

Lightweight & Strong

Optimized TRAK 2.0 Kayak Rib Design Makes a Difference
On and Off the Water



TRAK Kayaks is a Calgary, Alberta, manufacturer of durable, lightweight and performance-driven portable kayaks. As the company pursued its goal of creating the ultimate touring kayak, it embarked on the design of its second generation kayak, TRAK 2.0, with the assistance of the Composites Innovation Center (CIC).



**Composites
Innovation Centre**

The CIC is not-for-profit corporation in Manitoba that supports the innovative research, development and application of composite materials and technologies for manufacturing industries.

Challenge

The challenge was to redesign the existing heavy, solid polyurethane interior ribs to reduce the weight of the Kayak. To ensure both the performance and manufacturing price point were maintained, the 2.0 design would have to meet strict cost targets and structural performance requirements.

The goal was to create a kayak that was light and compact enough to carry, could support a payload of up to 350 lbs, and exceeded expectations in the water. It could not compromise performance or increase cost.

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Success at a Glance

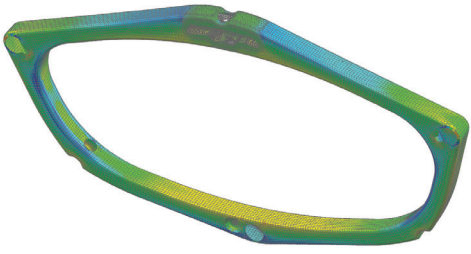
- **Reduced kayak weight by 10 lbs**
- **Optimized structural design for strength-to-weight ratio**
- **Exceptional in-the-water performance**

Solution

The CIC used Siemens NX to study the feasibility of different concepts and alternative materials. Based on their results, the rib was redesigned out of hollow carbon fibre. Co-moulded 3D printed inserts were added so that the existing components could be fastened to the inside of the kayak.

The CIC performed a complete virtual analysis of the various design concepts and optimized the design using NX automated tools for combining 2D and 3D meshes. To ensure the structure met the stress requirements, they reviewed the laminate in NX Composite Laminates on a ply-by-ply basis using Hoffman ply failure theory.

Carbon Fibre 6 mm - opposite.dimple_sml2 - Solution 2_kayak2 Result
Subcase - State: Load 1, Start: Step 1
Ply Stress - Classical, Worst Ply: Ply 1 Mid
Min: -2.08E+004, Max: 2.12E+004, Units = lbf/in²(psi)
Contour: Nodal
Deformation: Displacement - Nodal Magnitude



Results

The final optimized rib design features a simplified geometry that ensures a seamless interface with the existing kayak connection points and maximizes the interior legroom.

The carbon-fibre ribs contribute to the TRAK 2.0's astounding strength-to-weight ratio and its exceptional performance in the water by making the kayak stiffer and more responsive than the original TRAK design with the plastic ribs.

Along with the new lightweight carbon-fibre ribs, the coaming latch mechanism was redesigned to reduce weight and cost. At 42 lbs, the TRAK 2.0 weighs 10 lbs less than the original TRAK kayak. When packed, it fits into a small, easy-to-carry bag.

Siemens NX made it possible for the CIC to help TRAK Kayaks stay within their cost targets and exceed performance expectations to create the ultimate adaptable, lightweight, and durable touring kayak.

About Maya HTT

- Industry leading software developer and provider of engineering services in CAE, Product Lifecycle Management (PLM) and Datacenter Infrastructure Management (DCIM)
- Extensive experience in design, analysis, systems integration and deployment
- Specializing in mechatronics, thermal, fluid and structural analysis, and composites
- Technological partner, software editor, and provider of Siemens CAD/CAE/PLM solutions for more than 30 years
- Worldwide customer technical specialist support

