :

- The AR-26 features a top-mounted carbon fiber intake with a smaller throttle body to improve efficiency and reduce pressure loss.
- Highlights
  - Carbon fiber construction
  - Reduced pressure loss
  - Improved airflow efficiency

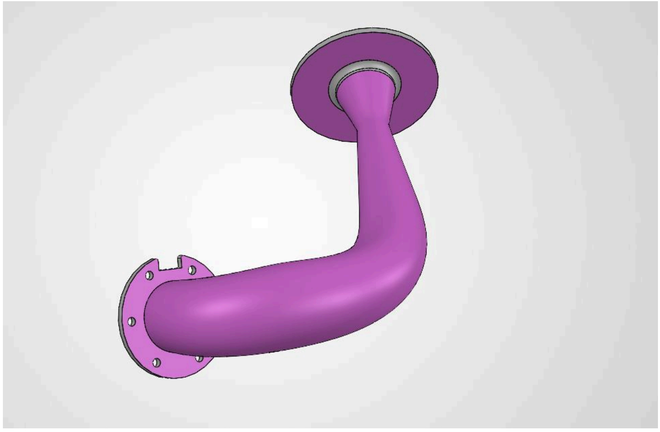


Fig: Airintake

POWERTRAIN

DRIVE SPROCKET OPTIMIZATION

Features :

- The drive sprocket uses a reduced number of teeth to achieve improved drivetrain response and acceleration characteristics.
- Highlights
  - Improved acceleration
  - Optimized power delivery
  - Better drivetrain response

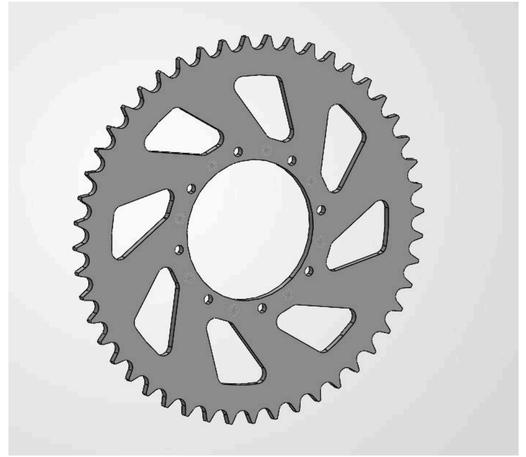


Fig: Custom Sprocket

IN-HOUSE DESIGNED RADIATOR

Features :

- A compact in-house radiator system was developed to improve cooling efficiency while reducing overall dimensions and weight.
- Highlights
  - Improved cooling efficiency
  - Compact packaging
  - Reduced weight

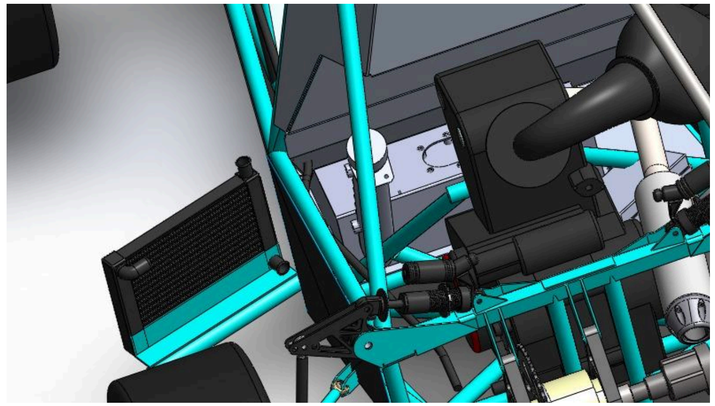


Fig: Cooling System

SUBSYSTEM 03

Vehicle Dynamics

The AR-26 Vehicle Dynamics Package Has Been Developed With A Strong Focus On Lightweight Design, Stability, Suspension Responsiveness, And Improved Handling Characteristics. The Subsystem Has Been Optimized Around The New 10-Inch Vehicle Platform To Improve Agility, Packaging Efficiency, And Overall Vehicle Performance.

High Efficiency

Good Performance

Robust And Durable

VEHICLE DYNAMICS

PUSH ROD SUSPENSION – FRONT & REAR

- The AR-26 features a Push Rod Suspension System at both the front and rear to improve suspension kinematics, reduce unsprung mass, and provide better chassis packaging.
- Key Highlights
  - Improved load transfer characteristics
  - Enhanced suspension responsiveness
  - Better tire contact during cornering
  - Optimized suspension geometry for stability and driver confidence

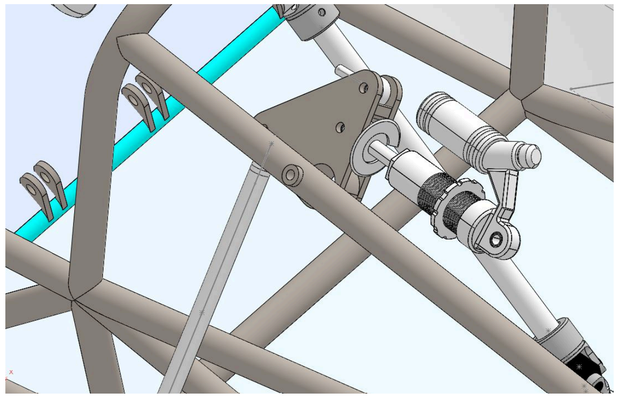


Fig: Push Rod Suspension

ANTI-ROLL BAR SYSTEM

An Anti-Roll Bar system has been implemented to further improve vehicle stability and reduce excessive body roll during cornering.

Advantages

- Improved lateral stability
- Better chassis balance
- Enhanced steering response
- Increased driver confidence during high-speed transitions

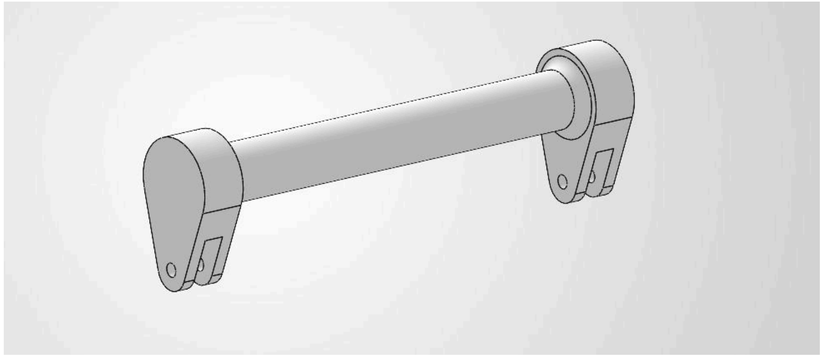


Fig: Anti Roll Bar System

VEHICLE DYNAMICS

CUSTOM COILOVERS

- The AR-26 utilizes custom-tuned coilovers designed specifically for the vehicle's suspension geometry and dynamic requirements.
- Design Focus
  - Suspension responsiveness
  - Mechanical grip
  - Cornering stability
  - Ease of tuning and setup optimization

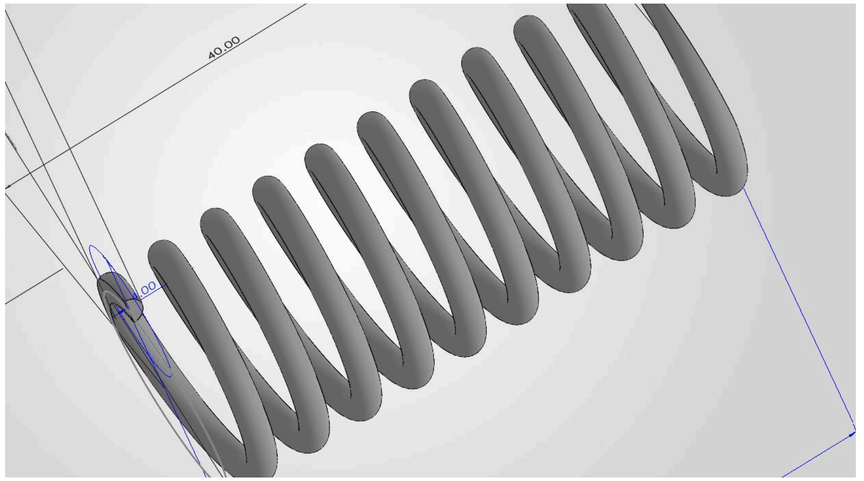


Fig: Custom Spring

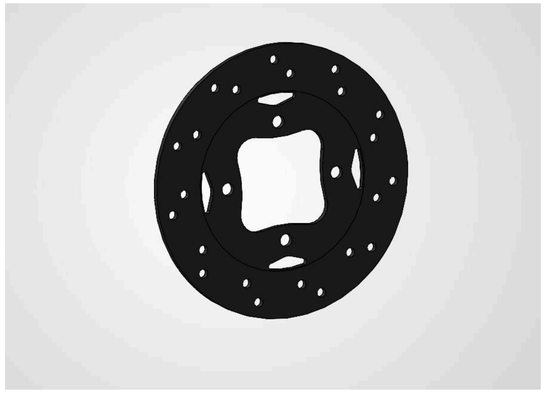


Fig: Front Brake Discs

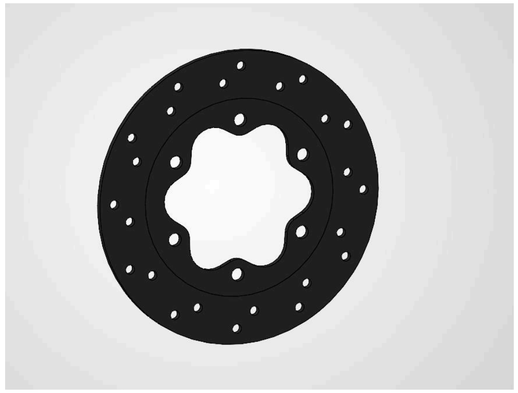


Fig: Rear Brake Discs

CUSTOM BRAKE DISCS

The braking system incorporates custom-designed brake discs optimized for lightweight construction and efficient heat dissipation.

Design Priorities

- Reduced rotational inertia
- Improved thermal management
- Consistent braking performance
- Lower unsprung mass contribution

VEHICLE DYNAMICS

WHEEL HUBS & UPRIGHTS

- The wheel hubs and uprights were redesigned specifically for the new 10-inch platform while prioritizing strength-to-weight optimization.
- Key Features
  - Lightweight optimized design
  - Improved structural rigidity
  - Reduced unsprung mass
  - Compact packaging for enhanced suspension integration

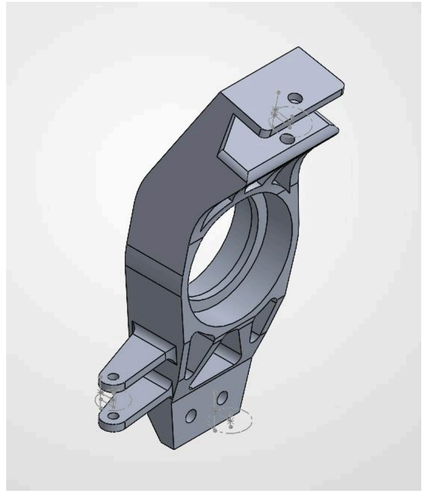


Fig: Front Upright

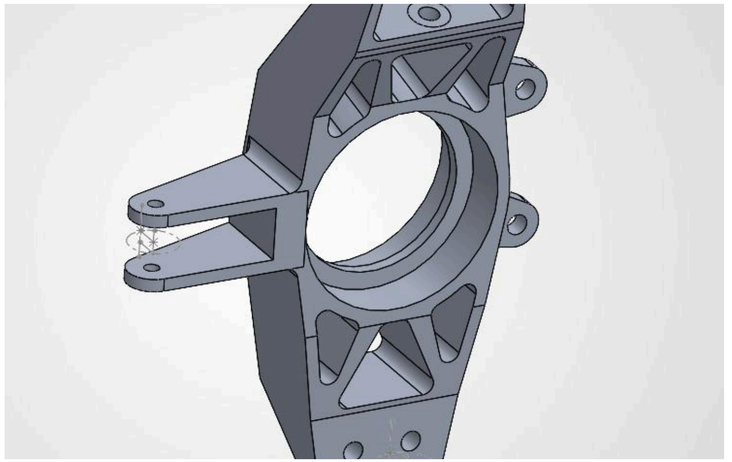


Fig: Rear Upright

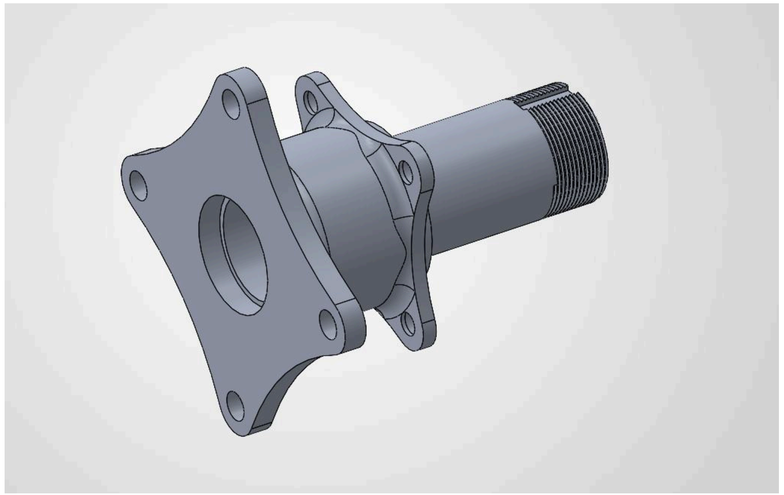


Fig: Wheel Hubs

VEHICLE DYNAMICS

10-INCH VEHICLE PLATFORM

- The complete Vehicle Dynamics subsystem has been optimized around a 10-inch wheel configuration to improve agility, handling response, and overall packaging efficiency.
- Benefits
  - Reduced rotational inertia
  - Improved steering responsiveness
  - Better vehicle agility
  - Enhanced overall dynamic performance

Fig: MRF ZTD1 10 inch wheels

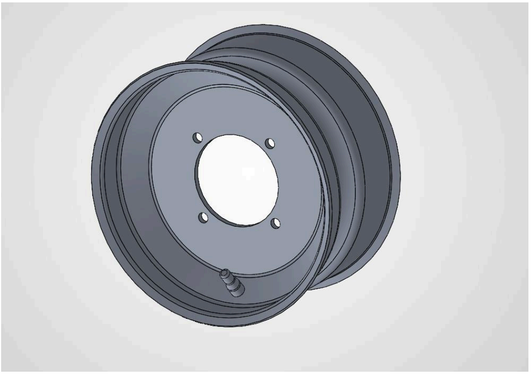


Fig: 10 inch wheel rims

STUDENT – FORMULA CAR

Sl	Brand / Pattern	Tyre Size	Load index	Speed Rating	Equivalent size (For Reference)	Std Rim Width* (inch)	Section Width (mm)	Tread Width (mm)	Overall Diameter (mm)	NSD (mm)	Compound	Application**	ECE (E4) Certified
A	ZTD1	18.0 x 6.0-10	NA	NA	18.0 x 6.0-10	6.5	205	160	460	3.2	M/S	Dry Racing	NA
		18.0 x 7.5-10	NA	NA	190/460-10	8	240	190	470	3.2	M/S	Dry Racing	NA

SUBSYSTEM 04

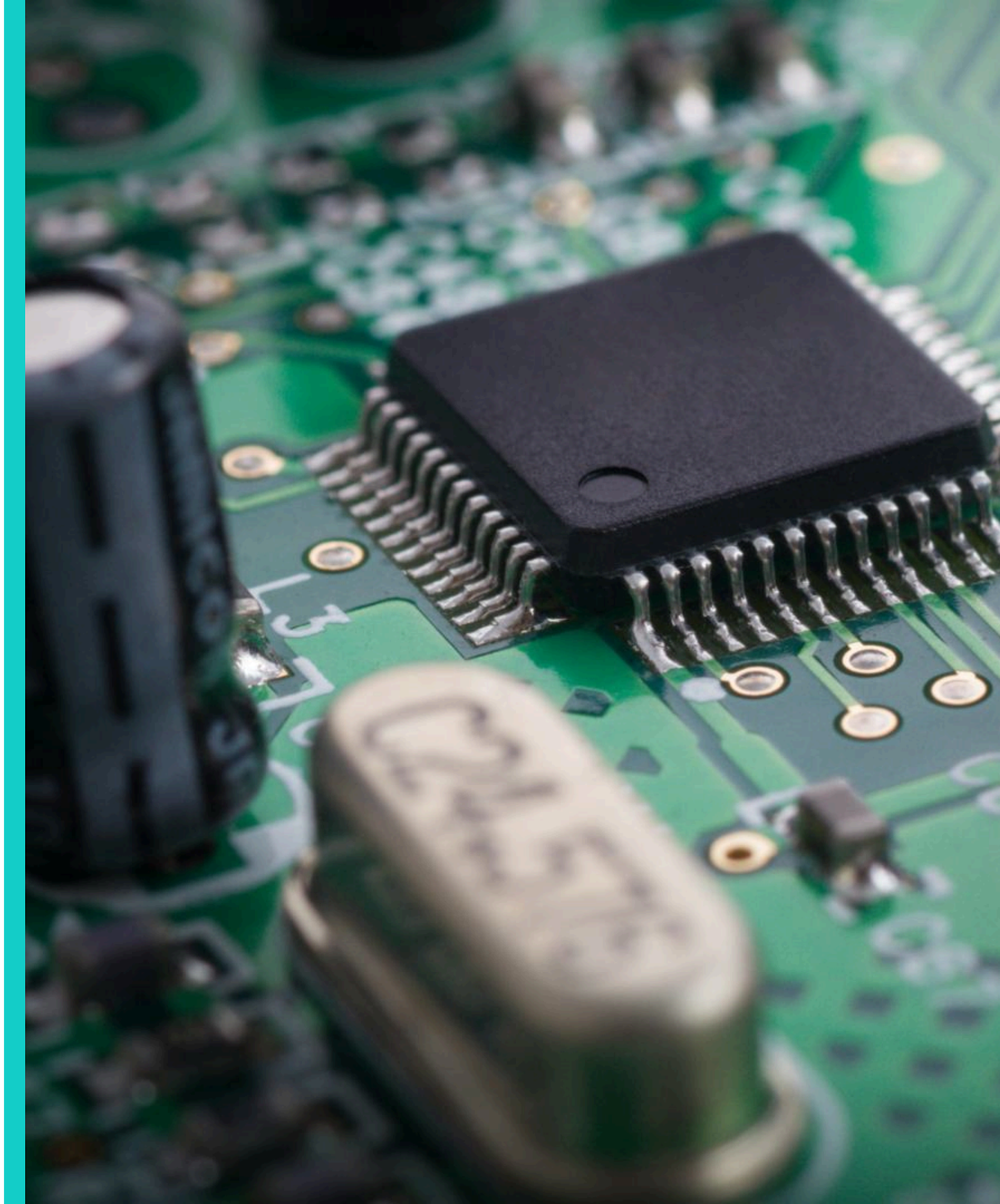
Electricals

The Electronics Subsystem Of The AR-26 Has Been Developed With A Focus On Real-Time Monitoring, Improved Engine Management, Vehicle Safety, And In-House Data Acquisition Capabilities.

High Efficiency

Good Performance

Robust And Durable



ELECTRICALS

SAFETY SYSTEMS

Brake System Plausibility Device

A Brake System Plausibility Device has been implemented to improve vehicle safety and ensure reliable brake system validation during operation.

Key Highlights

- Monitors brake pressure + throttle position.
- Triggers shutdown when brake > threshold AND throttle > 25%.
- Output goes directly to the main shutdown relay.
- Enhanced system safety
- Reliable brake signal validation
- Improved operational monitoring

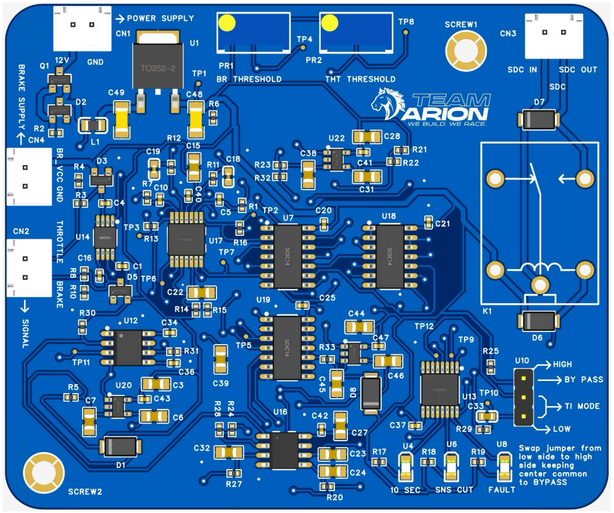


Fig: BSPD PCB

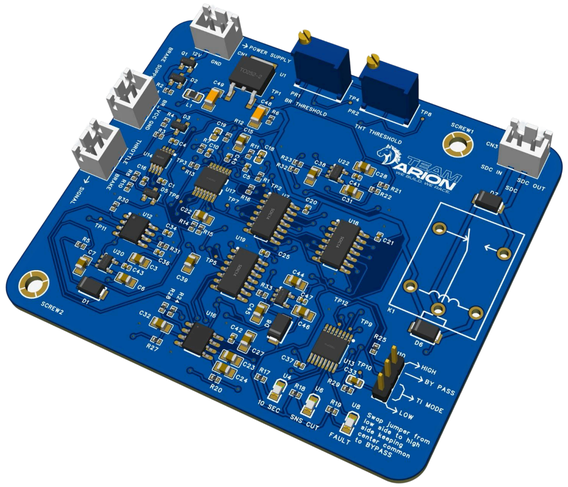


Fig: BSPD PCB

ELECTRICALS

R200 ECU Integration

The AR-26 utilizes the Race Dynamics R200 ECU featuring multiple adjustable parameters and advanced engine management capabilities.

Key Highlights

- Launch Control
- Adjustable ignition timing
- Fuel injection tuning
- Multiple engine maps
- Real-time parameter monitoring
- Powertrain parameters

Fig: R200 ECU Race Dynamics

In-House Data Acquisition System

An in-house Data Acquisition System has been developed for monitoring critical vehicle parameters during testing and dynamic events.

Monitored Parameters

- Suspension travel
- Ride height
- Tire temperature
- Powertrain parameters

SUBSYSTEM 05

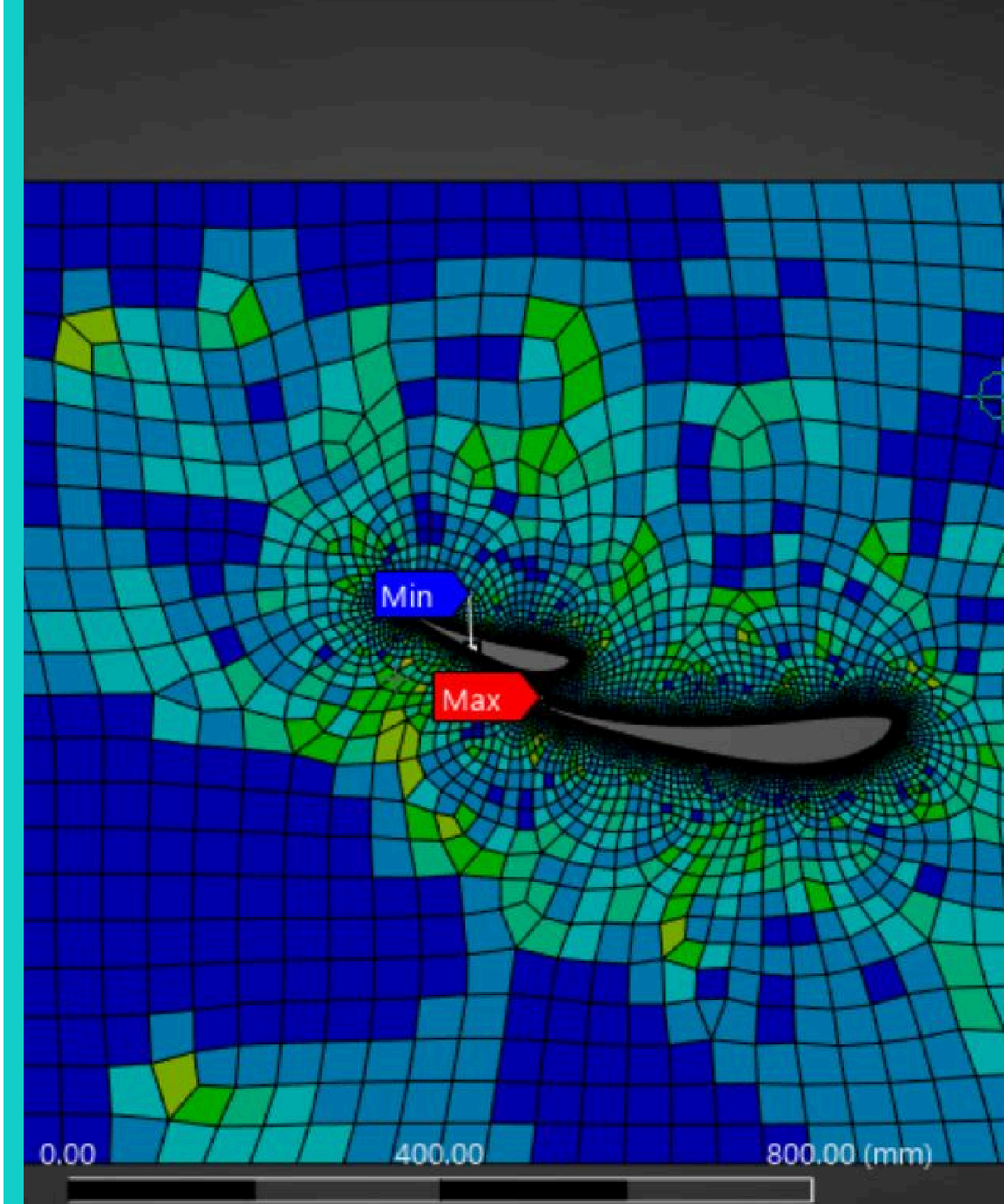
Aerodynamics

The Aerodynamics Subsystem Has Been Implemented On The AR-26 For The Very First Time With A Focus On Improved Stability, Aerodynamic Efficiency, And Overall Vehicle Performance.
The Package Consists Of Both Front And Rear Wings Designed Specifically For The AR-26 Platform.

High Efficiency

Good Performance

Robust And Durable



AERODYNAMICS

FRONT WING

- The AR-26 Front Wing has been designed using carbon fiber construction to achieve lightweight performance and improved aerodynamic efficiency. The geometry was optimized specifically for the AR-26 platform.
- Key Highlights
  - Carbon fiber construction
  - Lightweight aerodynamic design
  - Improved front-end stability
  - Optimized wing dimensions
- Basic Dimensions
  - Width : 1340 mm
  - Length : 586 mm
  - Height : 250 mm

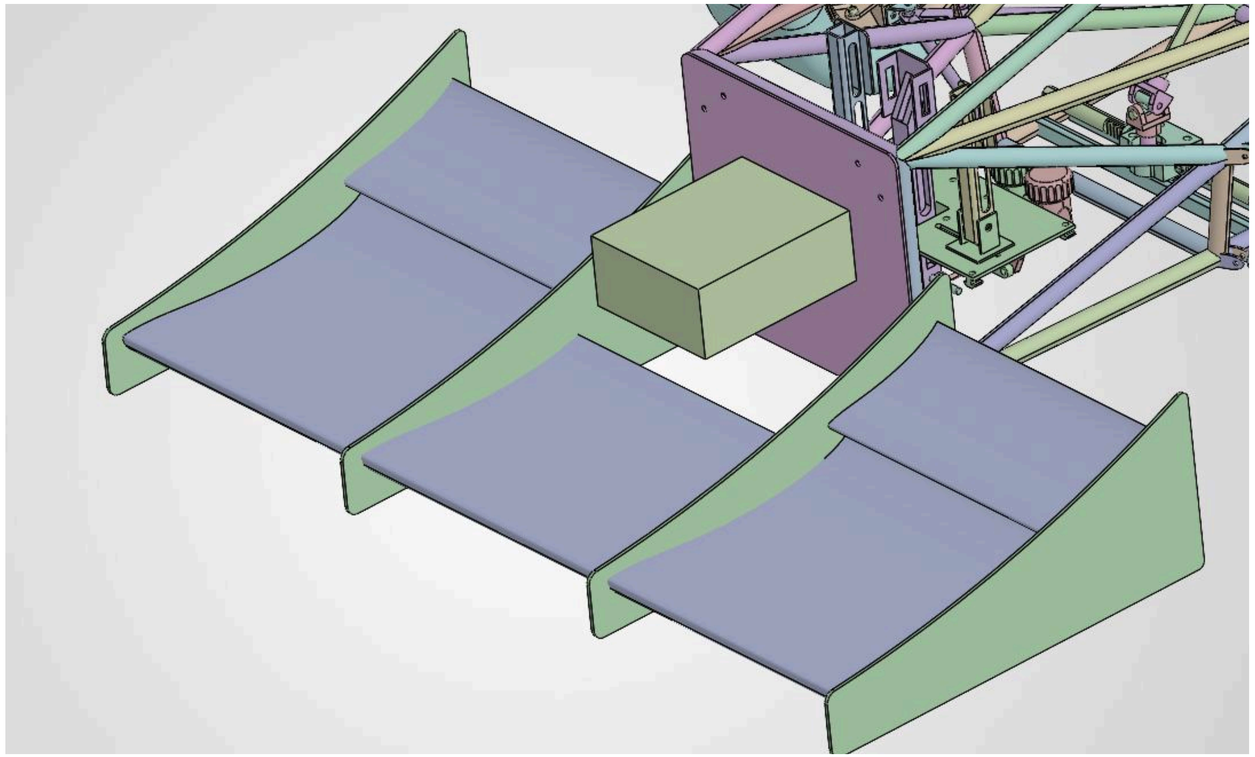


Fig: Front Wing

AERODYNAMICS

REAR WING

- The Rear Wing has been newly developed to complement the aerodynamic balance of the vehicle while maintaining lightweight construction through carbon fiber manufacturing.
- Key Highlights
  - Carbon fiber construction
  - Improved rear-end stability
  - Enhanced aerodynamic balance
  - Optimized wing profile and dimensions
- Basic Dimensions
  - Width : 1020 mm
  - Length : 511 mm
  - Height : 264 mm

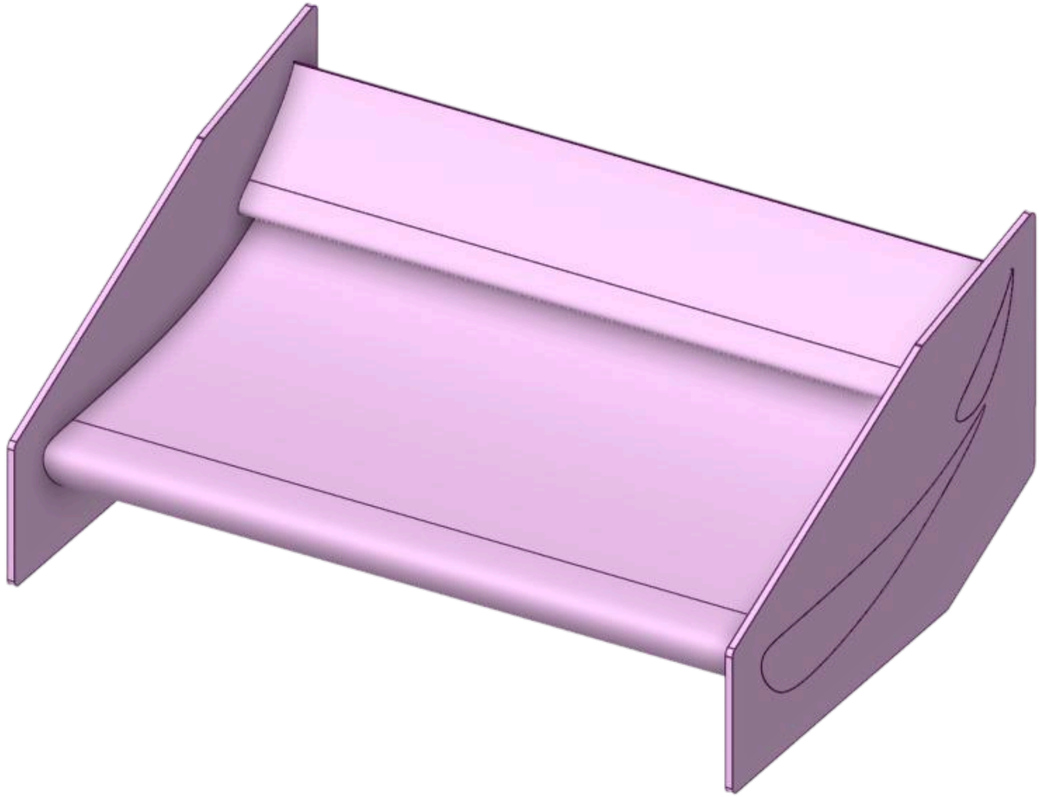


Fig: Rear Wing