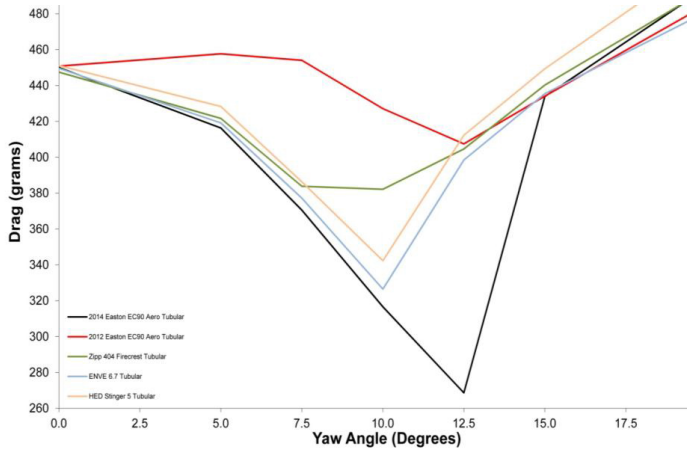
ENGINEERING SPECIFICATION DOCUMENT

EF/EK Civic Time Attack Program
Aero Package & Bodywork Specification



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Contents

1 Purpose

This document defines the **complete aerodynamic package** for the EF/EK Civic AWD time attack build, including:

- Custom front bumper and integrated aero surfaces,
- Front splitter and support structure,
- Canards and front vortex generation,
- Side skirt sealing system,
- Rear diffuser layout,
- Rear wing assembly,
- Custom rear bumper and flow exit management.

The goal is a **balanced, repeatable, structurally safe** aero package that enhances cornering speed, braking stability, and high-speed downforce.

2 System Overview

2.1 Intended Use

- Time attack competition (high-speed, single-driver sessions).
- Aero efficiency prioritized over low-speed drag.
- Car runs hot: high brake and tyre temps expected.

2.2 Aero Package Components

- **Front splitter** with undertray sealing.
- **Twin front canards** (per side).
- **Wide custom front bumper** with:
  - Built-in airflow channels,
  - Brake duct ports,
  - Splitter mounting structure.
- **Side skirts** with low ground clearance and flat bottom tie-in.
- **Rear diffuser** (3–5 element design).
- **Rear wing** with adjustable AoA and chassis-mounted uprights.
- **Custom rear bumper** with diffuser exit management.

3 Aero Performance Targets

3.1 Downforce Goals

Targets based on 150–180 km/h typical time attack corner speeds:

Component	Downforce Target	Notes
Front Splitter	150–250 N	Depends on ride height
Rear Wing	300–500 N	Adjustable, balance tuning
Diffuser	100–200 N	Depends on ramp angle
Canards	20–40 N each	Vortex generation
Side Skirts	Seal efficiency, not force	Reduces floor losses

Table 1: Design downforce targets at high speed.

3.2 Balance Targets

- Front aero balance: **46–52%** depending on track.
- Total downforce goal: **550–850 N at 160 km/h**.
- Aero balance must align with chassis rake & alignment.

4 Front Splitter System

4.1 Design Specifications

- Material: 10–12 mm marine plywood / alum composite / carbon panel.
- Overhang: 50–90 mm beyond bumper.
- Edge radius: 3–5 mm.
- Chassis mounting: **6–8 hard mounts** + front tethers.

4.2 Structural Requirements

- Must support driver weight (for inspection).
- Mounting brackets: 3–4 mm steel or 6061-T6 aluminum.
- Load path must transfer downforce directly to subframe rails.

4.3 Integration with Bumper

- Bumper lower lip shaped to seal splitter–bumper junction.
- Air dam vertical wall height: 70–110 mm.

5 Front Canards

5.1 Geometry

- Two per side recommended.
- Sweep angle: 20–30° upward.
- Length: 160–220 mm.

5.2 Purpose

- Generate front-end downforce.
- Create high-energy vortex to seal splitter edges.

- Improve turn-in response at high speed.

6 Custom Front Bumper

6.1 Functional Features

- Large central intake for radiator.
- Dual brake duct inlets aimed at caliper bridge.
- Integrated splitter attach flange.
- Side "air curtain" channels optional.

6.2 Material

- Fiberglass, carbon, or ABS.
- Thickness: 3–5 mm panels.

7 Side Skirts

7.1 Design Parameters

- Material: aluminum or carbon.
- Height: 40–60 mm off ground.
- Flush mount to chassis pinch weld.
- Tie-in to flat undertray (optional).

7.2 Purpose

- Reduce lateral air intrusion under car.
- Increase diffuser performance.
- Stabilize aero balance at high speed.

8 Rear Diffuser System

8.1 Design Specifications

- Ramp angle: 7–12°.
- Length: 600–900 mm depending on bumper.
- Channels: 3–5 vertical strakes.
- Leading edge tied to flat floor.

8.2 Mounting Requirements

- Must mount to rear subframe or frame rails.
- 4–6 mounting points minimum.
- Panels must resist flutter at 200 km/h.

9 Rear Wing Assembly

9.1 Geometry

- Wing span: 1200–1500 mm.
- Chord: 200–300 mm.
- AoA Range: 0–15°.

9.2 Mounting

- **Chassis-mounted** recommended.
- Uprights: 5–8 mm aluminum or steel.
- Endplates: 2–3 mm aluminum or carbon.

9.3 Purpose

- High rear stability in sweepers.
- Balance for aggressive front aero.

10 Custom Rear Bumper

10.1 Functional Features

- Enlarged diffuser exit zone.
- Smooth flow path from rear wheels.
- Integrated venting if needed to reduce drag.

10.2 Material

- Fiberglass or carbon composite.
- Reinforced mounting zones at diffuser interface.

11 Material Selection

Component	**Material**	**Thickness**
Splitter	Marine plywood / alum composite	10–12 mm
Canards	Carbon fiber	2–3 mm
Side Skirts	Aluminum / carbon	2–3 mm
Diffuser Panels	Alum/composite	2–4 mm
Wing Endplates	Alum/carbon	2–3 mm
Bumpers	FRP/carbon	3–5 mm

Table 2: Material recommendations for aero package.

12 Structural Mounting Requirements

- Use **M6–M8 grade 10.9** hardware for aero mounts.
- All load paths must go to chassis rails/subframes.
- Avoid attaching major aero to thin bumper plastic.
- Add reinforcement plates behind bumper skin.

13 Aero–Chassis Integration

- Rake must remain 5–15 mm for splitter effectiveness.
- Rear wing AoA tuned based on understeer/oversteer behaviour.
- Diffuser requires minimum 70–80 mm rear ride height.

14 Future Revisions

- CFD analysis and simulated downforce numbers.
- Add CAD drawings of splitter, canards, diffuser.
- Add load testing results (static and dynamic).
- Add track testing data for aero balance.