Defense

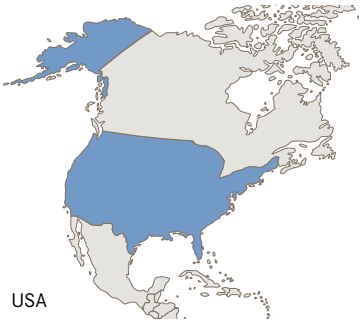
Decades of distinguished service.

Who: U.S. Army, Navy, Marine Corps and Coast Guard

What: Engines and propulsion systems for every purpose—from light armor to heavy combat vehicles, and from small patrol vessels to large naval ships

Why: Power, dependability and power-to-weight ratio

Where: Deployed all over the world



MTU's relationship with the U.S. military dates back to World War II. Today, MTU continues to be a key supplier to the U.S. Army, Navy, Marine Corps and Coast Guard. Whether providing parts, service and new Detroit Diesel 2-Cycle engines for legacy vehicles or state-of-the-art, high power-density MTU engines for modern vehicles and vessels, MTU is trusted to deliver for the world's most demanding customers.

Experience is an important asset in the military. It's honored and respected by personnel up and down the line—and rightly so. Through experience, sergeants earn their stripes. It's why soldiers receive awards for uncommon acts of valor. It impacts crucial tactical decisions. And it's the reason many battles are won. The same values that military personnel revere also hold true for the diesel engines and propulsion systems they count on every day.

Over the years, MTU has garnered considerable experience—thanks to a relationship with the U.S. military that dates back to World War II. In 1937, General Motors formed GM Diesel, the predecessor to Detroit Diesel. The first engines were compact, lightweight two-cycle products developed to power standby generators, vehicles and road-building equipment. As GM was developing the concept, World War II started. The U.S. Army needed a dependable engine to power its fleet of tanks. It found the perfect fit with GM Diesel 2-Cycle engines. Since diesel fuel is less flammable than gasoline, it was perfectly suited for battle conditions. It also provided tanks with more durable, robust power.

World War II helped launch GM Diesel into a full-scale division of GM, and production expanded in the U.S. Soon, engine production grew even further, as the British and Russian armies put GM Diesel engines into service.

Tedd Grulke, MTU director of governmental sales

"The products developed by MTU are in a class by themselves. There are no commercial engines anywhere that even come close."

Power. Passion. Partnership.

At the Redford manufacturing facility, 2-Cycle engine production escalated during World War II to meet rising demand for tanks and landing crafts.

A powerful presence
For the next several decades, the 2-Cycle engine dominated the defense industry. It powered equipment from tanks to naval vessels to ground combat vehicles. By 1965, one million Series 71 engines had been manufactured. That same year, GM Diesel was renamed Detroit Diesel. Today, the original Series 71 design lives on. New, powerful eight-cylinder versions are still produced for the military, while remanufactured reliabilt® models are sold by MTU for military and non-military applications.

The 2-Cycle engine powered most of the 20th century's diesel-driven industrial history. By land or sea, in peace and at war, a progressively more powerful and efficient series of "Detroits" could be found in every industry in every corner of the globe. At one time, the 2-Cycle's three-million-square-foot diesel engine manufacturing facility in Redford, Michigan, was producing upwards of 100,000 2-Cycle engines (Series 53, 71, 92 and 149) per year to power a variety of applications, from on-highway trucks to mining equipment, construction and industrial equipment to motor yachts, tanks and landing craft to standby generators.

New standards, new directions
While still going strong in the defense industry, the 2-Cycle engine's dominance on the world stage for "civilian" use ended in the late 1980s. With the advent of the EPA came more stringent emissions requirements. These standards were much more strict for commercial engines than for military engines. As a result, gradual changes formed between emissions-compliant commercial products and military engines. As the products became more different, the volume of military engines shrank.

In the '90s, the 2-Cycle product was phased out for commercial vehicles and replaced by new, emissions-friendly four-cycle engines. Annual 2-Cycle production plummeted from over 100,000 units per year to an all-time low of nearly 3,000 units per year.

Detroit and Germany join forces
A new partnership changed the 2-Cycle's fate. In 1994, Detroit Diesel joined forces with a German company—MTU Friedrichshafen. MTU military engines were designed and engineered solely for military applications. Unlike Detroit Diesel, MTU military engines were completely different from their commercial engines, optimized for the unique challenges of today's military. When the two companies first started working together, their different perspectives and strengths became clear. MTU even had a separate business unit for "special purpose" engines. But both companies had the same problem—low volume.

With the new partnership, Detroit Diesel suddenly had access to specialized products that could exceed customer expectations. MTU military engines were widely accepted all over the world, with nearly 100% market share. Detroit Diesel made these specialized MTU engines available to U.S. defense customers.

In 2006, the relationship reached a new level when MTU acquired Detroit Diesel's off-highway operations, and along with it, the Detroit Diesel 2-Cycle product line. The acquisition marked a significant capital investment by MTU to sharpen market focus and renew commitment to customer support, including millions of dollars to revitalize the overall support of the Detroit Diesel 2-Cycle product line with genuine, high-quality new and reliabilt® remanufactured parts.

New tactics pay off
The new business strategy toward developing specialized engines paid off right from the start. In the late '90s, the U.S. Marine Corps began the development phase for its Expeditionary Fighting Vehicle. The MT 883 engine was selected by General Dynamics for this important mission. The selection was a major breakthrough—it was the first time that the U.S. Department of Defense accepted an MTU product as the principal propulsion system in one of its Class A programs.

The high-profile amphibious vehicle endured a long development process. During a 15-year period, General Dynamics built about 25 assessment vehicles. Everything was put to the test, and the engines performed admirably. Although the engine was up to the challenge, the program was discontinued in 2011.

Leaner and meaner
During the same time period, another specialized MTU engine was called into duty for the U.S. Army's Future Combat System (FCS) project. The FCS program was the Army's first use of hybrid-electric propulsion systems for combat vehicles. As a technology leader in power and propulsion systems, MTU was a natural choice to partner with the Army on this new initiative.

The FCS program was the centerpiece of the U.S. Army's modernization project to develop a highly integrated, lightweight and easily deployable combat force. At that time, the U.S. military had more than 33,000 armored vehicles in operation, over half of which were powered by Detroit Diesel 2-Cycle engines. The FCS program was targeted to repower these vehicles, many of which were projected to be in operation until the year 2050.

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Customized engines based on the Series 880 and Series 890 are being tested for the U.S. Army's Ground Combat Vehicle. Engines pictured are previous-generation models.

Unlike commercial hybrid vehicles, military hybrid-electric vehicles are significantly more robust and more powerful. The vehicles also have much greater electrical power requirements. Given its high power density, the MTU Series 890 made the ideal engine. The engines were well received as the vehicle underwent several years of development. However, the project changed scope and the U.S. Army cancelled the program. Fortunately, there's a silver lining. The FCS project has led toward the development of a larger vehicle called a Ground Combat Vehicle (GCV), which is presently employing MTU engines in its testing phase.

A modern superpower

Today, robust, compact and cutting-edge engines are available in every power category and for every purpose—from light armor to heavy combat vehicles, and from small patrol vessels to large naval ships. In addition to diesel engines adapted for defense applications, MTU offers complete drive systems, which include engine, gearbox, cooling and air filtration system and monitoring and control system. MTU also provides project systems—providing special development of engines and power transmission components for customer-specific drive units.

Why does the U.S. military, arguably the world's most demanding customer, rely on MTU engines and parts for vehicles in applications where failure is not an option? MTU engines and drive systems have set the standards for years with unrivaled power, performance and reliability. Exceptional quality and state-of-the-art technology are combined with economic benefits such as high fuel efficiency, low operating costs and high power density to satisfy the unique demands of military operations.

High power density is essential for armored vehicle engines. In military operations, every inch of the vehicle must be protected by armor. While lighter, smaller vehicles are more nimble and valuable on the battlefield, any reductions in engine power and performance are not an option. Cutting-edge MTU engineering conserves engine weight and cubic space without sacrificing horsepower. Tedd Grulke, MTU director of governmental sales, says, "The products developed by MTU are in a class by themselves. There are no commercial engines anywhere that even come close. These engines are purpose-built and purpose-designed specifically for military use."

Reliability at sea

High power density and exceptional reliability are also critical at sea. As the largest supplier of propulsion engines and systems to the Navy and Coast Guard, MTU has provided trusted and proven engines as well as complete, integrated propulsion and ship automation systems for decades. Since 1950, MTU has—along with its predecessor companies such as Detroit Diesel—delivered over 30,000 engines to almost every navy in the world.

Today, MTU continues to power navy and governmental vessels patrolling waters all over the world. For the U.S. Navy, MTU engines are rigorously tested and purpose-built for all kinds of combat missions. Mark V and Mark V.1 boats are designed to deliver special ops teams in all conditions. Their rugged MTU engines are well suited to take a pounding, powering the boat at speeds up to 50 knots in six-foot seas. From small offshore patrol vessels to giant destroyers, ship reliability and availability are the highest priorities. With MTU engines and propulsion systems, they are superbly equipped for their demanding tasks. And for naval vessels that require quieter engines for mine hunting or anti-submarine warfare, MTU has engineered systems with a low acoustic signature.

The Coast Guard depends on MTU engines to power motor lifeboats, coastal patrol boats, national security cutters and fast-response cutters in extreme conditions. Because these vessels often stay at sea for long periods, they demand a lot from their propulsion systems. With exceptional reliability, low lifecycle costs and fuel efficiency, MTU engines are always on call. Presently, the Coast Guard depends on MTU for all of its new patrol and response boats.

MTU propulsion systems are based on MTU commercial shipping engines, thousands of which are highly specialized for marine use and operate successfully all over the world. They are modified according to the special requirements of military and governmental vessels. High power density, low weight, compact design, and mechanical and thermal stability characterize MTU engines just as much as simple operation and low lifecycle costs.

Moving swiftly into the future

The future of the relationship between MTU and the military looks bright. MTU continues to develop, manufacture and service powerful, completely customized drive systems for armored vehicles and marine vessels.

The U.S. Navy is testing designs for its new Littoral Combat Ship (LCS) class. The *USS Independence* is a three-hull design made entirely of aluminum, making the vessel light and fast—achieving speeds in excess of 45 knots.

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Conceptual rendering of the Ground Combat Vehicle, currently under development.

The other vessel, the *USS Freedom*, is a single-hull, semi-hydroplaning design. Regardless of the design, the LCS has to meet strict requirements. According to the U.S. Navy, "the LCS must be capable of operating at low speeds for littoral mission operations, transit at economical speeds and also excel in high-speed sprints." MTU engines are at the heart of each propulsion system, capable of propelling the vessel up to 28 knots on diesel power alone.

A powerful new ground force

Development for the U.S. Army's newest infantry fighting vehicle—the Ground Combat Vehicle (GCV)—is now under way. The program will replace 1,800 infantry fighting vehicles with state-of-the-art GCVs. Two MTU propulsion systems have been selected for testing, based on the proven MTU Series 880 and Series 890 engine platforms.

Both engine platforms are based on technologically advanced high-speed diesel engines with an unrivaled power-to-weight ratio and a broad range of capabilities. The engines can operate on a multitude of military fuels, in a variety of extreme conditions—from hot, dusty deserts to cold mountain passes. With a proven track record in militaries throughout the world, these engine platforms are the clear technology leaders in power density for infantry and armored vehicles.

Both engines will be put to the test over the next several years. The first stage of the program—the Technology Development phase—will take two years. This stage will yield the preliminary design of the GCV and provide the U.S. Army with a basis for defining the direction of the Engineering and Manufacturing Development phase. Over a four-year period, several "engineering pilot" vehicles will be built and tested. Once everything has been perfected and the technology is production ready, serial production will begin. The entire process will take seven years.

The U.S. Army intends to field more than 1,800 GCVs at nearly $11 million per vehicle. Production is expected to begin in 2018. While the engines are usually manufactured in Germany, these engines will be built at MTU's new U.S. facility in Aiken, South Carolina. It will be the first such program with an MTU branded military engine built in the U.S.

MTU has decades of experience with drive systems for U.S. land and marine defense. The world's most demanding customers count on MTU to deliver. Battle and weather conditions constantly change. Technology is always evolving as well. But the mission has always stayed the same: providing power, technology and dependability when they're needed the most.

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