Lightweight Road Wheel Development

Material & Design Expertise

Lancer Systems is dedicated to the development of highly differentiated, engineered solutions based on materials technology and our understanding of customer need. We derive a competitive advantage through partnering with market leaders to develop reliable solutions that reduce risk and are robust at service entry. We understand the demand for weight reduction in today's defense platforms and have developed new materials and applications of our existing materials in response. Our engineered thermoplastic-composite solutions help achieve new weight goals without compromising performance levels. Our engineered thermoplastic and thermoplastic-composite components are applied to a variety of structural and nonstructural applications in UAVs, large gun systems, small arms and combat vehicles as well as other defense-related applications.

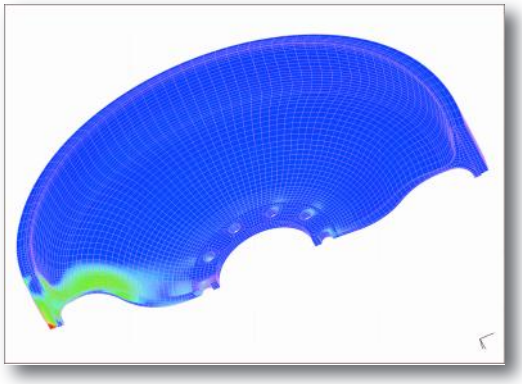
Partnership & Collaboration

We continue to seek new ways to add value for our customers through material expertise, product innovation, testing and risk sharing. In 2004 we were approached by a combat vehicle manufacturer and asked to help reduce the weight of their armored vehicles. Focusing on their APC, the OEM elected to reduce the weight of the wheel, a major component, without reducing the functionality, durability, reliability or safety of the vehicle. Their engineering center, having collaborated with us in the past, turned to us for help in achieving their weight-reduction goal. After some discussions and reviews we agreed to develop a lightweight, composite wheel. This project required a combination of our advanced material and design capabilities with the OEM's knowledge and field experience of their vehicles. Major barriers had to be considered, such as cost, manufacturability, prototyping, tooling, maintenance and refurbishment criteria.

Lightweight Road Wheel

Our engineers have designed a revolutionary new road wheel concept —a bolt-on replacement for existing wheels with a substantial weight savings. The new road wheel concept combines engineered-thermoplastic composites, rubber and metal to form a robust wheel solution as strong and durable as the existing aluminum road wheels.

- 41 percent lighter than current aluminum wheel
- 192 kg (422 lbs) weight savings per vehicle
- Retrofits existing vehicles



Benefits—Survivability and reduction of logistics footprint. Reducing vehicle weight increases engine efficiency, thus reducing the fuel consumption and logistical footprint. Additionally, vehicle survivability is enhanced by allowing an equal weight of armor, blast protection or ammunition to be added to the vehicle. For example, the following may be included:

- 270 rounds for the of 25 mm cannon rounds, or
- 351 rounds of 40 mm automatic grenades, or
- 1,735 rounds for the .50 cal machine gun, or
- 7,540 rounds for the 7.62 mm machine gun, or
- 15,670 rounds of 5.56 mm for ground troops, or
- 228 liters of diesel fuel, or
- 192 kilos of armor or blast protection

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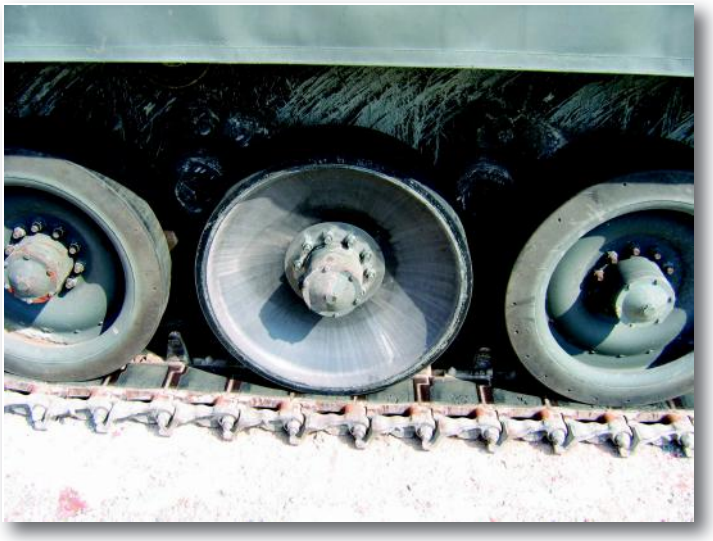
Development and Testing

The road wheel is a hybrid glass and carbon fiber composite and steel design that offers a substantial weight advantage over the existing steel or aluminum designs. The current prototype wheel set weights 59.4 lbs (27 kg), offering a weight savings of 41% over comparable aluminum wheel designs.

The wheel's body is glass and carbon fiber composite that utilizes a steel center plate, tire interface and lug supports while the tire utilizes the same base rubber chemistry as the current road wheels. The wheels have gone through extensive testing, including dynamic load, static load, center wear guide tests utilizing test facilities at Red River Army Depot, Michigan Technological University and others. The latest series of tests mounted two wheel sets on a 27 ton vehicle and successfully completing a series high and low speed road and rough terrain courses. The wheel is in the final stages of development and testing.



Lancer Systems

Lancer Systems is a world class team of engineering and manufacturing experts that are committed to developing and delivering innovating material solutions for tomorrow's most advanced warfighter systems. Lancer has the capability to design and manufacture elastomers, plastics, composites and optical connectivity products, as well as apply assembly and logistics expertise. Lancer fills the gap between prime contractor and component manufacturer. Our customer-centric philosophy is all about collaborative business relationships, adding value and delivering quality product on time.

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