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PROUD MANUFACTURER OF THE U.S. ARMY'S IOTV, U.S. MARINE CORPS' IMTV AND PLATE CARRIER SYSTEM, ALL CURRENTLY IN THEATER THROUGHOUT THE WORLD



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## Racing Development

### Oshkosh Defense raced at the Baja 1000 to improve the breed



Written by: [Jan Tegler](#) on February 11, 2011

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Oshkosh Extreme Racing's Light Combat Vehicle M2 on the Baja. Photo courtesy of Oshkosh Defense

NASCAR Stars Jimmy Johnson and Robby Gordon.

Indy 500 winners Rick Mears, Danny Sullivan, and Buddy Rice.

Actors Patrick Dempsey, Steve McQueen, James Garner, and Paul Newman.

Ford, Chevrolet, Toyota, Chrysler.

These are just a few of the notable names that have taken on the famous Baja 1000 in its 43 years of existence. Oh, and one more – Oshkosh Defense (OD).

If you're scratching your head at the mention of OD in company with the others, you're not alone. A division of Oshkosh Corporation, known primarily as a manufacturer of heavy duty specialty (fire, refuse, towing & recovery, plow) trucks, Oshkosh Defense builds tactical vehicles for the U.S. military.

And on Nov. 18, 2010, they became racers, taking the green flag along with nearly 300 other competitors at the 43<sup>rd</sup> Tecate SCORE Baja 1000. One hundred-sixty seven of the starters managed to finish the grueling race. Unique among them were the two Light Concept Vehicles (LCV) campaigned by OD in partnership with experienced Baja competitor, California Gold Racing (CGR). The joint team was dubbed Oshkosh Extreme Racing (OER).

So why would a defense manufacturer decide to go racing? Further, why would anyone race a concept vehicle – the kind of futuristic vehicles most often seen on turntables at major auto shows?

"To compress the technology-development cycle," answers Chris Yakes, OD's vice president of Advanced Products.

Given the amount of data and experience OD accumulated with its LCVs, both in preparation for the race and over the 1,061-mile torture test that was the 2010 Baja 1000, this unusual move seems to have made a great deal of sense.

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In the near term, the outlook for military tactical truck/vehicle manufacturers is hazy. The recently announced decision to cancel the Marine Corps' \$15.5 billion Expeditionary Fighting Vehicle – along with some uncertainty regarding the U.S. Army's Ground Combat Vehicle (valued at \$17 billion) and Joint Light Tactical Vehicle (JLTV, valued at \$20 billion) programs – leaves makers of these land vehicles pondering how best to proceed. Should they develop specific vehicles or develop technologies that can be adapted to existing platforms as well as new designs?

OD is pursuing both options. The company's Light Concept Vehicles are just that – “concept vehicles” – meant to serve as test beds for the firm's proprietary propulsion, suspension, armor, cooling, and blast mitigation systems. And while OD already has a strong portfolio in medium and heavy tactical wheeled vehicles, the LCVs and the technologies being tested by them could fit into the programs above and the expected recapitalization of DoD's HMMWV (Humvee) fleet.

“We've been very successful with our M-ATV [Mine Resistant Ambush Protected All-terrain Vehicle] program, and we've developed a lot of technologies internally that we can quickly bring to market,” Yakes affirms. “With the LCV we're doing the same thing, developing key powertrain, chassis, and blast performance/mitigation technologies for potential areas of the military market. These are capabilities we want to prove and demonstrate such that for one of the upcoming light tactical vehicle programs we could employ the LCV or the technologies from the LCV.”

The Baja 1000 provides quite a venue for such a “demonstration.” Covered by scores of media outlets, and with an on-site spectator count approaching a quarter-million, the “roughest run under the sun” is an altogether different and more public venue for vehicle testing.

The idea to race at Baja rather than utilizing familiar military test venues came about just over two years ago. In 2008, Yakes met long-time pro off-road racer and Baja specialist Glenn Harris. Harris invited the Oshkosh Defense executive to pre-run Baja with him to experience the terrain and its challenges.

“We've had a lot of success with other projects running development activities within a competitive environment,” Yakes explains. “So we started exploring what we could do to help drive technology as fast as it could be developed. Through some contacts I met Glenn and visited him for the pre-run and started talking about what it would take to run in an off-road competition environment.



**LCV M1 dropped out of the race due to a steering failure. Photo courtesy of Oshkosh Defense**



**A night pit stop for LCV M2. The Baja 1000 is the supreme test for offroad vehicles. Photo courtesy of Oshkosh Defense**

“The Baja 1000 is an amazing test,” Yakes continues. “Pushing a vehicle for 1,000 miles in a little over two days is something that just doesn't happen in the military test environment. We wanted to put our technologies under the strain that competition produces and generate excitement.”

And so, after a year of preparation including the melding of Oshkosh engineering personnel with CGR team members and mock races through the southern California desert to simulate the challenge of the Baja 1000, OER found itself in Ensenada, Mexico, the race's starting point. The team's LCVs, dubbed M1 and M2, certainly stood out.

“The vehicles always drew a crowd around, especially at the pre-race parade and while we were

waiting in the starting line queue,” Yakes recalls.

So different were they from the complement of pure racing and production-based trucks and buggies that populate the four-wheeled vehicle classes that they were categorized in a class of their own.

Weighing in at approximately 16,000 pounds, the LCVs are light by tactical vehicle standards but not by race-truck metrics. The fastest, wildest truck division, and the category from which the 2010 overall race winner would come, is known as the Trophy Truck class. A typical Trophy Truck weighs in at just over 6,000 pounds. Powered primarily by race-prepped V8 gasoline engines producing between 650 hp and 850 hp, the rear-wheel-drive Trophy Trucks fly across Baja's varied and sinister terrain at speeds of up to 130 mph.

Taller and wider than the other racers, the LCVs made only small concessions to the racing environment.

“We kept the trucks as stock as possible,” Yakes emphasizes. “The purpose was to develop our technologies for the warfighter, not necessarily for racing. All we really did were safety enhancements such as a roll cage, proper seats, seatbelts, and a few other items.”

Under their skin, the LCVs distinguished themselves from any vehicle the 1000 has ever seen. The truck Generated by [www.PDFonFly.com](http://www.PDFonFly.com) at 3/2/2011 2:47:17 PM  
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powered by a version of OD's ProPulse propulsion system featuring a 400 hp diesel engine and two 140-hp electric motors. The diesel acts solely as a generator, sending power to the electric motors, which drive the truck's front and rear axles. The vehicles have no torque converter, automatic transmission, transfer case, or drive shafts.

The full hybrid-diesel-electric ProPulse system adds ultracapacitors (rather than batteries) to store energy. Energy is also recycled via a regenerative braking function. Also in testing in Oshkosh's larger MTRV (Medium Tactical Vehicle Replacement) and HEMTT (Heavy Expanded Mobility Tactical Truck), the benefits of ProPulse are many, particularly for vehicles intended for the military.

Fuel economy is improved (up to 40 percent) along with range. Running on electric power alone, the LCV emits a much lower heat signature than a conventionally powered vehicle and has the ability to operate silently. The hybrid powertrain also helps to better physically protect vehicle occupants. Because of the deletion of the conventional driveline, components and crew can be packaged optimally for blast mitigation.

"It opens up design possibilities," says Yakes. "We can do things like repositioning the engine, installing it sideways or in other positions. You can optimize where the vehicle crew sits because there's the opportunity to relocate components.

"In the LCV we can use the space underneath the occupants to truly absorb a blast," he adds. "You don't have to worry about transfer cases, heavy prop-shafts, or transmissions coming up through the floor of the crew compartment in the event of an explosion below the vehicle. We have much more space below the crew to work with energy absorption technologies."

Another benefit (and a likely stipulation of the requirements for the JLTV or other future tactical vehicles) is the ability of the LCV or any ProPulse-equipped vehicle to act as a generator, quietly exporting enough electricity to power a city block, airfield, hospital, or command center, eliminating the logistical burden of hauling noisy conventionally-fueled generators.

But ProPulse isn't the only proprietary technology the LCV has going for it. The truck also fields the "next generation" of OD's patented TAK-4 independent suspension.

"It's basically the next generation of what was on the M-ATV," Yakes notes. "We took the TAK-4 and increased its capability to run off-road at speed by about 50 percent. We went from 16 inches of wheel-travel to greater than 20 inches. We use more advanced spring elements, employing technologies that Oshkosh has developed. The combination results in better ride quality at high speeds off-road."

In fact, the LCVs reached speeds above 80 mph during the race, according to CGR principal and LCV-driver Harris. What's more, they were much more comfortable to drive over the punishing course than the race vehicles Harris has campaigned for three decades.

"Running my buggy at top speed, the feedback you normally get with its rear engine is in your face," Harris stresses. "There is so much less from the LCV, it's incredible. The combination of its wheel and tire size, the suspension, the smooth transmission of power, and its steering make the ride very comfortable.

"A thousand miles was not a problem for the driver," he adds. "It's also very quiet. The diesel power plant is well insulated. It also ran at a constant rpm because the power is regulated through its electric motors. There was a whole different feel and sound to it."

As Yakes observes, such qualities in a military vehicle are of great advantage to troops.

"Ride quality is key to soldiers being ready to conduct a mission when they reach any area where an operation takes place. Troops driving or riding in the vehicle for days on end experience much less fatigue instead of being beat up by older technology suspensions. A better ride also aids troops in outrunning the enemy, getting in front of them or getting around them at high speeds."

So how did Oshkosh Extreme Racing perform?

Vildosola Racing was 2010's overall winner. The father and son team of Gustavo Vildosola Sr. and Gustavo "Tavo" Vildosola Jr. became the first Mexican team ever to win the event when their Ford F-150 Trophy Truck crossed the finish line in 19 hours, four seconds, beating Robby Gordon's Chevy CK-1500 to La Paz by 22 minutes, 18 seconds.

"What they did is unique and it's great for our sport," said Tavo Vildosola. "To see someone from outside off-road racing participate and actually finish their first time out is very impressive."

Starting last among all competitors so as not to impede other racers, M1 and M2 took a bit longer to reach the finish in La Paz. In fact, M1 never made it, succumbing to a steering problem at the 150-mile mark. But M2 motored on, taking the checkers in 51 hours.

It was a landmark achievement for a concept vehicle never designed to go racing.



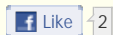
**Oshkosh Extreme Racing Team drivers celebrate after LCV M2 crosses the finish line. Photo courtesy of Oshkosh Defense**

"For these vehicles and the Oshkosh team to perform as they did right out of the gate after relatively little development, taking on an event as challenging as the Baja 1000, and completing it is an amazing accomplishment," says Harris. "Almost no one matches that on their first attempt at Baja!"

"Racing is like a time-warp for component testing," Yakes enthuses. "I think we gained about two years of development data in this short amount of time. We've identified points where we can improve and lessons learned. We're assigning engineers to the data to address any problems and develop for the future."

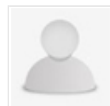
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