



Across the nation the Hollings Manufacturing Extension Program works with over 30,000 manufacturers each year. This case study describes the important role of the Manufacturing Extension Partnership of Mississippi (MEP.ms) Center at Mississippi State University's CAVS Extension in the support of product design, testing, plant layout, facilitation, manufacturing planning and operations at Navistar Defense's plant in West Point, Mississippi. As a result, twelve different vehicles were launched, over 1,000 people were employed at peak production, a strong supply chain of local and regional small and mid-sized manufacturers was developed and nurtured, and the lives of hundreds of U.S. troops and contractors were saved.



*Governor Barbour with Senator Wicker and Staff of the MEP.ms Center at MSU-CAVS-E at the Navistar Dedication.*

*“Public-private partnerships like the one between Navistar Defense in West Point and the Manufacturing Extension Partnership of Mississippi at Mississippi State University are the key to advancing our state’s economy while providing support to quality manufacturers.*”

*MEP.ms is just one example of how Mississippi universities are helping companies excel. Building a strong workforce takes a combination of innovative job training programs and tapping into our state’s universities to put bright minds to work on industry needs.”*

Haley Barbour—Governor of Mississippi



The Manufacturing Extension Partnership of Mississippi (MEP.ms)—a line of business of the Mississippi Technology Alliance—is one of sixty such centers comprising Hollings Manufacturing Extension Partnership (MEP)—a nationwide network of not-for-profit centers serving all 50 states and Puerto Rico. The MEP works with U.S. manufacturers to help them create and retain jobs, increase profits, and save time and money. The nationwide network provides a variety of services, from innovation strategies to process improvements to green manufacturing. MEP also works with partners at the state and federal levels on programs that put manufacturers in position to develop new customers, expand into new markets and create new products.

The MEP of Mississippi is comprised of five MEP.ms Centers which are university or community colleges based and are located throughout the state. MEP.ms works with these MEP.ms Centers and other partner organizations to provide a variety of services tailored to meet the most critical needs of Mississippi's manufacturers ranging from innovation strategies, to process improvements, to green manufacturing. The Mission of MEP.ms and its five affiliated MEP.ms Centers is to help strengthen the global competitiveness of Mississippi-based manufacturing by deploying products and services that produce measurable impacts and top-line growth for manufacturers.

This case study highlights the results from a multi-year series of projects that have substantially impacted both national security and regional economic development. In particular, this report documents work performed by the MEP.ms Center at CAVS Extension (MEP.ms-CAVSE), in support of the launch of Navistar Defense's military vehicle plant in West Point, MS. The MEP.ms field team supported Navistar's military vehicle initiative by designing and implementing the plant's production system, providing advanced planning in support of over 12 new vehicle launches, and developing quality and manufacturing engineering support to local and regional suppliers. The crowning achievement of this West Point plant was the successful commercialization and rapid manufacturing ramp-up of the critically important MRAP (Mine Resistant – Ambush Protected) vehicle. This body of work occurred within accelerated delivery timeframes driven by the life threatening situations encountered by US troops and contractors in Iraq and Afghanistan. The successful launch of the West Point plant provided employment to over 1,000 people during the peak production period, which resulted in dramatically reducing overseas casualties to Improvised Explosive Devices (IED's). This successful effort would not have been possible without the strong leadership of David Creasap, Navistar Defense's Director of Operations, who provided direction to the MEP field team throughout the program.

The work of the MEP.ms-CAVS Extension field team fits within two overall phases of work 1) Kellogg Brown and Root Armored Cabs for Contractors and 2) MRAP Armored Vehicles and other Military Vehicles. During the four plus years of this total effort (2006-2010), over 13,500 vehicles (representing 12 different models and vehicle platforms) were produced and delivered to the Iraq and Afghanistan conflicts. The Navistar-West Point plant and production system, designed through a collaborative effort between the MEP.ms-CAVSE field team and Navistar, was the highest volume MRAP facility among several other military contractors. This plant, throughout the production period, made a significant contribution to the community by re-employing hundreds of laid-off workers from a closed food processing facility. During this rapid industrialization effort, robust benefits were incurred by several of the small and medium size manufacturing enterprises (SMEs) which comprise the plant's supply chain. Currently, the Navistar Defense – West Point plant is still producing vehicles to support the U. S. military.

## The Threat & Plant Launch

By 2005, the Improvised Explosive Device (IED) threat in Iraq resulted in excessive casualties to U.S. contractors and troops. In fact, the US casualty rate from 2004 through 2008 averaged over 800 deaths per year. During this period, the US Department of Defense (DoD) established the development, acquisition and delivery of 'next generation' armored vehicles to the effort in Iraq as its top priority. Against this backdrop, Navistar, a major US truck manufacturer, made several strategic decisions with regards to its military business. First, they decided to leverage an existing relationship with Griffin Inc., a small manufacturer of cash-in-transit armored trucks located in Byhalia, MS. Also, Navistar leveraged their existing truck manufacturing capabilities by relying on an "off the shelf" truck chassis design. This case study is structured into two phases, as illustrated in Figure 1.



## Launch Phase 1: KBR (Kellogg Brown and Root) Armored Cabs - (January – June, 2006)

From the initial stages, Navistar/Griffin contracted with the MEP.ms-CAVSE Center, a Mississippi State University engineering outreach and extension center, to assist in the manufacturing startup activities at a 50 year old boiler plant in West Point. The MEP.ms Team responded and were among the first people working on-site in West Point at the beginning of the project. This field team was led by Glenn Dennis, MEP.ms-CAVSE Manager of Engineering Extension. The team’s initial focus was to assist in transforming the abandoned boiler plant into a facility to manufacture and assemble armored cabs to be used by KBR truck drivers for delivery of critical supplies throughout Iraq. This work included detailed planning of the production lines, and designing workstations and fixtures, required to successfully build armored truck cabs. In addition, the MEP field team developed and qualified several local suppliers to become part of the supply chain for the West Point plant. As a result, the MEP field team conducted projects with the following SMEs which were suppliers to the West Point plant:

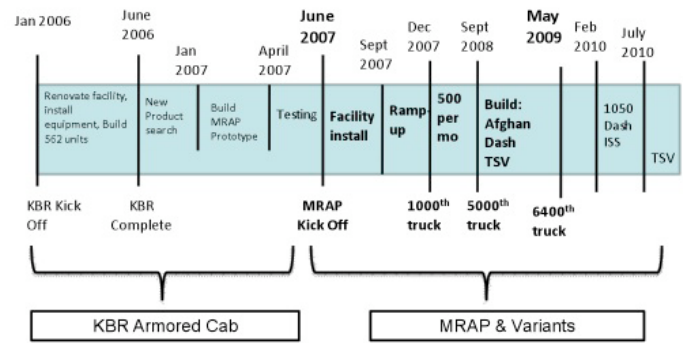
Griffin (Byhalia, MS); Longbranch Fabrication (West Point, MS); Orman Welding and Fabrication (West Point, MS); Precision Machining & Fabrication (Tupelo, MS); Temtco Steel (Louisville, MS)

The plant was successfully transformed, and the production plan implemented, within only six months, so that 562 armored truck cabs were produced on-time and under budget at the West Point plant.

The impact of this KBR project was substantial. In addition to providing employment for almost 300 people during this contract period, these newly designed cabs, contributed in saving the lives of numerous truck drivers. In fact, the West Point plant received an email from KBR personnel in Iraq, thanking them for their work in producing these protective cabs. Prior to the introduction of these cabs, the truck drivers had very little protection against even light arms fire as tragic and violent ambushes were common place.

## Launch Phase 2: MRAP Vehicles and other Military Products (June 2006 to Present)

Following the successful KBR Armored Cab phase of work, Navistar Defense searched for additional product opportunities so that the West Point plant could remain viable. According to Secretary of Defense Robert Gates, the MRAP was designated as the “highest priority of the Department of Defense acquisition program.” Due to the growing IED threat, an 80% reduction in casualties was targeted, as a result of the introduction of the MRAP vehicles. Navistar Defense quickly focused on the development and marketing of their version of the MRAPs, which they branded as MaxxPro®. Concurrently, the MEP.ms Team was tasked with working on the engineering challenge of facilitating the plant, equipment, and production plan necessary to produce the MRAPs at high volume. Figure 2 below reflects both phases of work and includes the transition into the MRAP phase of work.



This aspect of the effort required the MEP field team to travel to Israel, where the initial prototype MRAP was designed and assembled. The objective of this work was to understand the ballistic armor protection package and determine the manufacturing process necessary for integration into a high-volume assembly operation in West Point. This prototype was flown back to the US, where the design was integrated with an existing Navistar truck chassis. This approach was quite successful, and resulted in an innovative and easily manufacturable vehicle design. This design did not require dependence on traditional “slow” welding processes, but on a “bolt and bond” process that greatly simplified the production process and reduced the assembly time.



The MEP.ms Team led the design effort for a high volume assembly line, rather than the traditional “stall build” approach, which has been commonly used in military vehicle production. The “bolt and bond” design, coupled with the high volume assembly line, resulted in a smoother production flow and eliminated time consuming operations (e.g., welding). As a result, the high volume West Point plant provided Navistar with a significant competitive advantage over competitors in terms of production capacity and ability to ramp-up production while maintaining shipping commitments.

On May 31, 2007, Navistar received a DoD order to build 1,200 MRAPs and on June 19, 2007, they received a second order for 755 vehicles. The production and delivery schedule was very aggressive, requiring Navistar from a standing start in June 2007 to a point of sustained monthly production of 500/month by January 2008. The key support roles provided by the MEP field team included:

- Utilization of the ‘Bolt and Bond’ assembly process which enabled the available West Point labor force to be employed and trained quickly (i.e., over 1,000 workers).
- Collaboration with local community colleges (East Mississippi Community College and the Manufacturing Solutions Center, a sister MEP.ms center) to support the rapid ramp-up in workforce training.

Developed Plant Layout, including provisions for needed equipment and facilities: paint booth, shipping docks, conveyors, overhead cranes, etc.

Utilized state-of-the-art simulation and modeling technology to optimize the sizing of equipment and facilities, under a wide variety of planning scenarios.

The MEP field team also worked with a cross section of, mostly, SMEs, which comprised the supply chain for the MRAP vehicle. A partial listing includes: Alphabet, ArmorStruxx, Southern Fabricators, Demmer, Griffin Inc., Grote, Kidde, Lapeer, Milton Manufacturing, Remington, Oran Safety Glass, Service Steel.

Figure 3 depicts the dramatic transformation of the West Point facility from an abandoned boiler plant.

*50 Year Old Abandoned Plant*



*Repurposed City Street Sweeper*



High Volume Truck Assembly

KBR Cabs at Full





The MEP program, through the MEP.ms Center at Mississippi State University's CAVS Extension, played an important role in helping a major defense contractor commercialize and manufacture products for the US military, including the design, prototyping, testing, contracting, manufacturing planning and building of a needed supply chain, comprised mostly of SMEs, within the state and region. A brief summary of the results from the MRAP phase of the project include the following:

Achieved 500/month production rate within the first 7 months of production. A total of 7,750 MRAPs, encompassing 7 model variants were produced over a 2 year timeframe.

At peak production, over 1,000 people were employed during a period when the West Point community had been hard hit by recession and lay-offs from another major manufacturer.

During peak contract periods, over 50% of all MRAP's produced for the U.S. military were manufactured at the West Point plant.

Develop 'Flexible' Plant – The West Point plant is designed to be flexible, which has enabled continuing manufacturing operations (e.g., a recent MRAP-Wrecker variant has been produced, leveraging the flexible capabilities designed into the plant facility by the MEP field team).

Received orders for the production of several thousand other Military Vehicles (including 5 variants) due to the success of the MRAP effort.

Development of a community-wide partnership played an important role in the success, including: Navistar, Griffin, DoD, Ms. State Univ., City of West Point, East Mississippi Community College, Mississippi Development Authority, others.

Saved Lives: **84% Reduction in US Casualties** - (904 in 2007 to 149 in 2009).

The MRAP project represented DoD's highest acquisition priority during the past several years, with a resulting reduction in US casualties of over 80%. Secretary of the Navy, Donald C. Winter (11/14/2007) remarked during a visit to the West Point plant: "... the MRAP program was the largest industrial buildup since World War II." Also, David Creasap, Director of Operations, Navistar Defense, stated the following in reference to the MEP.ms-CAVSE field team led by Glenn Dennis: "With the assistance of CAVS Extension's Glenn Dennis, we were able to conceptualize, budget, and provide a transition plan to create the highest production output facility supporting the MRAP program. Over the next 11 months, the planning has become a reality and our West Point facility has become the premier plant for this product supporting the Warfighter and saving lives. ... Glenn continues to provide the leadership and innovative ideas to enhance our product quality, volume capacity and overall process flow." Finally, Dr. David Shaw, MSU's Vice President for Research and Economic Development, states: "MSU's CAVS Extension is playing a key role in providing engineering and manufacturing support to industries throughout Mississippi. In particular, the Navistar Defense project is a stellar example of how the university works with industry to create sustained economic benefits, stimulating hundreds of jobs in the West Point, MS area."

This work was recently recognized by the University Economic Development Association, where the MEP.ms team received the 2010 National Award for Excellence in Business Assistance and Entrepreneurship.

