TABLE OF CON-TENT

CANADA, IT'S TIME TO BUILD OUR OWN AUTOMOBILE

CANADA POWERS THE WORLD'S BEST AUTOMOBILES.
BUT WE DON'T HAVE ONE OF OUR OWN.

YET

CANADA'S AUTOMOTIVE GAP

Canada supplies advanced components, materials, and engineering to the world's top performance car brands, yet it has no Canadian-owned performance automotive brand. The capability exists, but the system to bring it together does not. This project begins by identifying that gap.

FROM ECOSYSTEM TO VEHICLE

The work began by mapping Canada's automotive ecosystem suppliers, research institutions, manufacturing strengths, and policy conditions. From this research, key gaps were identified in complete vehicle integration, high-performance battery systems, and unified powertrain architecture.
The project then translated those findings into a physical vehicle system architecture.

WHAT IS BEING DESIGNED

The project focuses on system architecture, including:

- Carbon monocoque structure
- Structural battery spine
- Hybrid V10 powertrain with electric torque vectoring
- Suspension, braking, steering, and cooling systems
- Human packaging and ergonomics
- These systems are explored through diagrams and low-to-medium fidelity physical prototypes.

OUTCOME

The result is a physical system architecture model and a strategic framework that together form a credible foundation for future design, aerodynamics, and high-fidelity development.

PROJECT FRAMEWORK AND CONTEXT

This project focuses on designing a track-focused hypercar system architecture grounded in motorsports principles, Canadian industrial capability, and long-term future relevance.
The design decisions in this project are not based on form first, but on understanding the physical forces that govern high-performance vehicles and creating an architecture that can manage those forces in a controlled and intentional way.

Canada has one of the strongest automotive supplier ecosystems in the world, yet it does not have a nationally owned performance car brand. This project explores how a halo hypercar can act as a realistic entry point by leveraging existing strengths rather than attempting mass manufacturing.

THE CORE PROBLEM IN PERFORMANCE VEHICLE DESIGN

In motorsports and track-focused driving, a car must repeatedly perform three actions:

- Braking as late as possible
- Maintaining grip through corners
- Accelerating aggressively onto straights

These actions expose the vehicle to extreme dynamic forces. The challenge is not generating power, but controlling how the vehicle behaves under load.

This behavior is governed by three primary vehicle dynamics:

- Pitch
- Roll
- Yaw

Understanding and managing these forces forms the foundation of this

PITCH – LONGITUDINAL LOAD TRANSFER

Pitch refers to the forward and backward rotation of the vehicle body.
During braking, the center of mass shifts forward, causing the front of the car to dive.
During acceleration, the center of mass shifts rearward, causing the rear of the car to squat.

Uncontrolled pitch can lead to:

- Uneven tire loading
- Reduced braking efficiency
- Loss of traction during acceleration
- Instability in aerodynamic performance due to ride-height changes

ROLL – LATERAL LOAD TRANSFER

Roll occurs when the vehicle experiences lateral forces during cornering.
As the car turns, weight shifts to the outside wheels, causing the body to roll. Excessive roll reduces the tire contact patch and affects steering precision.

Poor roll control can lead to:

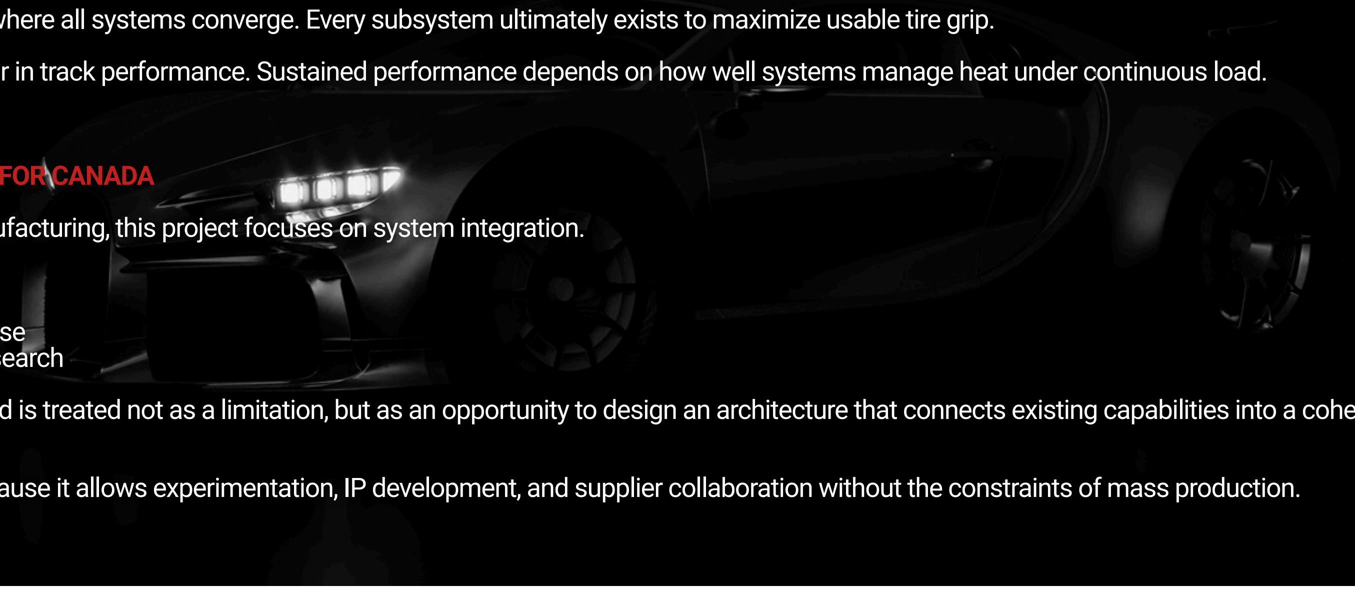
- Understeer or oversteer
- Reduced cornering grip
- Loss of driver confidence

YAW – ROTATIONAL CONTROL

Yaw refers to the rotation of the vehicle around its vertical axis, particularly during corner entry and exit.
Yaw behavior determines how willingly the car rotates into a corner. Too little yaw results in understeer, while too much yaw leads to instability.

Yaw control is a defining factor in modern high-performance vehicles and is closely tied to:

- Power delivery
- Braking behavior
- Suspension geometry
- Precise yaw control allows the car to rotate efficiently rather than slide.



ADDITIONAL DYNAMIC CONSIDERATIONS

Center of gravity plays a major role in pitch and roll behavior. A lower center of gravity improves stability and responsiveness.

Unsprung mass affects how quickly the wheels can react to surface changes. Excessive unsprung mass reduces grip and control.

The tire contact patch is the final point where all systems converge. Every subsystem ultimately exists to maximize usable tire grip.

Thermal management is a limiting factor in track performance. Sustained performance depends on how well systems manage heat under continuous load.

WHY THIS APPROACH MAKES SENSE FOR CANADA

Rather than attempting full vehicle manufacturing, this project focuses on system integration.

Canada already produces:

- High-level automotive components
- Motorsports manufacturing expertise
- Advanced materials and battery research

The absence of a complete vehicle brand is treated not as a limitation, but as an opportunity to design an architecture that connects existing capabilities into a coherent system.

A hypercar is used as a halo project because it allows experimentation, IP development, and supplier collaboration without the constraints of mass production.

POSITIONING THE PROJECT

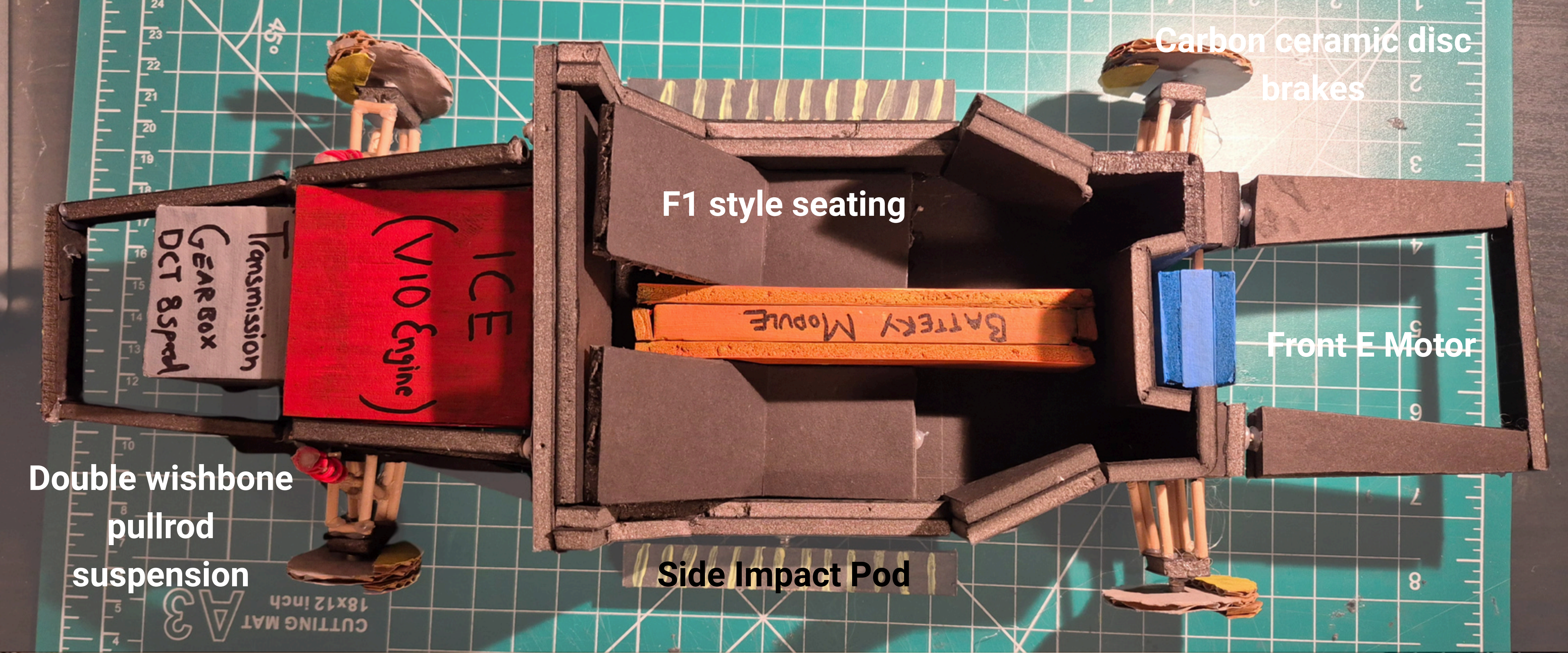
This project does not aim to redesign existing hypercars. It defines a performance-driven system architecture grounded in real vehicle dynamics, Canadian industrial strengths, and long-term adaptability.

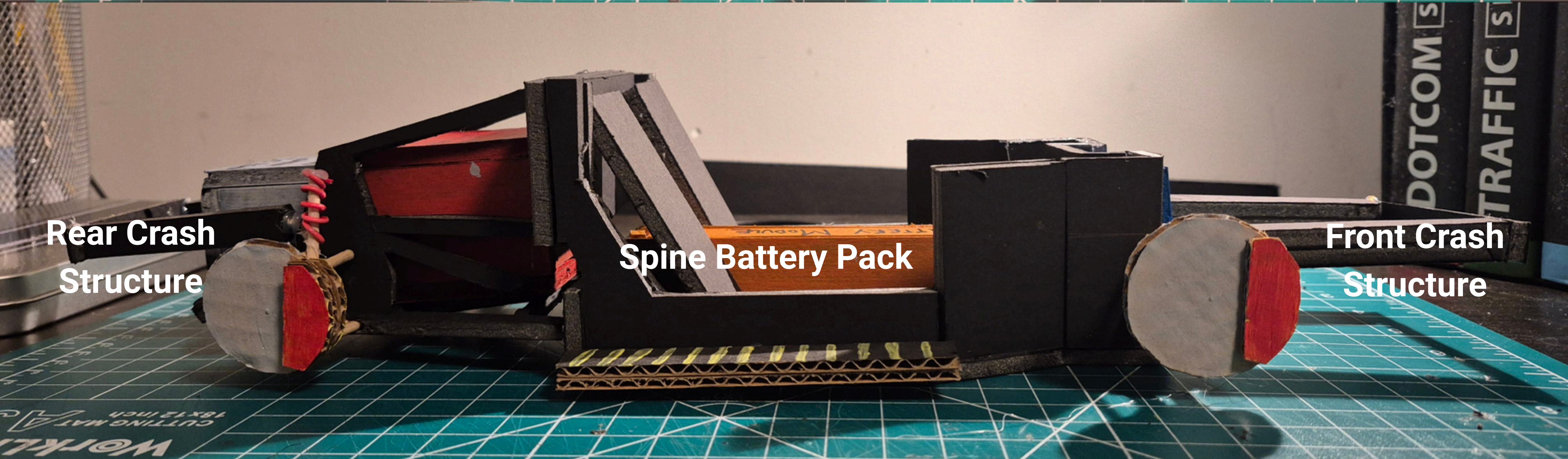
Canada already supports the world's leading performance vehicles through advanced suppliers, materials research, and motorsports manufacturing, yet it lacks a nationally owned performance brand. This project positions a hypercar as a halo platform that showcases capability, innovation, and identity rather than mass production.

The timing is deliberate. Global supply-chain shifts, tariff pressures, and renewed focus on domestic manufacturing create an opportunity for Canada to invest in high-value automotive innovation. Current economic discussions around national competitiveness and industrial independence reinforce the relevance of this work.

Alongside system architecture, the project also explores design and visual identity. The vehicle's form is developed in parallel with its technical layout, ensuring proportions, stance, and surface language reflect performance intent rather than decorative styling.

Each subsystem that follows responds to both vehicle dynamics requirements and Canadian opportunity, forming a coherent, future-ready architecture supported by an appropriate design direction.


Carbon ceramic disc brakes
F1 style seating
Transmission GEARBOX DCT 8spd
ICE (V10 Engine)
BATTERY MODULE
Front E Motor
Double wishbone pullrod suspension
Side Impact Pod


Rear Crash Structure
Spine Battery Pack
Front Crash Structure


ICE
(V10 Engine)
GEARBOX
DCT 8speed
BATTERY MODULE
What Canada doesn't Makes?
Engines
Ceramic brakes
Tires

SUSPENSION SYSTEM ARCHITECTURE

In motorsports, a car must brake as late as possible, carry maximum speed through corners, and accelerate aggressively on corner exit. During these actions, the vehicle is constantly subjected to pitch, roll, and yaw forces. Under braking, the car pitches forward and loads the front tires. Under acceleration, the car squats and shifts weight rearward. During cornering, lateral forces cause body roll and camber change at the wheels.
The suspension system exists to manage these forces while keeping the tire contact patch as stable as possible. All suspension design decisions in this project were made as responses to these physical constraints, with a focus on track performance, future adaptability, and Canadian capability.

What exists already?

Canada does not manufacture complete suspension systems for hypercars or performance OEMs. However, it has world-class expertise in:
Advanced damper technology
Motorsports suspension components
Precision machining and testing
Control systems and vehicle dynamics
Canadian companies already supply critical suspension elements to Formula 1, Le Mans, and high-performance road cars, but these components are delivered as parts, not as a fully integrated Canadian-owned suspension architecture.

2. Suspension options explored

Several suspension architectures were studied before selecting the final configuration:

MacPherson strut
Common in mass-market vehicles due to packaging efficiency and low cost. Rejected because it offers limited camber control under high lateral loads and is not suitable for extreme track performance.

Multi-link suspension
Offers good road comfort and packaging flexibility, but introduces complexity and compromises precision when tuned for motorsports-level loads.

Double wishbone (outboard)
Provides strong camber control and predictable handling, but increases unsprung mass and limits aerodynamic packaging.

Double wishbone with inboard pushrod / pullrod actuation
This configuration separates the wheel control arms from the spring and damper units, allowing the suspension loads to be transferred into the chassis. This option was selected.

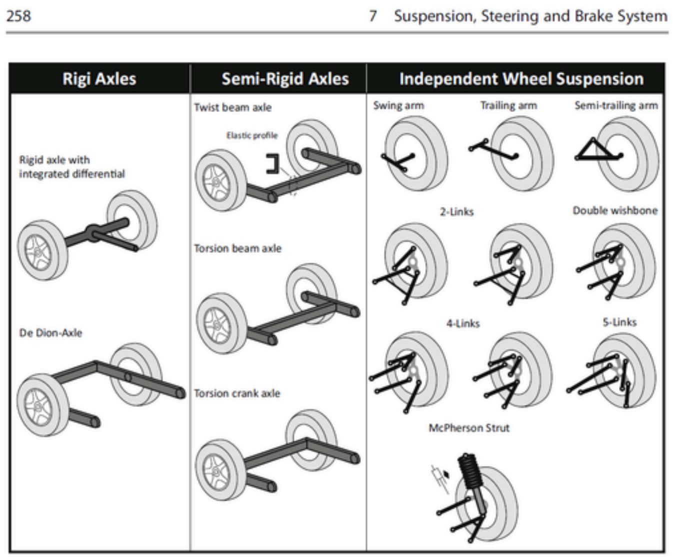


Fig. 7.3 Systematics of suspensions

Why This Configuration

This system:

- Maintains consistent camber during cornering
- Improves turn-in and steering precision
- Allows independent tuning at each wheel
- Supports torque vectoring and brake-by-wire systems
- Enables adjustable ride height and damping
- The suspension can operate at higher ride height for road use and poor surfaces, then lower itself for track driving. Controlled pitch under braking and squat under acceleration improve stability without compromising drivability.

262 7 Suspension, Steering and Brake System

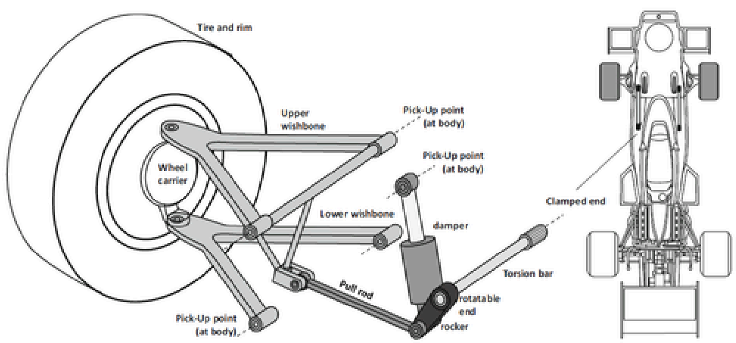


Fig. 7.7 Double wishbone with pull-rod and torsion bar on Lotus T72 (1970)

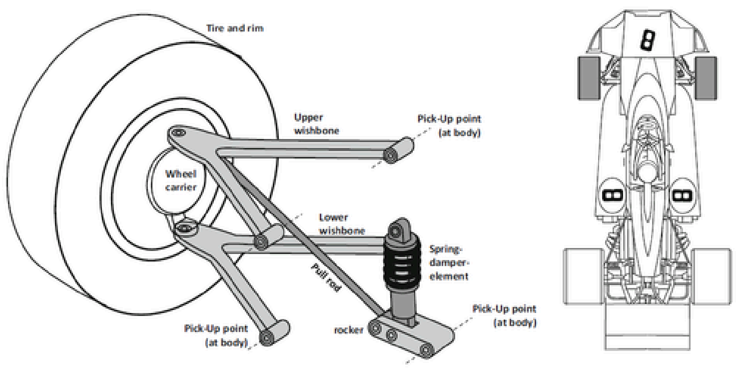


Fig. 7.8 Double wishbone with pull-rod and coil spring-damper element on Brabham BT44 (1974)

Road-Legal and Canadian Climate Considerations

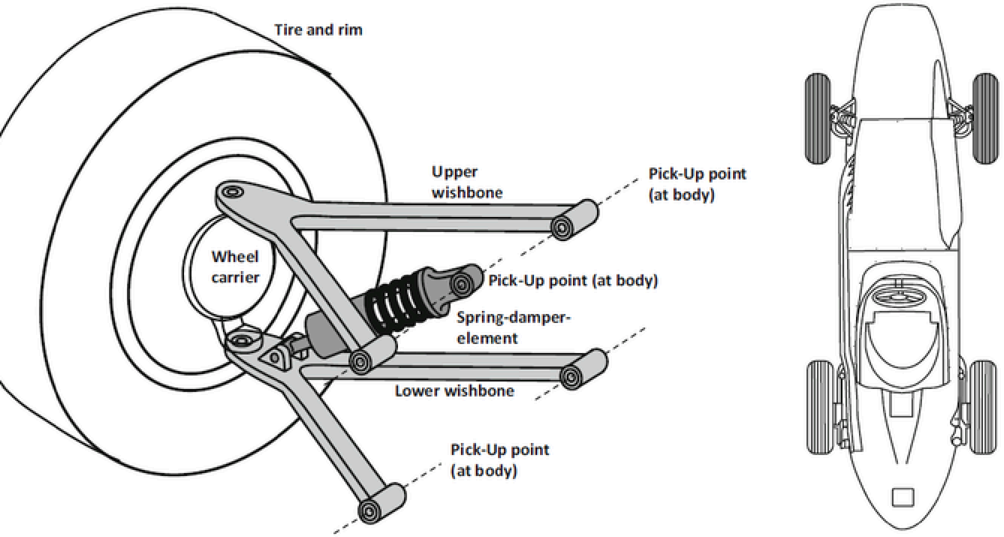
This architecture allows compliance with road regulations by maintaining sufficient ride height, wheel travel, and durability for public use. Adjustable damping and ride height improve usability on uneven roads, cold surfaces, and seasonal conditions common in Canada, while still supporting aggressive track settings when required.

Canadian Capability and Opportunity

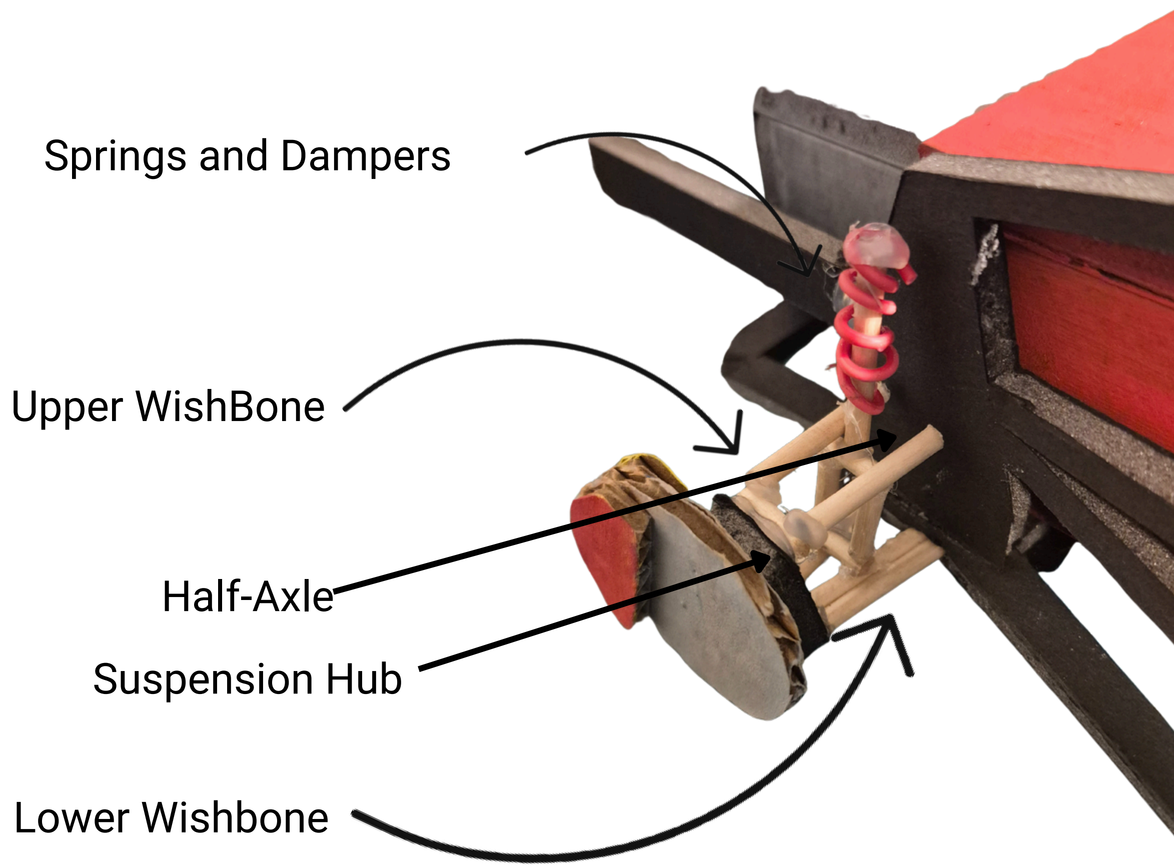
Canada already contributes advanced damper technology, precision manufacturing, and vehicle dynamics expertise. However, there is no Canadian-owned, track-focused suspension architecture developed as a complete system.

This project defines that system-level opportunity, moving Canadian expertise from component supply toward integrated performance architecture.

7 Suspension, Steering and Brake System



. 7.5 Double wishbone with coil spring damper element on Aston Martin DBR9 (1959)



BATTERY SYSTEM ARCHITECTURE

Context
In a modern track-focused hypercar, the battery is not just an energy source. It is a structural, thermal, and performance-critical system. It must deliver high power instantly, recover energy under braking, and remain stable under extreme heat, cold, and repeated load cycles.
This project treats the battery as a performance subsystem, not a range-driven EV pack.

What Exists Already

Canada is deeply involved in the battery supply chain, including:
Raw materials such as lithium, nickel, graphite, and rare earth elements
Battery research, testing, and cell development
Grid-scale and automotive battery manufacturing support

However, Canada does not currently produce a high-discharge, motorsport-oriented battery architecture designed specifically for performance vehicles.

Design Choice

The proposed system uses a high-power lithium-ion battery focused on discharge and regeneration rather than long-range capacity.

- Cell type: high-discharge pouch or prismatic cells
- Chemistry direction: nickel-rich lithium-ion (NMC or advanced NCA variants)
- Voltage architecture: high-voltage system optimized for power density

The battery is packaged as a central structural spine, running low and close to the vehicle's center of gravity.

Why This Is a Design Decision

This configuration:
Delivers instant power to front and rear electric motors
Supports regenerative braking to recover energy under deceleration
Stabilizes weight distribution and lowers center of gravity
Allows repeated track laps without thermal fade
Works with torque vectoring and brake-by-wire systems
This is a motorsport-first battery architecture, not a consumer EV solution.

Canadian Climate and Road Use Considerations

The system is designed to operate reliably in cold temperatures common in Canada. Thermal management prioritizes consistent performance in winter conditions while remaining safe and durable for road use. This ensures the car is usable beyond ideal track environments.

Internal System Architecture (How It Is Built)

Cells

High-discharge pouch or prismatic cells optimized for rapid energy delivery and recovery rather than maximum range.

Modules

Cells grouped into compact modules to allow thermal control, serviceability, and scalability.

Battery Pack / Spine

Modules are housed in a rigid enclosure that acts as a structural element within the vehicle's architecture.

Battery Management System (BMS)

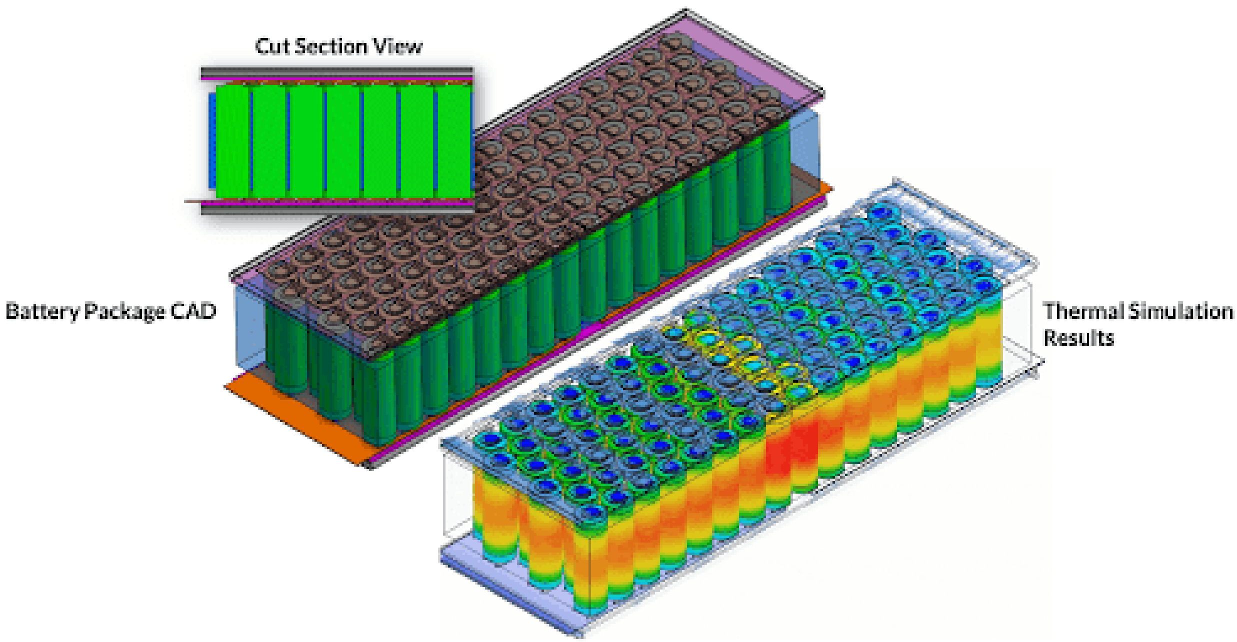
Monitors voltage, temperature, state of charge, and discharge rates to protect the system under extreme track loads.

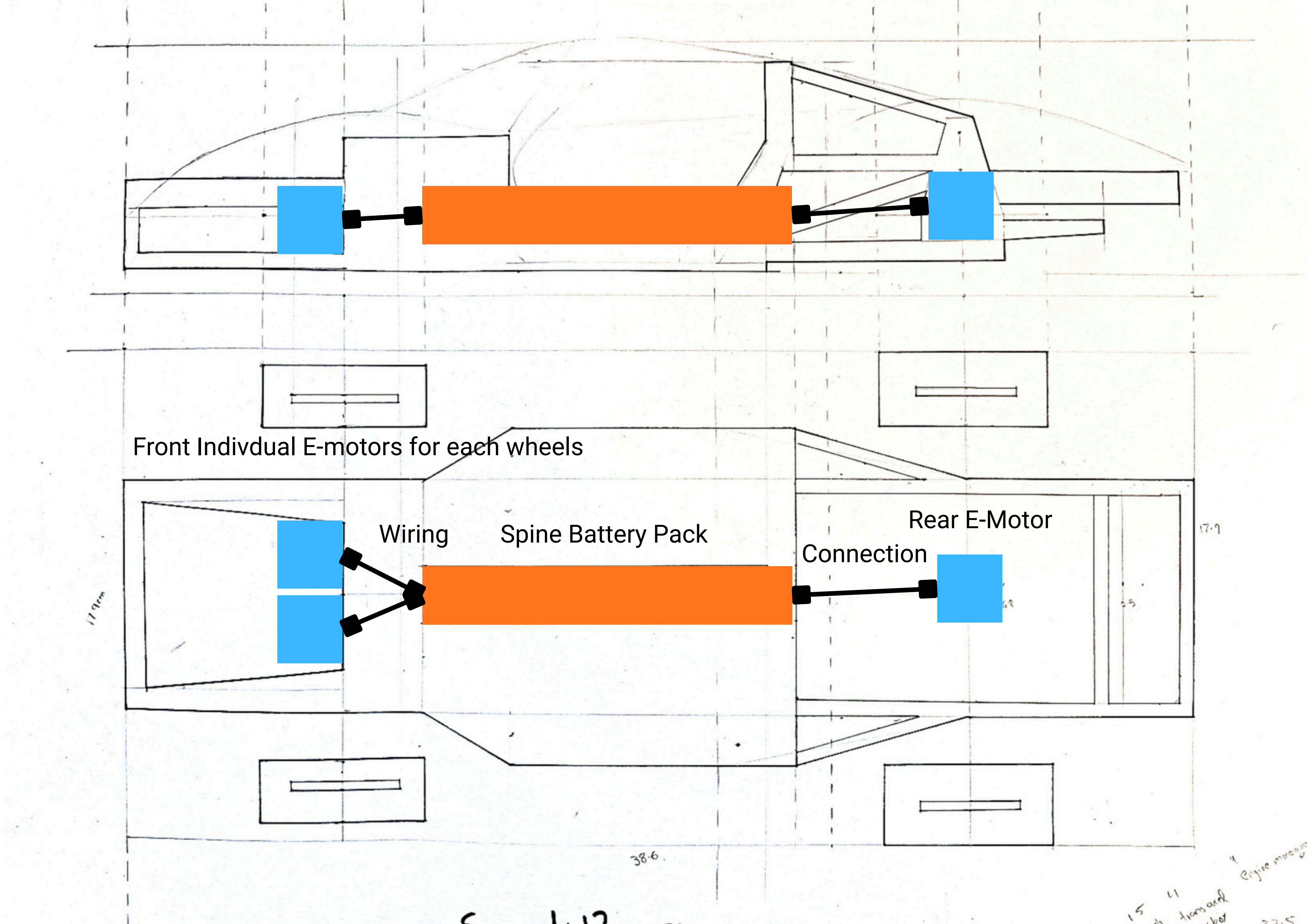
Power Electronics

High-voltage connections feed front and rear electric motors and support regenerative braking.

Thermal System

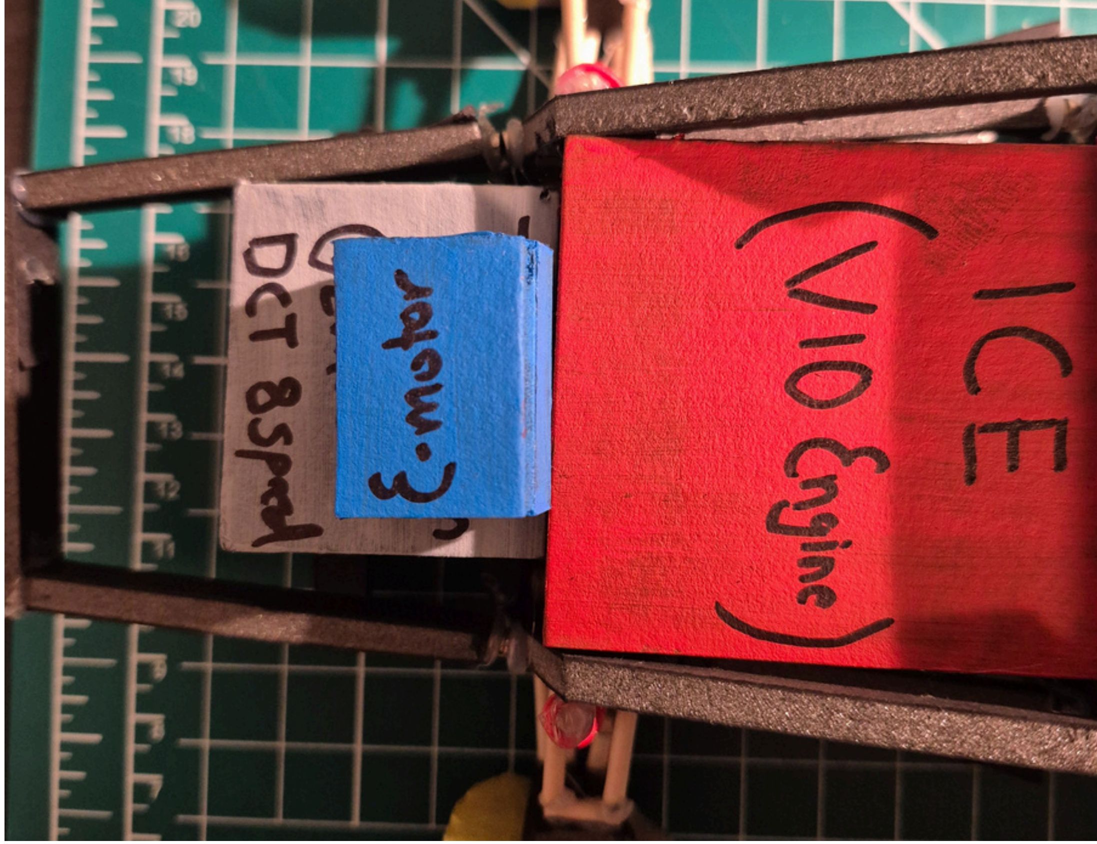
Liquid cooling channels manage heat generated during acceleration and regeneration, ensuring repeatable performance.




Front Indivdual E-motors for each wheels
Wiring
Spine Battery Pack
Rear E-Motor
Connection
38·6

Electric Motor System

Context
In modern motorsports, performance is no longer defined by peak horsepower alone. Cars must accelerate instantly out of corners, manage traction in changing conditions, and recover energy under braking. Electric motors are used not to replace the internal combustion engine, but to fill performance gaps created by physics: turbo lag, gear shifts, traction limits, and braking inefficiencies.

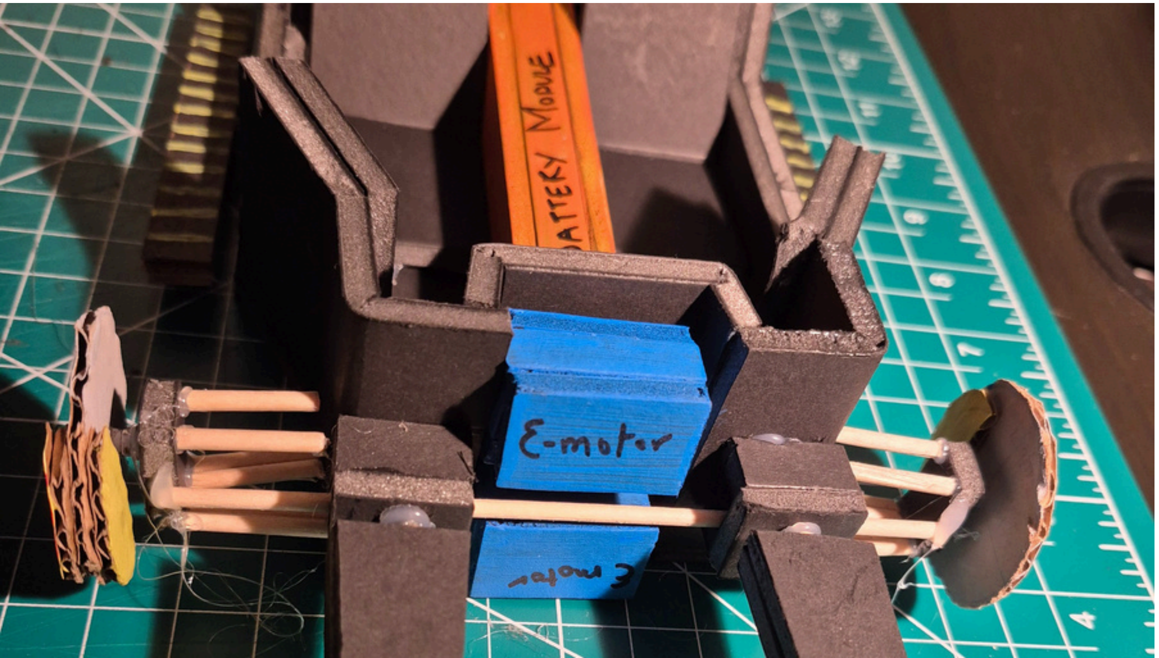


This project uses a hybrid electric motor architecture:

• Two independent electric motors at the front wheels
• One electric motor integrated at the rear, assisting the ICE drivetrain
The motors are paired with an internal combustion engine rather than replacing it.

Electric Motor System (E-Motors)
Proposed Output Targets
The electric system is sized for track performance, not range.
Front e-motors (2 total): 250 hp each, 500 hp total
Rear e-motor (1 total): 200 hp
Combined electric output: 700 hp

This is paired with the ICE to reach the overall target.



What each e-motor does in the architecture

Front left e-motor
Drives the front left wheel independently. Provides instant torque at corner exit and enables torque vectoring by increasing or reducing power relative to the other front wheel.

Front right e-motor
Drives the front right wheel independently. Works with the left motor to control yaw behavior, improve turn-in, and stabilize the car in low-grip conditions.

Rear e-motor
Supports the ICE drivetrain at the rear axle. Provides torque fill during gear shifts and low RPM, adds boost during acceleration, and switches to regenerative braking during deceleration to recover energy into the battery.

Why this is a design decision

This layout directly addresses motorsport demands:
• Instant torque delivery during corner exit
• Torque vectoring at the front axle for improved turn-in and stability
• Filling power gaps during gear shifts
• Regenerative braking to recover energy under heavy braking
• Reduced reliance on mechanical differentials
This allows the car to brake later, rotate more precisely, and accelerate earlier out of corners.

How it works with the rest of the car
The electric motors are integrated with:
• Brake-by-wire systems for regenerative braking
• Suspension and chassis dynamics for torque vectoring
• Battery thermal management
• ICE and transaxle for blended power delivery
Power from electric motors and the engine is coordinated electronically before reaching the wheels.

INTERNAL COMBUSTION ENGINE (ICE) — V12 SYSTEM ARCHITECTURE

Design Choice
The project uses a mid-mounted, naturally aspirated V12 as part of a hybrid performance system.
The engine is designed to function as:

- A high-RPM power source
- A sustained power delivery unit at high speeds
- An emotional and mechanical counterbalance to electrification
- It is paired with electric motors rather than used alone.

Why This Is a Design Decision

This engine configuration:

- Provides linear power delivery at high speeds
- Reduces vibration compared to lower-cylinder engines
- Maintains performance consistency during long track sessions
- Complements electric torque at low RPM
- Allows extreme throttle precision and driver feedback
- The V12 is chosen for performance stability and nostalgia.

Does Canada make engines?
Canada does not currently manufacture complete high-performance automotive engines, especially not V10s or V12s for hypercars.
However, that does not mean Canada is weak in engine capability.

Canada is strong in:

- Engine components
- Precision machining
- Powertrain validation and testing
- OEM engine assembly for mass-market vehicles
- Engineering services for global automakers

What Canada lacks is engine IP ownership, not engineering competence.

So how are we sourcing the engine?
The engine is externally sourced, but system-integrated in Canada.
That means:
The core ICE is developed with a specialist manufacturer
Canada owns the integration, packaging, cooling, hybridization, and validation
The engine becomes part of a Canadian-controlled system, not a drop-in part

Who could realistically build it?
Examples of non-Canadian but realistic partners:

- Cosworth
- Ilmor Engineering
- Ricardo
- AVL

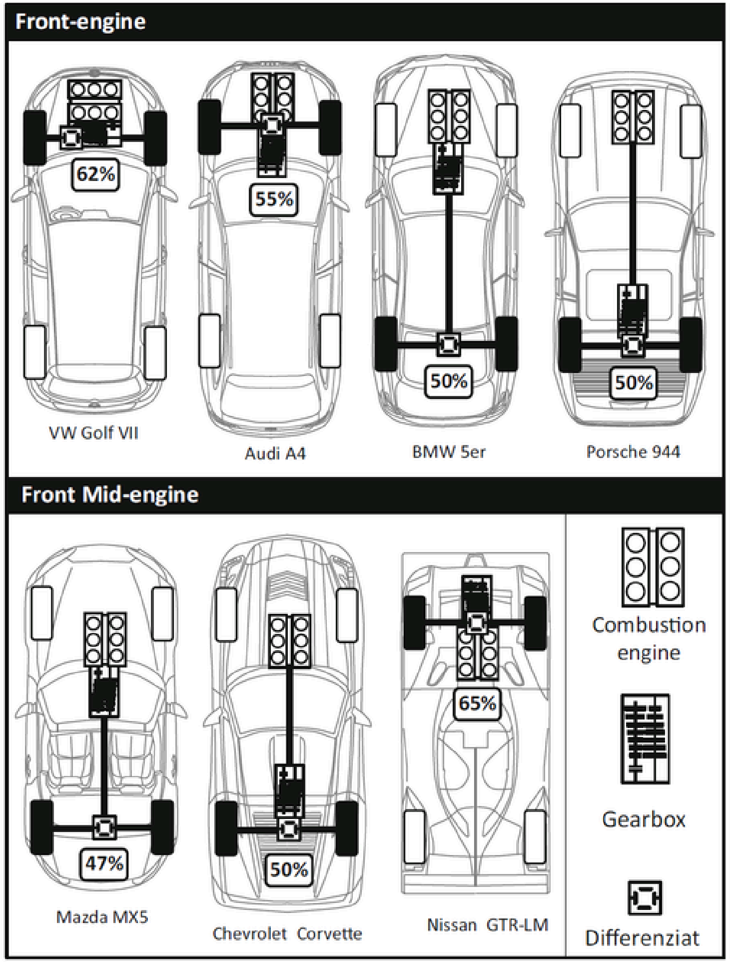
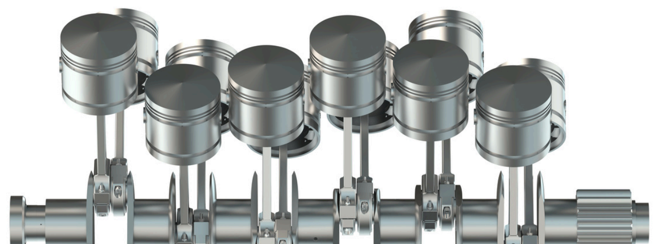


Fig. 9.2 Powertrain concepts with front and front-mid engine as combustion engine and single-axle drive



Why a V12 (not just performance, but emotion)

The decision to use a naturally aspirated V12 is not only technical — it is cultural and experiential.
High-revving V12 engines represent the peak of analog motorsport emotion. They deliver:

- Linear power delivery
- Extremely high RPM capability
- A sound profile that creates a physical, emotional response

Cars like the Lexus LFA proved that engine acoustics, tuning harmony, and throttle response can become the identity of the car itself. In an era where many performance cars are becoming silent or digitally augmented, a V12 creates a memorable, visceral experience that enthusiasts actively seek.
This is especially important for a halo car , it needs to be felt, not just measured.

How Canada can realistically do this

Canada may not manufacture complete V12 engines today, but it c
own how the engine is experienced.
Canada contributes by:

- Defining the engine's operating philosophy
- Specifying high-RPM behavior and throttle mapping
- Designing intake and exhaust resonance
- Integrating the engine into a hybrid system that enhances response rather than replacing it

Engine manufacturing can be handled by a specialist partner, but:
- Calibration
- Sound tuning
- Thermal management
- Structural integration

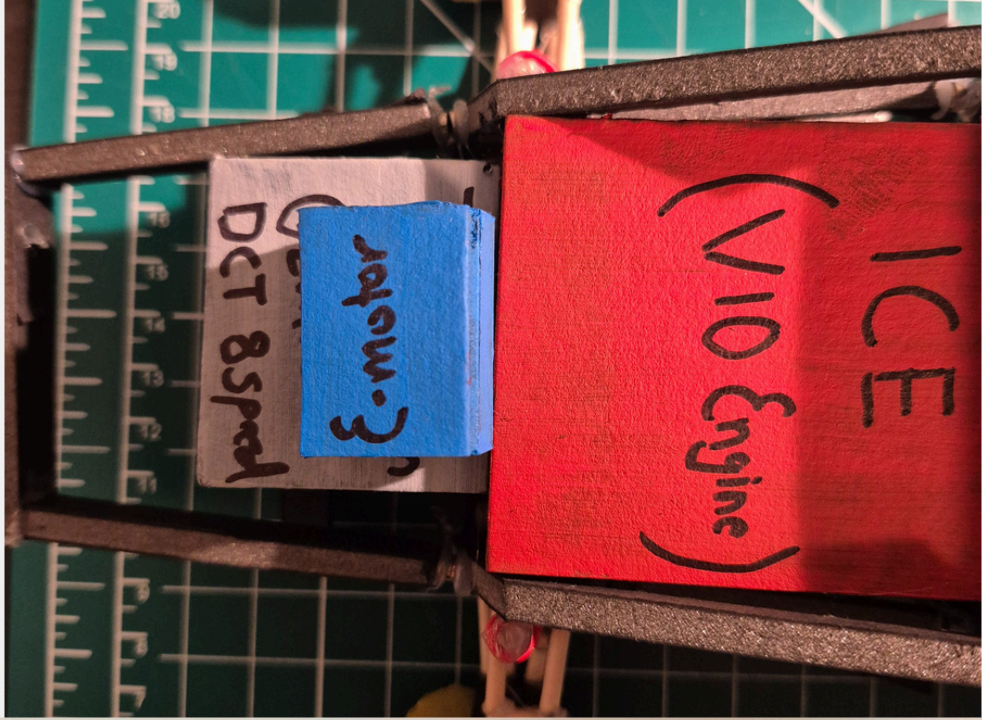
are controlled by the Canadian system architecture.
This is where the identity is created.

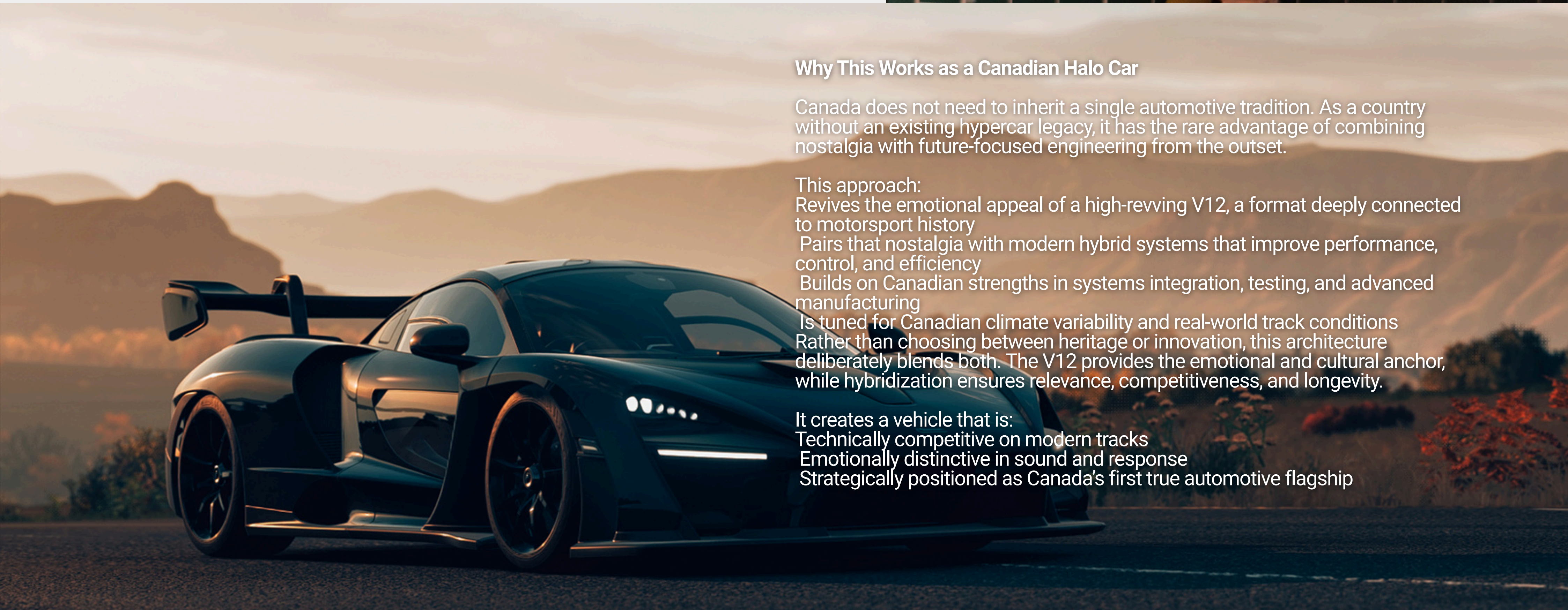
Performance intent
The performance target is defined by power-to-weight ratio, not raw horsepower alone.
Target values:
Combined system output: ~1,200–1,400 hp
Vehicle mass target: ~1,300–1,400 kg
Power-to-weight ratio: ~1 hp per kg or better

This places the car in the same performance territory as the most extreme modern track-focused hypercars.

Why RPM matters in motorsport

High RPM engines:
- Produce power through airflow efficiency, not boost
- Offer predictable throttle response
- Reduce thermal lag
- Improve driver confidence on corner exit
- A V12 capable of 9,500–10,000 RPM delivers:
- Smooth torque curve
- High sustained power
- Reduced stress per cylinder compared to smaller turbo engines
- This makes it ideal for track use, where consistency matters more than peak numbers.





Why This Works as a Canadian Halo Car

Canada does not need to inherit a single automotive tradition. As a country without an existing hypercar legacy, it has the rare advantage of combining nostalgia with future-focused engineering from the outset.

This approach:
Revives the emotional appeal of a high-revving V12, a format deeply connected to motorsport history
Pairs that nostalgia with modern hybrid systems that improve performance, control, and efficiency
Builds on Canadian strengths in systems integration, testing, and advanced manufacturing
Is tuned for Canadian climate variability and real-world track conditions
Rather than choosing between heritage or innovation, this architecture deliberately blends both. The V12 provides the emotional and cultural anchor, while hybridization ensures relevance, competitiveness, and longevity.

It creates a vehicle that is:
Technically competitive on modern tracks
Emotionally distinctive in sound and response
Strategically positioned as Canada's first true automotive flagship

BRAKE SYSTEM ARCHITECTURE

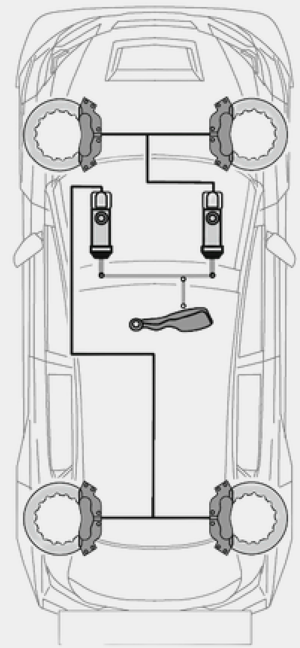
1. What Exists Already
Canada does not manufacture complete high-performance brake systems for hypercars. Most carbon-ceramic braking systems are developed by specialized global suppliers and integrated by OEMs.

2. Design Choice
The project uses carbon-ceramic disc brakes combined with a brake-by-wire system, integrated with regenerative braking from the electric motors.

3. Why This Is a Design Decision
This configuration:

- Handles extreme heat during repeated high-speed braking
- Reduces unsprung mass compared to steel brakes
- Maintains consistent braking performance on track
- Allows seamless blending of mechanical and regenerative braking
- Enables precise brake modulation and stability control

Brake-by-wire allows braking force to be digitally managed rather than mechanically linked.

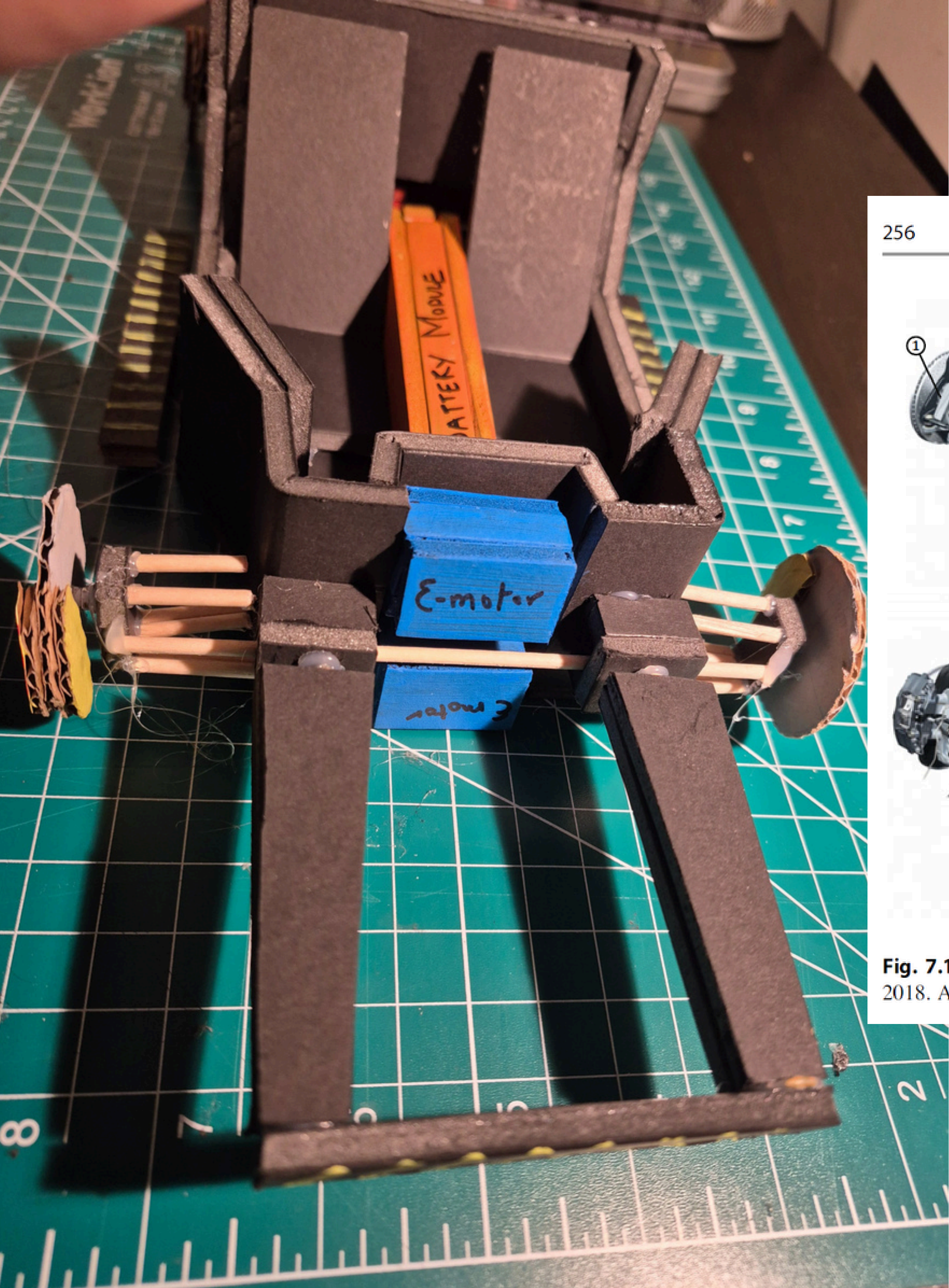


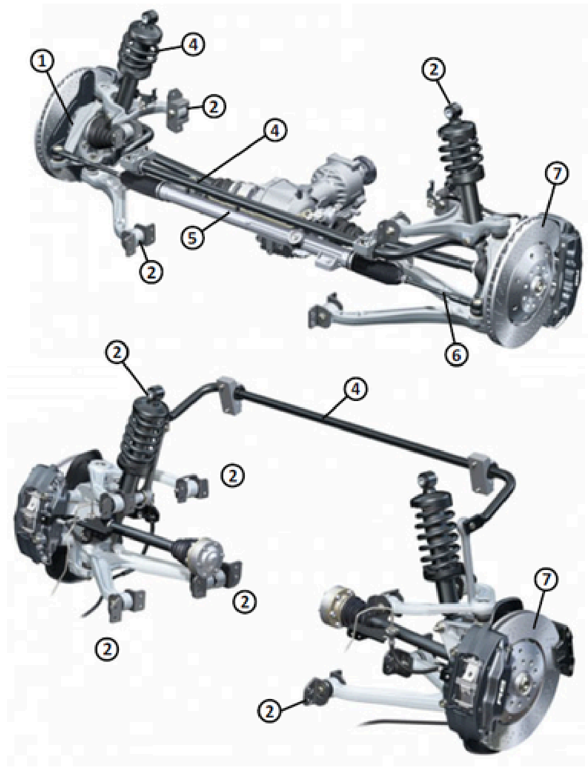
4. What Canada Contributes
Canada contributes through:
Control systems and software expertise
Precision manufacturing of brake components and housings
Vehicle dynamics integration and testing
The intelligence of the braking system becomes a Canadian-led contribution.

5. **Why Brake-by-Wire + Regeneration**

Regenerative braking:
Recovers energy during deceleration
Reduces thermal load on mechanical brakes
Improves efficiency and endurance on track
Brake-by-wire ensures smooth coordination between electric motors and carbon-ceramic brakes.

The front break calipers are bigger than the rear because motorsports car breaks a lot and the centre of mass shifts forward, hence need more control in front end.





Suspension

- Wheel carrier and wheel bearing ①
- Joints and bushings ②
- Control arms and/or axle beam ③
- Springs, Shocks, Anti-roll bar ④
- Subframe
- Tire and rim

Steering system

- Steering gear ⑤
- Tie rods and ⑥
- tie rod joints
- Steering column and steering wheel

Brake system and pedals

- Brake caliper and brake disk ⑦
- Brake line
- Master brake cylinder and Brake booster
- ABS and ESC valve block with Pumps and control unit
- Accelerator, brake and clutch pedal

Drive shafts
Fuel system and
Exhaust system

Fig. 7.1 Modules and module scopes of the chassis. (Photos on the left courtesy of © Audi AG 2018. All Rights Reserved)

TRANSAXLE & 8-SPEED DCT – DESIGN & ARCHITECTURAL CHOICE

What the Transaxle Is
A transaxle combines the gearbox and differential into a single unit at the rear of the car. In a mid-engine layout, this allows the engine, transmission, and driven wheels to function as one compact system.

Why a Rear-Mounted Transaxle
Placing the transaxle at the rear:

- Centralizes mass for better balance
- Reduces drivetrain length and complexity
- Improves traction under acceleration
- Supports high-power outputs without excessive weight
- This layout is standard in motorsports because it directly improves stability and corner exit performance.

Why an 8-Speed Dual-Clutch Transmission (DCT)

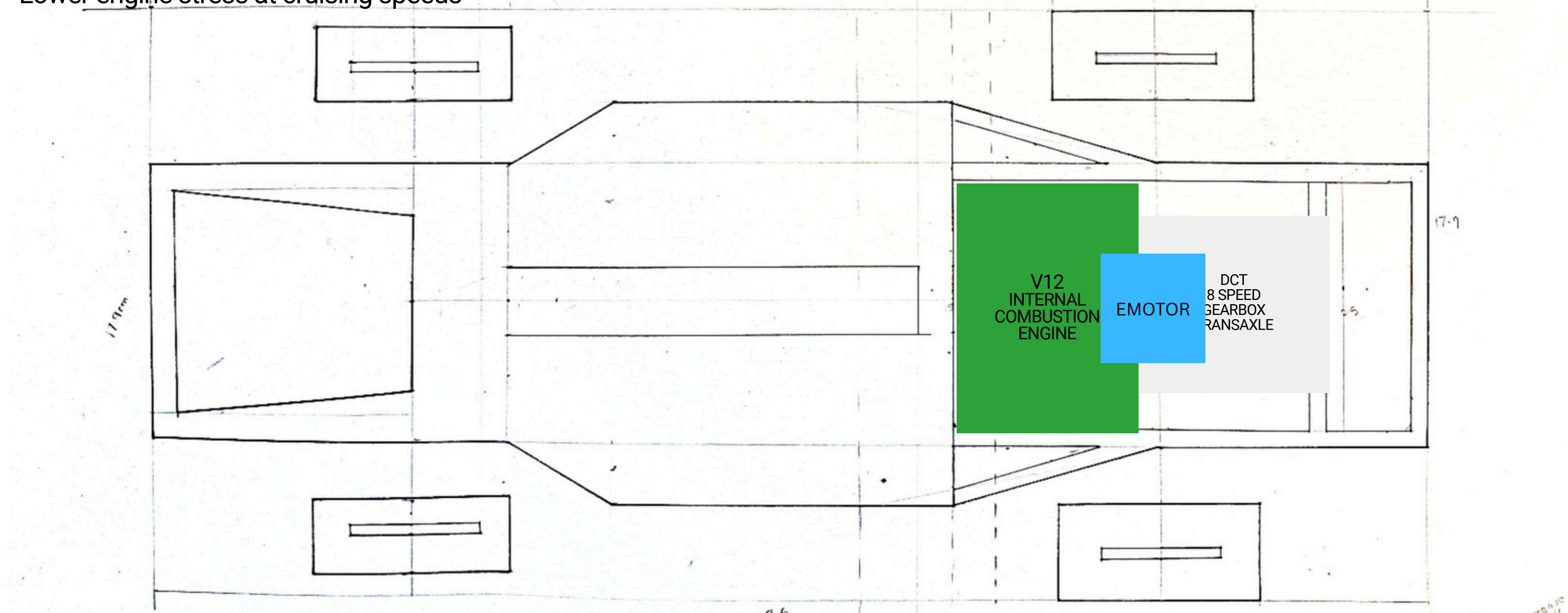
An 8-speed DCT was selected because it balances track performance and road usability.
It allows:

- Faster gear shifts with no power interruption
- Closer gear ratios for better acceleration
- A wider total ratio spread for both low-speed control and high top speed
- Lower engine stress at cruising speeds

Why DCT Over Manual or Single-Clutch
Compared to other options:
Manual transmissions are slower and inconsistent on track
Single-clutch automated systems interrupt power delivery
CVTs cannot handle hypercar torque levels
A DCT offers:
Immediate response
Repeatable performance
Better integration with hybrid systems

How This Helps the Overall Architecture
The transaxle and DCT work as a control hub:
They blend ICE and electric torque smoothly
They reduce drivetrain shock loads
They improve durability during track sessions
They allow precise software control
This is essential for a vehicle designed to brake late, exit corners hard, and accelerate aggressively.

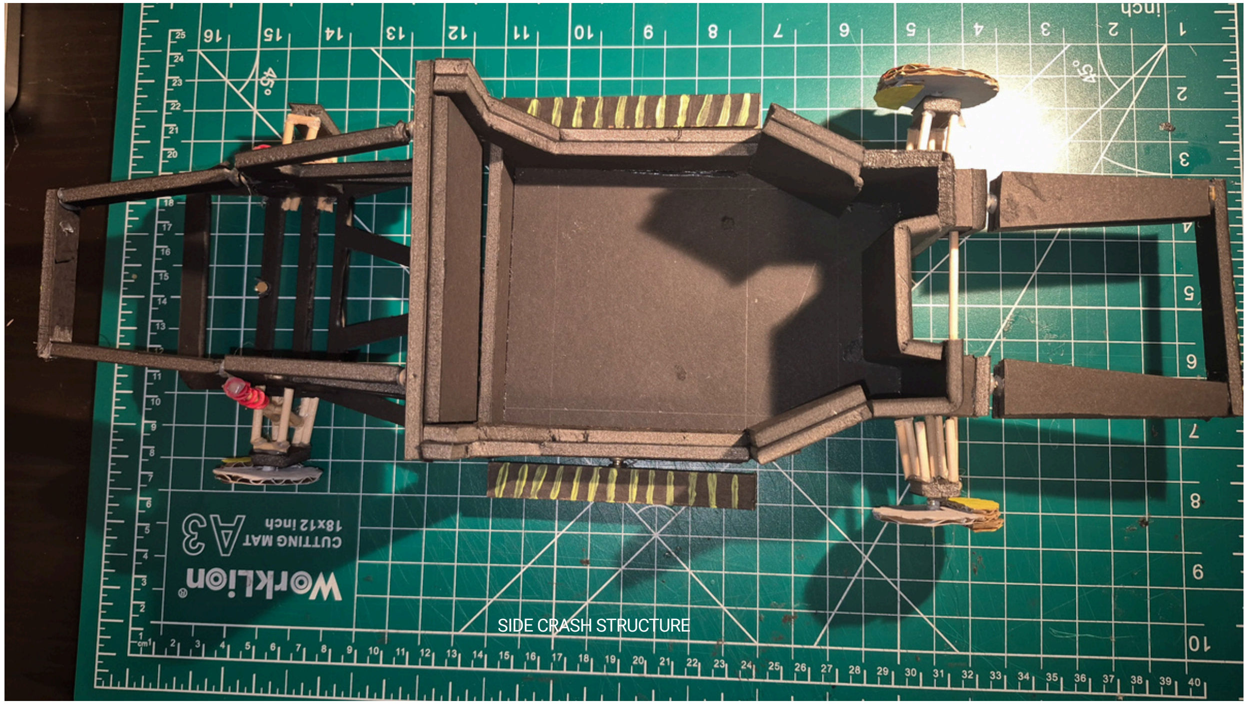
Road Legal + Canadian Conditions
An 8-speed DCT allows:
Smooth low-speed driving in traffic
Controlled torque delivery on snow or wet surfaces
Adaptive shift behavior based on temperature and grip
This makes the architecture usable beyond the track.



The carbon-fiber monocoque acts as the core of the vehicle architecture. It is the fixed reference for all other subsystems, including suspension mounting points, seating position, battery placement, and structural load paths. The monocoque is designed to be extremely stiff, providing high torsional rigidity, which allows the suspension and vehicle control systems to function accurately under high cornering, braking, and acceleration forces.

The chassis
is treated as a modular system built around the monocoque. Front and rear structural assemblies are attached to the carbon tub rather than forming a single continuous frame. This allows different powertrain and suspension configurations to be developed on the same central structure while keeping mass low and packaging efficient.

Crash structures are placed at the front rear and on the sides of the vehicle as sacrificial components. These structures are designed to deform during impact, absorbing energy before it reaches the monocoque. The passenger cell remains rigid, protecting the occupants and preventing structural failure of the main tub. This approach also allows damaged sections to be replaced without compromising the core structure.



9.3 Structural Designs 419

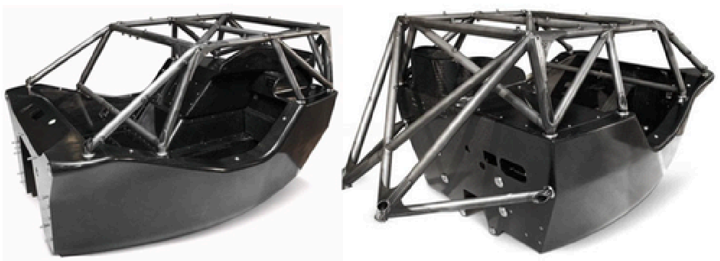
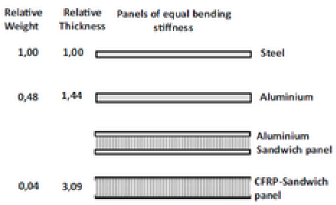


Fig. 9.29 DTM safety cell. (Courtesy of © Audi AG 2018. All Rights Reserved)



Material	Density [kg/m^3]	Tensile Strength [N/mm^2]	Elastic Modulus [N/mm^2]	Relative strength
Steel	7,8	1300	200000	167
Aluminium	2,8	350	73000	124
Intermediate Modulus Carbon Fibers	1,51	2500	151000	1656
High Modulus Carbon Fibers	1,54	1550	212000	1006

Fig. 9.30 Properties of carbon compared to other materials

Overall, this architecture prioritizes stiffness, safety, and modularity. It supports track-level performance while remaining road legal and adaptable to future powertrain and aerodynamic developments.

VEHICLE CONTROL UNIT (VCU)

The Vehicle Control Unit is the central system that coordinates all power, braking, and stability systems. It turns separate components into one controlled vehicle.

Why It Is Needed

- This car uses:
- ICE power
- Front and rear electric motors
- Brake-by-wire
- Regenerative braking
- Active suspension
- The VCU ensures these systems work together, not independently.

Torque Vectoring

Torque vectoring allows the VCU to control torque at each wheel individually.
This:
Improves corner rotation
Reduces understeer
Increases exit speed
Improves stability in low grip
Electric motors enable instant torque adjustments.

Power Blending & Lag Reduction

The VCU:
Fills torque gaps during gear shifts
Assists the engine at low RPM
Smooths acceleration
This eliminates power interruption and improves drivability.

Braking & Regeneration

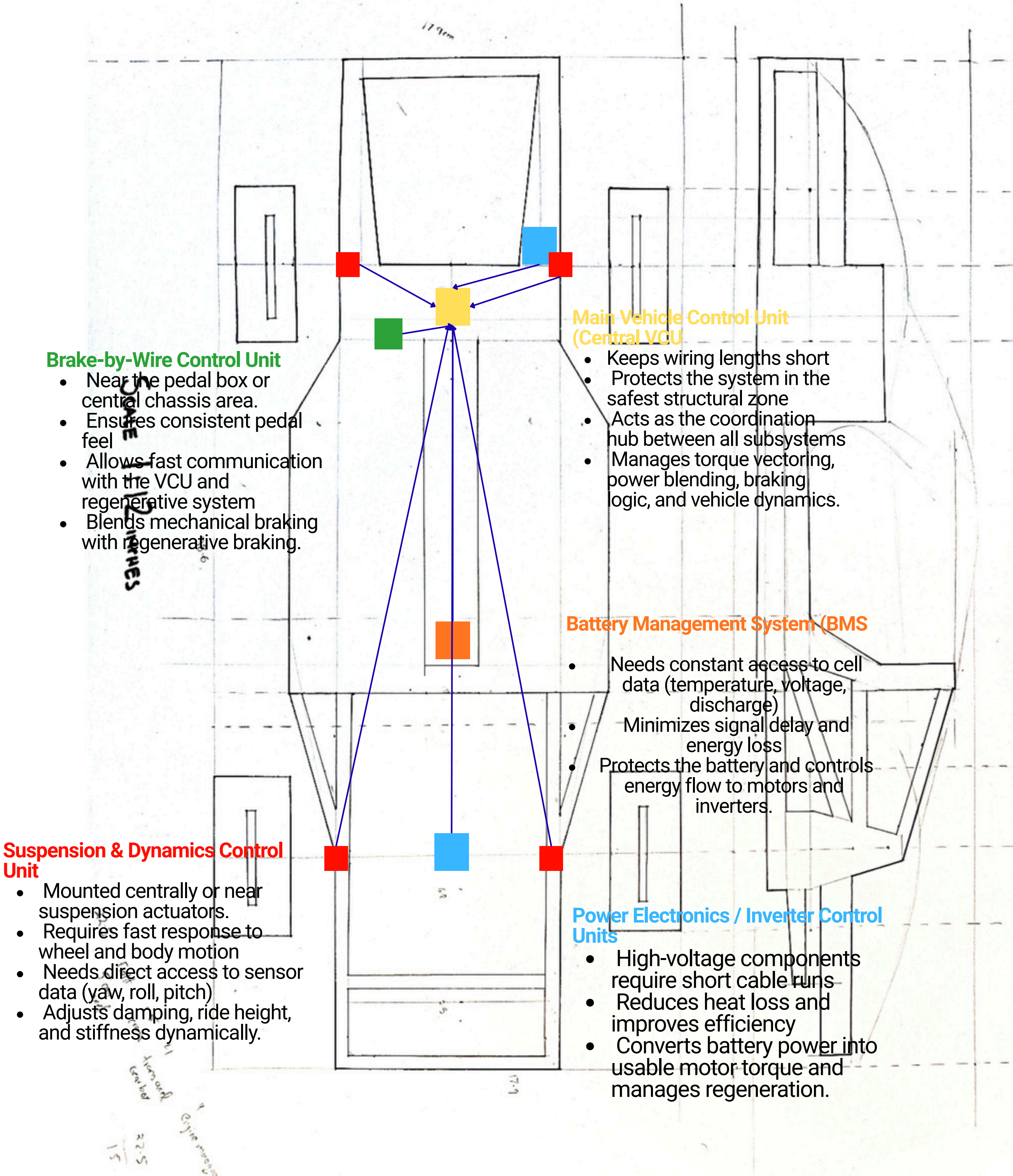
The VCU blends:
Regenerative braking from motors
Mechanical braking from carbon-ceramic discs
This improves efficiency and reduces brake heat.

Vehicle Dynamics Control

The VCU monitors:
Steering
Wheel speed
Yaw, pitch, and roll
It adjusts torque and braking in real time to maintain control.

Road Legal & Canadian Conditions

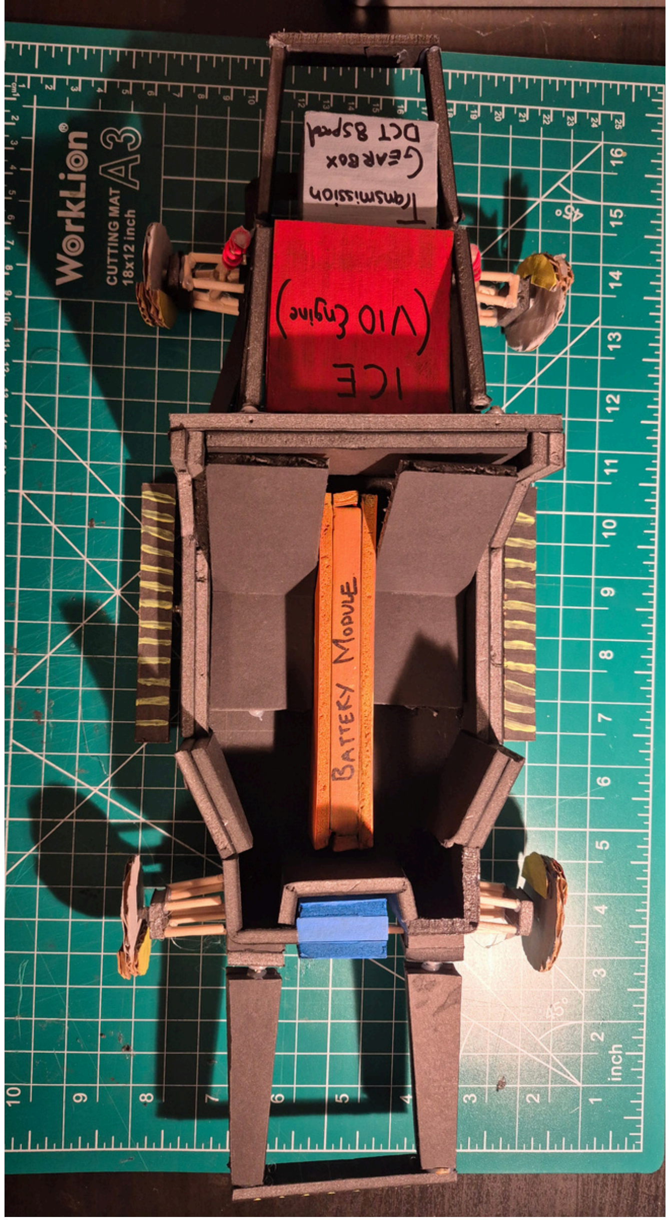
The VCU adapts performance for:
Snow and ice
Cold temperatures
Urban driving
Driving modes allow track and road use from the same system.



After defining the mechanical and control systems, aerodynamics, intake, and cooling become the next step because they shape the final form of the car. These systems translate performance requirements into visible design. Aerodynamics are responsible for generating downforce, reducing drag, and maintaining stability during braking, cornering, and acceleration. They work directly with suspension behavior, torque vectoring, and the vehicle control unit to keep the car balanced at high speeds.

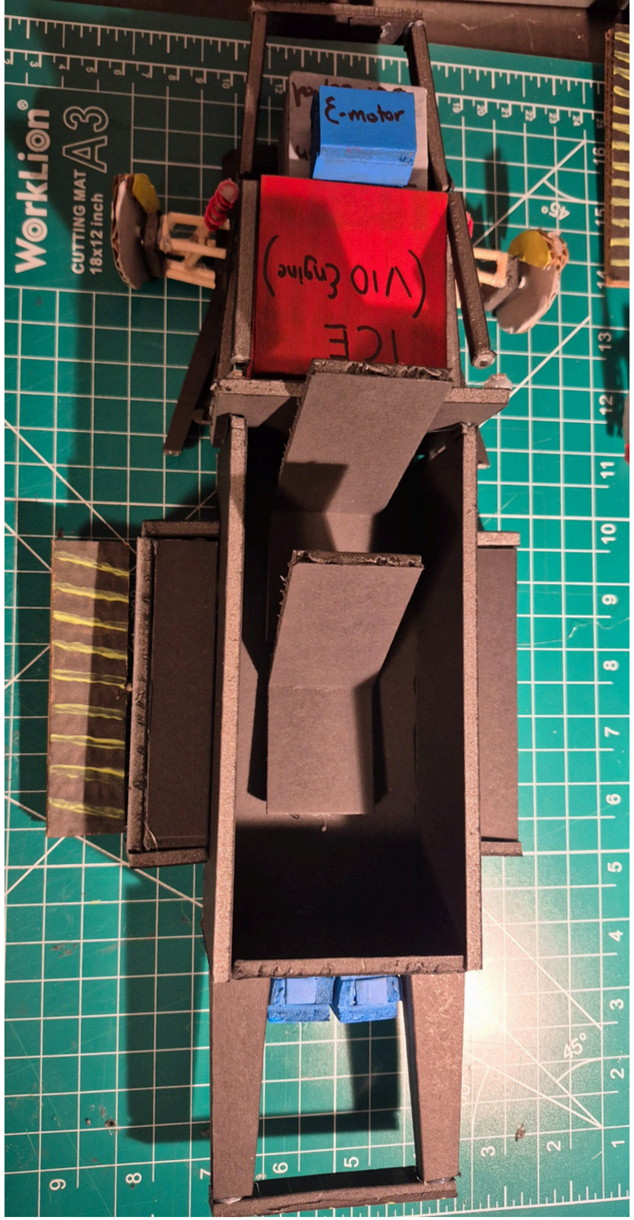
The air intake architecture is designed to supply the engine with clean, high-pressure air while also cooling the electric motors, battery, and power electronics. Intake placement is driven by engine position, thermal loads, and packaging constraints, allowing airflow to move through the car rather than simply around it. The cooling system is treated as a complete system, with separate thermal paths for the ICE and electric components, radiators positioned for efficiency, and controlled airflow exits to manage heat without adding lift or instability.

Together, these systems support both track performance and road legality, ensuring consistent cooling in high-load conditions and reliable operation in Canadian climates. This phase defines the body proportions, intake shapes, and overall silhouette of the vehicle, marking the transition from system architecture to the final hypercar design.



Side-by-Side Seating (2 seats)

Allows a wider cabin, which increases frontal area and slightly raises drag, but improves practicality and weight distribution across the car. This layout is more road-friendly and easier to integrate with standard doors, controls, and safety systems.



Tandem Seating (1+1)

Places passengers in line, significantly narrowing the cockpit and reducing frontal area, which improves aerodynamic efficiency and airflow management. This layout favors extreme performance and allows cleaner body surfaces, but reduces accessibility and everyday usability.

Subsystem	What Exists in Canada Today	Gap	Opportunity Created	Value for Investors	Value for Canada	Availability Status
Carbon Monocoque & Chassis	Aerospace carbon manufacturing, motorsport	No Canadian-owned hypercar monocoque architecture	Develop modular, crash-integrated carbon tubs and	Long-term structural IP, licensing	Moves Canada from supplier to system owner	Partial
Suspension System (Push/Pull Rod + Active Damping)	World-class damper technology, motorsport	No complete Canadian suspension system for hybrid	Canadian suspension IP optimized for track + road legality	Exportable system to EV startups & motorsport	Positions Canada in performance vehicle dynamics	Partial
Battery Pack (High-Discharge Spine Architecture)	Battery research, mining, cell supply	No hypercar-grade high-discharge battery architecture	High-power battery systems for performance EVs	Strategic IP in next-gen EV tech	Links resources → engineering → vehicles	Not Available
Electric Motors & Inverters	Electric motor manufacturing capability, power	No Canadian performance motor package	Torque-vectoring motors optimized for cold climates	Scalable propulsion IP	EV propulsion independence	Partial
Internal Combustion Engine (V10 / V12 Hybrid)	Precision machining, engine components	No Canadian hypercar engine program	Hybrid-optimized ICE developed via partnerships	Halo branding, technology transfer	Engineering prestige & skill growth	Not Available
Transaxle & Gearbox (8-Speed DCT)	Precision manufacturing	No Canadian DCT or hybrid transaxle	Hybrid-ready performance gearbox IP	High-margin drivetrain technology	Completes national drivetrain ecosystem	Not Available
Braking System (Carbon Ceramic + Brake-by-Wire)	Materials research	No Canadian brake system manufacturer	Integrated brake-by-wire + regen braking systems	Safety-critical, licensable IP	Motorsport and EV safety advancement	Not Available
Vehicle Control Unit (VCU & Software)	Strong software, AI, controls talent	No unified high-performance vehicle OS	Torque vectoring, hybrid control, telemetry software	Software scales beyond this car	Positions Canada in vehicle intelligence	Partial
Aerodynamics & Cooling Systems	Aerospace CFD, thermal research	No Canadian-led hypercar aero systems	Active aero and ground-effect cooling IP	Licensing to motorsport and EVs	Aerospace-to-automotive crossover	Partial
Manufacturing & Assembly Model	Tier-1 suppliers, skilled labor	No Canadian hypercar brand integration	Crate-based ecosystem assembly	Low capital entry, fast scaling	Retains high-value manufacturing jobs	Fully Available

CITATION

Frömmig, Lars. Basic Course in Race Car Technology: Introduction to the Interaction of Tires, Chassis, Aerodynamics, Differential Locks and Frame. Springer Vieweg, 2023.

The images and diagrams included in this work are sourced from Lars Frömmig's Basic Course in Race Car Technology. These visuals are utilized to illustrate the technical foundations of my design philosophy, providing a clearer understanding of the systems-level integration I learned from this book.