Land-Based Combat Manufacturing: Opportunities and Assets in Mississippi

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Table of Contents

Executive Summary	4
Introduction	5
Land-Based Combat Manufacturing Industry	7
Market Characteristics	11
Competitive Landscape	14
Global Market	17
United States Market	23
Industry Location	25
Site Selection Factors	30
Mississippi Assets	33
Workforce Availability	36
Discussion	41
Conclusion and Recommendations	42
References	44
Appendices	48

Executive Summary

Armored vehicles, the most prominent product in the land-based combat industry, can separate into three subtypes wheeled vehicles, tracked vehicles, and battle tanks. State and federal governments primarily drive the market by purchasing industry products. There are few major players in the market, as investment costs create a high barrier to entry. The United States is the largest individual buyer, but the Asia-Pacific region dominates the market. This demand presents opportunities for growth, both domestically and internationally. Numerous indicators project global market growth for military ground vehicles in the upcoming years. Site selection factors in the industry are proximity to related businesses, transportation assets, and the presence of research institutions. Assets in Mississippi to support industry growth are the Center for Advanced Vehicular Systems, the U.S. Army Engineer Research and Development Center, Camp Shelby Joint Forces Training Center, and the Port of Gulfport. An available workforce in also present in the state and comes at a lower cost to employers. Using the site selection factors and measuring them against Mississippi's assets, the state earns an overall grade of B- in its ability to support the industry. The state's growth efforts should focus on assisting current land-based combat companies already in the state with their growth strategies, rather than company relocations. Defining why Mississippi is losing defense production contracts to other states or other companies can clarify, individually, where Mississippi weak. While Mississippi has assets to support the growth of the land-based combat manufacturing industry, efforts should focus on assisting companies within the state.

Introduction

Purpose

This report fills the goals of the 2019 – 2023 State Strategic Plan to strengthen Mississippi's defense and national security assets as an economic driver for the state. Specifically, the report addresses Objective 3A *to develop a comprehensive business retention and expansion program to identify and grow key value propositions associated with defense industry segments that would find Mississippi attractive, including, but not limited to: foreign military sales, blue economy innovations, land-based combat systems, cybersecurity, unmanned systems, aerospace, advanced materials, joint military training missions, space force*. This report will analyze the land-based combat systems industry from a global perspective as well as the market in the United States. The analysis inventories assets to support the industry within the state of Mississippi and provides recommendations to policy and industry leaders.

Background

The Department of Defense Office of Economic Adjustment (OEA) Mississippi Defense Initiative (MDI) commissioned this report. This program exists to strengthen and diversify the defense industry through the building of collaborative partnerships between defense contractors, educational institutions, and local and state governments. Promoting commercialization and technology transfer of defense technology is an important component of the initiative. This study looks at unmanned and autonomous systems through the lens of land-based combat systems manufacturing. This report analyses characteristics of the land-based combat manufacturing industry, where manufacturing facilities locate, and what factors contribute to those locations. The report discusses the assets to support the industry in Mississippi and if and how Mississippi should attract and grow the sector.

Methods of Investigation

This study utilized using both publicly available data and information obtained from private databases. Data sources used include Gazelle, EMSI, Nexis Uni, IBIS World, and BCC Research. Additionally, the researcher gathered information from public press releases, individual company websites, and military information websites. This report defines common site selection factors for manufacturing facilities in the industry. These factors are evaluated against Mississippi to determine if Mississippi is a good fit for industry expansion.

Scope

This research primarily looks at three reports addressing of the land-based combat manufacturing market. The reports addressed different sectors of the industry, including Tank and Armored Vehicles Manufacturing in the United States, the Global Military Ground Vehicles Manufacturing Market, and Military Armored Vehicles and Tank Manufacturing. This approach allows for a holistic view of the market from a global, national, and state perspective. The research focuses on the state of Mississippi and if Mississippi can sustain growth and support the land-based combat manufacturing industry.

Land-Based Combat Manufacturing Industry

Armored vehicles are the most significant product segment of the land-based combat manufacturing industry. More specifically, these are wheeled vehicles, tracked vehicles, and battle tanks. Each vehicle type makes up about one-third share of market revenue. The most common and well-known vehicle types in the industry are the Bradley, M113, Stryker, MRAP, and Abrams Tank vehicles. Industry growth in Mississippi can likely come from wheeled or tracked vehicles.

Land-based combat systems, while a broad term, can be categorized into three main market segments of military ground armored vehicles: wheeled armored vehicles, tracked armored vehicles, and battle tanks. Other subtypes of wheeled or tracked vehicles include armored personnel carriers, infantry fighting vehicles, light armored vehicles, armored combat support vehicles, light utility vehicles, anti-aircraft vehicles, self-propelled weapons, and related parts. (Savaskan, 2019; The Business Research Company, 2018; Arun, 2018). These variations of land-based combat vehicles are designed and developed to serve a variety of purposes, from basic transportation to medical services (Arun). All military armored vehicles, mainly made of steel, are designed to withstand high impact from bullets and missiles, which vary based on the purpose of the vehicle while protecting persons inside (Arun). All land-based combat in the form of military vehicles are armored but will either be wheeled or tracked, based on their specific purpose and need.

Vehicle classification can also be by use rather than the type of wheel, including unmanned vehicles, infantry fighting vehicles, and armored personnel carriers. Unmanned ground vehicles include those used for operations too dangerous or impossible for infantry to be involved, present, or onboard (The Business Research Company). An infantry fighting vehicle (IFV) is an armored vehicle that serves a dual purpose; it transports infantry and has weapons systems, typically small-bore cannons. On the other hand, an armored personnel carrier (APC) is primarily designed for infantry transportation but may have heavy machine guns for protection. The most

common IFV vehicle type is the M2 Bradley while the most common AFC is the M113 vehicle (see Figures 1 and 2)

Figure 1 *IFV – M2 Bradley*

Source: Armed Forces

Figure 2 *APC – M113*

Source: Armed Forces

Wheeled Vehicles

Wheeled armored vehicles are simply military vehicles on wheels rather than tracks. Wheeled armored vehicles are cheaper to maintain, lighter, more mobile than typical tracked vehicles, but they have limited landscape on which they can travel (Savaskan). The most notable products in this segment are the Stryker armored fighting vehicle and the mine-resistant ambush-protected (MRAP) vehicle (see Figures 3 and 4).

Figure 3 *Stryker Wheeled Vehicle*

Source: Bloomberg

The Stryker, manufactured by General Dynamics, combines the likeness of an infantry carrier vehicles and mobile gun system (Military.com, 2020). The eight-wheeled vehicle

is ideal for firepower and battlefield mobility (Military.com). MRAP vehicles provide mobility and mounted firepower capabilities while protecting soldiers from explosives, underbody mines, and firearm threats (U.S. Army). The MRAP design is unique in that is has a v-shaped hull that deflects land mines from beneath the vehicle.

Figure 4 *MRAP Wheeled Vehicle*

Source: Military Today

Tracked Vehicles

Opposed to wheeled vehicles, tracked armored vehicles operate on tracks. Typically, tracked armored vehicles are more expensive to manufacture, less mobile, more heavily armored, and able to travel more diverse landscapes when compared to wheeled vehicles (Savaskan). The more prominent vehicle in this category is the Bradley M2-M3, manufactured by BAE Systems; the armored fighting vehicle protects against small firearms and has mounted firepower (see Figure 5) (Savaskan; Military.com).

Figure 5 *M2-M3 Bradley Fighting Vehicle*

Source: Military Today

Battle Tanks

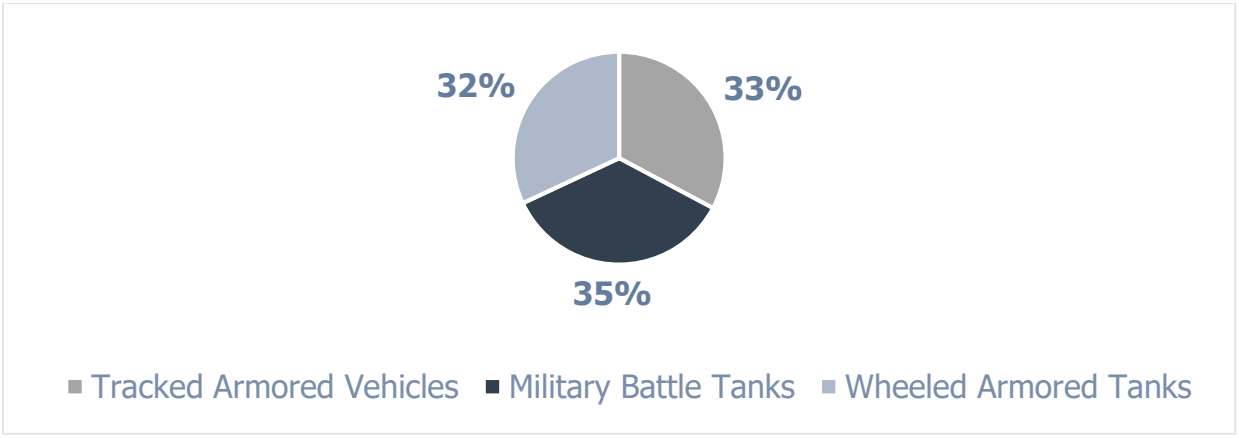
Military battle tanks are armored tracked vehicles. However, they are typically separated from tracked vehicles because they account for a large portion of the military land vehicles market. Military tanks or battle tanks are the most heavily armored military vehicle having platforms for weapons, including machine guns and long-barreled guns (Savaskan; The Business Research Company). Military tanks do not operate well in urban or mountain environments, but they provide cross-country mobility (Arun; Savaskan). There is typically a high cost associated with the maintenance and upkeep of battle tanks (Savaskan). The most notable tank in the market is the Abrams main battle tank, manufactured by General Dynamics in Lima, Ohio (see Figure 6) (Savaskan; Military.com; Fellman, 2019). Each type of armored vehicle accounts for about one-third of the market share, but battle tanks generate the highest revenue (see Figure 7).

Figure 6 *M1A2 Abrams Battle Tank*

Source: Military.com

Figure 7

Industry Revenue by Product Segment in the United States (2019)



Source: IBIS World

The main industry product in the land-based combat manufacturing sector is armored vehicles. Armored vehicles can be categorized into three main segments, wheeled vehicles, tracked vehicles, and battle tanks. Each type takes about one-third of the market revenue, with battle tanks slightly gaining more share. Opportunities for Mississippi lay in wheeled or tracked vehicles, as an Ohio facility primarily produces battle tanks.

Market Characteristics

The land-based combat systems manufacturing industry is distinctive in that federal or state governments across the globe primarily drive the market. The availability of funds a government has to support its defense operations in any given year will affect the industry. Military tensions, technology advances, and public-private partnerships also drive the market. On the other hand, the high cost of investment creates a substantial barrier to entry. The increasing use of air warfare and increased protection against cyber-attacks hinder growth in the industry.

External Drivers

Drivers of the land-based combat systems market are mainly defense spending as purchases primarily come from government military budgets. National governments typically fund the market in its entirety; thus, the primary demand determinant is federal funding for defense (Savaskan; Arun). When a national economy is doing well, it can collect more taxes and can fund more security and military operations (Savaskan). Conversely, if the financial condition of a nation is performing poorly, government spending is focused on improving the economy and less on military functions (Savaskan). In the United States, in particular, funding for the industry comes from the United States Military and contracts from the Department of Defense (Savaskan). On the other hand, the industry has seen a recent rise in private companies investing in the industry, especially in military vehicle manufacturing (Arun). The success of the United

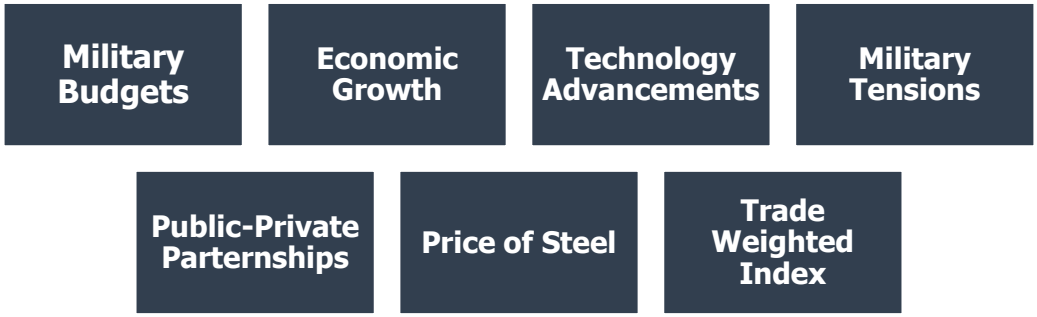
States economy has a positive effect on armored vehicle demand. Overall growth in the United States presents opportunities for industry growth in Mississippi.

BCC Research identified four specific drivers of the military armored vehicles and tanks market as economic growth, technology advances, rising military tensions, and public-private partnerships. The market benefits from economic growth, specifically the growth of developing countries, as they can allocate a larger budget to defense and less towards the welfare of citizens (Arun). The market can benefit when developing countries increase their defense budgets. Second, an increase in technology advancement supports the market. Numerous companies expect to increase their research and development efforts, which allows to market to expand (Arun). Terrorism and tensions among counties, while unfavorable to some, do support the market's growth through countries investing in their military and defense operations and asset inventory (Arun). Last, the establishment of public-private partnerships encourages collaborations an investment into local markets (Arun). Mississippi companies in the industry should monitor advancements, development, and trends in the industry to remain competitive.

Savaskan offers additional industry drivers as the price of steel and the trade-weighted index. The price of steel impacts the industry, as most products are made of steel. Typically, a manufacturer can pass the increased cost of steel to the customers. However, contracts are customarily made before production begins, making the price challenging to defer (Savaskan). The trade-weighted index (TWI) measures the value of a country's currency relative to the currencies of its trading partners. In 2019, the TWI decreased, leading to a relatively lower price of exports and a relatively higher price of imports (Savaskan). When the TWI decreases, international industry competitors benefit through an increasing demand to export their products overseas (Savaskan). Military budgets, growing national economies, advancing technologies, military tensions, public-private partnerships, the price of steel, and the TWI support and drive the market for land-based combat systems manufacturing (see Figure 8).

Figure 8

External Drivers of the Land-Based Combat Industry



Industry Restraints

The high barriers to entry and investment costs deter new companies from entering the market. The increased use of air warfare and cyberwars also restrict industry growth. Strict government policies and a small number of buyers create a high barrier for market entry; thus, the market concentrates within a few companies (The Business Research Company). A new company wanting to enter the market faces high startup costs in terms of machinery, research and development, and import-export expenses, in addition to continuous testing costs (Arun). The increasing demand and transition to air warfare restrict the market's growth. The introduction and expansion of air warfare tactics, including antitank missile systems, may cause the military ground vehicles market to fall (Arun). Due to the projected increases in cyberattacks allocated portions of government and defense budgets to protect and counteract against these attacks (Arun). The spending on cybersecurity investment projects to impact the military armored vehicles market negatively (Arun). The high barriers of entry, increasing air warfare, and projected investment in cybersecurity all limit the market's ability to see growth.

Competitive Landscape

A few significant players heavily dominate the competitive market for the manufacturing of the land-based systems. The global market primarily consists of General Dynamics, BAE Systems, Rheinmetall AG, Navistar, and Oshkosh. According to BCC Research, the ten largest companies in the military armored vehicles and tanks controlled 46% of the market in 2017 (Arun). BAE Systems currently has an office on the Mississippi Coast while Navistar operates a production facility in West Point.

General Dynamics

General Dynamics is the most significant player in this market, accounting for 17.5% share of the market, according to The Business Research Company. Founded in 1889 and headquartered in Virginia, General Dynamics primarily operates as an aerospace and defense company. The company has operations across North America, Africa, Europe, the Asia Pacific, the Middle East, and South America (Arun). The company has four main divisions of operation: marine systems, aerospace, information systems, and combat systems. The combat systems division consists of three business units: European land systems, land systems ordinance, and tactical systems and technology (Arun). The combat systems division manufactures military battle tanks, tracked armored vehicles, light armored vehicles, and weapon systems (Arun). The section of the combat systems division, which produces wheeled combat, tracked combat, and battle tank vehicles, generated a revenue of $4.1 billion in 2017 (Arun). General Dynamics hopes to achieve growth by offering more products in the medium weight armored fighting category (Arun).

General Dynamics had an information technology center in Hattiesburg, Mississippi. In 2018, *The Hattiesburg American* reported that the call-center facility was to be bought by Maximus, Inc. (Beveridge, 2018).

BAE Systems

The second most prominent competitor in the market for military ground vehicles is BAE Systems. BAE Systems captured 8% of the military ground vehicle market in

2017 (The Business Research Company). BAE Systems, based in London, United Kingdom, and founded in 1999, operates primarily in Australia, The United Kingdom, India, Saudi Arabia, and the United States (Arun). The company designs and manufactures defense equipment, security, and aerospace products (The Business Research Company; Arun). BAE Systems is composed of five divisions: Platforms and Services (United States), Platforms and Services (United Kingdom), Platforms and Services (International), Electronic Systems, and Cyber and Intelligence (Arun). The United States sector of the Platforms and Services division manufacturing military armored vehicles and tanks earned $1.1 billion in revenue in 2017 (Arun). BAE Systems recently designed a camouflage system technology that makes vehicles invisible during combat. The growth strategy of BAE Systems is to focus on the research and development of its product's performance (Arun).

Additionally, BAE Systems currently has a Support Systems office on the Mississippi Coast in Gautier (BAE Systems). Multiple news sources report BAE Systems had a facility in Hattiesburg, MS, from 2004 to at least 2014. The facility, and 68 employees, oversaw the final integration and testing of weapon systems (Burns, 2014).

Rheinmetall AG

Following General Dynamics and BAE Systems in terms of market share is Rheinmetall AG. Rheinmetall AG captured 5.3% of the military ground vehicles market in 2017 (The Business Research Company). The automotive part supplies and technology company, founded in 1889, operates in Dusseldorf, Germany (Arun). Rheinmetall AG operates two main divisions: automotive and defense. The defense division manufactures armored tracked vehicles, protection systems, and weapon systems (Arun). Rheinmetall AG is estimated to have earned revenues of $1.2 billion from military armored vehicles and tanks in 2017 alone (Arun). The company's growth strategy is to establish partnerships with other European companies (Arun).

Rheinmetall AG has a robust presence internationally, especially in Europe, with a focus in Germany. Facilities in the United States are in Virginia, Arkansas, Maine, and

Michigan (Rheinmetall Defence, 2020). There is no history of Rheinmetall facilities in Mississippi.

Oshkosh

The fourth-largest competitor is Oshkosh Corporation, with a 4% market share in 2017 (Arun). The company headquartered in Oshkosh, Wisconsin, was founded in 1917, and manufacturers military vehicles, truck bodies, and specialty trucks (Arun). The company's three divisions are Access Equipment – fire and emergency, Commercial, and Defense (Arun). The Defense division produces wheeled vehicles for the United States and generated revenues of $9.8 billion in the military armored vehicles and tanks market in 2017 (Arun). Similar to BAE Systems, Oshkosh hopes to see growth through investment in research and development and expansion of products in the market (Arun).

Oshkosh Defense primarily operates of Oshkosh, Wisconsin, but also has a facility in Maryland. Oshkosh does not have a history of facilities in Mississippi. However, the company recently announced its first facility in the Southeast in Jefferson County, Tennessee (Tennessee Economic & Community Development, 2019). The location fabricates body assemblies for joint light tactical vehicles.

Navistar International Corporation

Navistar International Corporation, formerly International Harvester, holds the position as the fifth-largest competitor in the military armored vehicles and tank market. The company secured a 4% share of the market in 2017 (Arun). Navistar, headquartered in Lisle, Illinois, and founded in 1902, manufactures military vehicles, school and commercial buses, engines, and service parts (Arun). The company operates within four divisions: Trucks, Parts, Global Operations, and Financial Service. The Trucks division produces trucks, military vehicles, and buses (Arun). In 2017, Navistar brought in a revenue of $900 million from its product sales of military vehicles (Arun). To gain more market share in the military vehicles segment, Navistar is focusing its strategy on increasing its advanced combat vehicle offerings (Arun).

Navistar currently has a production facility in West Point, Mississippi. Ted Wright told *Mississippi Business* that the assembly plant had produced tens of thousands of vehicles since 2006. More information about the Navistar location in Mississippi is in the Manufacturing in Mississippi section.

Global Market

The global market is dominated by the Asia-Pacific region, while the United States is the largest individual purchaser. The demand from a worldwide perspective expects to grow in the upcoming years. This growth presents an opportunity for Mississippi production, both domestically and globally.

There are numerous indicators to capture the global market for land-based combat manufacturing. The historical and projected market size, the per capita average expenditure, and the regional spending provide insight into the industry from a global perspective. The supplemental qualitative analysis offers a further explanation on the worldwide market. While the Asia-Pacific region is the most significant in the industry in terms of expenditure, the United States is the largest buyer. Manufacturing facilities primarily located in the United States and Europe (see Figure 9).

Figure 9

Global Military Armored Vehicles, Tank, and Tank Component Business Locations

Source: Nexis Uni

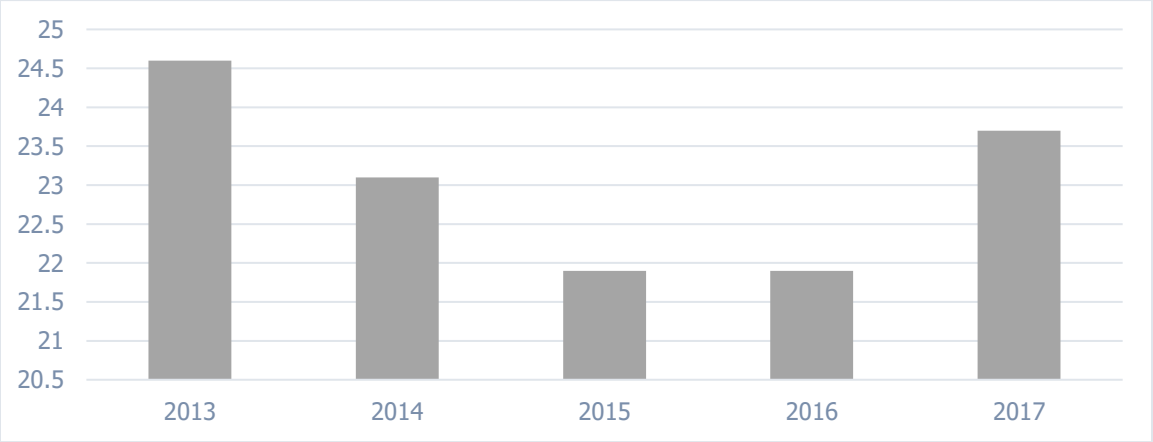
Market Size

In the past few years, the global market for ground vehicles decreased. However, indicators project growth in the years leading up to 2021. The projected increase in demand and spending provides a positive outlook for the industry from a global lens. Declining expenditure in any particular market could mean buyers are switching to other products, or consumers no longer want the products. The market size for land-based combat vehicles projects growth, meaning the industry could see success in upcoming years. Mississippi can benefit from this growth through increased manufacturing or new business locations in the state.

Overall, the market for military ground vehicle manufacturing accounted for 0.03% of the global gross domestic product (GDP) and 1.3% of all military expenditure (The Business Research Company). The Business Research company anticipates the global military ground vehicles manufacturing market to increase in the upcoming years, following a decline from 2016. According to The Business Research Company, the global market for the manufacturing of military ground vehicles was $24.6 billion in 2013 and declined to $23.7 billion in 2017 (see Figure 10). This decline is attributed to cuts in defense budgets by large spenders in the industry, such as the United States and Russia (The Business Research Company).

Figure 10

Historical Global Market Size for Ground Vehicles Manufacturing, $ Billion

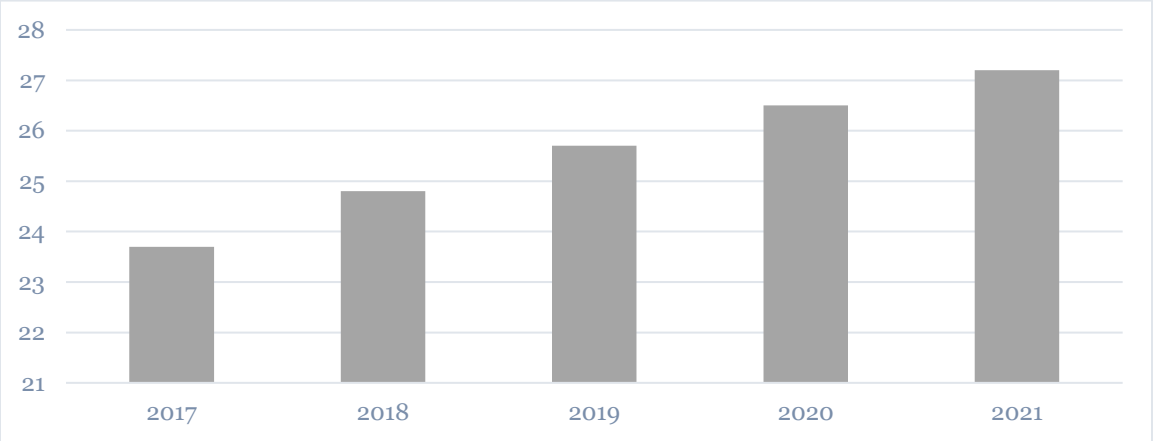


Source: The Business Research Company

Growth in China, India, and Southeast Asian nations have shown increasing budget allocations for defense spending (The Business Research Company). The Business Research Company expects the global market to grow to $27.2 billion in 2021 (see Figure 11). Countries in the Asia-Pacific region expect to drive the market due to rising threats and increasing nationalism (The Business Research Company).

Figure 11

Forecast Global Market Size for Ground Vehicles Manufacturing, $ Billion



Source: The Business Research Company

The global market for military ground vehicle manufacturing experienced a decline in the years before 2017 due to reduced spending by substantial industry purchasers. However, The Business Research Company projects market increases to the year 2021. The Asia-Pacific region will primarily drive the rise as threats in the area are expected to grow as well. The forecasted growth will benefit the global market in terms of expenditure and presents an opportunity for production expansion in the United States and Mississippi to meet the market demand.

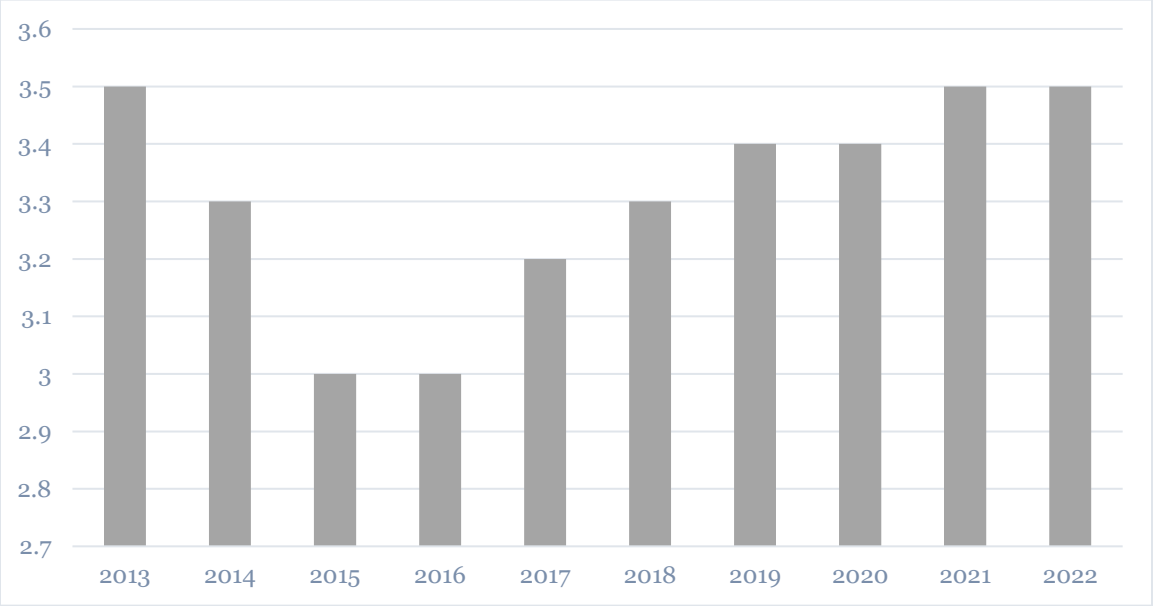
Per Capita Average Expenditure

The global per capita average of military armored vehicles and tanks expenditure shows a gradual increase in the coming years. The per capita average indicates the number of military armored vehicles and tanks used per person across the globe.

According to BCC Research, the global per capita average military armored vehicle and tank market was $3.5 in 2013 and fell to $3.2 in 2017. Arun expects the average to return to $3.5 in 2022. (see Figure 12) (Arun). This increase presents an opportunity for growth in the United States and Mississippi.

Figure 12

Global Per Capita Average Military Armored Vehicles and Tank Market Expenditure, ($)



Source: BCC Research

The gradual increase in the global per capita average of the military armored vehicles and tanks market expenditure slightly exceeds the projected population growth. This increase offers a positive global outlook for the land-based combat manufacturing market.

Regional Spending

The global market for military armored vehicles has a concentration in the Asia Pacific region. According to The Business Research Company, the area's spending on military ground vehicles reached $10.9 billion and 46.1% of the global market in 2017 (see Table 1). Spending in the region has increased due to security threats and in an attempt to secure borders with ground vehicles (The Business Research Company).

Western and Eastern Europe, respectively, follow the Asia Pacific region in terms of regional market share. Growth in Asia provides an opportunity for Mississippi to export to the area.

Table 1

Global Military Ground Vehicle Manufacturing Market, 2017

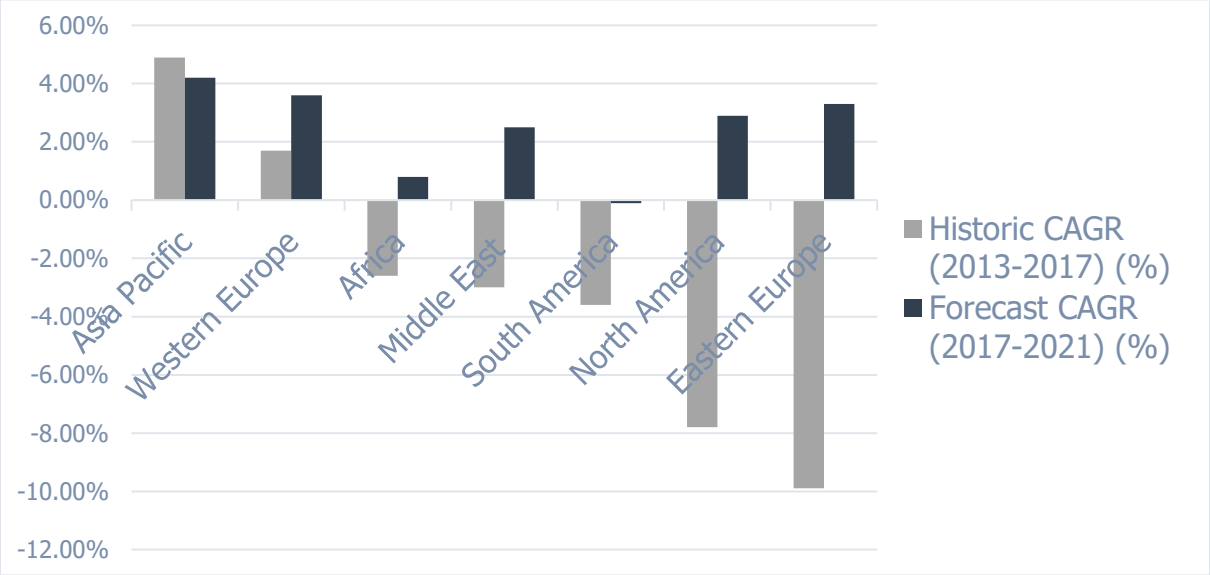
Region	Region Share	Market Value ($ Billion)
Asia Pacific	46.1%	10.9
Western Europe	13.2%	3.1
Eastern Europe	11.6%	2.8
Middle East	11.4%	2.7
North America	11.3%	2.7
Africa	4.8%	1.1
South America	1.5%	0.4

Source: The Business Research Company

Additionally, the Asia Pacific region had a compound annual growth rate of 4.9% from 2013-2017 and expects to see continued growth through 2021 (see Figure 14) (The Business Research Company). This expansion and increased spending can be attributed to the Asian country governments wanting to defend their territory and increase the capabilities of the ground vehicle fleet (The Business Research Company). Although the United States does not export to all countries in the region, this expected growth presents an opportunity for Mississippi to ship to the Asian region.

Figure 14

Global Military Ground Vehicle Manufacturing Market, Historic and Forecast Growth Rate, By Region, 2013-2021, Percentage (%)



Source: The Business Research Company

Although the Asia Pacific region dominates in market share and growth, the United States is the country with the most significant expenditure. In 2017, the United States' purchases were the largest in the world at $2.53 billion and accounting for a 10.7% share of the market (see Table 2) (The Business Research Company). This large share can be attributed to the United States' involvement in peacekeeping missions across the globe (The Business Research Company). Military vehicle manufacturers in the United States can benefit from the sizeable defense budget of the United States.

Table 2

Global Military Ground Vehicle Manufacturing Market, by Country, 2017

Country	Country Share (%)	Revenue ($ Billion)
United States	10.7%	2.53
China	9.4%	2.23
Russia	5.9%	1.39
India	3.8%	.91
France	3.4%	.80
United Kingdom	2.4%	.57
Germany	2.1%	.49
Japan	2.0%	.47
Italy	1.5%	.35
Australia	0.8%	.18
Spain	0.7%	.18
Brazil	0.7%	.16
Others	56.7%	13.4

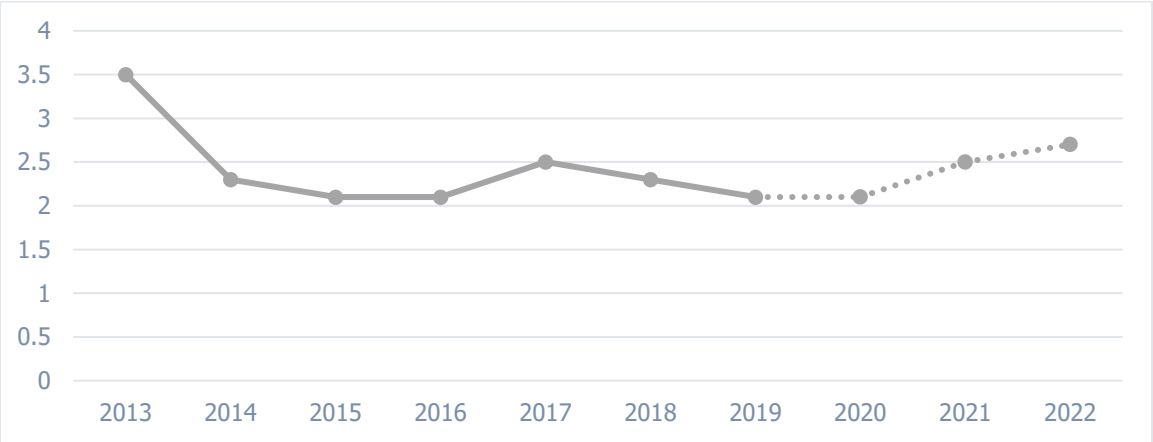
Source: The Business Research Company

United States Market

The United States military spending budget accounts for 3.3% of GDP, according to BCC Research (2018). The United States in 2013 spent $3.5 billion on military armored vehicles and tanks, and the spending declined to $2.5 billion in 2017 (Arun). The compound annual growth rate for 2017 to 2021 expects to rise by 0.9% to $2.7 billion (see Figure 15) (The Business Research Company; Arun).

Figure 15

United States Military Armored Vehicles and Tank, Historic Market (2013-2017) Forecast Market, through 2022, ($ Billions)



Source: BCC Research

In 2017 the armored vehicle fleet in the United States comprised 41,062 armored fighting vehicles and 5,884 battle tanks (Arun). The United States spent over $2 billion on armored vehicles and $497.9 million on battle tanks in 2017 alone (Arun). In 2017, the military armored vehicle and tank market accounted for 0.3% of the United States' total military expenditure (Arun). This budget allocation for military armored and military ground vehicles has been driven by the United States' operations in peacekeeping efforts across the globe (The Business Research Company). Additionally, the declining compound annual growth rate and spending of the United States is due to the reduction in troop size and requiring fewer vehicles for transportation and battle (The Business Research Company). Even with these declines, the United States is still the most significant player in this market.

United States Exports

An analysis of the United States military exports can provide insight into available opportunities in Mississippi. According to the SIPRI Transfers Database, the United States' exported over $2 billion armored vehicles in 2019 alone, accounting for 8% of all military exports. From 2014 to 2019, the United States exported armored vehicles

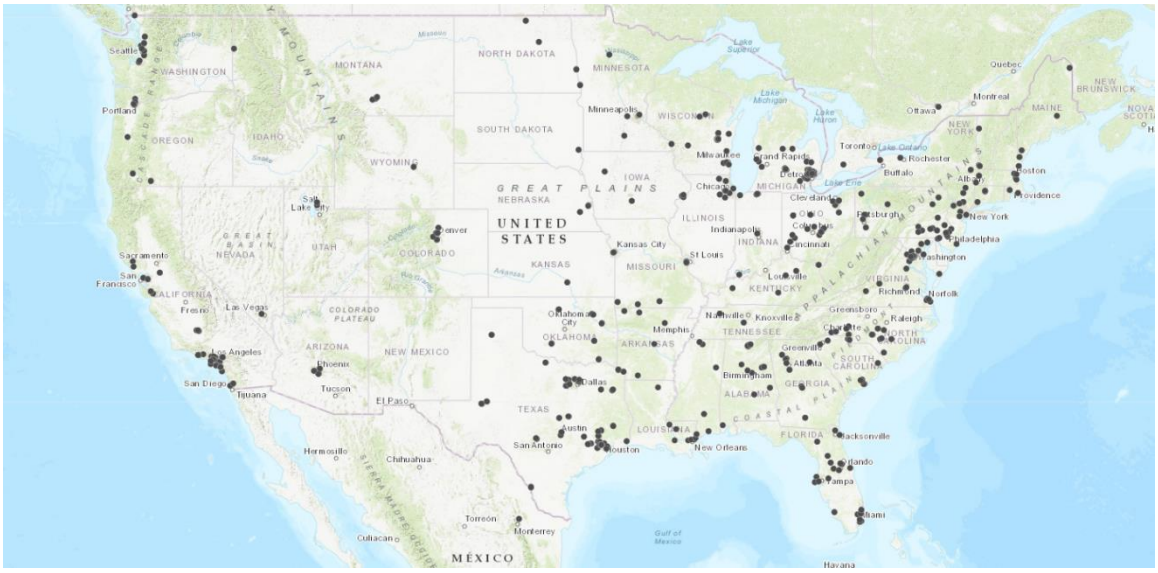
worth $18 billion, accounting for 10% of all exports (SIPRI). Conversely, the United States International Trade Commission reports over $7 million in Tanks And Other Armored Fighting Vehicles, Motorized, Whether or Not Fitted With Weapons, and Parts of Such Vehicles exports from 2014 to 2019. Baltimore, MD, Philadelphia, PA, and New York, NY, are the highest districts in terms of export value for this industry (The United States International Trade Commission, 2020). Mississippi can utilize the strategic port on the Gulf Coast to capture portions of the export market.

Industry Location

Due to the small number of competitors in the industry, company locations tend to concentrate on a few central metropolitan areas. According to Nexis Uni, there are 653 facilities across the globe with the NAICS code of 336992 Military Armored Vehicle, Tank, and Tank Manufacturing as their primary or secondary code. In the United States, business location is highly concreated, with 37.8% of businesses located in the Great Lakes, especially Michigan, region, followed by 20.2% of companies in the Southeast region (see Figure 16). (Savaskan). Of those 653 facilities, 462 are in the United States, with 49 in Michigan (Nexis Uni). Following the highest state of company locations, are Texas with 47, California with 37, Virginia with 28, Florida with 26, and Ohio with 23 (Nexis Uni). Mississippi is lower on the list with five companies.

Figure 16

United States Military Armored Vehicles, Tank, and Tank Component Business Locations



Source: Nexis Uni

The Great Lakes region is most notably home to General Dynamics Land Systems, a subsidiary of General Dynamics, the largest company in the industry (Savaskan). Companies in the Southeast region include Applied Energetics and Steward and Stevenson Services, which is a part of BAE Systems (Savaskan). The high concentration of industry location is primary due to clustering, in which subcontractors and suppliers want to be close to the main players. Industry partnerships are more comfortable to make and maintain when companies are near each other as well (Savaskan).

Manufacturing in Mississippi

There are five companies in Mississippi in the land-based combat manufacturing industry, including one production facility and four supportive companies (see Figure 17). Major players with operations in Mississippi include Navistar and BAE Systems. Seemann Composites, Griffin, Inc., and Cite Armored are smaller but play an integral role in growing the industry in Mississippi.

Figure 17

Mississippi Military Armored Vehicles, Tank, and Tank Component Business Locations

Source: Nexis Uni

Navistar

Since 2006, Navistar Defense's primary manufacturing facility has been in West Point, Mississippi (MBJ Newswires, 2020). Navistar, before January 2020, was leasing the facility but recently committed to the area by purchasing the 562,000 square foot manufacturing facility (MBJ Newswires). A $35 million contract from Pakistan was awarded to the Mississippi Navistar plant to manufacture 40 armored vehicles, completed in 2018 (The Clarion-Ledger, 2017). Also, according to the *Mississippi*

Business Journal, in December of 2019, Navistar was awarded a foreign military contract of $24.5 million to provide medium tactical vehicles, to be completed at the West Point facility (2020). Navistar's commitment and strong presence in Mississippi offers a foundation for the industry's growth.

BAE Systems

BAE Systems currently has a Support Solutions office located in Gautier, Mississippi. The Support Solutions department supports the Department of Defense, federal agencies, and private organizations (BAE Systems). According to *WDAM*, a previous BAE Systems location in Hattiesburg, MS assembled and tested the M-777 Howitzer. The facility also refurbished six Howitzers each month before being sent back out and used for battle (Made in Mississippi: BAE Systems 2011). The once vital facility has since closed.

Seemann Composites

Seemann Composites, Inc. operates out of Gulfport, Mississippi, and manufactures fiberglass boats, racing yachts, and composite materials (Gazelle, 2019). The company specializes in designing, developing, and building high-performance composites (Seemann Composites). Seemann currently does business with the U.S. Naval Warfare Center Cardenrock Division, U.S. Naval Undersea Warfare Center, and the U.S. Army Tank-Automotive and Armaments Command. Seemann focuses on the production of components for the Department of Defense and commercial sectors (Seemann Composites). The company stays at the forefront of composite processing technology and is known for its innovation of vacuum infusion (Gazelle). Bill Seemann, the founder, invented the SCRIMP (Seemann Composites Resin Infusion Molding Process) technology to meet the demands of the United States Navy (MIT Open Courseware). The technology is useful in building large-scale structural composite parts with the need to be robust, durable, and lightweight (MIT Open Courseware). The innovative technology created by Seemann Composites has changed the industry for vacuum-assisted resin transfer molding of composites.

While Seemann Composites has enjoyed success, according to Gazelle, the company does not have a high likelihood of expansion soon. According to Nexis Uni, the company has an annual revenue of $16 million and 90 employees.

Griffin, Inc.

Griffin, Inc., located in Byhalia, manufactures armored vehicles, specialty tanks, architectural security products (Griffin Incorporated). The company employs 70 workers and generates annual revenue of $14 million (Nexis Uni). Griffin makes a variety of SWAT vehicles, riot control vehicles, water tanker vehicles, and military armored personal carriers (Griffin Incorporated). Although Griffin produces a range of armored vehicles, the company does not have a history of producing wheeled vehicles. The company was the first armored vehicles manufactured to use G-90 galvanized metal, which increases the life of the vehicle exterior. The company has provided for the United States Military and the Israeli Ministry of Defense. Griffin also supplies for police departments and SWAT within the United States (Griffin Incorporated). Gazelle gives the company a G-Score of 1, meaning Griffin is not likely to expand.

Cite Armored

Cite Armored, Inc. operates out of Holly Springs and has 35 employees, (Nexis Uni). Cite Armored manufactures armored vehicles, in addition to refurbishing, repairing, and part replacement (Cite Armored). Cite Armored does not have a history of wheeled vehicle production. The company makes military vehicles in addition to armored personnel carriers, U.S. military vehicles, national guard vehicles, border patrol vehicles, homeland security vehicles, and transport busses (Cite Armored). In addition to cars for the military and defense operation, Cite Armored also manufactures for the law enforcement and government, including SWAT vehicles, local law enforcement, first responders, municipalities, and sheriff departments (Cite Armored). Similarly, to Seemann Composites, Gazelle does not identify Cite Armored as currently likely to expand.

General Dynamics

General Dynamics previously had a call-center in Hattiesburg, Mississippi, but Maximus bought the facility in 2018 (Beveridge).

While the number of facilities in Mississippi is lower compared to other states, the presence of major players provides the area with the opportunity for growth. There is potential for major players to expand their operations in Mississippi and utilize the state's assets. There is potential for the land-based combat manufacturing industry in Mississippi to build upon the numerous military installations and defense contractors throughout the state.

Site Selection Factors

When determining where a new plant or facility locates, a company evaluates multiple locations and chooses one that best suits their needs. Smaller companies typically conduct research and choose a new location on their own, while larger companies hire a consultant. Most large or high-profile relocations or expansions are publicly announced in press releases by the company, the municipality, or a local organization.

A qualitative analysis of expansion or relocation press releases can provide insight into what factors or assets a land-based combat system manufacturing facility or company wants and needs to see success and grow. In general, depending on the industry, a company chooses a location based on a few factors including, workforce availability, financial incentives offered, political forces, education pipeline, proximity to transportation, quality of life, and available suppliers. In this industry, the government extends incentives on a contractual basis. It is common for a local or state government to assist a private company in winning production contracts from the United States Department of Defense.

Although the government can be eager to hand out financial incentives to support their community's economic wellbeing, sometimes monetary value is irrelevant in the decision-making process. According to Fanney and Wickline in 2015, Arkansas offered $87 million in incentives in hopes of the United States Army choosing local Lockheed Martin to build the Humvee's replacement. The Army and Pentagon Officials did not explicitly state why they decided on Oshkosh Defense located in Wisconsin. However, officials with Oshkosh state the company was not dependent on economic incentives or taxpayers funded bonds' (Associated Press, 2015). Oshkosh Defense officials claim the Wisconsin defense contractor did not need incentives to win the government contract (Associated Press). While financial incentives can entice the government to choose a specific contractor or persuade a company location, they are not always a useful tool.

Additional site selection factors may include proximity to similar manufacturing companies. For example, a large number of defense-related companies initially located in Camden, Arkansas, due to numerous manufacturing facilities (Fanney & Wickline, 2015). The area also had WWII bunkers, which companies can use for storage (Fanny & Wickline). In 2015, the area was home to facilities operated by General Dynamics, Raytheon, Aerojet Rocketdyne, Rheinmetall Defense, and Esterline (Fanney & Wickline). While each company has different specific needs, a state must ensure its valuable resources to provide for the defense-related manufacturing facilities.

Transportation is critical not only to defense manufacturing facilities but to the distribution industry as well. BAE Systems recently expanded operations to a facility in Temple, Texas, as they wanted to reduce transportation costs, hence the decision to locate near Fort Hood (Temple Economic Development Corporation, 2011). The local economic development organization, Temple Economic Development Corporation, claims that transportation was vital in attracting BAE Systems to the area. The available industrial space with room for growth was another critical component.

Furthermore, the thriving location cluster in Michigan did not happen by chance. The industry grew from the well-known existing automotive manufacturing cluster in

Detroit. The state now takes a targeted approach in growing the defense sector through the Michigan Defense Center (MDC), an operation of the Michigan Economic Development Corporation. The defense center focuses explicitly on the support, protection, and growth of the state's defense and national security assets (Michigan Defense Center). The MDC also serves as a liaison between the state, the federal government, and the defense community while guiding polices to protect and grow the defense economy (Michigan Defense Center). The United States Army Combat Capabilities Development Command Ground Vehicle Systems Center (CCDC) is also located in Michigan. The CCDC's mission is to research, develop, and integrate advanced technology into ground vehicles (U.S. Army Combat Capabilities Development Command, 2019). The laboratory leads efforts to support the United States Army's combat development and ensure the vehicles and equipment meet rigorous standards and performance measures (U.S. Army Combat Capabilities Development Command). General Dynamics Land Systems' Vice President of Communications states the advantages of Michigan include the state of the art technical facilities, the available talent, and support from local and state economic development organizations (Detroit Regional Chamber). Michigan has been able to create and sustain its defense community through combined efforts from multiple joined forces.

While not explicitly defined, one can conclude defense company ecosystems, especially those in the land-based combat segment, are not dependent on monetary incentives provided by governments. In addition to the workforce, defense companies and manufacturing facilities prefer to locate in areas near similar companies, with transportation assets, and proximity to military research institutions (see Figure 18)

Figure 18

Industry Site Selection Factors

Mississippi Assets

Assets in Mississippi that support the land-based combat manufacturing industry include the Center for Advanced Vehicular Systems, the U.S. Army Engineer Research and Development Center, Camp Shelby Joint Forces Training Center, and the Port of Gulfport. These facilities have the potential to work directly and partner with defense companies and contractors in the state. The research institutions and training facilities aid in the attraction and growth of the land-based combat system to the state of Mississippi.

The Center for Advanced Vehicular Systems (CAVS) at Mississippi State University (MSU) is an automotive research center that specializes in enhancing transportation safety and improving vehicle efficiency (MSU CAVS). CAVS focuses on autonomous mobility research and works specifically in creating solutions for non-urban environments (MSU CAVS). The center operates a 55-acre multi-terrain proving ground that includes sand, rock, grass, wooded trails, and lowlands (see Figure 19) (MSU CAVS). The area is used to test the mobility capabilities of multiple vehicle types (MSU CAVS). CAVS also has the ability for sensor research, artificial intelligence, and vehicle robotization (MSU CAVS). A partnership between CAVS and a business location in Mississippi has the potential to further the advancements of the land-based combat industry.

Figure 19

Mississippi State University Center for Advanced Vehicular Systems

Source: MSU CAVS

Additionally, the research center is expanding the studies of steel and steel capabilities. Steel research is currently centered on alloys, high strength steel, and modeling of performance measures (MSU CAVS). The advanced steel research facility allows for custom alloy productions and small scale commercial production (MSU CAVS). The land-based combat manufacturing industry can benefit from CAVS's focus on autonomous vehicle advancements, proving ground, and steel research.

Second, the United States Army Engineer Research and Development Center (ERDC) is located in Vicksburg, MS, and is an organization of the United States Army Corps of Engineers. ERDC conducts research and development supports municipal, state, and federal agencies as well as industry businesses (U.S. Army Corps of Engineers Engineer Research and Development Center, 2013). Four of the seven laboratories are in Mississippi, including the Coastal and Hydraulics Laboratory, Environmental Laboratory, Geotechnical and Structures, and Information Technology Laboratory (U.S. Army Corps of Engineers Engineer Research and Development Center). A partnership between ERDC and a business location in Mississippi also has the potential to further the advancements of the land-based combat industry.

The land-based combat sector can specifically benefit from the Military Engineering business area. The business area develops lightweight protection systems that can be deployed in remote areas (U.S. Army Corps of Engineers Engineer Research and Development Center). The concentration of ERDC labs and specific military business area creates advantages for military companies in the state of Mississippi.

The Camp Shelby Joint Forces Training Center (CSJFTC), can also support the industry in terms of training and testing. Camp Shelby, located on more than 134,000 acres of land in south Mississippi, is used by the Army to train both active and reserve units (CSJFTC). The facility has a wide range of training and support capabilities available to the military and defense operations (CSJFTC). The site currently serves as a training location for the M1 Abrams, Bradley Infantry Fighting Vehicles, and the M109A6 Paladin Howitzers (Camp Shelby Joint Forces Training Center). Reservists and National Guardsmen from across the county travel to Camp Shelby and utilize their facility on a regular and continual basis (Camp Shelby Joint Forces Training Center). The center has the potential to draw in companies that want to be in proximity to a training facility.

Last, the Port of Gulfport can be utilized by the land-based combat manufacturing industry (see Figure 20). The Port is designated as Foreign Trade Zone #92, which can support Mississippi exports of land-based combat industry products (Port of Gulfport, Mississippi). The Port is also a Strategic Seaport, meaning the military can use the Port for cargo and equipment shipments Port of Gulfport (Port of Gulfport, Mississippi). The designation is significant as only 22 strategic ports in the United States and the only one in between Beaumont, TX and Jacksonville, FL. The presence of the Port aids in transportation resources of industry products, especially in terms of exports.

Figure 20

Port of Gulfport Mississippi

Source: Port of Gulfport Mississippi

Workforce Availability

While a region may be able to support an industry in terms of physical assets, there also must be workers to support the companies. Mississippi has an available workforce to support the growth of the land-based combat industry. The level of unemployment in the state indicates that Mississippi can successfully support new business and expansion. The cost of labor is cheaper compared to other states. However, the low purchasing power has the potential to discourage workers from moving to Mississippi. The level of education for workers in the industry is comparable to the national average. The workforce in Mississippi can support the land-based combat manufacturing industry's growth.

Occupations in the United States

Using the NAICS code 336992 Military Tank Vehicles, Tank and Tank Component Manufacturing, EMSI provides 123 occupations in the industry in the United States with at least one worker. Filtering occupations further by the percentage of total jobs in the sector by greater than 0.5%, 31 occupations remain. These 31 occupations account for

6,066 positions and 84.4% of the industry as a whole (see Appendix A). After removing general occupations not specific to the manufacturing and production process such as Sales Representatives and Accountants, 25 occupations remain. These 25 occupations account for 73.4% and 5,531 jobs in NAICS 336992 in the United States (see Appendix B).

Assemblers and Fabricators, All Other, Including Team Assemblers, account for the most significant percentage of the industry at 27.2% and 2,051 workers (see Table 3). Welders, Cutters, Solderers, and Brazers, account for 6.3% and 476, followed by Mechanical Engineers at 4.6% of the industry with 447 workers.

Table 3

Top Ten Occupations in the Land-Based Combat Industry the United States

SOC	Description	Employed (2019)	% of Total Jobs (2019)
51-2098	Assemblers and Fabricators, All Other, Including Team Assemblers	2,051	27.2%
51-4121	Welders, Cutters, Solderers, and Brazers	476	6.3%
17-2141	Mechanical Engineers	347	4.6%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	308	4.1%
51-1011	First-Line Supervisors of Production and Operating Workers	304	4.0%
51-9199	Production Workers, All Other	234	3.1%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	177	2.3%
51-4041	Machinists	156	2.1%
51-2041	Structural Metal Fabricators and Fitters	142	1.9%

51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	138	1.8%
	Others	1,200	16%
	Total	**5,531**	**73.4%**

Source: EMSI

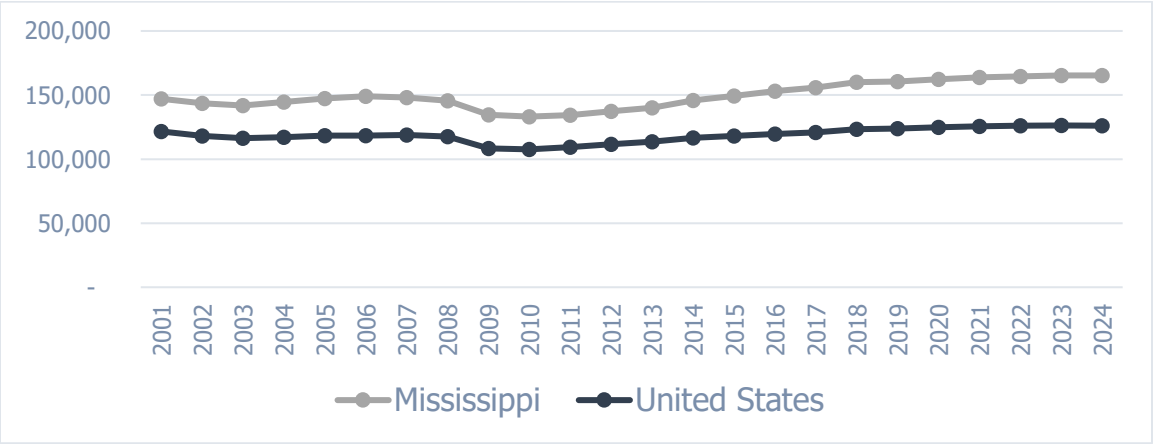
Workforce Cost and Prevalence in Mississippi

Total jobs in these occupations in Mississippi have grown over the past five years, have an average location quotient above one, and earn an average of $20.19 per hour. Most occupations in this group require a high school diploma and are held by males ages 25 to 64 (EMSI).

In Mississippi, these occupations are more prevalent and come at a low cost. The availability of this group of professions in Mississippi is higher than the national average (EMSI). The increased supply of workers in this industry can make it easier for companies to find candidates. Mississippi has maintained a supply higher than the national average since 2001. EMSI projects this to remain steady through 2023 (see Figure 21).

Figure 21

Mississippi Workforce Availability is Higher than the National Average



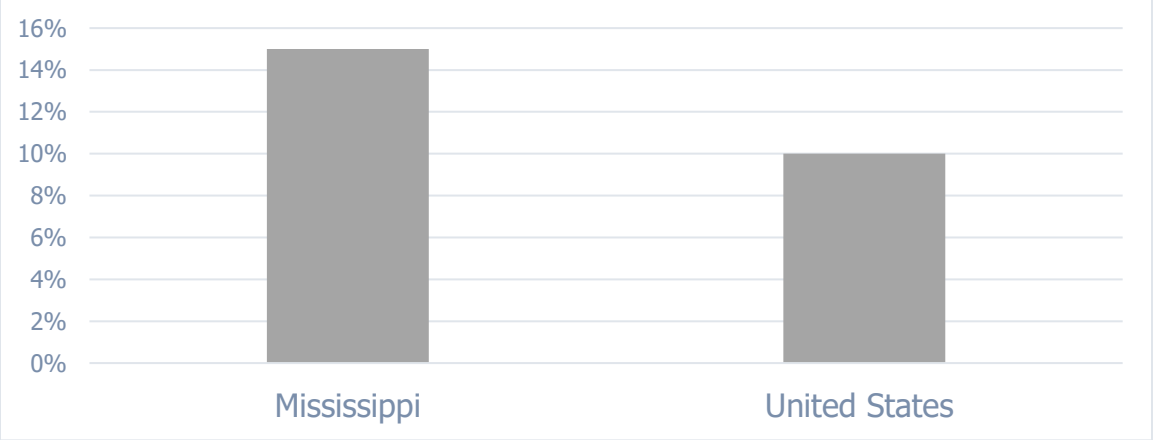
Source: EMSI

The lower cost of labor may be attractive to employers but can hinder workers from entering the field. The cost of labor in Mississippi is 16% less expensive than the national median. The United States median compensation for these occupations is $18.44 per hour, while Mississippi's median hourly wage is $15.49 per hour (EMSI). Conversely, the purchasing power is 6% less than the national median, after adjusting for the cost of living, which may make it difficult to attract workers to the region.

The majority of occupations that are most prevalent in the land-based combat manufacturing industry are classified as a production occupation, with the SOC code starting with 51. In general, if a region has unemployment over 3.5%, there are sufficient laborers to support industry growth. The production occupation in Mississippi is well above the national average unemployment thus can support industry growth (see Figure 22).

Figure 22

Production Occupations Unemployment (2019)



Source: EMSI

Mississippi Educational Insights

Mississippi has the available workforce numbers when looking at the group of occupations in the industry as a unit. However, it is worth taking a closer look into the education required for positions in the industry, and if Mississippi has an educated workforce in addition to the supply. The same group of 25 occupations making of the

core of the industry across the United States is relatively proportionate in terms of the percentage of education needed per trade (see Table 4).

Table 4

Industry Occupations Education Requirements, United States Compared to Mississippi

Typical Entry-Level of Education	United States	Mississippi
No formal education credential	22.95%	25.04%
High school diploma or equivalent	55.76%	55.81%
Post-secondary nondegree award or Associates degree	1.18%	.69%
Bachelor's degree	20.11%	18.46%

Source: EMSI

The similarity in this percentage indicates that the Mississippi workforce's educational requirements are comparable and on par with the national average when comparing individual occupations. Mississippi has a slightly higher proportion of jobs requiring no formal education and a somewhat lower portion of jobs requiring a bachelor's degree. This slight variation should not play an integral role in the success of the land-based combat manufacturing industry's success in terms of an educated workforce.

In summary, Mississippi has an available and educated workforce to support the land-based combat manufacturing industry. The industry's occupation growth rate and rate of industry unemployment in the state of Mississippi indicate the region has a sufficient available workforce to provide for company expansions, relocations, and growth in the state. The labor comes cheaper than the national average. However, workers may be reluctant to move to the region due to the low purchasing power. Mississippi workers are comparable to the national average when it comes to entry-level education in the industry. The available and educated workforce provides the state with an asset when attracting new companies to Mississippi.

Discussion

Based on qualitative analysis, site selection factors for land-based combat manufacturers are proximity to related businesses, research centers, transportation, and useful assets. A skilled workforce and education pipeline, as well as a targeted and joined effort among economic development organizations, also supports the industry.

While Mississippi has defense and military-related business in the manufacturing sector, the number of firms are few compared to other clusters across the United States. The research centers in the state can be used in the attraction of land-based combat manufacturing facilities to the area. CAVS conducts research specific on autonomous vehicles and steel, which both can have a substantial impact on the industry. The workforce to support the sector is available in Mississippi, and the low cost is attractive to companies. On the other hand, the low purchasing power in the state can deter skilled talent from moving and staying in the area. The training and testing opportunities available at Camp Shelby Joint Forces Training Center makes for another asset in the attraction of the lad based combat industry. A strategic port is an asset for both domestic production and exports. Overall, Mississippi scores an average of B- on available factors to support the industry.

Site Selection Factors	Mississippi Evaluation	Details
Proximity to related businesses	C	Few related businesses
Transportation	B	Port of Gulfport, Mississippi
Research Centers	B	Engineer Research and Development Center and MSU Center for Advanced Vehicle Systems
Workforce	A	Available workforce
Other Assets	C	Camp Shelby Joint Forces Training Center
Overall	**B-**	

Conclusion and Recommendations

Conclusion

The main product of the land-based combat systems industry is armored vehicles. The subtypes of armored vehicles are wheeled vehicles, tracked vehicles, and battle tanks. The most common types of vehicles include the Bradley, M113, Stryker, MRAP, and Abrams Tank. Government funding is the primary driver of the industry. However, military tensions, technology advances, public-private partnerships, the price of steel, and the trade-weighted index also play a role in driving the market. The increasing use of air warfare and investment in cybersecurity may threaten industry growth. High barriers to entry caused by investment costs also restrict new companies from entering the market. The five strongest companies in the industry are General Dynamics, BAE Systems, Rheinmetall AG, Navistar, and Oshkosh. Currently, the only manufacturing facility in Mississippi is a Navistar plant in West Point.

The Asia-Pacific region dominates the global market, but the United States is the largest individual purchaser, which presents both domestic and export opportunities for the state. The overall market size, per capita average expenditure, and regional spending show a projected increase in the market in upcoming years. Companies in the United States primality locate in two clusters, the Great Lakes region, especially Michigan, and the Southeast with a focus in Texas. Five companies currently operate in Mississippi: Navistar, BAE Systems, Seemann Composites, Griffin Inc., and Cite Armored. BAE Systems has a support office while the other manufacture armored vehicles or related parts. The site selection factors companies use to make location decisions are proximity to related business, transportation assets, presence of research centers, and available workforce. Mississippi's assets that can be used to grow the industry are Mississippi State University's Center for Advanced Vehicular Systems, the U.S. Army Engineer Research and Development Center, Camp Shelby Joint Forces Training Center, and the Port of Gulfport. Mississippi also has an available supply of educated workers, which comes at a low cost. Overall, Mississippi's ability to support

the land-based combat systems manufacturing industry's growth earns a B-. The state has a stable workforce but lacks in proximity to related businesses.

Recommendations

Mississippi should focus on growth efforts with companies already within the state rather than the attraction of new ones. Ensuring Mississippi defense contractors have assets and resources needed for individual growth ensures a foundational framework for industry growth. The state should focus on assisting companies in obtaining United States Department of Defense contracts as well as international ones. Additionally, determining why Mississippi companies lost contracts also provides insight into what the state lacks and how to situate the state going forward. The state should also foster and grow relationships with local assets and assist them in their growth needs. The research institutions and training centers are valuable, and the state should also ensure they have resources to grow. Finally, the states' assets should be in constant promotion. The Port of Gulfport, ERDC, CAVS, and CSJFTC should be marketed as resources for all military companies and installations, not just land-based combat companies. Ensuring these resources have a positive relationship with all national security companies contributes to the military friendless of the state. Mississippi has the assets to support the land-based combat industry' s growth. However, it should start with companies with current operations in the state.

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Appendix A

United States occupations in NAICS 336992, filtered by a percentage higher than 0.5%

SOC	Description	Employed (2019)	% of Total Jobs (2019)
51-2098	Assemblers and Fabricators, All Other, Including Team Assemblers	2,051	27.2%
51-4121	Welders, Cutters, Solderers, and Brazers	476	6.3%
17-2141	Mechanical Engineers	347	4.6%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	308	4.1%
51-1011	First-Line Supervisors of Production and Operating Workers	304	4.0%
51-9199	Production Workers, All Other	234	3.1%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	177	2.3%
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	164	2.2%
51-4041	Machinists	156	2.1%
51-2041	Structural Metal Fabricators and Fitters	142	1.9%
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	138	1.8%
49-9071	Maintenance and Repair Workers, General	131	1.7%
17-2112	Industrial Engineers	128	1.7%
11-3051	Industrial Production Managers	128	1.7%
43-5071	Shipping, Receiving, and Traffic Clerks	113	1.5%
11-1021	General and Operations Managers	102	1.4%
51-9122	Painters, Transportation Equipment	91	1.2%
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	84	1.1%
13-1028	Buyers and Purchasing Agents	78	1.0%
43-5061	Production, Planning, and Expediting Clerks	73	1.0%
43-9061	Office Clerks, General	73	1.0%
43-5081	Stock Clerks and Order Fillers	68	0.9%
49-9041	Industrial Machinery Mechanics	67	0.9%
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	66	0.9%
53-7051	Industrial Truck and Tractor Operators	66	0.9%
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	59	0.8%

43-4051	Customer Service Representatives	58	0.8%
17-3026	Industrial Engineering Technicians	48	0.6%
43-3031	Bookkeeping, Accounting, and Auditing Clerks	48	0.6%
17-3027	Mechanical Engineering Technicians	46	0.6%
51-4111	Tool and Die Makers	43	0.6%
	TOTAL	**6,066**	**80.4%**

Appendix B

United States occupations in NAICS 336992, filtered by a percentage higher than 0.5%, and occupations not specific to the manufacturing function

SOC	Description	Employed (2019)	% of Total Jobs (2019)
51-2098	Assemblers and Fabricators, All Other, Including Team Assemblers	2,051	27.2%
51-4121	Welders, Cutters, Solderers, and Brazers	476	6.3%
17-2141	Mechanical Engineers	347	4.6%
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	308	4.1%
51-1011	First-Line Supervisors of Production and Operating Workers	304	4.0%
51-9199	Production Workers, All Other	234	3.1%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	177	2.3%
51-4041	Machinists	156	2.1%
51-2041	Structural Metal Fabricators and Fitters	142	1.9%
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	138	1.8%
49-9071	Maintenance and Repair Workers, General	131	1.7%
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11-1021	General and Operations Managers	102	1.4%
51-9122	Painters, Transportation Equipment	91	1.2%
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	84	1.1%
43-5061	Production, Planning, and Expediting Clerks	73	1.0%
43-5081	Stock Clerks and Order Fillers	68	0.9%
49-9041	Industrial Machinery Mechanics	67	0.9%
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	66	0.9%
53-7051	Industrial Truck and Tractor Operators	66	0.9%
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	59	0.8%
17-3026	Industrial Engineering Technicians	48	0.6%
17-3027	Mechanical Engineering Technicians	46	0.6%
51-4111	Tool and Die Makers	43	0.6%
	TOTAL	**5,531**	**73.4%**

THE UNIVERSITY OF SOUTHERN MISSISSIPPI
TRENT LOTT NATIONAL CENTER

Mississippi Defense Initiative is a Service of the Trent Lott National Center

Services Offered by The University of Southern Mississippi College of Business and Economic Development and Trent Lott National Center for Economic Development and Entrepreneurship

The College of Business and Economic Development offers graduate education in economic development through the Master of Science in Economic Development (MSED) program and a Graduate Certificate in Economic Development. The Trent Lott National Center partners with the MSED program to further the students experience by working with economic developers, communities, companies, and non-profit organizations through five main approaches:

1. University Economic Development researchers provide technical assistance in defining problems or opportunities; evaluating the effects of change; and providing recommendations for improvements.

2. Graduate students work on applied research projects involving actual community or organization case scenarios (e.g., retail trade studies, economic impact studies).

3. Each student is required to complete a data analytics capstone project. The capstone project involves completing a Quality-of-Place (QOP) study for a community.

4. Each student is required to complete an internship in an economic development organization.

5. Communities may have sponsored research projects and tap into the faculty expertise and university data sources (e.g., EMSI and REMI).

Examples of class projects involving research for Mississippi communities:

- Retail Analysis for Marion County
- Feasibility of a multi-sports complex in Grenada County
- Economic Impact of the Gulfport-Biloxi International Airport
- Ecotourism Development for the Mississippi Aquarium in Gulfport
- Strategic Plans for the City of Pearl and Simpson County Development Foundation
- Community Study for the Hattiesburg Mid-Town District
- Competitiveness studies for defense-dependent communities
- Multimodal transportation research for Mississippi Port Directors
- Workforce Analyses for the Mississippi Department of Education and Department of Human Services

The University of Southern Mississippi also offers economic development training for working professionals and graduate students through its annual True South Basic Economic Development Course - an International Economic Development Council accredited introductory course. This course fulfills one of the prerequisites for those who wish to take the Certified Economic Developer (CEcD) exam.