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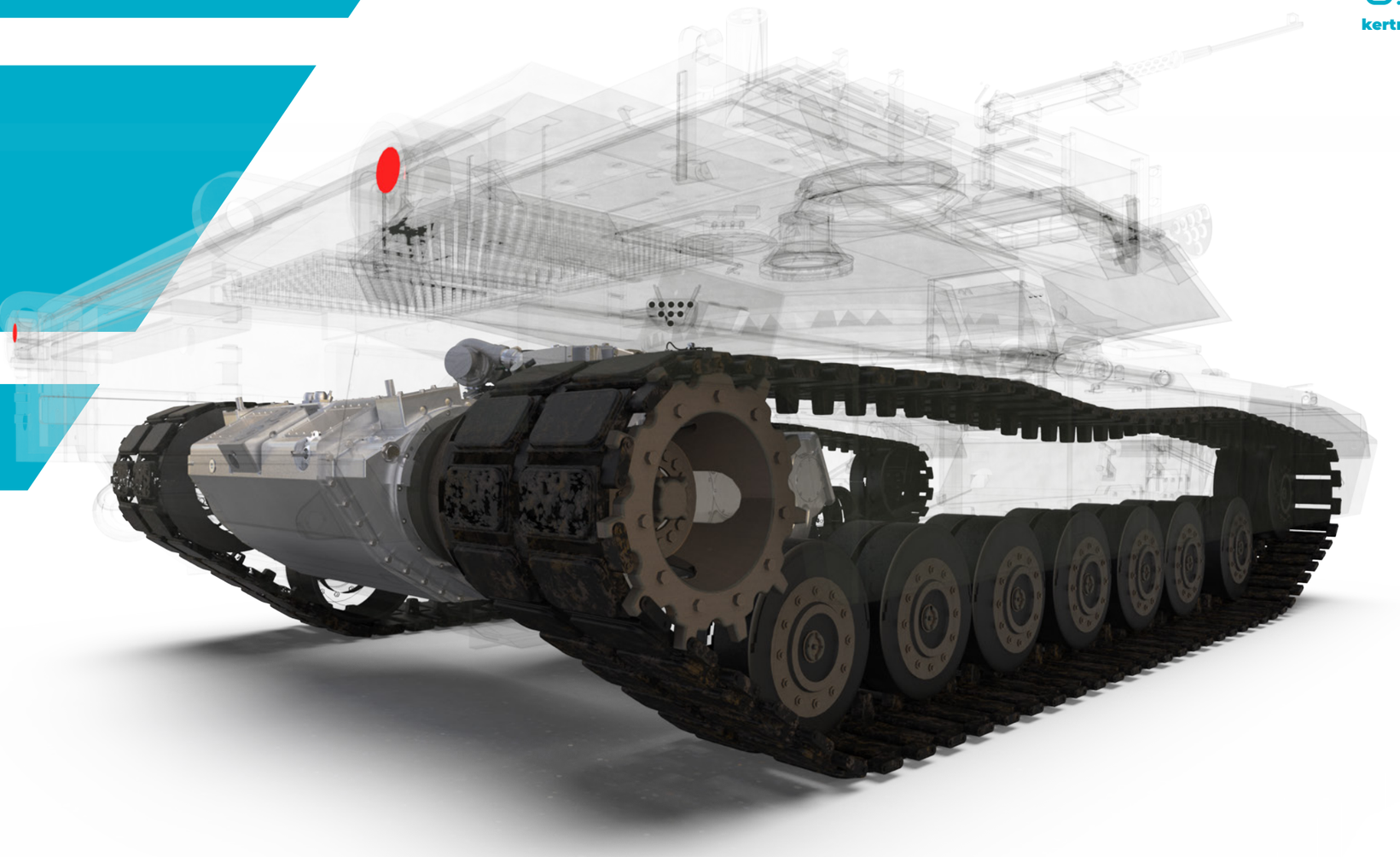
GEMINI



CROSS-DRIVE TRANSMISSION
SYSTEMS FOR TRACKED VEHICLES

KTR
KER-TRAIN RESEARCH

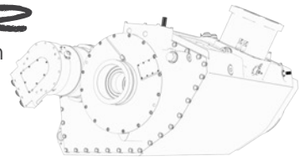
KER-TRAIN PROUDLY PRESENTS GEMINI

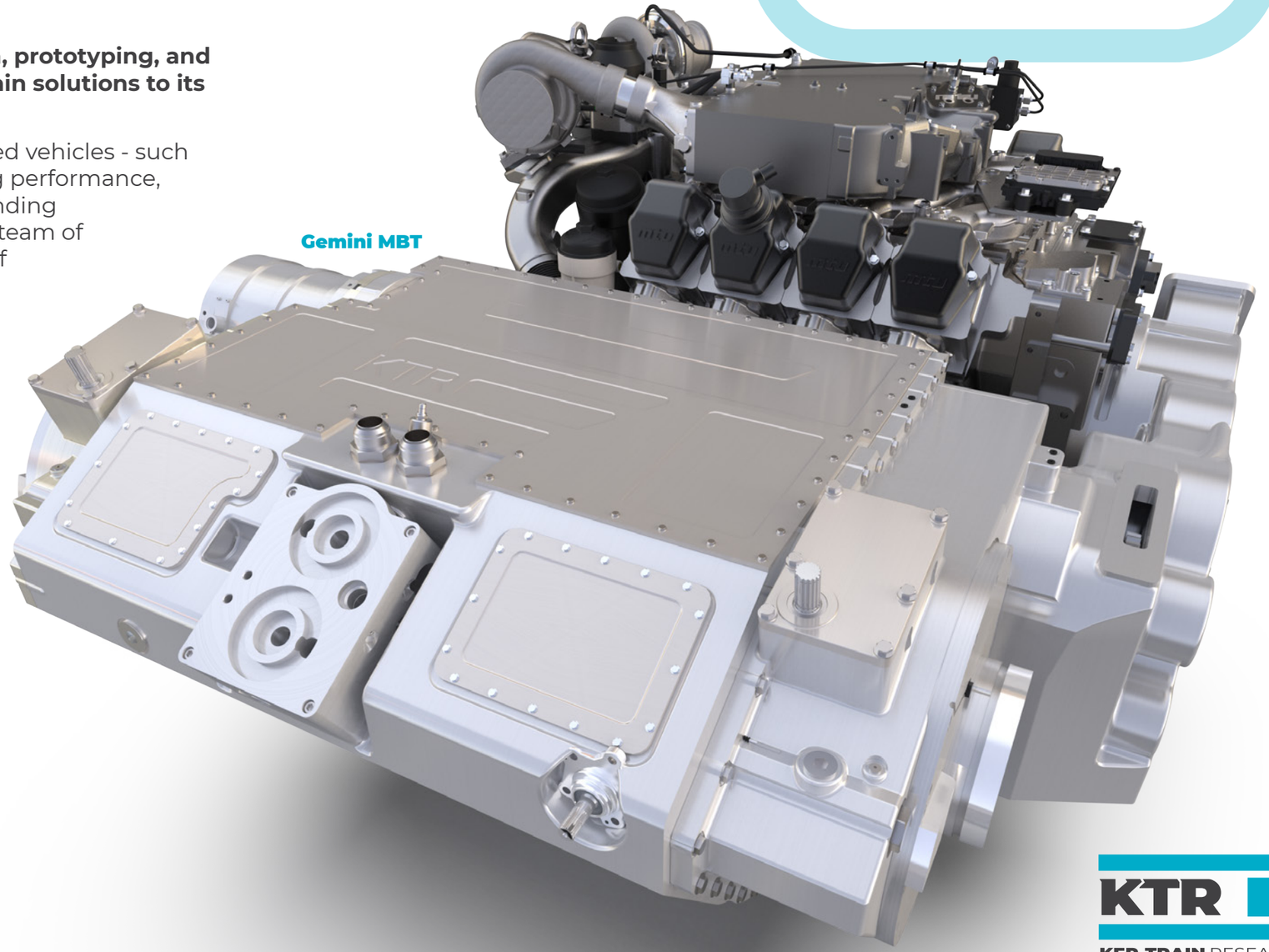
With a long history of high-quality powertrain design, prototyping, and testing, KTR delivers end-to-end specialized powertrain solutions to its clients.

Gemini offers significant benefits for designers of tracked vehicles - such as tanks and armored personnel carriers – by enhancing performance, durability, and operational efficiency in the most demanding environments. At the core of our success is a dedicated team of drivetrain engineers and specialists, bringing decades of expertise to the development of advanced Binary Logic transmissions. Compact and versatile, these transmissions integrate seamlessly with any propulsion system, including hybrid and electrified options.

Through strategic partnerships across the globe, Ker-Train ensures that our solutions consistently meet the rigorous standards required by defense forces worldwide. Ker-Train is at your service. Our unwavering commitment to excellence drives us to push the boundaries of extreme-duty drivetrain technology every day.

MITCH KERR
President, Ker-Train Research





Gemini MBT

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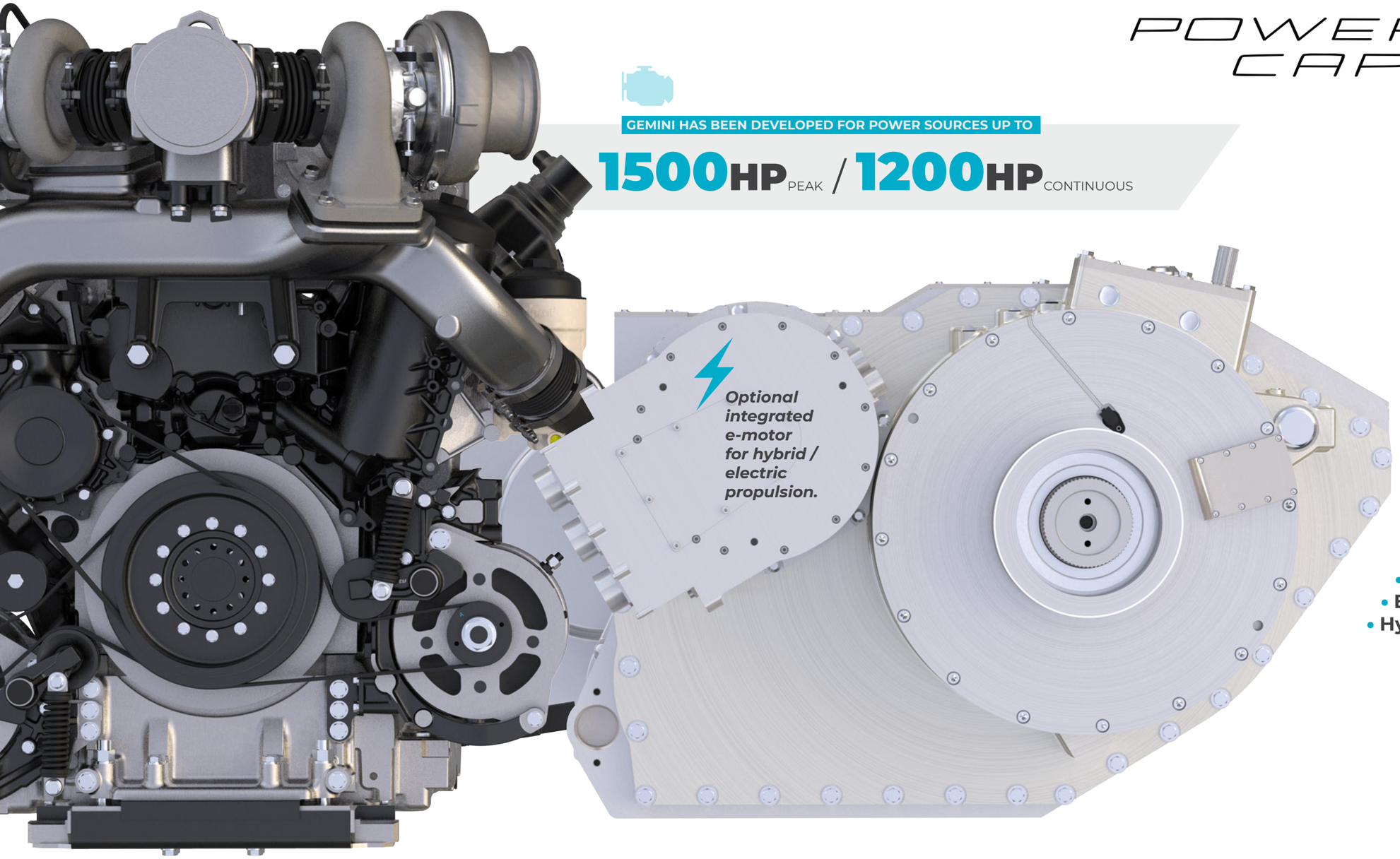
POWER CAPACITY

GEMINI HAS BEEN DEVELOPED FOR POWER SOURCES UP TO

1500HP PEAK / **1200HP** CONTINUOUS



Full Power Spectrum

The compact Gemini platform, with its unique core gear and clutch technologies and architecture, can be simply scaled and configured to support any propulsion power needed for a given vehicle.

- **Diesel / Gas Engines**
- **Gas Turbine**
- **Electric-only systems**
- **Hybrid**

GEMINI

*Scaleable to higher input power requirements. Contact Ker-Train to discuss your project.

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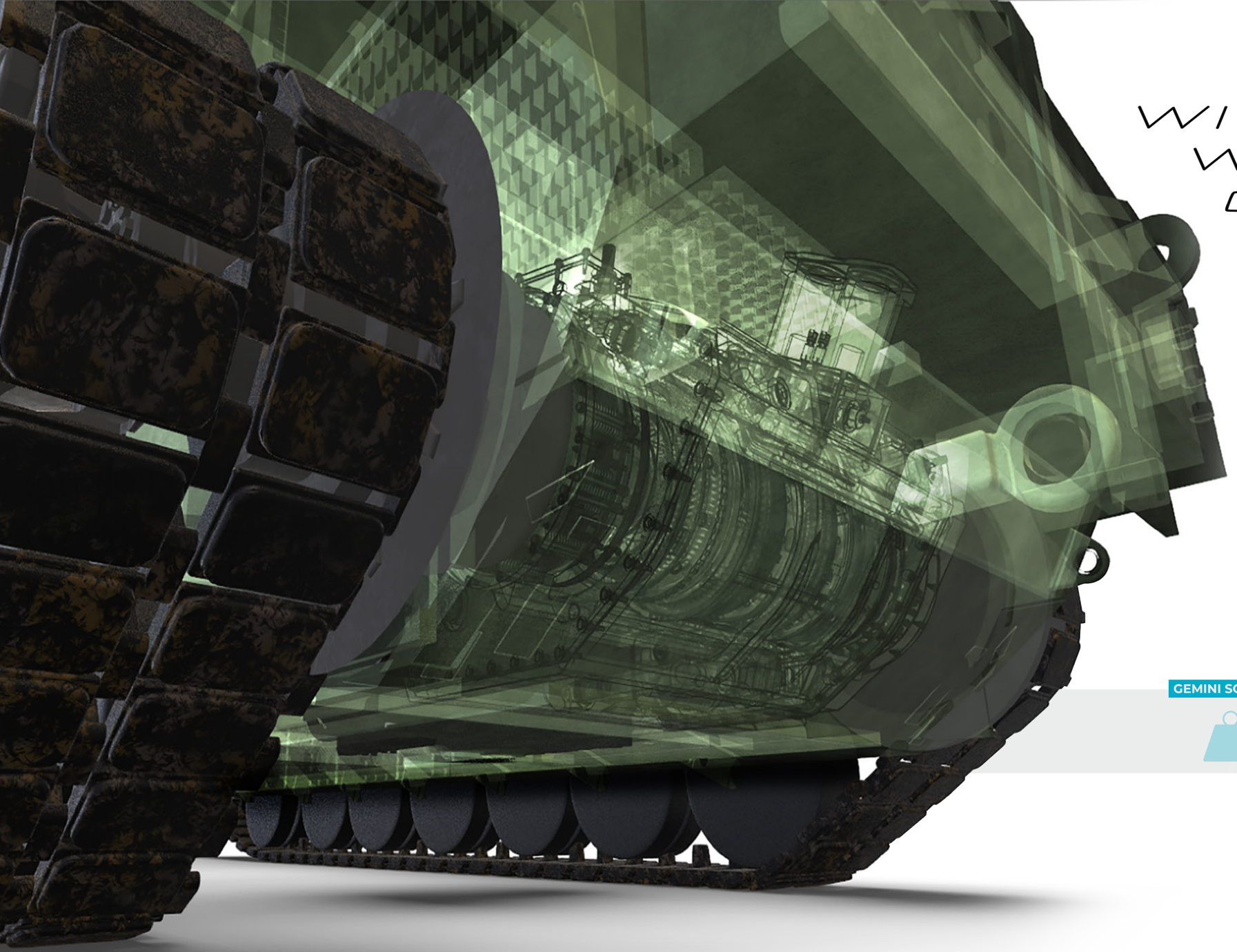

WIDE-RANGE WEIGHT CAPACITY

Complete Vehicle Flexibility
The Gemini platform can be simply scaled and configured to support all tracked vehicle classes.

- **Lightweight / Unmanned Vehicles**
- **Middleweight / Troop Carriers**
- **Heavyweight / Main Battle Tanks**

GEMINI SOLUTIONS HAVE BEEN DEVELOPED FOR VEHICLES

UP TO **80 TONS**US

GEMINI

**Scaleable for any vehicle weight - Contact Ker-Train to discuss your specific project.*

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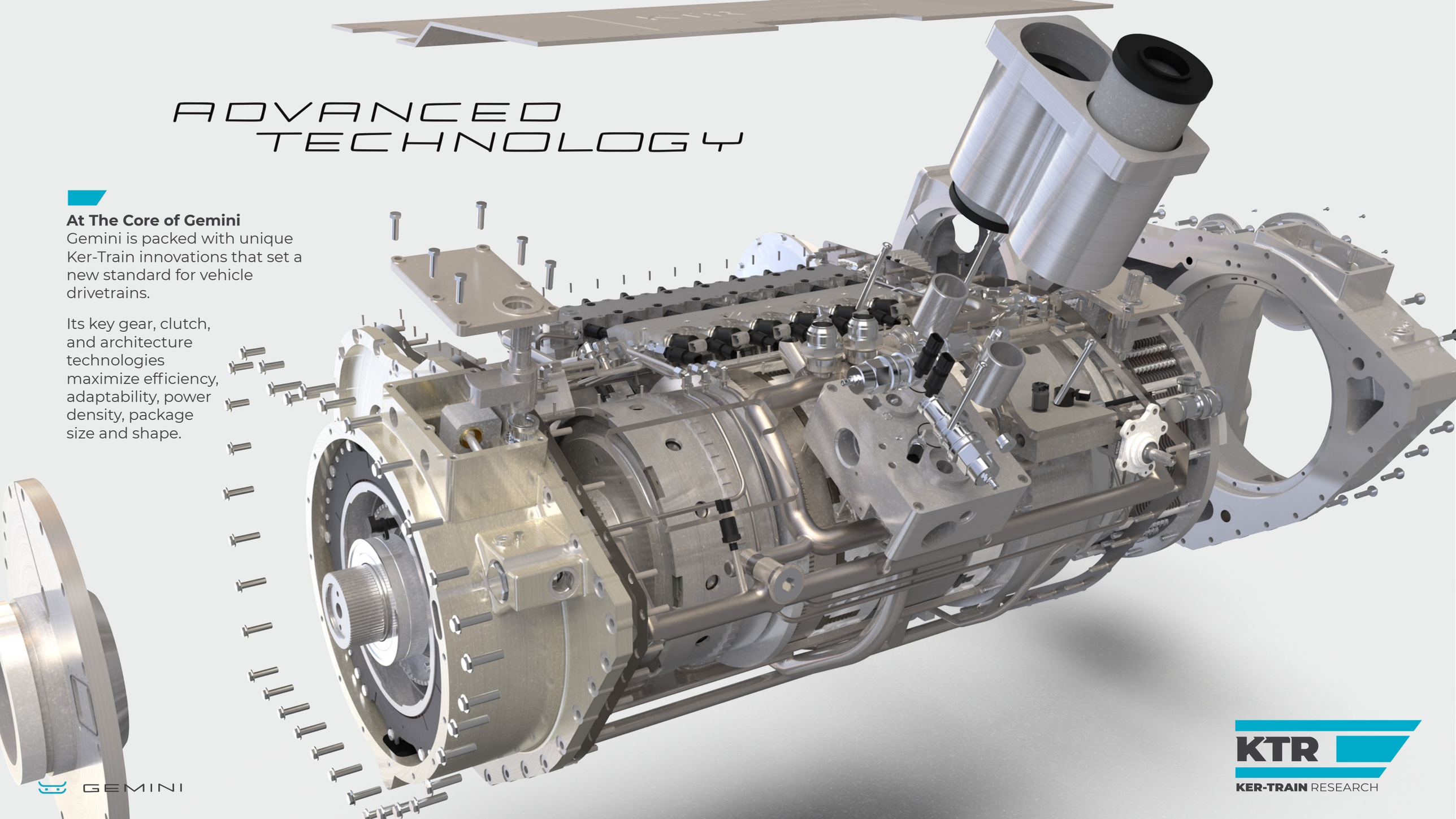
ADVANCED TECHNOLOGY

At The Core of Gemini
Gemini is packed with unique Ker-Train innovations that set a new standard for vehicle drivetrains.

Its key gear, clutch, and architecture technologies maximize efficiency, adaptability, power density, package size and shape.



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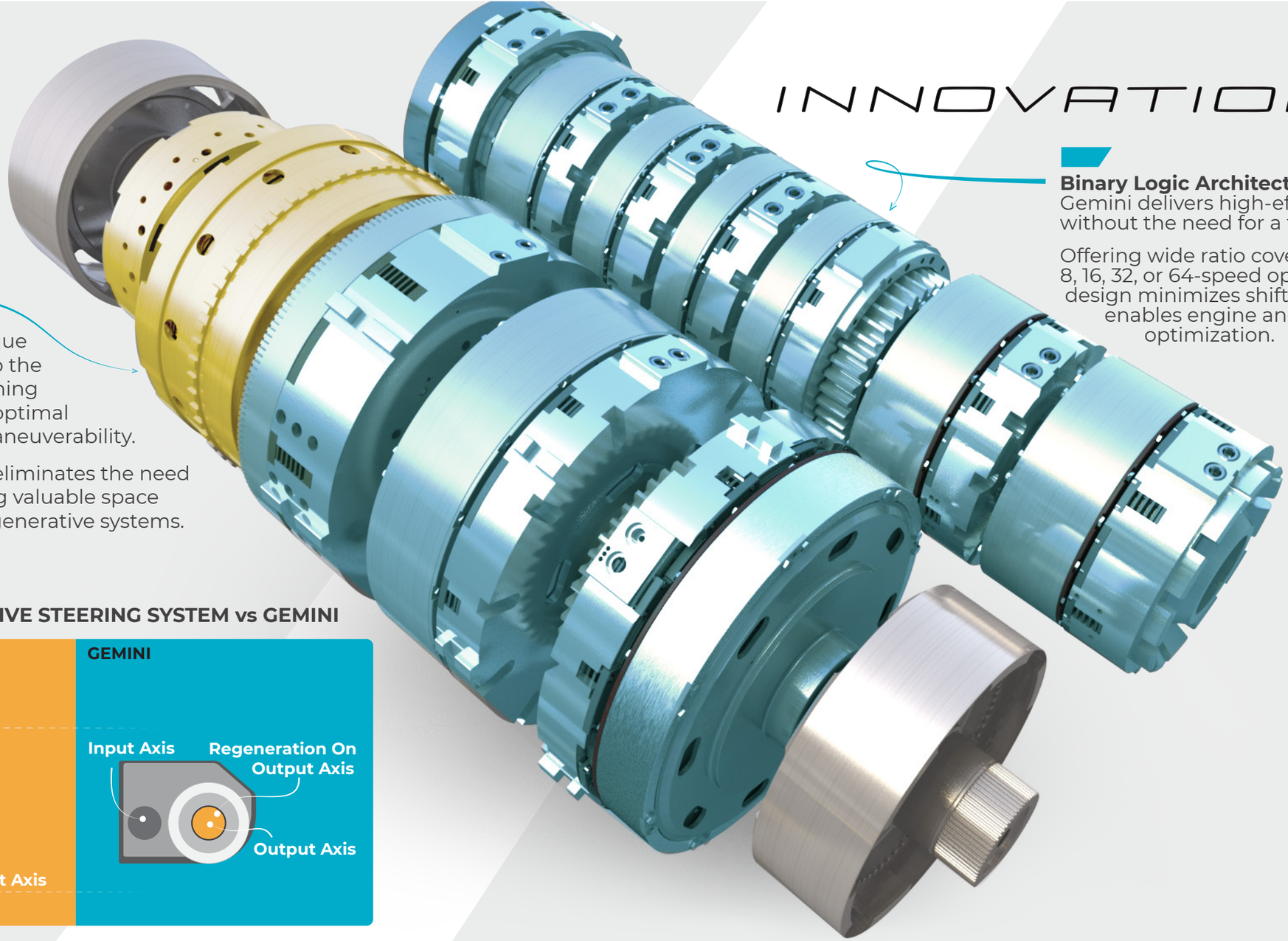
INNOVATION



Regenerative Steer Differential
Gemini efficiently transfers negative torque from the inner track to the outer track during turning maneuvers, ensuring optimal vehicle control and maneuverability.

It's single-axis design eliminates the need for a cross-shaft, saving valuable space compared to other regenerative systems.

Binary Logic Architecture
Gemini delivers high-efficiency propulsion without the need for a torque converter.

Offering wide ratio coverage across 8, 16, 32, or 64-speed options. This quasi-CVT design minimizes shift disturbances and enables engine and motor speed optimization.

TYPICAL REGENERATIVE STEERING SYSTEM vs GEMINI

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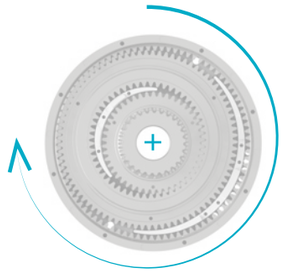
STRENGTH

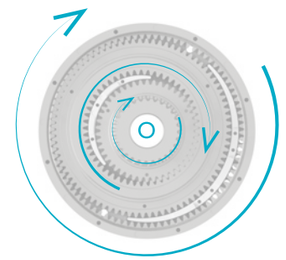
Coplanar Gearing

Gemini's Coplanar gearing system is a compact, efficient alternative to traditional planetary gearsets, offering customizable ratios from 1.1:1 to over 10:1 - enhancing power density and maximizing the propulsion benefits of the architecture.

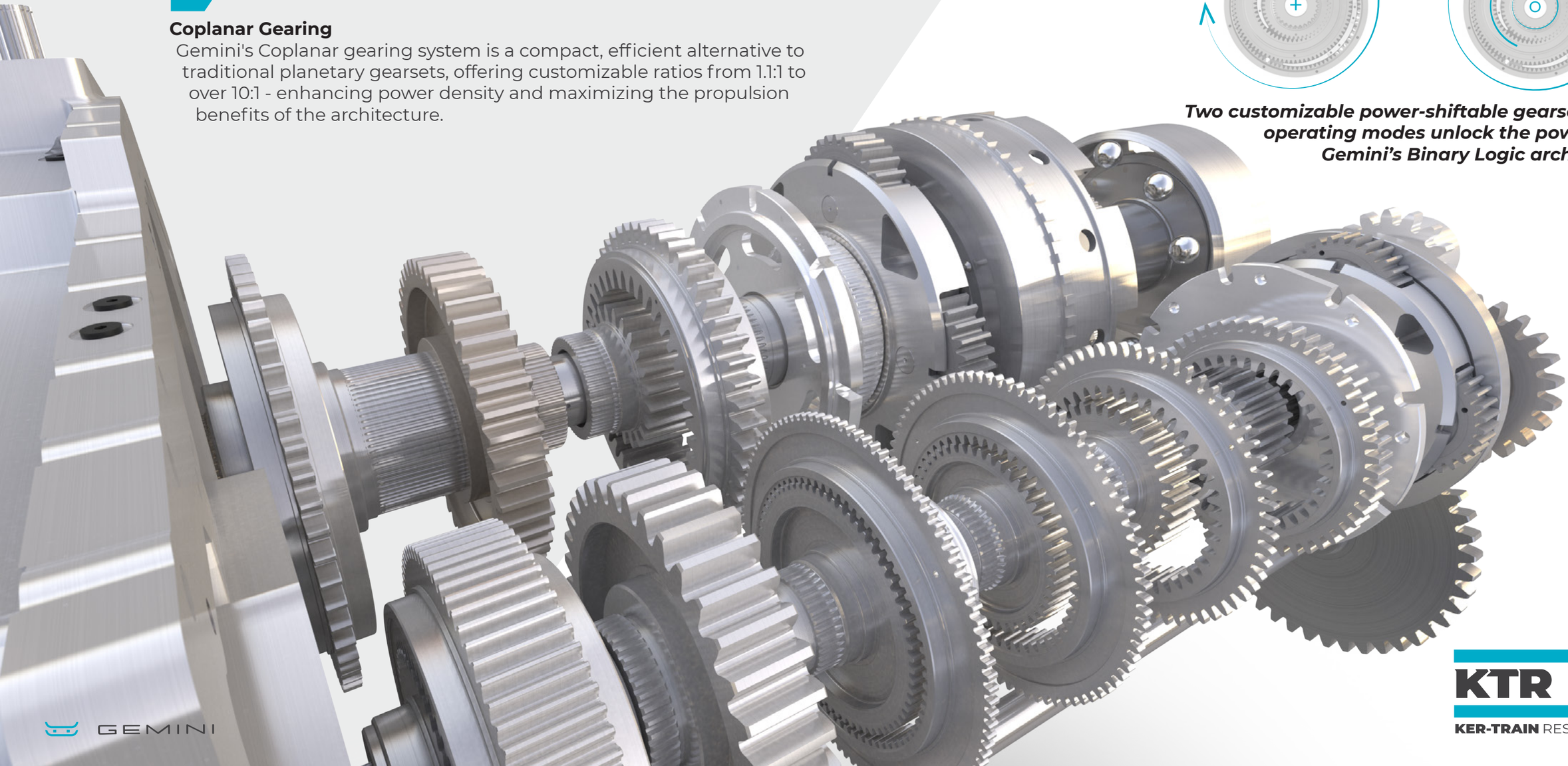
Direct Drive Mode



Ratio Drive Mode



Two customizable power-shiftable gearset operating modes unlock the power of Gemini's Binary Logic architecture.



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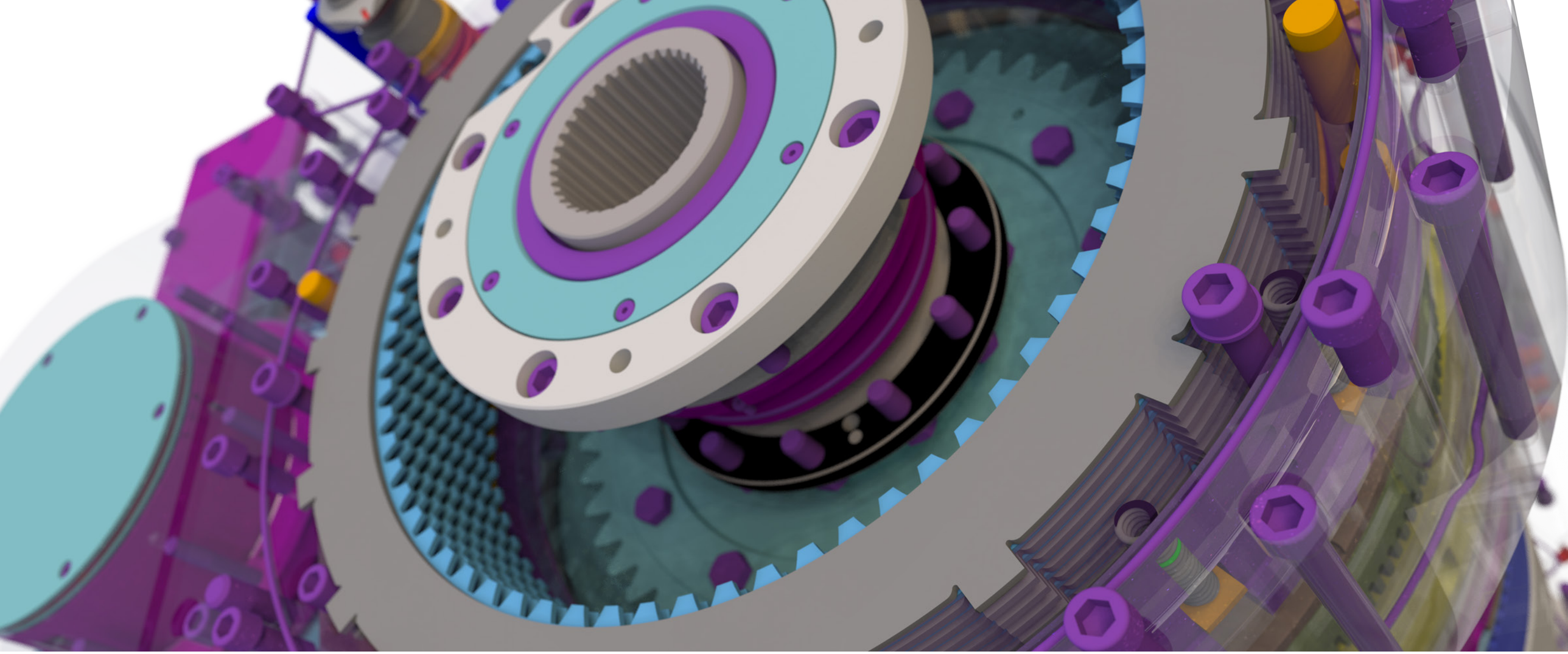

FULLY INTEGRATED

Advanced Braking for Extreme Conditions
Designed to meet the most severe vehicle demands, Gemini's brake-by-wire-capable integrated wet braking system provides a critical vehicle function and an efficient use of space - no external braking functions required.

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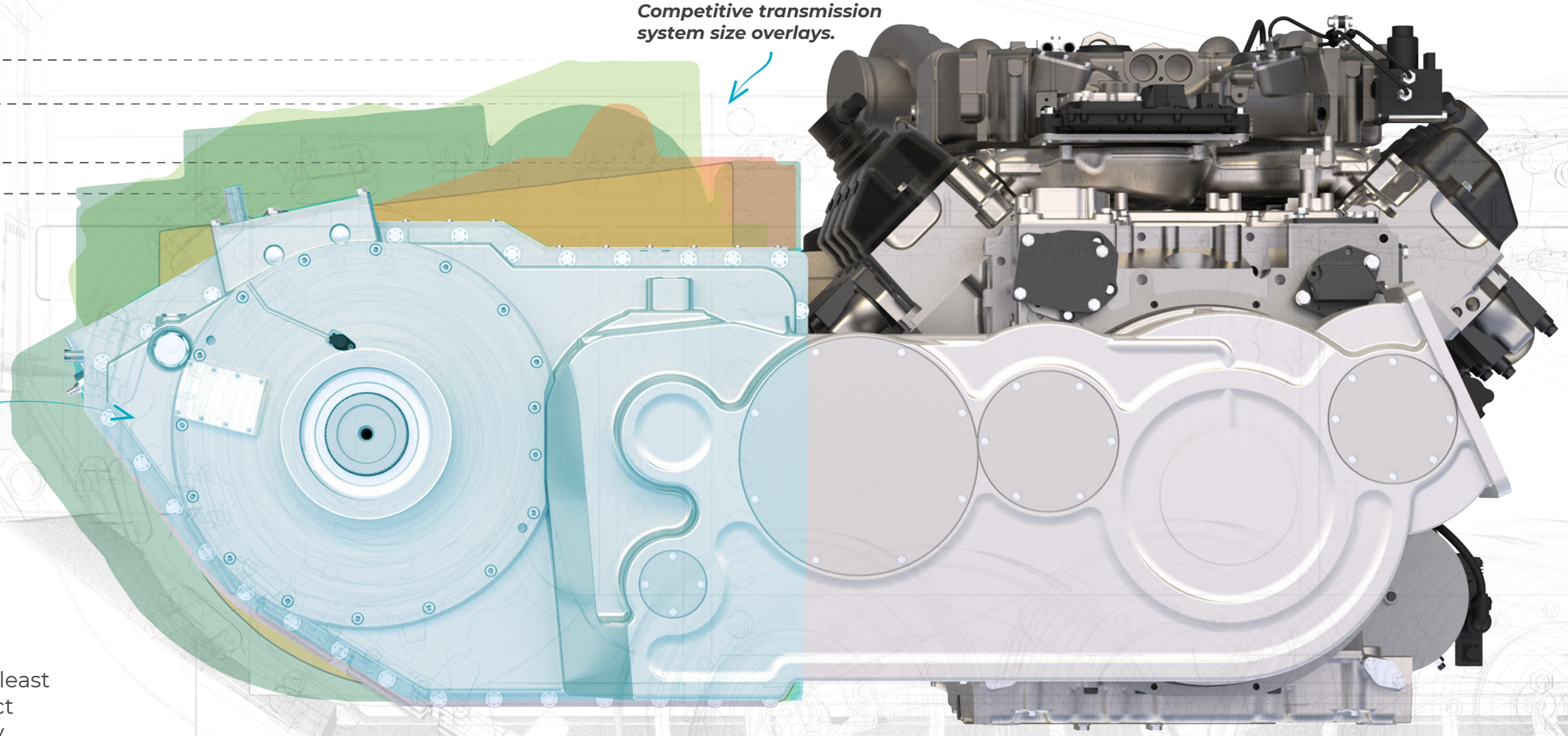
OPTIMIZED PACKAGING

GEMINI HAS MORE CLEARANCE THAN COMPETIVE TECHNOLOGY

UP TO **12.5”** MORE CLEARANCE

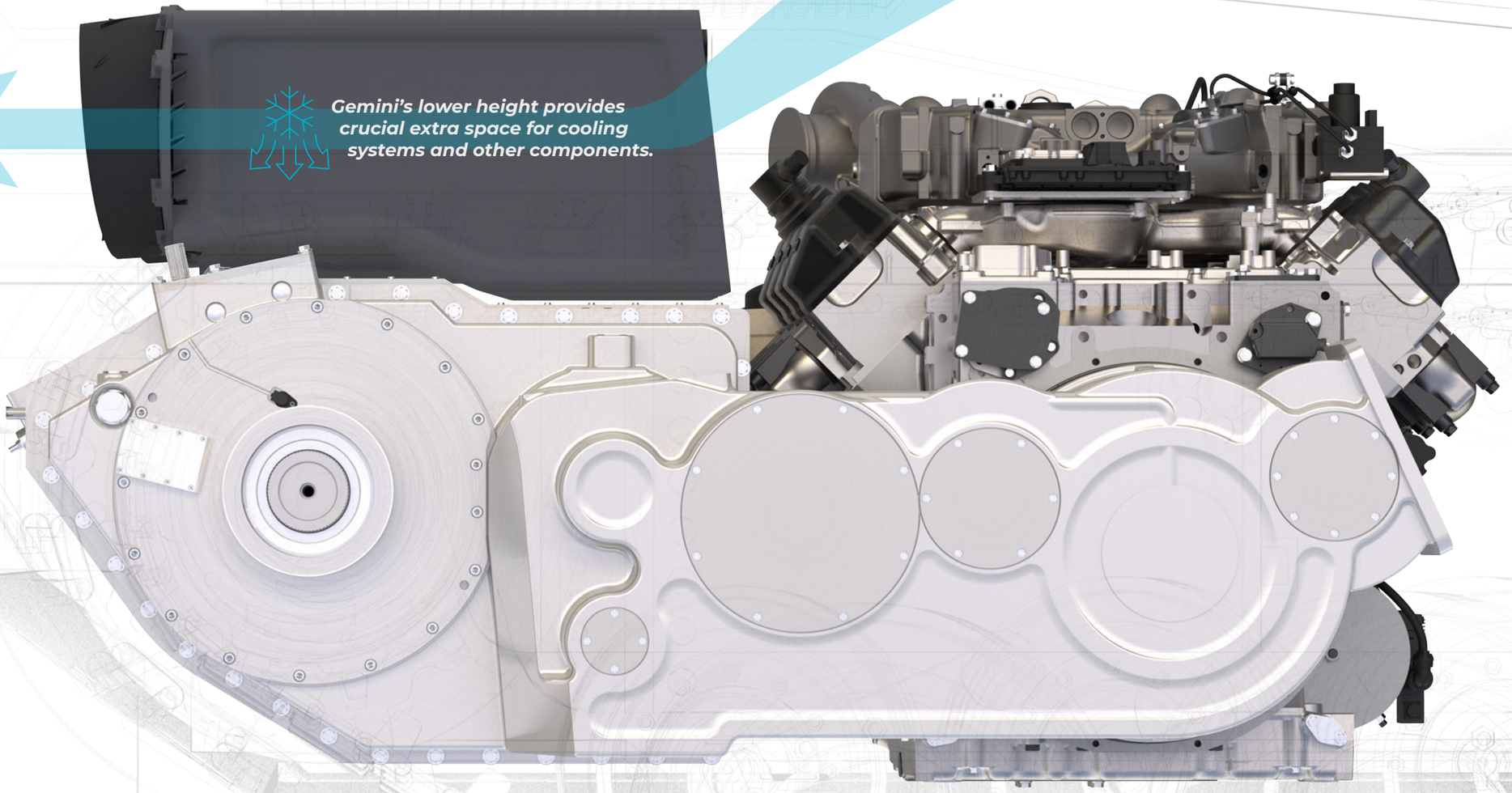


Compact Design is the Competitive Edge

The Gemini platform delivers exceptional efficiency and versatility while boasting a significantly smaller size compared to existing off-the-shelf cross-drive transmissions. Standing at least 6 inches shorter in height, this compact design provides a critical advantage by freeing up valuable space above the transmission.

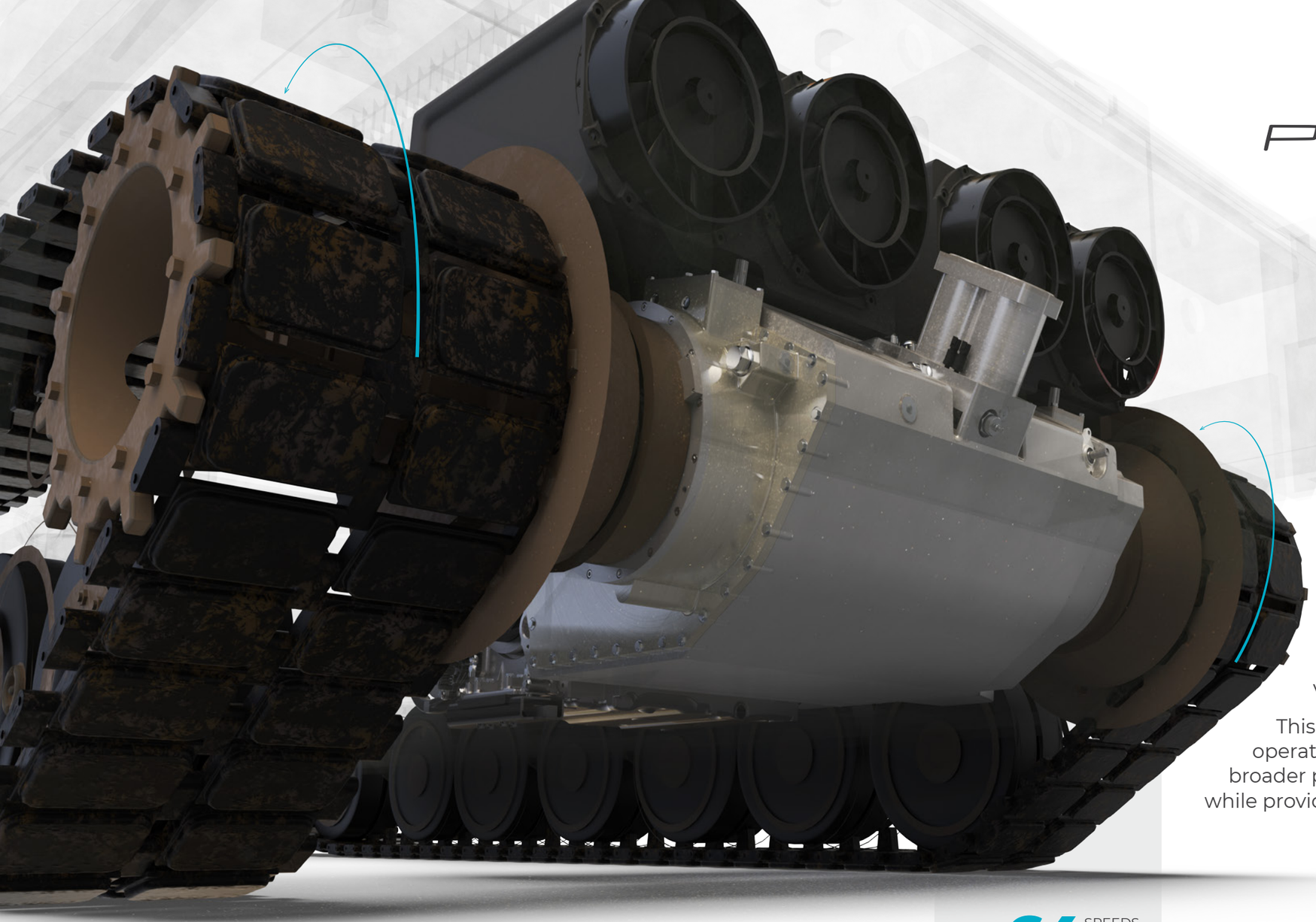
* Transmission dimensions collected, estimated, and scaled from manufacturer websites.

OPTIMIZED COOLING



The Ultimate Low-Profile Tracked Vehicle Transmission

The most compact cross-drive transmission architecture that exists today provides extra space in the most advantageous location; above the transmission where critical, high-capacity engine cooling systems must be placed.



PRECISE MOBILITY CONTROL

Extreme Multispeed Capability
Employing a high-ratio-count (up to 64 speeds) and high-ratio-resolution Binary Logic design, Gemini achieves smaller steps between gear ratios and closely resembles an ideal continuously variable transmission (CVT).

This design provides a large increase in propulsion operating points (targeting higher engine efficiency) and broader power coverage across various terrains and conditions while providing precise steering control at any speed.

UP TO **64** SPEEDS

RATIO-COUNT

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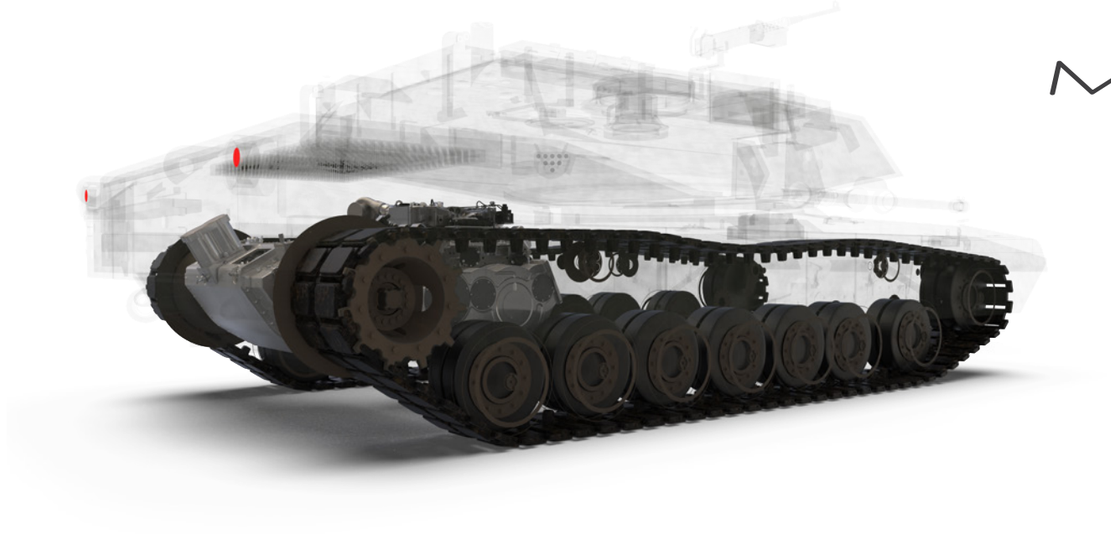
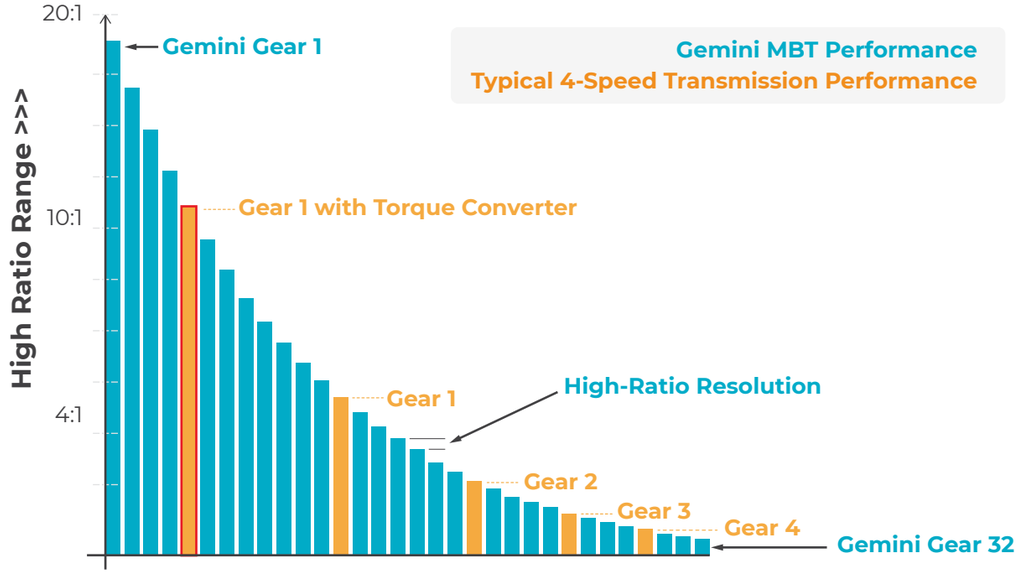


MULTISPEED PERFORMANCE

High Ratio Resolution
Smaller steps between gear ratios optimize engine and motor operating points, resulting in increased efficiency, extended vehicle range, and smoother shifting with Gemini's multispeed transmission technology.

This advanced system offers a wider range of power coverage and more operating points for improved overall performance.

Typical Transmission vs Gemini



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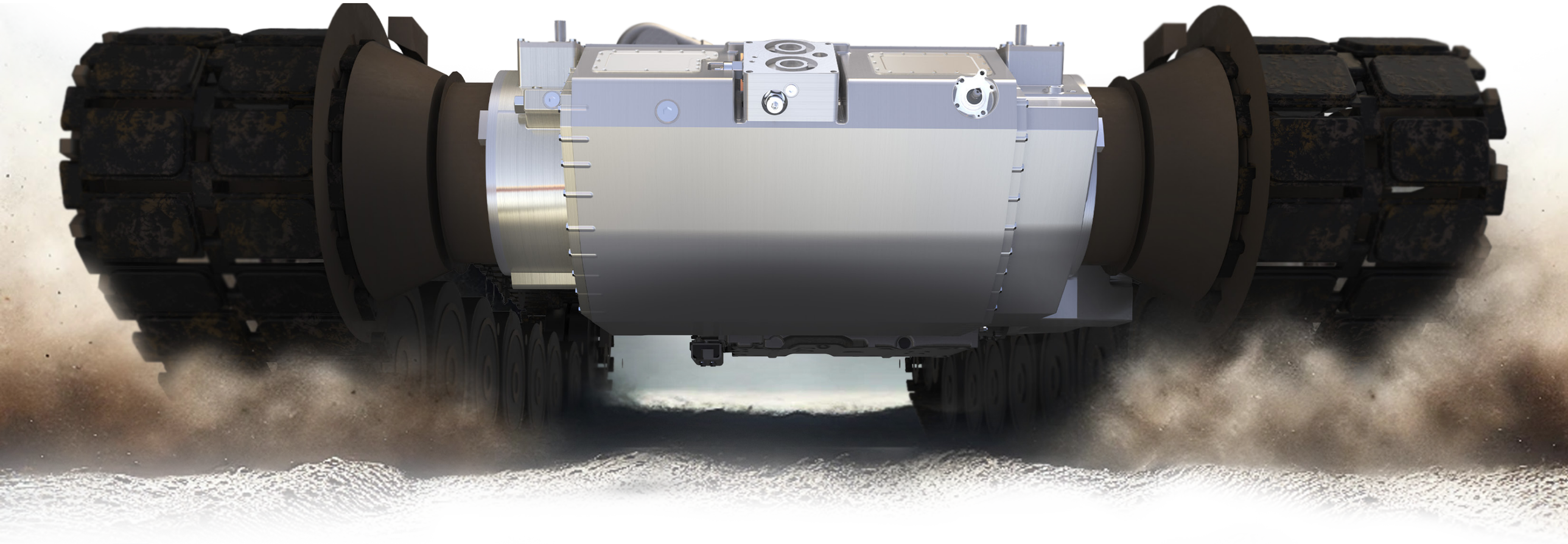
MAXIMIZED SPEED

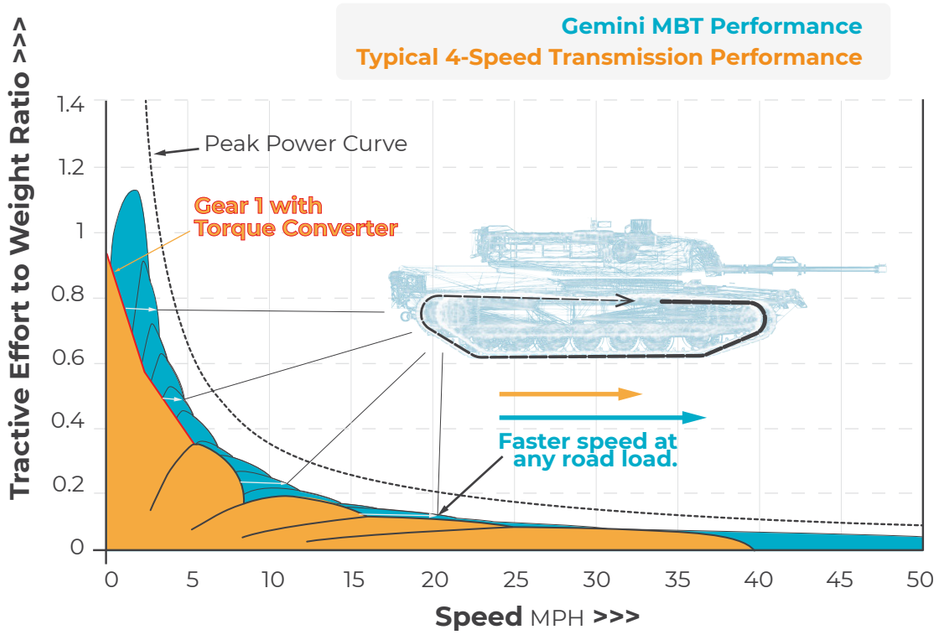


Ultra-Efficient Design and Extreme Multispeed Performance

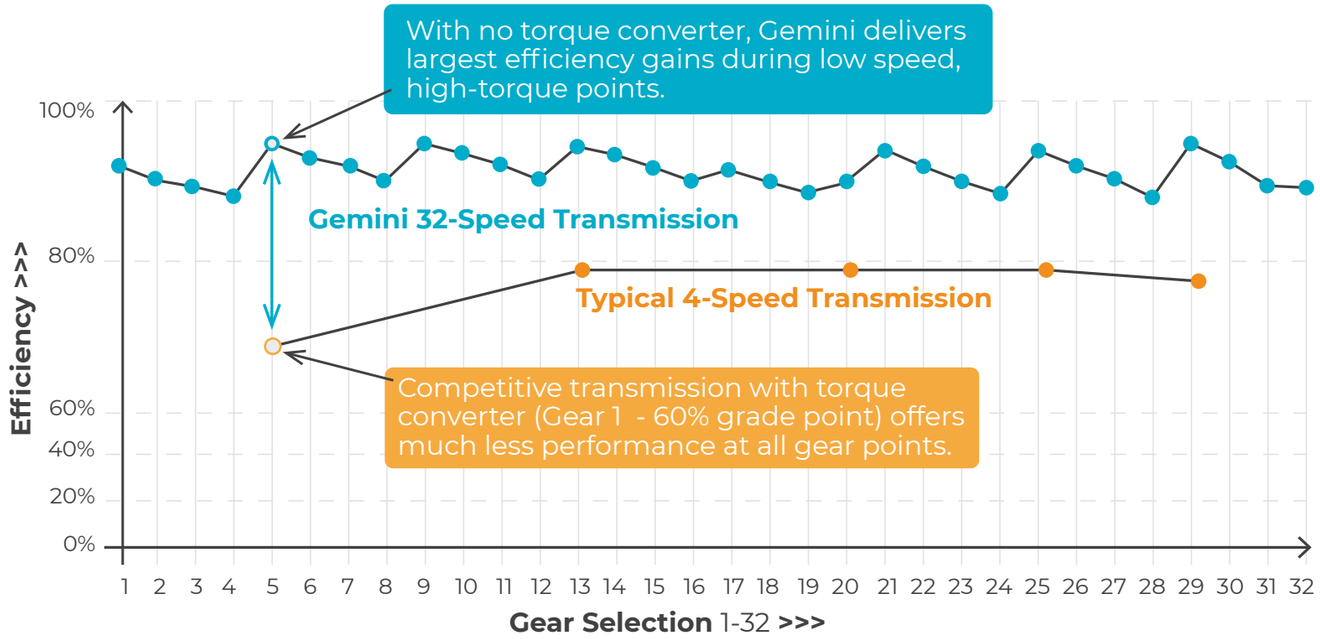
Gemini redefines efficiency in military vehicles with its high-ratio gears, reducing fuel consumption and boosting range while maintaining operational efficiency. Unlike traditional 4-speed systems that lose energy at low speeds, Gemini's Coplanar design ensures seamless power delivery without the need for a torque converter, providing unmatched control in low-speed, high-torque conditions. Its power curve delivers faster vehicle speeds across all loaded driving scenarios.

MAXIMIZED SPEED AND RANGE

Typical vs Gemini Transmission Tractive Effort Comparison



Typical vs Gemini Transmission Efficiency Comparison



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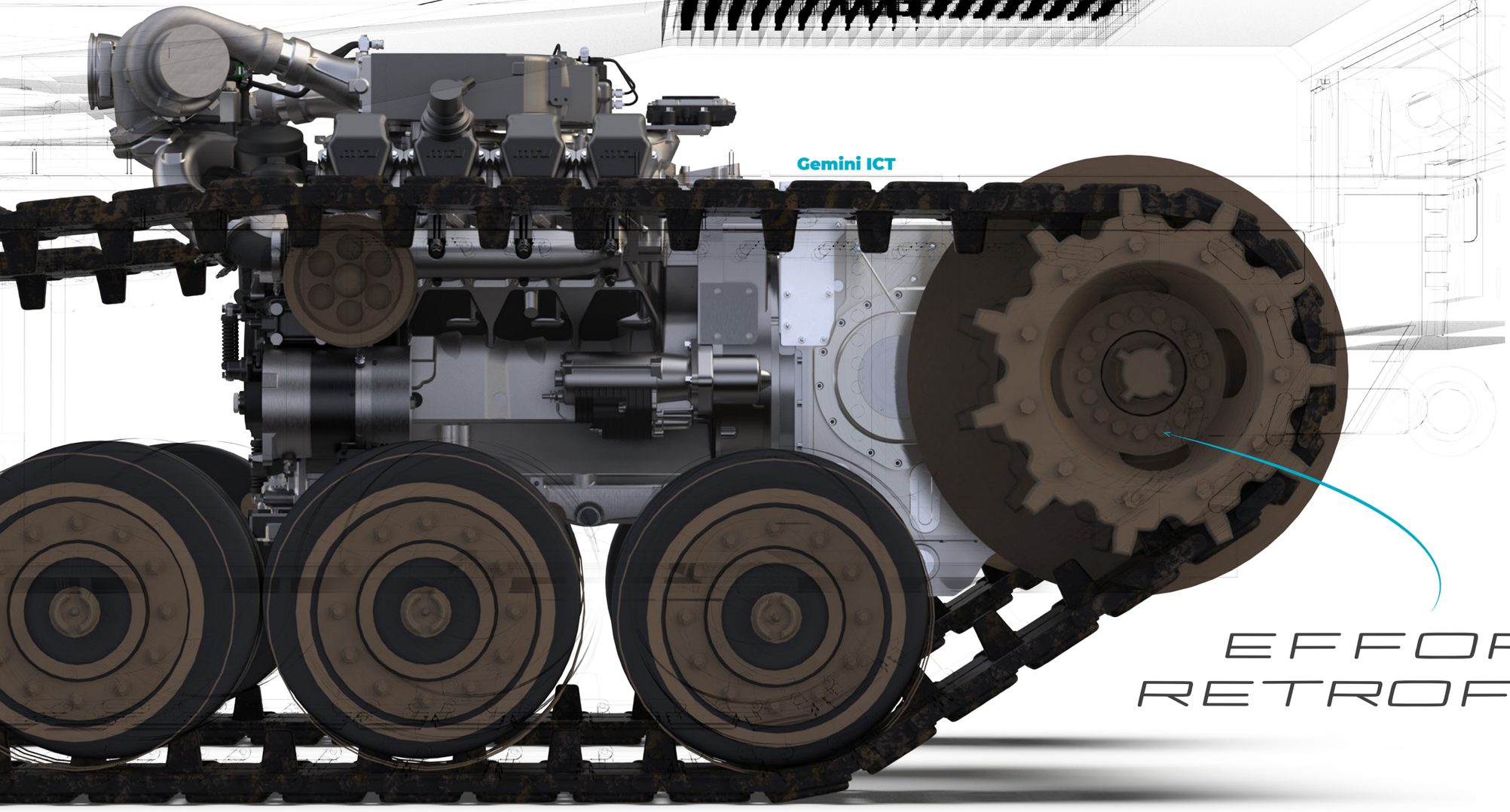


EFFORTLESS RETROFITS

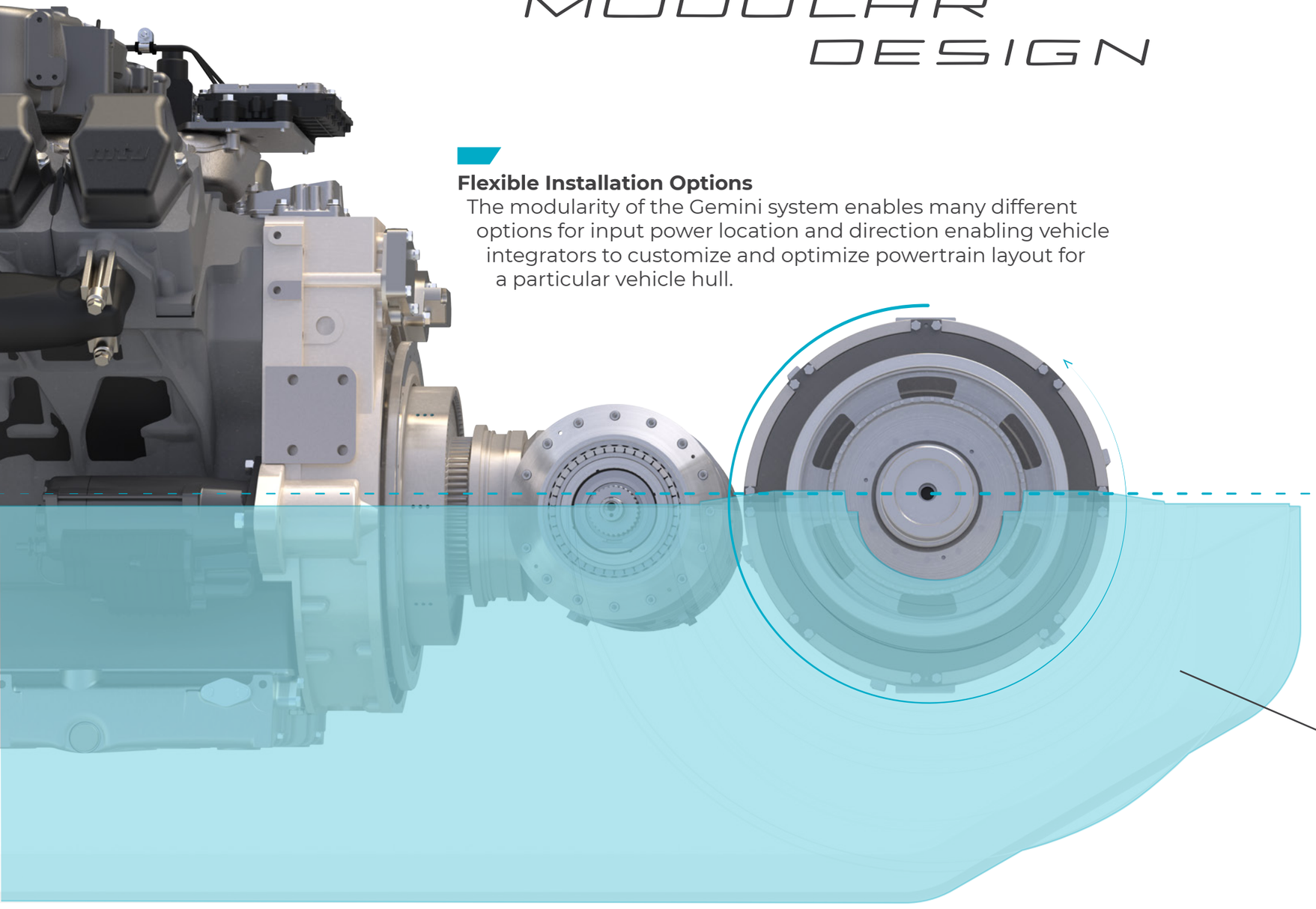
Flexibility and Scalability

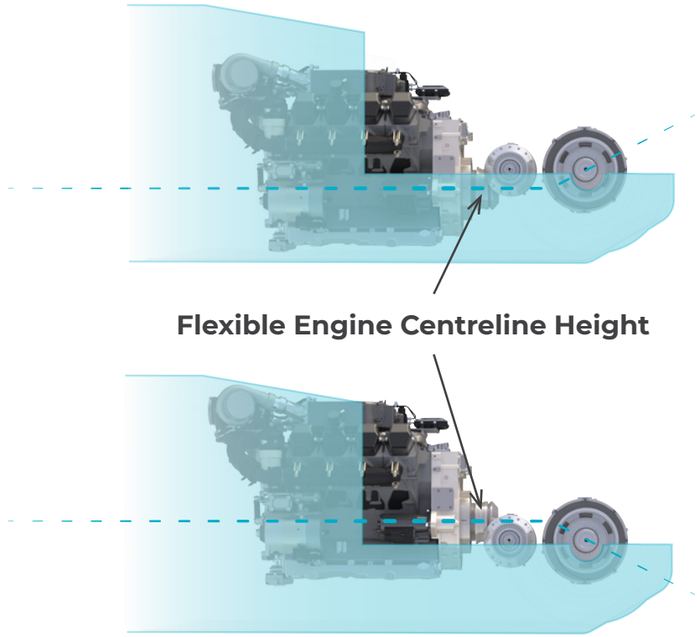
The Gemini transmission platform offers unparalleled flexibility for vehicle integrators. Its modular design is adaptable to both parallel and transverse engine orientations, can accommodate varying engine input heights, and supports both front and rear mounting due to its consistent operation in forward and reverse. This versatility allows for optimized powertrain layouts across different vehicle weight classes, enhancing performance in new builds and retrofit projects alike.

MODULAR DESIGN

Flexible Installation Options

The modularity of the Gemini system enables many different options for input power location and direction enabling vehicle integrators to customize and optimize powertrain layout for a particular vehicle hull.





Flexible Engine Centreline Height

Engine Centreline

Two primary transmission axes can rotate with respect to each other.

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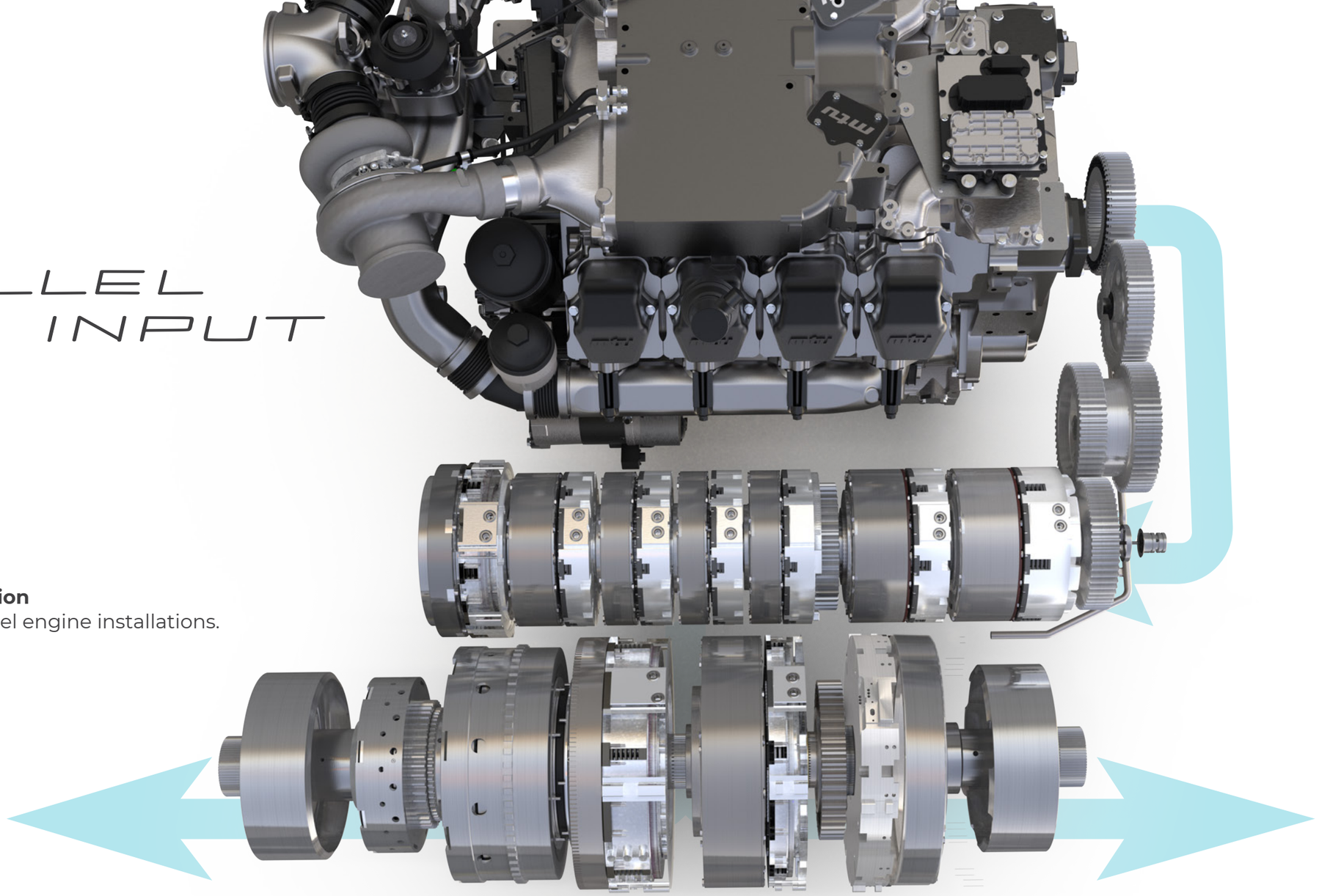
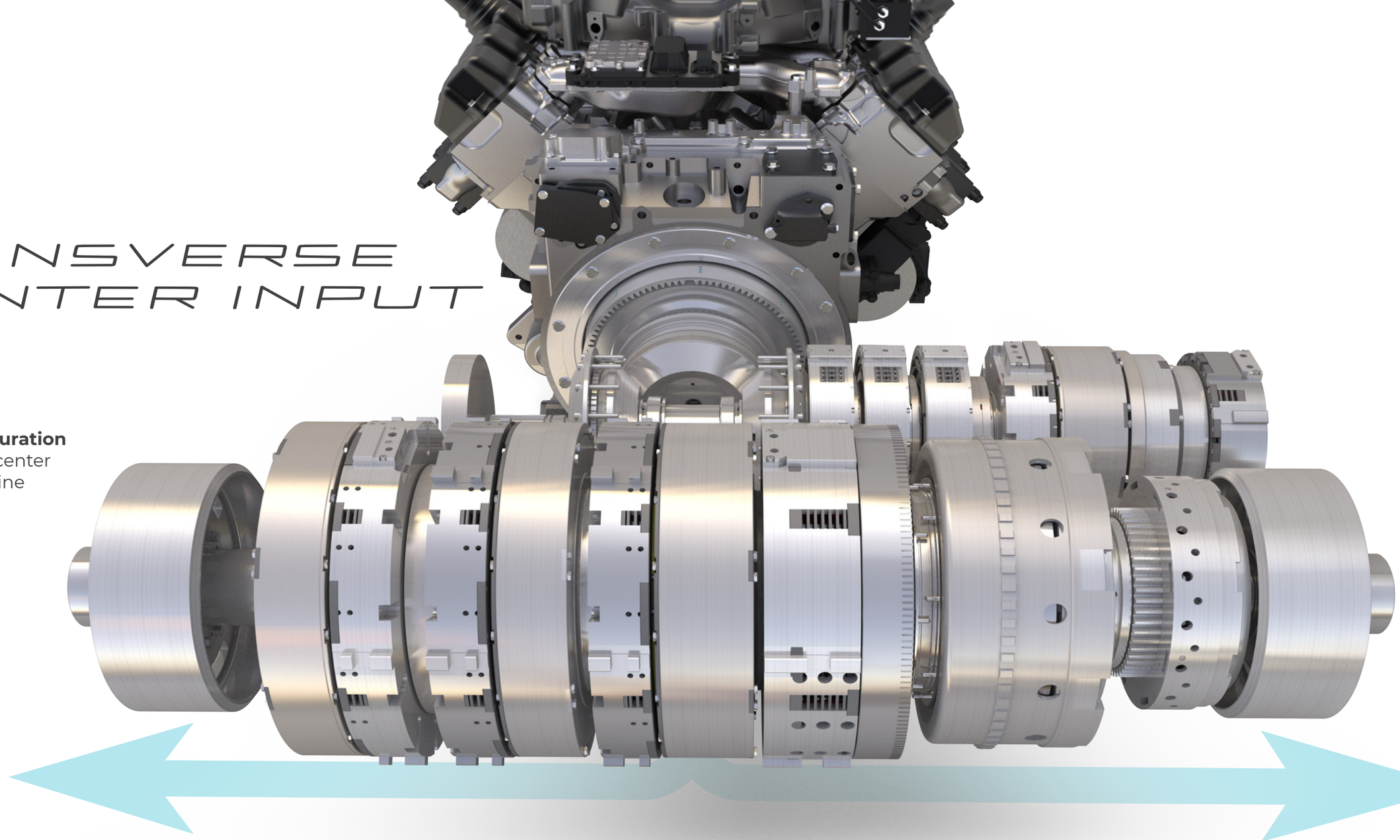
PARALLEL INPUT



U Drive Configuration
Optimized for parallel engine installations.

TRANSVERSE CENTER INPUT

T Drive Configuration
Optimized for center transverse engine installations.



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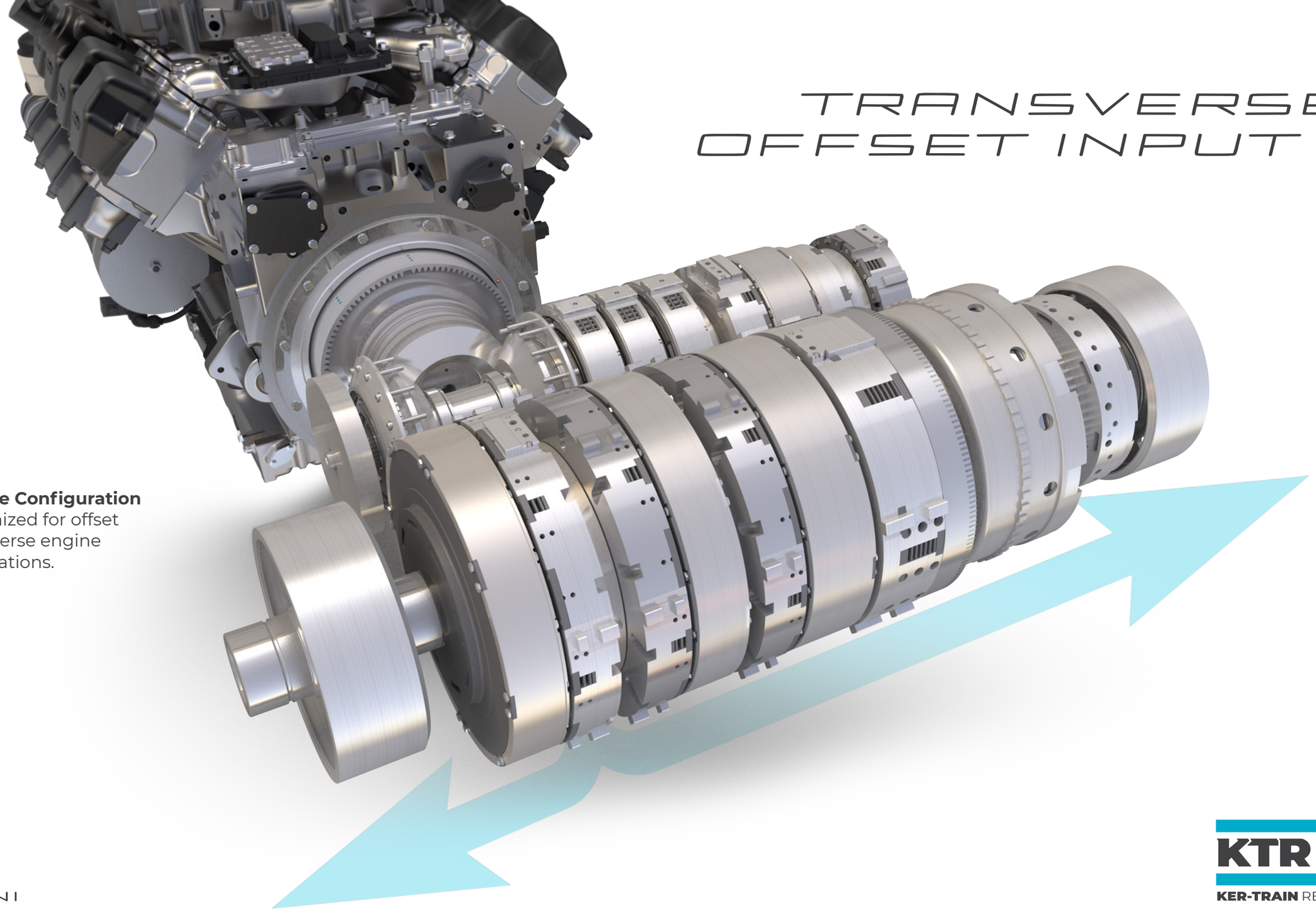
TRANSVERSE OFFSET INPUT



L Drive Configuration
Optimized for offset transverse engine installations.

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GEMINI ICT

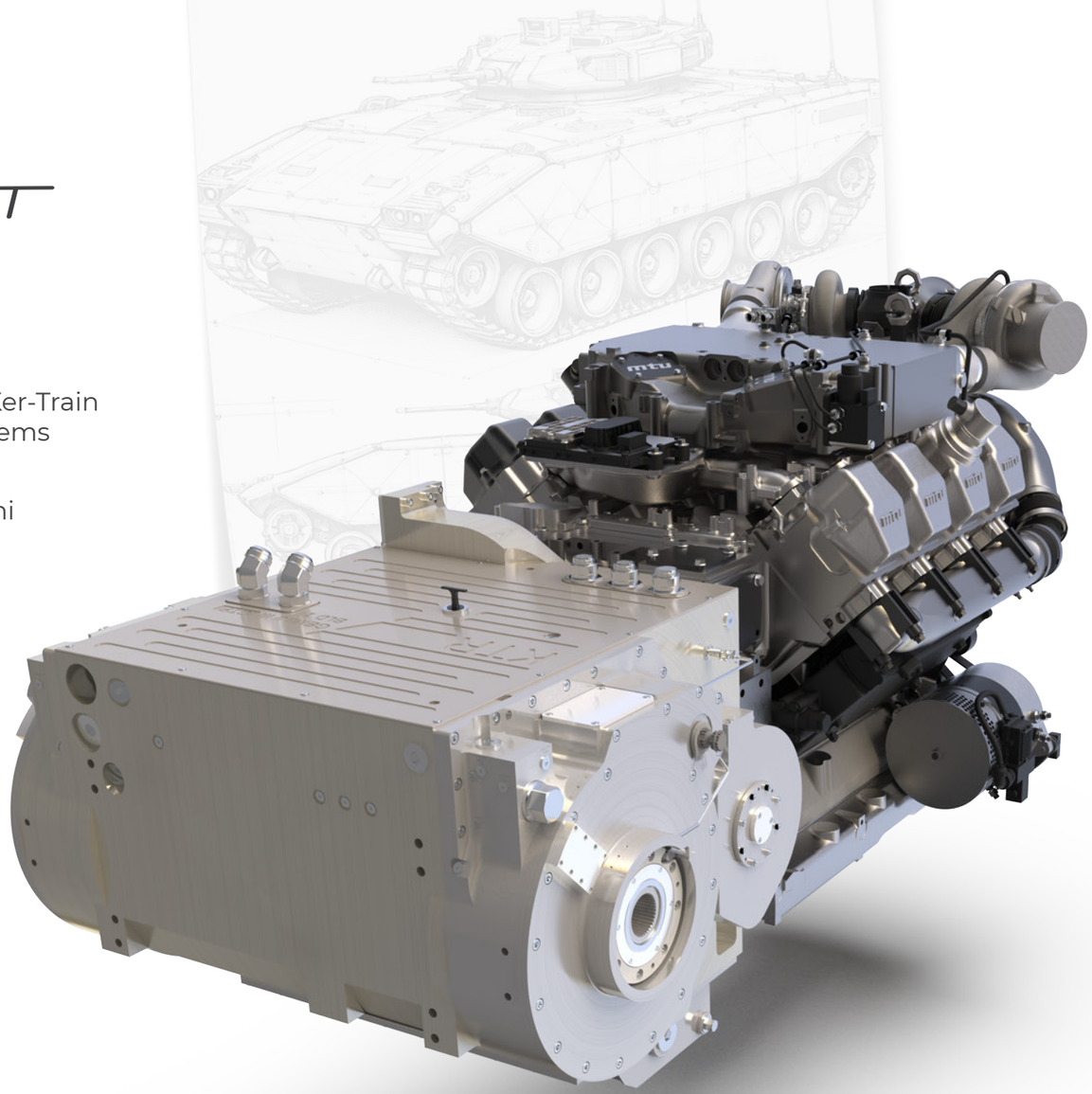
Innovative Combat Transmission
Gemini ICT was developed through a joint effort by Ker-Train Research Inc. and the U.S. Army Ground Vehicle Systems Center (GVSC).

Featuring advanced drive-by-wire technology, Gemini ICT was designed as a drop-in replacement for the HMPT transmission in the Bradley Fighting Vehicle (BFV).

Gemini ICT maintains the same space requirements while providing 25% more power capacity. It also enhances low-ratio efficiency, from 50-60% to 90%, in lower ranges ensuring exceptional responsiveness and power delivery at all speeds.

Key Benefits

- **Drop-in replacement for HMPT transmission with no space increase**
- **25% more power capacity, both peak and continuous**
- **90% efficiency at low ratios, a dramatic improvement over legacy systems (as low as 50%)**



Gemini ICT Specifications

1,000 / 785 hp
Peak/Cont. Input Power Capacity

40-50 US Tons
Vehicle Weight Capacity

2,020 / 1,583 lbf-ft
Peak/Cont. Input Torque Capacity

47.6 / 37.4 hp/ft
Peak/Cont. Power Density

32
Propulsion Ranges (Forward & Reverse)

32
Steering Ranges (per side)

14.32 : 1
Highest Ratio

0.75 : 1
Lowest Ratio

16,000 lbf-ft
Maximum Total Output Torque

3,785 rpm
Maximum Output Speed

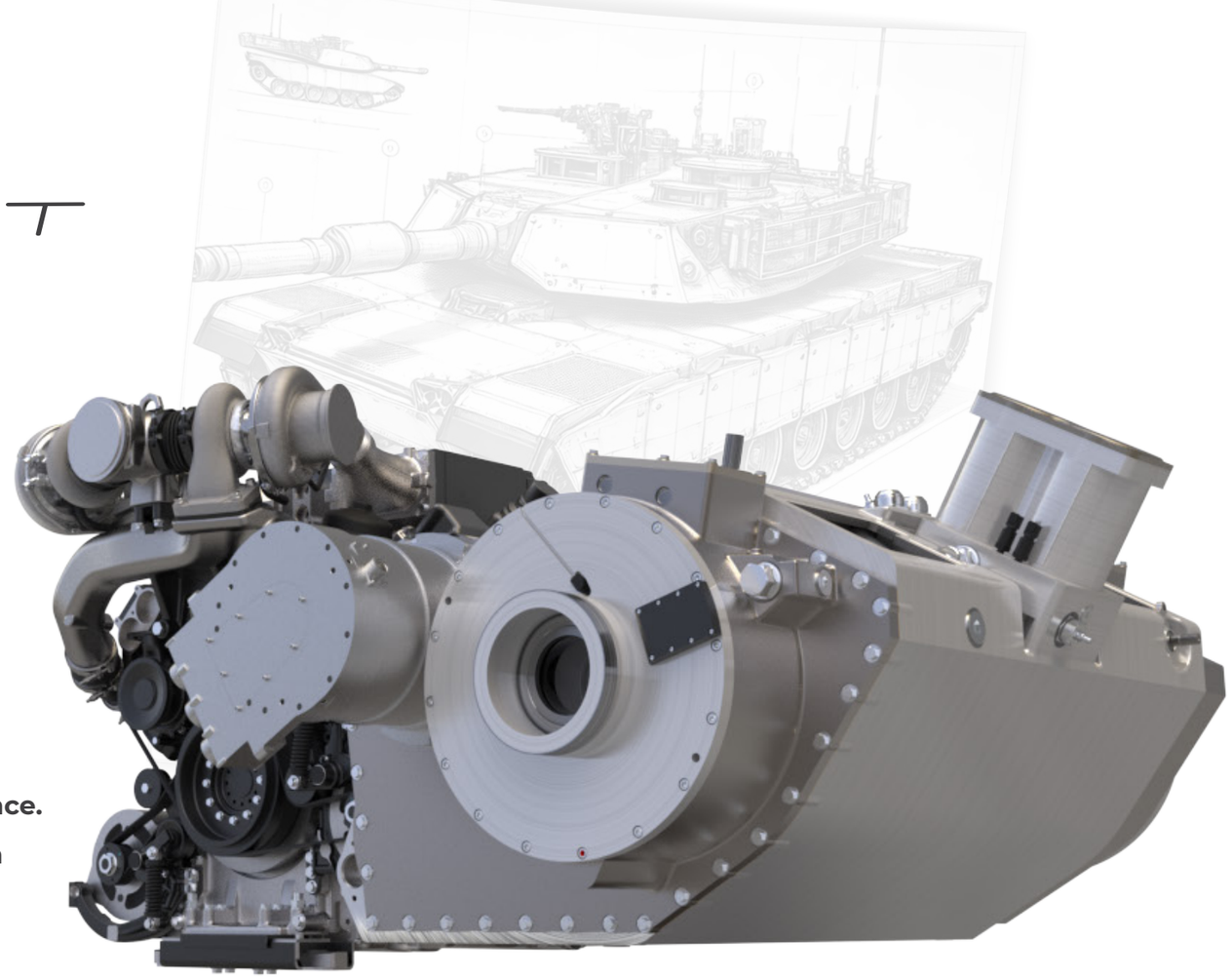
GEMINI MBT

Main Battle Transmission
Using its Gemini architecture, KTR has developed the Gemini MBT for 70 to 80 ton main battle tanks.

The compact, 16-speed unit is a U-configuration, hybrid-capable unit that supports a variety of diesel engines as well as the legacy gas turbine.

Key Benefits:

- **Fits existing vehicles**
- **Exceeds current vehicle performance.**
- **Currently only transmission design that would enable replacement of gas turbine with a fuel-efficient diesel, leaving adequate space for cooling system.**



Gemini MBT Specifications

1,500 / 1300 hp
Peak/Cont. Input Power

70-80 US Tons
Vehicle Weight Capacity

3,690 / 3,200 Lbf-ft
Peak/Cont. Input Torque

66.6 / 57.4 hp/ft³
Peak/Cont. Power Density

16
Propulsion Ranges (Forward & Reverse)

32
Steering Ranges (per side)

17.38 : 1
Highest Ratio

1 : 1
Lowest Ratio

35,000 lbf-ft
Max. Total Output Torque

3,785 rpm
Max. Output Speed

DECADES OF DEVELOPMENT

TARGET VEHICLE > M11 APC

GEMINI I
Circa 1995

275 Hp
13 Ton

GEMINI II
Circa 2003

450 Hp
20 Ton

TARGET VEHICLE > BRADLEY IFV, AMPV, PIM

GEMINI III ALPHA
Circa 2010

850 Hp Peak
670 Hp Continuous
40-50 Tons

GEMINI III BETA
Circa 2015

900 Hp Peak
700 Hp Continuous
40-50 Tons

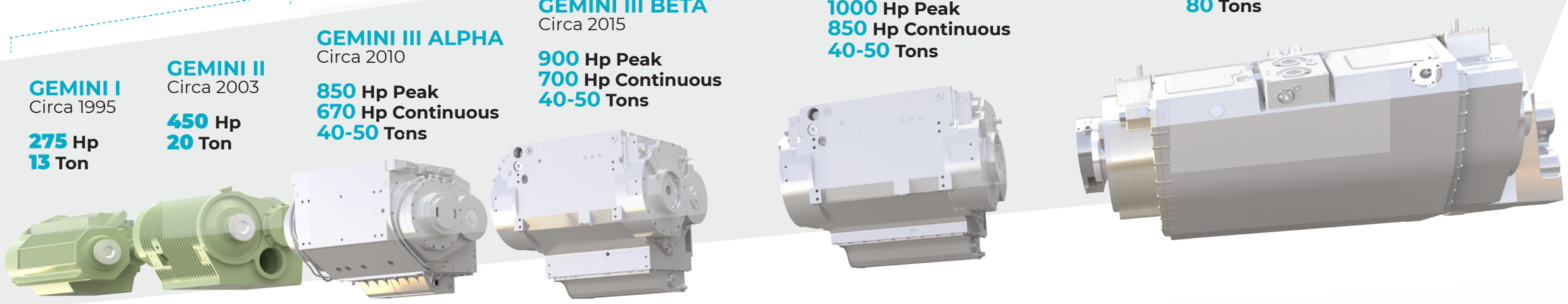
GEMINI ICT
Circa 2022

1000 Hp Peak
850 Hp Continuous
40-50 Tons

TARGET VEHICLE > MAIN BATTLE TANK

GEMINI MBT
Circa 2024

1500 Hp Peak
1300 Hp Continuous
80 Tons



A Legacy of Innovation
Decades of experience, passion, and teamwork have driven the development of Gemini Cross-Drive Transmission Systems — engineered to meet the demands of the toughest environments in the world.

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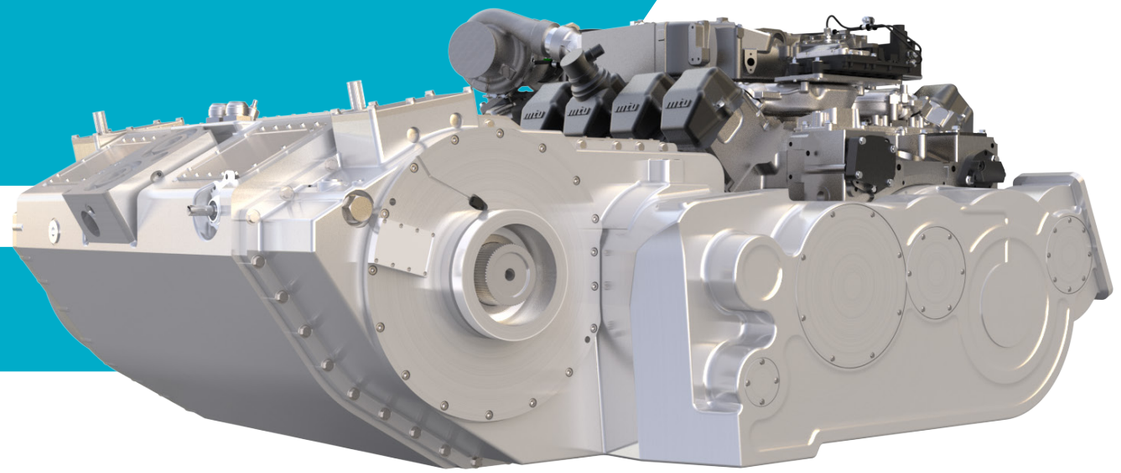

CROSS-DRIVE TRANSMISSION SYSTEMS FOR TRACKED VEHICLES

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