Topic B — Body Exteriors

Active Aerodynamic Exterior Panels for Hypercars & Ultra-Luxury Vehicles

Document: Topic Document B — Body Exteriors Track

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1. Relationship with the Rules

This document is the **Topic Document for the Body Exteriors Track** of the Rimac Innovation Challenge at FSAA 2026. It is issued under, and forms an integral part of, the **Rimac Innovation Challenge — Official Rules and Framework (FSAA), v1.4** (the "Rules"), in accordance with Clauses 2.3 and 4.2 of the Rules.

Capitalised terms used and not defined in this document have the meaning given to them in Clause 1 of the Rules. In case of any inconsistency between this document and the Rules, the Rules prevail, except where this document expressly addresses a Track-specific point that the Rules leave to the Topic Documents.

2. Topic Overview

Aerodynamic performance is one of the strongest differentiators of a modern hypercar. It governs top speed, high-speed stability, downforce-limited cornering, braking confidence and thermal management. Today, active aerodynamics in production hypercars is implemented almost exclusively through *discrete* moving elements: rear wings on linear actuators, deployable flaps, movable splitters, and active air-brakes. These elements work, but they impose a fixed trade-off between performance and the visual cleanliness expected from an ultra-luxury vehicle, and they leave large areas of the body shell aerodynamically passive.

This Track explores the next step: **exterior panels that actively contribute to the aerodynamics of the vehicle** by changing their shape, curvature or local stiffness in response to vehicle state, rather than by hinging or sliding as discrete parts. The objective is to recover aerodynamic performance from areas of the body that today are passive, while preserving — or enhancing — the design language and craftsmanship of a hypercar / ultra-luxury vehicle.

3. Challenge Objective

The objective of this Track is to propose innovative concepts for **exterior body panels that actively contribute to vehicle aerodynamics**, supported by a credible engineering rationale and a pragmatic cost–benefit view per Clause 5.3(e) of the Rules. Submissions are expected to address both the aerodynamic concept and its physical realisation: actuation, materials, integration with surrounding body structure, durability and control.

4. Suggested Areas of Innovation

Teams are encouraged – but not required – to address one or more of the following areas. The list is indicative, not prescriptive; Teams are free to propose alternative or adjacent ideas within the Track scope:

- Morphing surfaces – panels that change camber, curvature or local section to alter pressure distribution (e.g., variable-camber rear deck, morphing diffuser ramps, deformable splitter lip).
- Flexible composites – structural laminates that can sustain controlled, repeatable elastic deformation while carrying body loads (e.g., bistable composites, compliant mechanisms, anisotropic lay-ups).
- Embedded actuation – actuators integrated within the panel envelope rather than mounted behind it (e.g., shape memory alloys (SMA), shape memory polymers, dielectric elastomers, piezoelectric stacks, miniature electro-hydraulic or pneumatic systems).
- Distributed actuation strategies – multiple smaller actuators driving a continuous surface, instead of one large actuator driving a rigid flap.
- Surface texture or microstructure modulation – reversible changes in surface microgeometry to influence the boundary layer (e.g., riblet-like features that can be activated).
- Coupling with vehicle dynamics state – control logic that links panel deformation to speed, yaw rate, longitudinal acceleration, ride height or downforce demand.
- Integration with thermal management – exterior surfaces that adapt to cooling demand (e.g., active vents that morph the surrounding panel rather than appearing as a separate slot).
- Architectures that hide the active function in the resting state – preserving the visual cleanliness expected of an ultra-luxury vehicle when the panel is not deformed.

5. Track Scope

5.1 In Scope

- Exterior body panels and their structural backing
- Morphing geometry concepts and the kinematics of the deformed shape.
- Actuator concepts integrated within the panel envelope
- Material concepts that enable controlled elastic deformation while carrying body loads
- Sensing and control logic linking aerodynamic state to vehicle dynamics demand.
- Integration with surrounding body structure: panel gaps, attachment points, paint/finish behaviour under deformation.
- Durability and cycle-life considerations
- Safety in failure modes

5.2 Out of Scope

- Conventional discrete moving aero elements that are already well established in current hypercars (e.g., rear wings actuated as a single rigid body, deployable air-brakes), unless used purely as a reference baseline for comparison.
- Interior aerodynamics, HVAC ducting and cabin air distribution.
- Powertrain cooling internals (radiator cores, intercooler design, fan systems).

- Autonomous driving software and decision-making logic.
- Full vehicle-level CFD validation campaigns. Order-of-magnitude aerodynamic estimates supporting the concept are welcome; a complete CFD validation is not expected within the 9-page paper.

6. Submission Requirements

Submissions for this Track must comply with the general submission requirements in **Clause 5 of the Rules**. In particular, the Technical Paper must be strictly less than ten (10) pages (i.e. maximum 9 pages) and address, at a minimum, the elements listed in Clause 5.3 of the Rules.

In addition, and specifically for this Track, the Technical Paper is expected to address:

- The aerodynamic intent: which aerodynamic quantity the proposed system targets (drag, downforce, balance front/rear, yaw stability, cooling-flow control) and the order-of-magnitude benefit claimed.
- The actuation system specification.
- Integration constraints with the body.
- Durability and environmental robustness.
- Safety and homologation considerations: behaviour in actuator failure.

Submission File Naming

Submissions for this Track shall use the following file-naming convention, adapted from typical Formula Student document-naming practice. A consistent file name allows the Organiser to track Submissions reliably across both Tracks and avoids ambiguity in the judging stage:

`RIC2026_BE_<FSAA-TeamNumber>_<UniversityCode>_<TeamName>.pdf`

Where:

1. **`RIC2026`** – fixed prefix identifying the Rimac Innovation Challenge 2026.
2. **`BE`** – fixed track code for this Topic Document (Body Exteriors).
3. **`<FSAA-TeamNumber>`** – the official three-digit team number assigned by FSAA (e.g., 023).
4. **`<UniversityCode>`** – short university acronym used by the Team (e.g., TUM, ETH, UNIZG, FER, UNILJ, POLITO).
5. **`<TeamName>`** – short team name without spaces; use dashes or CamelCase if needed (e.g., FSB-Racing, TUfast, AMZ).

Examples:

6. `RIC2026_BE_045_ETH_AMZ.pdf`
7. `RIC2026_BE_012_UNILJ_Superior-Engineering.pdf`
8. `RIC2026_BE_031_FER_FSB-Racing.pdf`

Teams submitting to both Tracks shall use one separately named file per Track, each carrying the appropriate track code. File names are case-sensitive; please use exactly the casing shown above. Submissions whose file names do not follow this convention may be renamed by the Organiser at intake but will not be rejected on this basis alone.

7. Evaluation Focus

All Submissions are evaluated against the indicative judging criteria in **Clause 6.4 of the Rules**. For this Track, particular attention is given to:

- Credibility of the aerodynamic benefit claim, order-of-magnitude reasoning consistent with established aerodynamics, even when full CFD or wind-tunnel data are not available.
- Physical realism of the actuation and material choices.
- Quality of the integration thinking
- Balance between aerodynamic performance and the visual / craftsmanship language of an ultra-luxury vehicle.
- Honest treatment of durability, safety, manufacturability and homologation constraints, rather than only the headline concept.

8. Live Presentation

Shortlisted Teams for this Track present live at the Event per **Clause 7 of the Rules** (20 minutes per Team, up to 4 Presenters per Team). Teams are encouraged to bring physical mock-ups, deformation demonstrators, material samples, or simulation visualisations where useful, subject to venue and safety constraints.

9. Contact and Clarifications

Questions regarding this Topic Document should be addressed to the Organiser through the contact channel notified to registered Teams. The Organiser may, at its discretion, issue written clarifications applicable to all Teams in this Track.