# UVic Hybrid - Rear Wing Manufacturing

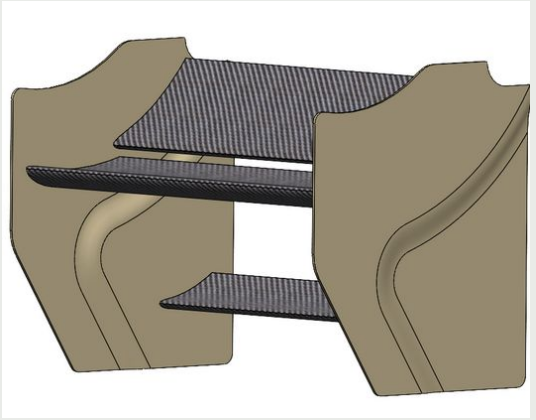
The rear wing was the final addition to the aerodynamic package and the most critical for generating downforce, thanks to its multi-element design. Each wing element follows an airfoil geometry, chosen for its low drag coefficient and ability to produce efficient downforce at various angles of attack. 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

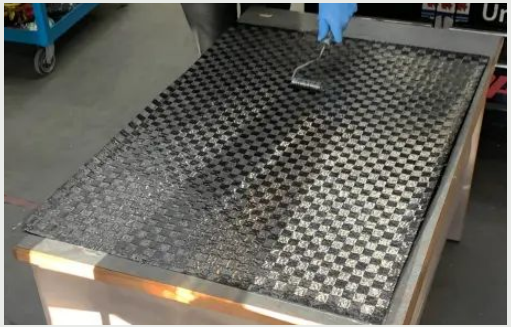
# UVic Hybrid - Vacuum Resin Infusion

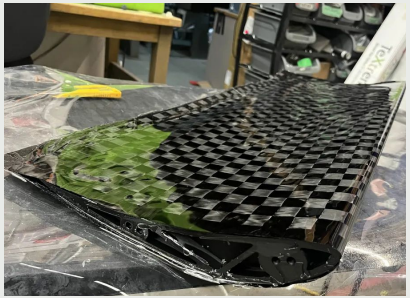
**Wet layup Process:**

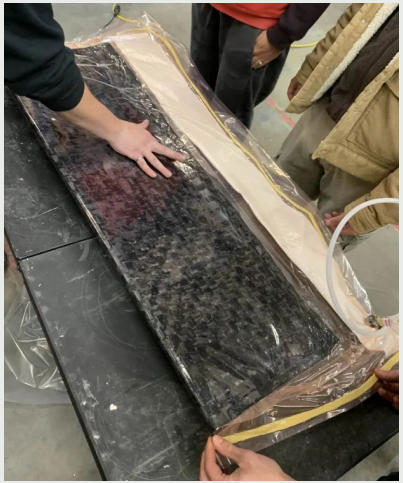
1. Lay Mylar release film over EPS foam
2. Apply LAM226 Resin over Mylar surface
3. Lay 88g spread-tow Carbon Fiber Weave over resin
4. Lay reinforcement (2x2 Twill Carbon Fiber Cloth)
5. Apply LAM226 Resin over reinforcement
6. Use roller over weave to ensure full reinforcement saturation
7. Repeat 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 baggin 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 will not be used in competition** due to **surface imperfections** and limited time available for rework before the competition event.