

UVic Hybrid -Rear Wing Manufacturing

The rear wing was the final addition to the aerodynamic package and the most critical for generating downforce, thanks to its multi-element design. Each wing element follows an airfoil geometry, chosen for its low drag coefficient and ability to produce efficient downforce at various angles of attack. Angle of attack optimization was conducted by the team lead, [R.Turner](#), using simulation and design iteration.

Design Requirements:

- Develop a rear wing comprising three airfoil-shaped elements to complete the aerodynamic package.
- Ensure a uniform surface finish to minimize drag and maintain aerodynamic efficiency.

Tools Used:

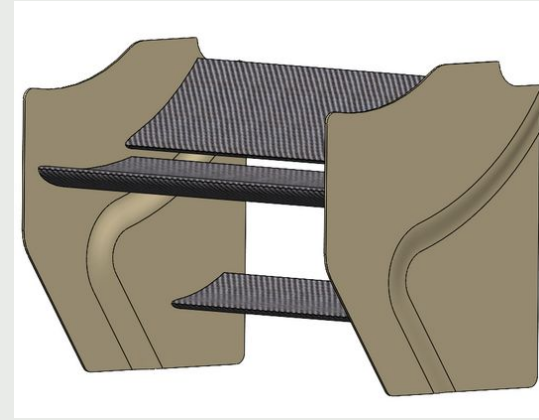
- Hot Wire
- Resin Infusion
- 3D printing

Approach:

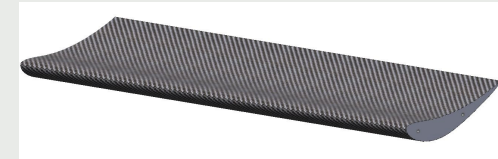
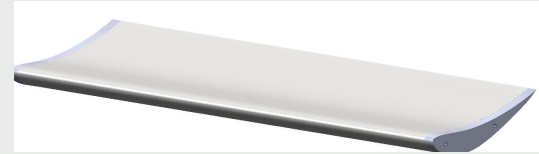
- EPS foam (mould)
- 3D printed Nylon wing inserts
- Eppler 420 airfoil profile

Result:

- Surface imperfections (e.g., bubbling) were observed on the wing element due to inadequate vacuum sealing.
- The part was not used in competition, as poorly performing aerodynamic components can be more detrimental than having none at all.



[8] [R.Turner](#), Rear wing



[8] [R.Turner](#), Wing Element with mounts

UVic Hybrid - Carbon Fiber Wing Element

Fabricate a rear wing element to increase downforce and vehicle stability at high speed while maintaining a low drag profile.

Materials:

- 88g spread-tow carbon fiber
- 2x2 Twill Carbon Fiber Cloth
- VB160 vacuum bagging film
- Mylar film (glossy finish)
- EPS core milled via CNC
- 1 layers - 88g spread-tow carbon fiber in wet layup
- 3 layers - 2x2 Twill Carbon Fiber Cloth
- 3D printed wing inserts (mounting)
- Pump



[12] CF wing element materials

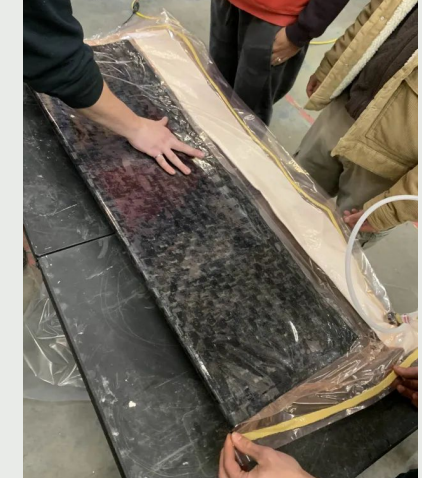
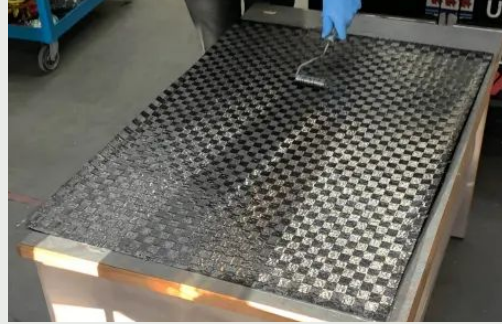
UVic Hybrid - Vacuum Resin Infusion

Wet layup Process:

1. Lay Mylar release film over EPS foam
2. Apply LAM226 Resin over Mylar surface
3. Lay 88g spread-tow Carbon Fiber Weave over resin
4. Lay reinforcement (2x2 Twill Carbon Fiber Cloth)
5. Apply LAM226 Resin over reinforcement
6. Use roller over weave to ensure full reinforcement saturation
7. Repeat 2x
8. Encapsulate the mylar tightly around the core

Vacuum Sealing Process:

1. Secure the leading edge of the wing to the vacuum bag fold.
2. Carefully eliminate all creases and folds around the part.
3. Apply VB160 vacuum bag film and seal with bagging tape.
4. Draw vacuum.



[13] CF wet layup process

UVic Hybrid - Result/Overview

Category	Observation	Improvements/ Recommendations
Vacuum seal	Minor vacuum leak caused trapped air and surface imperfections	Apply additional sealant at complex corners to improve vacuum seal integrity
Resin Distribution	Excess resin pooling led to uneven saturation	Reduce resin pooling with tighter spread control
Mold Release	Mold was partially damaged during part removal	Use wax paper or release film (e.g., Mylar) to ensure clean release and protect the mold
Seam Quality	Creases and folds in vacuum bag affected surface finish	Incorporate gusset folds and wider masking tape for cleaner seams and smoother surfaces
Tooling	Frayed edges and jagged cuts during prep	Use sharper scissors and wider masking tape to improve cut accuracy and edge quality



[14] CF final result

The resin infusion of carbon fiber can produce exceptionally good results. The wing produced will not be used in competition due to surface imperfections and limited time available for rework before the competition event.