Opportunities for Mississippi to Grow the Defense Maintenance Industry

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Executive Summary

The Mississippi Defense Diversification Strategic Plan 2019-2023 established the goal for the state to exploit and grow the state's extensive maintenance and repair capabilities for Department of Defense (DoD) mission support. The specific task to achieve this goal is to encourage defense contractors and sub-contractors to provide logistics, maintenance, and technical support for aircraft, ships, and land-based equipment. This report evaluates the feasibility of achieving this task and finds it feasible

The state of Mississippi has been able to assert itself as a top destination for defense contractors to perform maintenance. Based on USASpending.gov, Mississippi is currently the second largest recipient of DoD funding for aircraft maintenance and the third for ship maintenance in the country. Land-based vehicle maintenance is being conducted, but on a smaller scale.

Within the state, there are several facilities that are available for maintenance on all three systems. When coupling the available facilities with Mississippi's current workforce and infrastructure (e.g., the Strategic Port of Gulfport), there appears to be opportunities available to allow Mississippi to capitalize on the military maintenance market and grow the defense economy. Foreign military sales and legacy systems holds great promise. Aircraft maintenance is an area where economic development assistance could reap significant benefits for the state.

Introduction

Purpose

The purpose of this report is to explain the role that maintenance plays in the total spending of the United States Military. With maintenance contributing to a large amount of DoD spending, it presents an opportunity for states, like Mississippi, to capitalize on assets within the state to attract defense contractors. Throughout the report, assets such as military facilities, private companies, workforce and infrastructure are highlighted to display the excellent opportunities Mississippi offers defense contractors.

This report is a result of the Mississippi Defense Diversification Strategic Plan 2019-2023 and Objective 4e. Exploit and grow the state's extensive maintenance and repair capabilities for mission support. The specific task is to encourage defense contractors and sub-contractors to provide support for joint training missions including, but not limited to, logistics, maintenance, and technical support.

Background

Military maintenance is an often overlooked expense that consumes a large portion of DoD's total budget every year. The maintenance of weapons systems and equipment of DoD's own assets is compounded with maintenance on items sold through Foreign Military Sales. With the significant investments made in this area, many defense contractors are working to find available facilities to perform maintenance on the three main types of systems: air, ship and ground vehicle.

Method of Investigation

The following sources of publicly available secondary data were used to conduct the analysis. The Congressional Budget Office was useful to investigate total DoD budgets and percentages allotted for maintenance. USAspending was used to determine DoD spending trends for the state of Mississippi. EMSI economic modeling was used to investigate the workforce supply and demand for maintenance jobs. Company and organization websites were also used to find specific information.

The location criteria was based on the Government Accounting Office (GAO) factors affecting depot performance (GAO 19-242).

Maintenance Performance Factor	Location Criteria
Having personnel with the right skills	Workforce
Having enough personnel	
Sufficient engineering support	
Having the right facilities	Military facilities/Infrastructure
Having the right equipment	
Condition of weapon system arriving for repair	
Weapon systems arrive for repair as planned	
Availability of spare parts	Private sector companies/supply chain

Scope

As stated earlier, the purpose of this report is to investigate the defense maintenance industry and how it relates to the state of Mississippi. The goal is to highlight the defense maintenance assets Mississippi has that make it a competitive destination for defense contractors. Within the report, a list with descriptions, of all military and civilian assets is included.

The report also includes a workforce analysis comparing the availability of maintenance-related occupations with the expected demand for those occupations. The goal for this analysis being to identify any potential gaps between the demand for workers in the industry and the supply within the state.

Opportunities for Increased Defense Maintenance in Mississippi

Aircraft Maintenance Opportunity Summary

Mississippi meets the criteria established for increased aircraft maintenance (See Table 1). The state already has several companies in this industry, military facilities are available to support maintenance, the workforce is competitive, and other infrastructure needed for aircraft maintenance is in place or being developed. This indicates that a concentrated effort on expanding the defense aircraft maintenance industry in Mississippi could benefit the state.

Table 1.

Mississippi Site Selection Criteria for Aircraft Maintenance Industry Assessment

Private Sector Companies • Are there significant, concentrations of private sector companies in the state that perform aircraft maintenance?	Yes	• There are a number of private sector companies in the state that perform aircraft maintenance such as Vertex, Tyonek, etc. • Vertex is one of the largest employers for aircraft maintenance in Mississippi. • Mississippi is currently attracting more private companies to the area. • Mississippi currently receives the second highest amount of DoD funding for aircraft maintenance in the country meaning there is excellent opportunities for these companies to expand.
Military Facilities • Does Mississippi have sufficient military facilities where maintenance is performed? • Are these facilities available for private sector government contractors to perform maintenance on military or FMS aircraft?	Yes	Locations are: • Gulfport with Theater Aviation Sustainment Maintenance Group • Gulfport with Combat Readiness Training Center • Hattiesburg with Camp Shelby Joint Forces Training Center – Hagler Army Airfield • Army Aviation Support Facilities 1, 2, 3 • Jackson with Thompson Field at Medgar Evers Airfield • Many of these facilities are equipped with adequate hangar space and runway lengths which are discussed below.
Workforce • Does the supply of current workers match the demand? • Is there an educational pipeline?	Yes	• Mississippi has a number of jobs available for aircraft maintenance related professions; however, there are separations between the supply and demand. • Mississippi will need to develop this sector of the workforce before it is prepared to deliver on a large scale. • The state offers an excellent cost of living at 81.1.

• Are wages competitive (MS vs Nation)?		• There are programs available within the state to educate potential new workers entering to perform this work. • Mississippi offers competitive wages for many of the jobs available in the industry when cost of living is accounted for.
Infrastructure • Is there sufficient infrastructure available for the maintenance of aircraft?	Yes	• The state has numerous airports which can handle aircraft maintenance (See Appendix A) • With multiple airports and a six Interstates, Mississippi provides sufficient infrastructure for the transport of aircraft throughout the state. • The Strategic Port of Gulfport is a competitive advantage

Ship Maintenance Opportunity Summary

The maintenance of vessels is an established industry in Mississippi with several large shipbuilding companies already located in the state. There is not a US Navy shipyard on the Gulf Coast (See Table 2). The Navy's four public shipyards are Norfolk Naval Shipyard (NNSY), Portsmouth Naval Shipyard (PNSY), Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS&IMF), and Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (PHNSY&IMF). However, Mississippi has major defense contractors who do maintenance for the US Navy and the state supports their efforts. These companies should be able to take the lead on any expansion efforts.

Table 2.

Mississippi Site Selection Criteria for Ship Maintenance Industry Assessment

Private Sector Companies • Are there significant, concentrations of private sector companies in the state that perform aircraft maintenance?	Yes	• There are a number of large private sector companies in the state that perform ship maintenance such as Huntington-Ingalls and VT Halter. • Being positioned along the Gulf Coast, the state has a relatively large number of ship building and maintenance companies. • Mississippi currently receives the third highest amount of DoD funding for ship maintenance in the country mainly due to the size of its ship companies.
Military Facilities • Does Mississippi have sufficient military facilities where	No	• Mississippi does not have any military assets available for ship maintenance. A large majority of ship maintenance is handled by the private companies.

maintenance is performed? • Are these facilities available for private sector government contractors to perform maintenance on military or FMS aircraft?		
Workforce • Does the supply of current workers match the demand? • Is there an educational pipeline? • Are wages competitive (MS vs Nation)?	Yes	• Mississippi has a large number of jobs available for several of the largest occupations for ship maintenance. • The state is equipped with a large number of skilled workers to perform this work. • There are programs available within the state to educate potential new workers entering to perform this work. • Mississippi offers competitive wages for many of the jobs available in the industry when cost of living is accounted for.
Infrastructure • Is there sufficient infrastructure available for the transport of ship maintenance supplies and equipment?	Yes	• Located along the Gulf Coast, there are 2 major ports available for use as well as other waterways such as the Mississippi River. • A sufficient rail and road system is also available for the transport of supplies and equipment.

Ground Vehicle Maintenace Opportunity Summary

Expanding the land vehicle maintenance industry appears to be the most challenging of the three areas explored in this study. The state somewhat meets most of the criteria established for defense land vehicle maintenance (See Table 3). However, the state faces a number of competitive issues when compared to more established regions performing land vehicle maintenance. The state would need to overcome institutional lock-ins to dramatically increase the business, however incremental growth appears to present opportunities.

Table 3.

Mississippi Site Selection Criteria for Land Vehicle Maintenance Industry Assessment

Private Sector Companies • Are there significant, concentrations of private sector companies in the state that perform aircraft maintenance?	Yes, with qualifications	• Mississippi has a few private companies such as Navistar and CITE that perform military ground vehicle maintenance. • Both of these companies are currently expanding their operations in Mississippi. • Mississippi is currently outpaced, in terms of funding, for vehicle maintenance but, the increased presence of these companies offers the opportunity to expand in the coming years. • Armored vehicle production is often associated with automotive clusters and the state's automotive industry is relatively new
Military Assets • Does Mississippi have sufficient military facilities where maintenance is performed? • Are these facilities available for private sector government contractors to perform maintenance on military or FMS aircraft?	Yes, with qualifications	• Multiple military facilities are located through the state that perform and have the capability to perform vehicle maintenance. • The Mississippi National Guard has prioritized maintence units (See Appendix B) • Camp Shelby Joint Forces Training Center and the ten field maintenance shops located in the state provide more than adequate support for ground vehicles. • The major Army repair depots e.g., Anniston Army Depot (ANAD) and R&D centers e.g., U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC) are not located in the state.
Workforce • Does the supply of current workers match the demand? • Is there an educational pipeline? • Are wages competitive (MS vs Nation)?	Yes, with qualifications	• Mississippi has a large number of ground vehicle mechanics and other vehicle maintenance professionals. • The major deficiencies for this sector come from a low supply of heavy machinery mechanics to perform maintenance on tanks and other large equipment. • There are programs available within the state to educate potential new workers entering to perform this work.
Infrastructure • Is there sufficient infrastructure available for the transport of ground vehicles?	Yes	• With 6 Interstates and 14 Federal Highways, Mississippi has sufficient road access to allow for the transport of vehicles • Due to the low population density, the traffic congestion and test range capability is advantageous compared to other states. • The Strategic Port of Gulfport is a competitive advantage

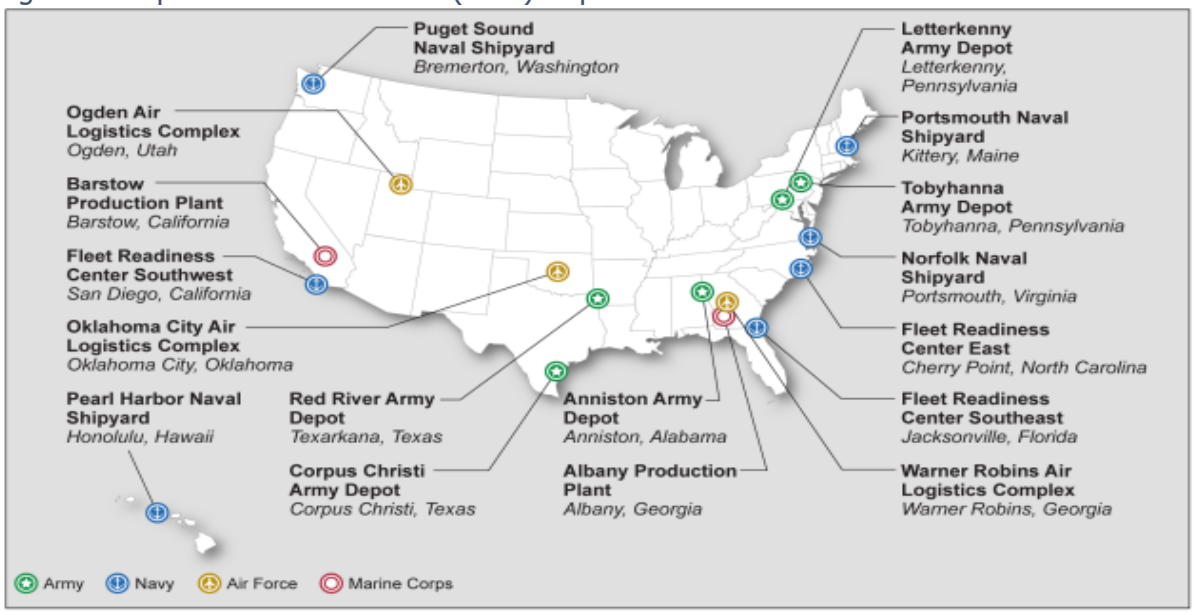
Defense Maintenance Industry

The United States Department of Defense (DoD) considers maintenance one of the most critical elements in establishing an effective combat force. Proper maintenance of weapon systems and other military assets allows the armed forces to achieve ideal combat readiness and vital assets sustainability. The defense maintenance industry includes both public and private sector companies, allowing DoD to maintain a "robust and viable" industrial base (Wilson, 2018).

DoD divides maintenance into two distinct components: field and depot. Field-level maintenance is performed by individual units on their own equipment. Field-level maintenance usually involves tasks such as battle damage repair, calibration, servicing, and inspecting. DoD regards field-level maintenance as "shop-type" work. While this maintenance component is not as lucrative for private sector businesses, it is still a crucial and expensive industry for DoD. In 2016, approximately $42 billion was devoted to the training, equipment, and other expenses related to field-level maintenance.

The other component of defense maintenance is depot-level maintenance. Depot-level maintenance is the component that largely drives the defense maintenance industry (See Figure 1). This type of maintenance involves large scale material maintenance such as major repairs, complete overhaul, large vehicle assembly, and rebuilding of weapon systems. Each military service manages its own depot-level maintenance infrastructure; however, in 2016, only 55% of depot-level maintenance was performed in service-owned facilities. The remaining 45% was contracted to commercial firms in the private sector. In the same year, DoD spent approximately $32 billion on depot-level maintenance and repair.

Figure 1: Department of Defense's (DOD) Depot Maintenance Sites



Source: GAO analysis of Department of Defense documents. | GAO-17-82R

The United States Army operates five depots across the country; Anniston, Corpus Christi, Letterkenny, Red River and Tobyhanna. Anniston Army Depot is a designated Center of Industrial and Technical Excellence (CITE) for tracked and wheeled ground combat vehicles (except Bradley tanks), along with other artillery, and weapon systems. Operation include maintenance include M1 Abrams Tank, M88 Recovery Vehicle, Stryker, M113 M9 Ace Combat Earthmover and the Assault Breacher Vehicle. Anniston Army Depot fights against the challenge of both uncertain levels of workload and diminishing funds.

- The Air Force operates three Air Logistic Complexes; Ogden, Oklahoma City and Warner Robins.
- The Navy operates four naval shipyards; Norfolk, Pearl Harbor, Portsmouth and Puget Sound; along with three fleet readiness centers; East, Southeast and Southwest.
- The Marine Corps operate one depot that is comprised of two production plants; Albany and Barstow.

Depot Backlogged Maintenance

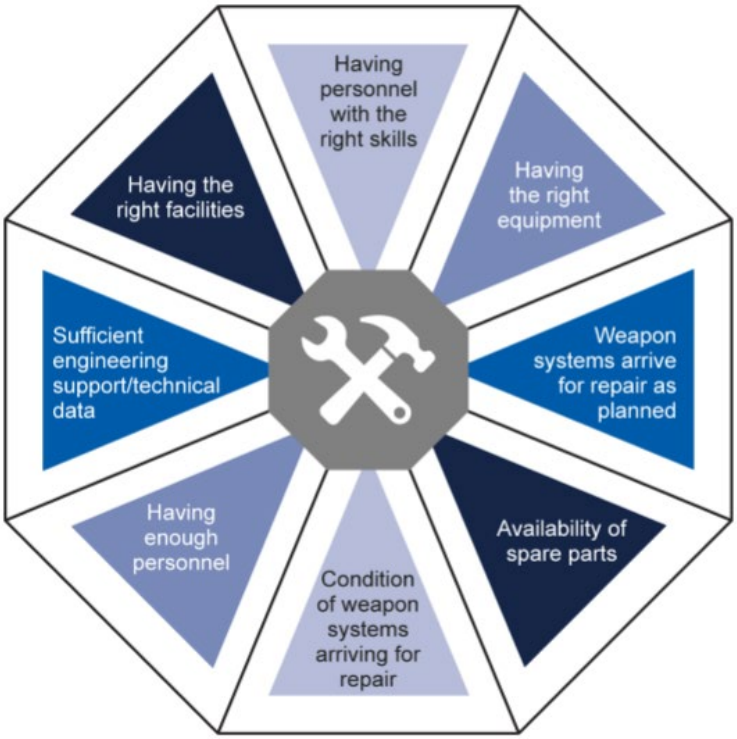
Each fiscal year, the Department of Defense allocate billions of dollars to the maintenance to ensure the readiness of all warfighting systems. Unfortunately, some of maintenance sent to each depot is not completed by the end of the fiscal year resulting in billions of dollars' worth of what is referred to as carryover (GAO-19-452). During fiscal years 2007 through fiscal year 2018, the Marine Corps, Navy and Air Force depots averaged less than 6 months of annual carryover or backlogged projects; $0.2 billion, $1.0 billion and $1.9 billion respectively.

The estimated carryover is currently $6.5 billion. Carryover is the direct result of insufficient maintenance equipment, and the inability to track progress of maintenance. The inability to steward existing maintenance request directly inhibits the United States from progressing in the advancement of any weapon system in the future. The Government Accountability Office recognizes four issues in key elements of current improvement plans. Elements include

- Analytically-based goals
- Results-oriented metrics
- Identification of required resources, risks and stakeholders
- Reporting on progress

The Government Accountability Office attributes much of the carryover expense to eight factors (Figure 2). The main factors include the skill level and size of workforce, condition of weapon systems that arrive to depot, availability of parts, and condition of facilities and equipment (GAO-14-19-242). These factors are the basis for the location criteria used in this report.

Figure 2. Factors Affecting Depot Performance



Source: GAO. | GAO-19-242

The most recent estimates reporting around 600,000 employees working in maintenance are a surprisingly under-appreciated resource for the defense industry. Significant portions of the United States defense budget are spent on Operations and Maintenance (O&M); however, most of the focus remains on operations. The budget maintenance component presents a massive opportunity to better utilize a skilled workforce and a large portion of the DoD budget (Lb, 2020).

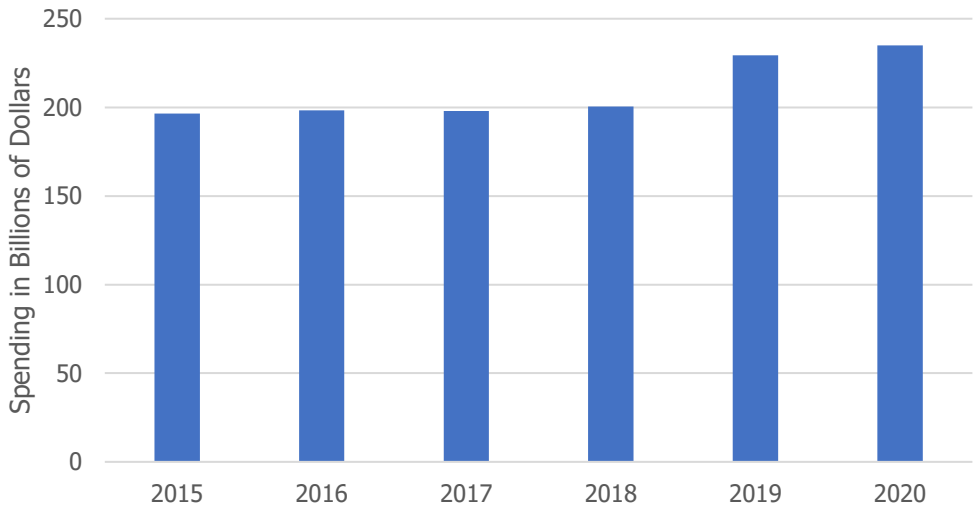
Legacy Systems

A legacy system is a piece of equipment that is outdated and no longer being produced, yet is still actively being used by the military. Legacy systems still live up to its original purpose but due to ceased production, maintenance and technology upgrades become costly to the Department of Defense. An issue with having legacy systems is not only maintaining such legacy systems but also simultaneously developing and maintaining new systems. Conducting mainteance on these older systems presents opportunites if the orginal production sites are not handling this service.

DoD and Foreign Government Spending on Defense Maintenance

Operations and maintenance account for a significant portion of the DoD budget each fiscal year. When overseas contingency operations (OCO) are included, O&M can account for approximately 50% of the U.S. defense budget (Snow, 2017). O&M spending has been steadily increasing since 2015, with 2019 being one of the highest budgets in history (see Figure 3).

Figure 3. DoD Base Spending on Operations and Maintenance by Year



Source: Comptroller.defense.gov

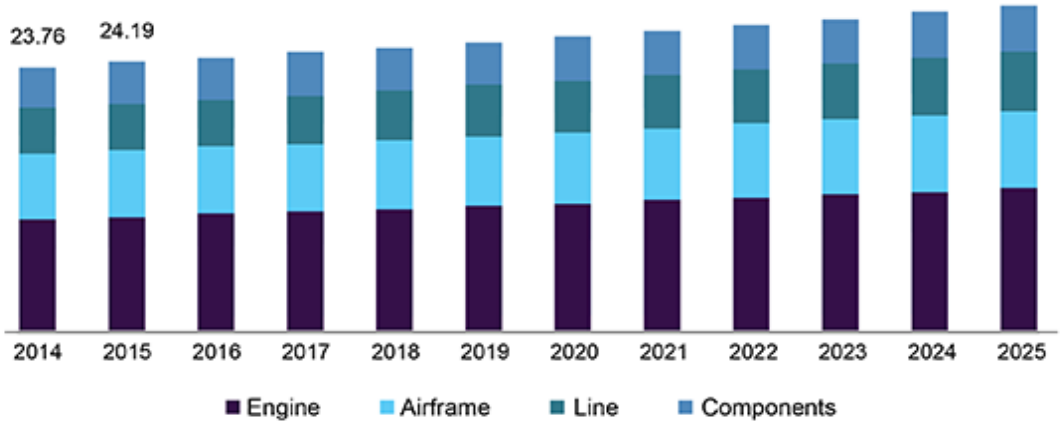
Since O&M funding covers a wide range of goods and services, the Congressional Budget Office (CBO) has had difficulty pinpointing the exact percentage for all O&M related expenses. However, in 2016 the former Pentagon comptroller, Robert Hale, noted that approximately one-third of its discretionary budget was being devoted to runaway costs related to maintaining equipment after its delivery to the armed forces. These operations and support (O&S) costs consist of expenses incurred from the initial deployment of the system through the end of the system's operation, including the total expenditure of maintaining and supporting the system (2014).

For an average weapon system, the original purchase price only accounts for about one-third of the total price. The other two-thirds are devoted to operation and maintenance of the system throughout its service life (Erwin, 2016). With the price of weapons systems skyrocketing over the past several years, O&S budgeting has had to balloon to keep up, growing by 20% since 2000. The growing cost of maintenance-related expenses has not deterred the DoD from continuing to invest, however.

The most recent DoD budget request for FY 2021 identified "military readiness" as one of its main goals. Readiness is defined in the report as "the measure of the U.S.

military forces' ability to fight and meet the demands of the National Defense Strategy." One of the methods they plan to use to implement this plan is stronger investments in maintenance to ensure all combat equipment is battle-ready at all times. The Navy alone plans to invest $9.9 billion in ship depot-level maintenance, with all other branches also investing additional billions in maintenance-related expenses. The rising price of weapons systems and, in turn, O&S has not only affected the U.S. DoD but the entire global market share for maintenance, repair, and overhaul (MRO) spending. A recent study found that the global market share for MRO related defense spending is expected to experience a 5.4% growth rate through 2025 (2019 grand research) (see Figure 4).

Figure 4. U.S. Aerospace and Defense MRO Market Size, by product, 2014-2025 (U.S. *Billion $)*



Source: grandviewresearch.com

This continued growth presents an excellent opportunity for maintainers to capitalize on the ever-growing maintenance industry and interest from the DoD.

Foreign Military Sales

Foreign Military Sales (FMS) is a method the U.S. government uses to exchange defense equipment, services, and training with its international partners and allied nations. Within this program, the U.S. government uses the DoD's procurement system to acquire defense assets that can then be purchased by foreign governments (2020 DSCA). The Defense Security Cooperation Agency (DSCA), the agency responsible for U.S. FMS, acts as the intermediary for the foreign governments, allowing them to receive the same benefits that DoD receives when acquiring defense equipment.

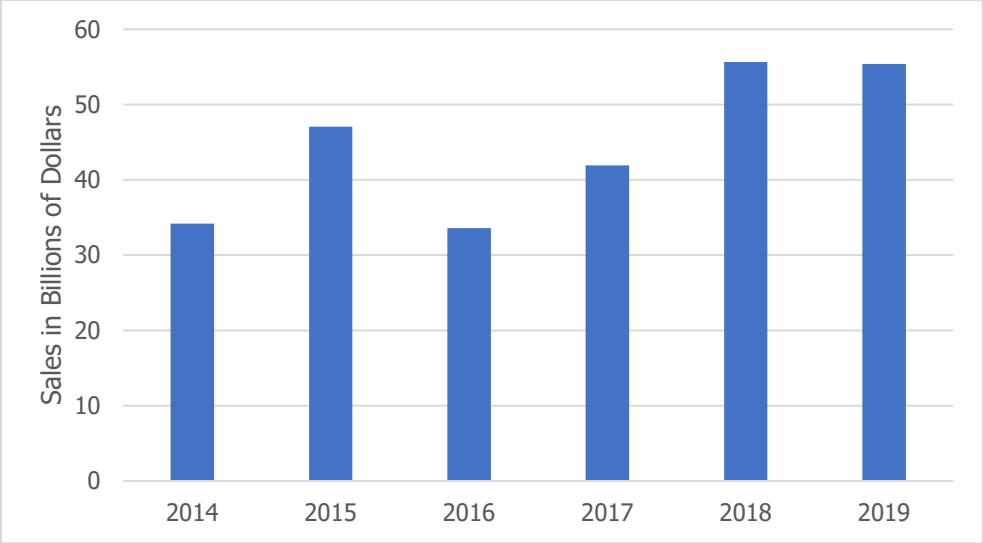
FMS includes the sale of arms and equipment and handling logistics, procurement, support, delivery, maintenance, and training. The DSCA believes in the

total package approach that provides countries engaging in FMS with the U.S. with services extending beyond the single end-item, system, or platform, including maintenance and training (DSCA). This policy allows vessels such as aircraft, ships, and land vehicles purchased through FMS to be repaired and serviced several years after the original purchase. The support process is known as case execution and is the longest phase of an FMS case life cycle (2020 TDA, FMS). The desire to provide a total package makes equipment maintenance one of the key aspects of FMS.

FMS has risen significantly every year since 2016, with a massive jump occurring in 2018. Total FMS increased from nearly $42 billion in 2017 to $55 billion in 2018, with that same figure carrying into 2019 (see Figure 5). This created a three-year rolling average of nearly $51 billion, demonstrating the strength and continued support of the sales of U.S. defense articles and services to foreign countries (2020 DSCA).

With FMS being at an all-time high, an excellent opportunity is presented to maintainers to capitalize on the DSCA's total package approach by repairing and maintaining old or damaged equipment purchased by foreign countries.

Figure 5. Foreign Military Sales Total by Year



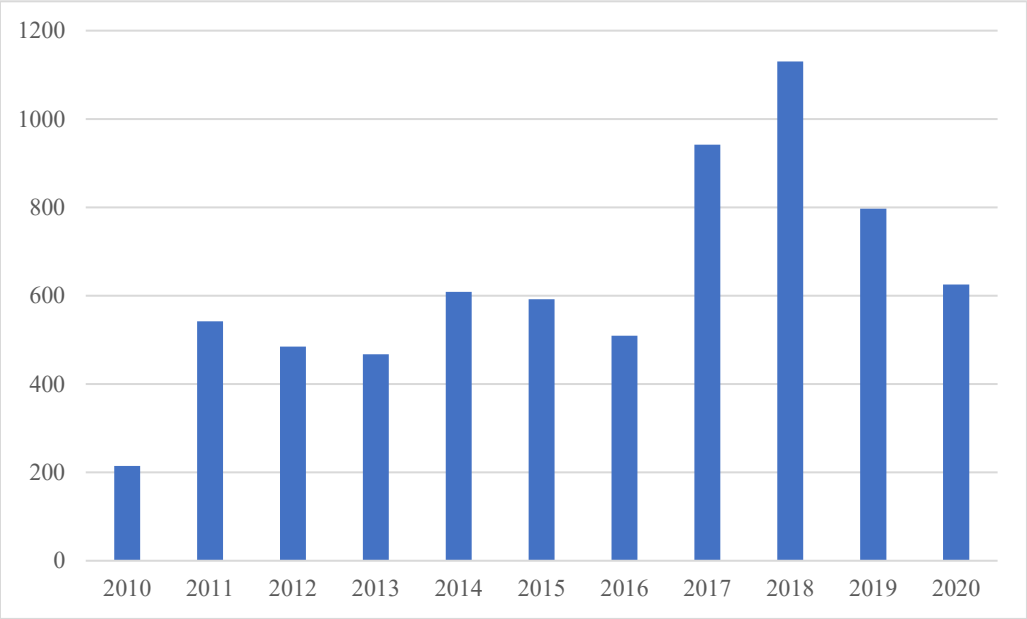
Source: Defense Security Cooperation Agency

Trends of Defense Contract Received

The trends of DoD maintenance spending in Mississippi show significant growth since 2010. From 2010 to 2018, DoD went from spending approximately $214.3 million to $1.1 billion on maintenance in Mississippi. During this time, there was a series of small dips in funding, followed by massive spikes. For example, DoD funding grew from $214.3 million to $541.8 million from 2010 to 2011, more than doubling in just one year.

The funding remained largely steady from 2011 to 2016 before exploding in 2017 when the amount grew to $941.7 million and surpassing $1 billion in 2018. Since 2018, however, the funding has decreased from $1.1 billion to $625.4 million in 2020 (see Figure 6). While it pales in comparison to the 2018 figures, this is still one the largest amounts of DoD funding for maintenance that Mississippi has seen throughout its history.

Figure 6. DoD Funding for Maintenance in Mississippi by Year



Source: USAspending.gov. Award Search >Filtered by Funding Agency (DoD), State (Mississippi), Product or Service Code (J0)

Mississippi's maintenance company that has received perhaps the largest amount of funding is Vertex Aerospace LLC, located in Madison. Vertex currently holds the three largest contracts issued by DoD in Mississippi since 2010, with the largest being for $1.3 billion from 2010 to 2018. Vertex has continued to be a major recipient of DoD maintenance funding as recently as 2020; however, the contracts have lowered since 2018.

Huntington Ingalls Inc. is another major recipient of DoD maintenance funding in Mississippi. Specializing in ship rebuild and repair, this company based in Pascagoula, Mississippi, received a massive contract in 2017 for $430 million and was completed in July of 2020. While a majority of DoD contracts in Mississippi have been awarded to Vertex, Huntington Ingalls absorbs nearly all contracts for maritime vessels in the state.

Aside from Vertex and Huntington Ingalls, a variety of various smaller companies have received maintenance contracts in Mississippi, including Navistar, VT Halter Marine, and United States Marine Inc. While these smaller companies do not receive a large number of contracts every year, they are still able to secure significant funding as a whole that contributes to Mississippi's total DoD funding.

While the funding for maintenance in Mississippi has trended down in recent years, Mississippi is still receiving historically high amounts. The 2020 funding total of $625.4 million is higher than any year prior to 2017 and represents a massive lump sum of funds.

If the recent trends continue and Mississippi can capitalize and major assets such as Vertex and Huntington Ingalls, the state could be in for another uptick in funding in 2021 and beyond.

Private Sector Industry in Mississippi

Mississippi has several private sector companies that perform maintenance using DoD funding. The broad range of companies covers maintenance on all three military vehicle types: land, maritime, and air. Some of the largest contributors and a description of their work will be outlined in this section.

Vertex Aerospace, LLC.
Vertex Aerospace is a defense aerospace company located in Madison. Vertex specializes in the support, repair, and maintenance of aircraft and aircraft components. Its goal is to provide a 'one-stop-shop solution' for all aerospace aftermarket services. With over 4,200 employees and over 65 U.S. and 35 international locations, Vertex is the largest aircraft maintenance company in Mississippi. The organization also prides itself in employing veterans with over 1,900 veteran employees. Currently, Vertex controls a vast majority of DoD maintenance contracts in Mississippi (Vertex Aerospace, 2020).

Tyonek Manufacturing Group, Inc.
Tyonek was founded in 2004 in Madison, Alabama. They have since expanded to open three new facilities in Northern Alabama with a logistics facility in Warner Robins, Georgia. They are a Native American owned company formed under the Alaska Native Claims Settlement Act of 1971. Currently, Tyonek is fulfilling aircraft maintenance related defense contracts with several countries in Hancock County, MS. Classified as an 8(a) business, Tyonek is a relatively large "small" business.

Huntington Ingalls Incorporated
Huntington Ingalls is America's largest military shipbuilding company. The company provides several other services such as ship repair and maintenance. Headquartered in Newport News, Virginia, Huntington Ingalls also operates Ingalls shipbuilding located in Pascagoula, MS. Positioned along the Mississippi Gulf Coast, the Ingalls shipbuilding division produces a vast majority of ships for the United States Navy. The company employees approximately 11,500 employees at the coast location, making it one of the largest private employers in the state (Huntington-Ingalls, 2020). Huntington-Ingalls largely controls all maritime vessel rebuild and maintenance in Mississippi and, as a result, is often awarded large amounts of funding from DoD.

VT Halter Marine Inc.
VT Halter Marine Inc. is a shipbuilding and repair company located in Pascagoula, MS. It is a subsidiary of ST Engineering. Founded in 1956 in New Orleans, LA., this company specializes in the building and repairing medium-sized ships such as patrol vessels, ferries, and logistic support vessels. VT Halter prides itself on being versatile, having designed, built, or repaired over 2,600 vessels. Located near Huntington-Ingalls, VT Halter provides competition for marine vessel maintenance in Mississippi.

United States Marine Inc.
United States Marine Inc. is a builder of high-performance, special mission boats for military or personal use. Located in Gulfport, MS, this small business originally built World Class racing sailboats. After being founded in 1971, the company transitioned into building and servicing "military patrol and special warfare boats ranging in length from 21 feet to 90 feet" (USMI, n.d.). The maintenance and repair facility is located in Chesapeake, VA. The Gulfport facility currently has over 131,550 square feet for the manufacture of their vessels.

Navistar Defense, LLC.
Navistar Defense is a branch of Navistar International Corporation. Navistar International formed this defense unit to begin the sale of military vehicles. Navistar Defense is one of the main providers for military vehicle maintenance in Mississippi. Located in West Point, MS, the manufacturing plant specializes in tactical wheeled and commercial military vehicles and maintenance. The plant recently received an $8 million upgrade and added 500 new jobs to bolster the facility (Seid, 2020). Currently, Navistar is one of the few companies in Mississippi performing ground vehicle maintenance.

CITE Armored

CITE Armored is an armored vehicle manufacturing company located in Holly Springs, MS. The company provides services on every level for armored vehicles, including repair and rebuild. The facility in Holly Springs includes an 80,000 sq ft. manufacturing facility with easy access to Interstate 78 as well as rail systems (CITE Armored, 2020). CITE is certified as an MWBE (Minority and Women Owned Business Development).

Figure 7. Private Defense Maintenance Companies in Mississippi

CITE Armored

Navistar Defense, LLC.

Vertex Aerospace LLC.

Tyonek Manufacturing Group, Inc.

United States Marine Inc.

Huntington-Ingalls Inc. and VT Halter Inc.

Current Military Assets

Camp Shelby Joint Forces Training Center

Camp Shelby is a military training center located in Perry and Forrest Counties with a small operating space in Green County, MS. It was originally established in 1917 to support the mobilization of troops for WWI but has continued to serve as a training site. Primarily used for the Reserve Components of the Army, Camp Shelby is also used by all Active Components from every branch of the U.S. military (Camp Shelby, n.d.). Within the 134,000 acres that Camp Shelby occupies, numerous facilities support battalion-level training and logistical support facilities where maintenance is performed. Camp Shelby has the largest concentration of military maintenance facilities in Mississippi.

Two major maintenance programs located at Camp Shelby are MATES and CSMS #1. MATES is an acronym for Maneuver Area Training Equipment Site. MATES was established for the pre-positoning of equipment for training and providing assets to conduct training. The major functions are to support training, repair parts supply, and prepare readiness data.

CSMS stands for Combined Support Maintenance Shop and is one of two in the state. While MATES is devoted largely to training and support, CSMS focuses solely on maintenance. CSMS works to perform field and sustainment maintenance for surface equipment for the Army National Guard and other DoD agencies.

Combat Readiness Training Center

The Combat Readiness Training Center is a Mississippi Air National Guard base located in Gulfport, MS adjacent to the Gulfport-Biloxi Airport. The base is used primarily for hosting large, realistic training activities for the military and is one of only four CRTCs in the country. The site is equipped with several facilities that can be used for the maintenance of aircraft and are available for joint use for private companies.

Theater Aviation Sustainment Maintenance Group

The 1108th Theater Aviation Sustainment Maintenance Group (TASMG) is an Army National Guard unit and maintenance facility located in Gulfport, MS. They are one of four Army National Guard regional maintenance facilities nationwide. TASMG provides aviation maintenance with depot level capabilities, including airframe repair, painting, and parts repair. TASMG is the largest military facilities devoted to aircraft maintenance in Mississippi.

Army Aviation Support Facilities

There are currently three Army Aviation Support Facilities (AASF) located throughout the state of Mississippi. These facilities are run by the Air National Guard and work to maintain different aircraft depending on location. AASF #1, located in Jackson at Hawkins Field, provides maintenance and support for UH-60 aircraft. AASF #2, located in Tupelo at Tupelo Regional Airport, works to maintain the MH-60 Blackhawk, UH-72

Lakota, and AH-64 Apache helicopters. AASF #3, located in Meridian at Key Field, maintains the CH-47 Chinook helicopter. Each facility boasts a skilled U.S. Air National Guard workforce to repair and maintain their respective aircraft.

Keesler Air Force Base

Keesler Air Force base is located in Biloxi, MS, along the Mississippi Gulf Coast. It is home to the 81st training wing, which includes the 2nd Air Force and 403rd Wing. The base is currently the largest employer on the Mississippi Gulf Coast (Keesler Air Force Base, n.d.). The 2nd Air Force mission provides highly trained, combat-ready forces. This mission provides several training courses in various disciplines, including advanced aircraft maintenance making it one of the larger aircraft maintenance facilities for aircraft maintenance in Mississippi.

Columbus Air Force Base

Columbus Air Force Base, located in Columbus, MS, is home to the 14th Flying Training Wing. This unit specializes in undergraduate pilot training on a variety of aircraft. Similar to Keesler, the base also hosts an aircraft maintenance group. The 14th Operations Group and its six squadrons oversee the Specialized Undergraduate Pilot Training missions and perform quality assurance for aircraft maintenance at the facility.

Naval Air Station Meridian

Naval Air Station Meridian (NAS Meridian) is a Navy airbase located in Meridian, MS. The base is one of only two naval jet strike pilot training facilities. NAS Meridian current activities involve supporting aviation and other technical training. The base occupies over 8,000 acres of land with an additional 4,000 acres at Joe Williams Field (NAS Meridian, n.d.). The facilities at NAS Meridian also serve to provide field-level maintenance for military aircraft.

Field Maintenance Shops 1-10

Throughout the state of Mississippi, there are ten field maintenance shops. These shops are under the Mississippi National Guard and work to support military equipment and vehicles. The locations are Tupelo, Louisville, Brookhaven, Gulfport, Senatobia, Greenville, Decatur, West Point, Florence, and Camp Shelby. The field maintenance shops provide services such as replacing parts and lower-level maintenance, those below the depot level.

Camp McCain

Camp McCain is a Mississippi National Guard training site located in Grenada, MS. Within its 13,000 acre property, Camp McCain offers training for tank maneuvers and artillery training. The site is also home to two (2) maintenance facilities: Unit Training and Equipment Site (UTES) and Combined Support Maintenance Shop (CSMS) #2. Similar to MATES at Camp Shelby, UTES provides support and training for the units while, CSMS provides maintenance for equipment.

Thompson Field
Thompson Field is an Air National Guard facility located in Jackson, MS near Jackson International Airport. This facility is home to the 172d Airlift Wing which specilializes in strategic airlift and aerial evacuation. The Wing is complemented by support units for maintenance and repair of aircraft. The aircraft stored at this site include the C-141B Starlifter and C-17. Currently, there are plans to expand this site to accommodate even more large aircraft.

Meridian Regional Airport
Meridian Regional Airport is a public airport located at Key Field in Lauderdale County, MS. The facility is a joint use public/military airfield. Key Field is home to the Mississippi Air National Guard's 186th Air Refueling Wing. The unit works to provide air refueling support and is complemented by a maintenance group. The Wing operates the KC-135R Stratotanker aerial refueling and cargo aircraft.

Workforce

For this report, the maintenance industry workforce is divided into four sections: ship, aircraft, ground vehicles, and ground heavy machinery, i.e., tanks. This section will address the supply and demand for Mississippi's maintenance workforce and several key factors that showcase the percentage of jobs available in the industry and jobs in demand. Additionally, programs needed to grow the workforce supply, such as training and education, will be included.

The aircraft services industry, NAICS code 488190, also has a relatively high demand for maintenance workers, with over 18% being employed as maintenance employees. A majority of these workers are employed as either aircraft mechanics or avionics technicians. The aircraft industry also has some of the highest earnings for the maintenance industry, which could be an asset for building this workforce.

Table 4.

Aircraft Maintenance Jobs and % in Industry, NAICS code 488190, 2019

SOC Code	Description	Total Jobs in Industry by % Nationwide
49-3011	Aircraft Mechanics and Service Technicians	16.3%
49-2091	Avionics Technicians	2.6 %
49-9071	Maintenance and Repair Workers, General	0.9%
51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	0.6%
17-3023	Electrical and Electronic Engineering Technologists and Technicians	0.5%
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	0.2%
49-9041	Industrial Machinery Mechanics	0.1%

Source: EMSI

The shipbuilding and manufacturing industry, NAICS Code 336611, has a relatively lower amount of maintenance workers. Most workers classified under this distinction are skilled workers such as welders, plumbers, and fiberglass laminators. While the demand for these workers is not as high as the other industries, their employment still represents a meaningful percentage of the total workforce.

Table 5.

Ship Maintenance Jobs and % in Industry, NAICS Code 336611, 2019

SOC Code	Description	Total Jobs in Industry by % Nationwide
51-4121	Welders, Cutters, Solderers, and Brazers	9.1%
51-2051	Fiberglass Laminators and Fabricators	5.9%
47-2152	Plumbers, Pipefitters, and Steamfitters	4.3%
17-2121	Marine Engineers and Naval Architects	3.8%
47-2111	Electricians	3.5%
51-2041	Structural Metal Fabricators and Fitters	3.3%
17-2141	Mechanical Engineers	1.1%
49-3051	Motorboat Mechanics and Service Technicians	0.9%
17-2071	Electrical Engineers	0.9%
51-6093	Upholsterers	0.8%
49-9041	Industrial Machinery Mechanics	0.6%

Source: EMSI

The demand for maintenance workers for the ground vehicle industry, NAICS code 811, is exceptionally high, with over 20% of the industry being maintenance type workers. When coupled with the heavy machinery workers for ground vehicles, NAICS code 336992, there appears to be significant demand for maintenance workers within this industry. When examining the supply of workers, it would be important that an area has a high supply of these workers to fulfill ground vehicle maintenance needs.

Table 6.

Ground Vehicle Maintenance Jobs and % in Industry, NAICS code 811, 2019

SOC Code	Description	Total Jobs in Industry by % Nationwide
49-3023	Automotive Service Technicians and Mechanics	20.7%
49-3021	Automotive Body and Related Repairers	6%
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	2.4%
49-9098	Helpers--Installation, Maintenance, and Repair Workers	1.2%
49-3022	Automotive Glass Installers and Repairers	1.2%

Source: EMSI

Table 7.

Ground Heavy Machinery Maintenance Jobs and % in Industry, NAICS code 336992, 2019

SOC Code	Description	Total Jobs in Industry by % Nationwide
51-2098	Miscellaneous Assemblers and Fabricators	21.9%
51-4041	Machinists	6.3%
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	0.6%
17-3026	Industrial Engineering Technologists and Technicians	0.6%
17-3098	Calibration Technologists and Technicians and Engineering Technologists and Technicians, Except Drafters, All Other	0.6%
17-3027	Mechanical Engineering Technologists and Technicians	0.6%
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	0.4%

Source: EMSI

In the aircraft service industry, there are also a large number of jobs and high location quotients for many of the jobs. There are large separations between hires and jobs available for the largest job which is aircraft mechanics while, the location quotient is still above 1. Overall, Mississippi has a health amount of jobs available in these jobs but, seems to have an issue filling them perhaps due to a shortage of workers.

Table 8.

Mississippi Job Supply Data for Aircraft Maintenance Industry, 2019

SOC Code	Description	Number of Jobs	Number of Hires	Location Quotient	Separations
17-3023	Electrical and Electronic Engineering Technologists and Technicians	1,027	416	1.03	411
49-2091	Avionics Technicians	273	72	0.98	71
49-3011	Aircraft Mechanics and Service Technicians	1,679	542	1.10	540
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	1,498	722	1.13	694
49-9041	Industrial Machinery Mechanics	5,219	2,321	1.69	2,083
49-9071	Maintenance and Repair Workers, General	13,994	7,418	1.13	7,049
51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	293	196	0.85	250
Total		**23,983**	**11,687**		**11,098**

Source: EMSI

The ship building industry boasts several skilled workers for the state. There is an incredibly high location quotient and high amount of hires for welders, cutters, solderers, and brazers which is the largest job for ship maintainers. The same can be said for several other jobs such as electricians, plumbers and pipefitters, and industrial machinery mechanics.

The deficiencies in this industry can be found in a low amount of marine engineers and fiberglass laminators. Both of these jobs have relatively low hirers for the industry with a low amount of jobs available. These particular jobs will need to be improved upon to expand the maintenance industry in the state.

Table 9.

Mississippi Job Supply Data for Ship Maintenance Industry, 2019

SOC Code	Description	Number of Jobs	Number of Hires	Location Quotient	Separations
17-2071	Electrical Engineers	1,293	370	0.87	342
17-2121	Marine Engineers and Naval Architects	299	40	2.80	40
17-2141	Mechanical Engineers	1,483	532	0.61	445
47-2111	Electricians	5,966	4,478	0.99	4,293
47-2152	Plumbers, Pipefitters, and Steamfitters	3,584	2,548	0.91	2,423
49-3051	Motorboat Mechanics and Service Technicians	175	53	0.82	50
49-9041	Industrial Machinery Mechanics	5,219	2,321	1.69	2,083
51-2041	Structural Metal Fabricators and Fitters	994	422	1.59	476
51-2051	Fiberglass Laminators and Fabricators	88	48	0.50	38
51-4121	Welders, Cutters, Solderers, and Brazers	6,224	3,359	1.84	3,242
51-6093	Upholsterers	3,276	2,025	10.64	1,967
Total		**48,863**	**32,227**		**31,744**

Source: EMSI

The major deficiencies for Mississippi in ground vehicle maintenance are related to serving heavy machinery ground vehicles. Many of the jobs available in this industry display both low hires and location quotient. However, it is worth noting that the largest demand for workers in this field is for miscellaneous assemblers and fabricators, of which Mississippi has a large amount, location quotient 1.89.

Table 10.

Mississippi Job Supply Data for Ground Vehicle Maintenance Industry, 2019

SOC Code	Description	Number of Jobs	Number of Hires	Location Quotient	Separations
49-3021	Automotive Body and Related Repairers	1,311	697	1.04	639
49-3022	Automotive Glass Installers and Repairers	208	104	1.21	96

49-3023	Automotive Service Technicians and Mechanics	7,079	3,248	1.16	3,194
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	1,498	722	1.13	694
49-9098	Helpers--Installation, Maintenance, and Repair Workers	584	544	0.74	520
Total		**10,680**	**5,315**		**5,144**

Source: EMSI

Table 11.

Mississippi Job Supply Data for Ground Heavy Machinery Maintenance Industry, 2019

SOC Code	Description	Number of Jobs	Number of Hires	Location Quotient	Separations
17-3026	Industrial Engineering Technologists and Technicians	301	125	0.56	101
17-3027	Mechanical Engineering Technologists and Technicians	220	128	0.65	136
17-3098	Calibration Technologists and Technicians and Engineering Technologists and Technicians, Except Drafters, All Other	614	334	0.84	315
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	3,045	1,536	1.35	1,458
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	2,652	1,655	1.16	1,511
51-2098	Miscellaneous Assemblers and Fabricators	20,261	16,031	1.89	16,346
51-4041	Machinists	2,905	1,619	0.96	1,510
Total		**29,999**	**21,428**		**21,377**

Source: EMSI

Workforce Training Programs

Delta Technical College

Delta Technical College is a year-round school that provides vocational training for mechanical and health-related trades (Delta Technical College, 2020). Courses available include welding and industrial, commercial, and residential electrician. There are two campuses in the state located in Horn Lake, MS and Ridgeland, MS.

Leake County Career and Technical Center

Leake County Career and Technical Center is located in Carthage, MS, and offers specialized training in various disciplines. Maintenance-related training includes maintenance and light repair and construction and carpentry. Many of the programs offered can be completed in conjunction with high school classes to allow students to train while still in high school.

Career Development Center
The Career Development Center is located in Jackson, MS, and offers 17 career and technical education programs. Programs related to maintenance include automotive service technician, construction, engineering, and welding. These programs are offered to many high school students in the Jackson area, and online options are also available.

Community Colleges
Community Colleges in the state that offer maintenance-related vocational training programs include Mississippi Gulf Coast Community College, East Mississippi Community College, Holmes Community College, East Central Community College, and Copiah-Lincoln Community College. Each school provides a unique offering of classes related to ground vehicle and ship maintenance training and education.

Aircraft Mechanic Training Programs
There are two schools in Mississippi that offer Airframe and Powerplant (A&P) certificates. The schools are Hinds Community College and Northwest Mississippi Community College. These programs provide a foundation for the fundamentals and technical procedures related to aircraft maintenance. A new program is currently being established in Hancock County near Stennis International Airport.

Infrastructure

The state of Mississippi is centrally located between the East and West coasts of the country, allowing for easy access to markets in several key locations, including Mobile, New Orleans, Memphis, Dallas, and Atlanta. With the Gulf of Mexico located at the Southern Border, there is also access to central and South American markets. There are a number of suitable infrastructure components that allow Mississippi to be a viable asset for logistics and manufacturing.

Roads
Mississippi's road system consists of six (6) interstates and 14 federal highways. The interstate system covers 698 miles, with the highways providing additional access (Mississippi, 2020). Due to relatively low population density, the traffic congestion is minimal, making them ideal for shipping. According to the Mississippi Development Authority, commuting distances of up to 40 miles is common.

Airports
There are 76 publicly owned, and four (4) privately owned airports in the state. Of these airports, 53 are attended, seven (7) have regularly scheduled service, and 20 provide service as needed (Mississippi, 2020). The airports provide a variety of services to private individuals and industrial partners. Some of the major airports in the state include Gulfport-Biloxi International, Hattiesburg-Laurel Regional Airport, Jackson-

Medgar Wiley Evers International Airport, Golden Triangle Regional Airport, Key Field, and Bobby L Chain Municipal Airport.

Rail

Mississippi's rail infrastructure consists of 30 rail systems and over 2,500 miles of track. There are various rail services available, including carload, trailer on flat car, and mini-bridge shipments. Most of the operations of the railways are handled by five (5) of North America's seven (7) Class I railroads and one (1) Class II regional. Major railroads in the state include Illinois Central and Gulf, Mobile, and Ohio.

Ports

Mississippi is surrounded by several major waterways that allow it to be a fantastic asset for water-based transport. The Mississippi River borders to the west, the Tennessee-Tombigbee Waterway borders to the east, and the Gulf of Mexico is located to the southern border. The combination of these waterways equates to approximately 800 miles of commercially navigable channels.

The Port of Pascagoula is the largest port in the state. The port features a 38-foot channel depth and is ranked as a top-20 port in the nation for foreign cargo volume. In addition, the port has two harbors with both public and private terminals with several transit and storage containers available. With more than 35 million tons of cargo moving through the port every year, it is well-equipped to handle large cargo volume (Mississippi, 2020).

The Port of Gulfport, the second major port in the state, is state-owned and features a 36-foot channel depth in the port's South Harbor. The port is well-equipped by owning tow 100-ton capacity harbor cranes, dry container and refrigerated storage, and 110 acres of total storage. Additionally, Foreign Trade Zone #92 is located on the dock and is available to provide distribution to major importers.

Port Bienville Industrial Park is a 3600-acre facility located in Hancock County, MS. The facility is a shallow draft barge port equipped with a 100-ton Manitowac crawler crane and heavy lift services. Port Bienville provides a variety of services including barge loading and unloading, warehousing, and rail car storage and maintenance. It also works to connect tenants to other ports along the Gulf Coast Intercostal Waterway such as the Port of New Orleans and Mississippi River routes.

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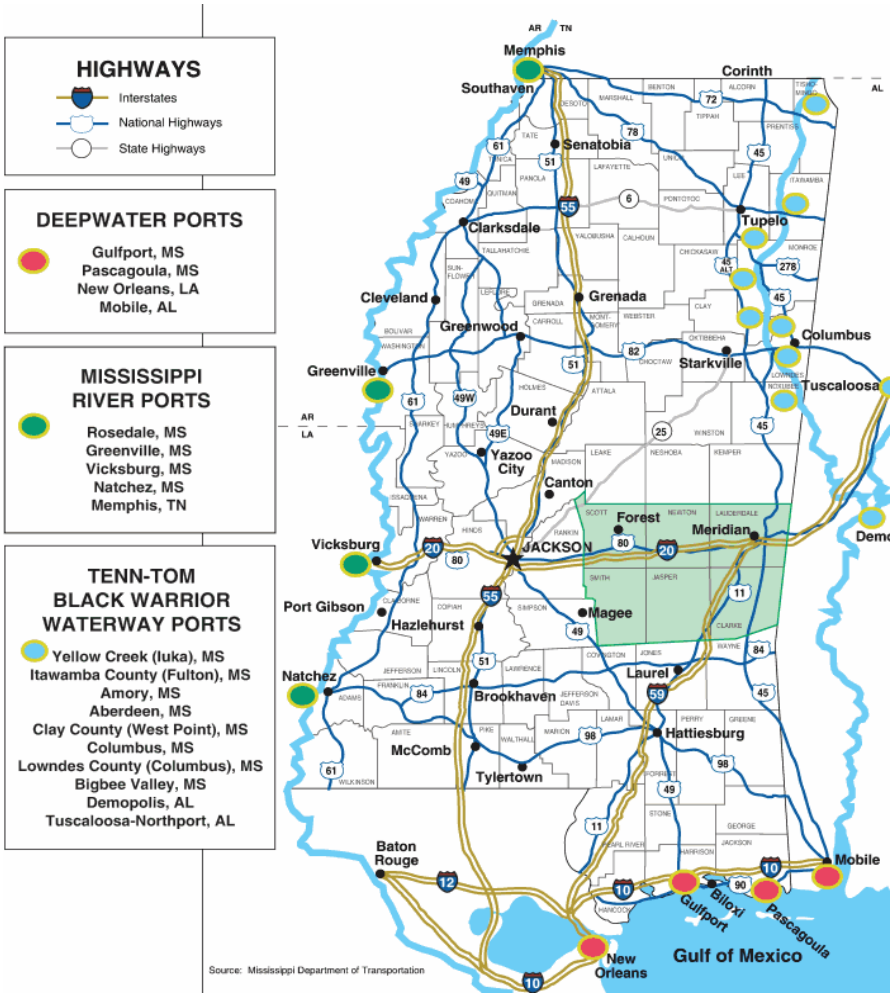
The Tennessee-Tomigbee Waterway (TTW) is a large national marine highway running north-south through the North Mississippi Industrial Development Association (NMIDA) region in the north-eastern part of the state. The Waterway connects the Tombigbee River and the Tennessee River to allow transport of goods through 23 states. There are six ports along the TTW located in Mississippi including Yellow Creek Port, Port of Itawamba, Amory Port, Aberdeen Port, Clay County Port, and Lowndes County Port.

In addition to the ports on the Gulf Coast and along the TTW, there are six ports located along the Mississippi River which borders the western part of the state. These ports include Port of Rosedale, Port of Greenville, Yazoo County Port, Port of Vicksburg, Port of Claiborne County, and Natchez Adams County Port. The ports located along the Mississippi River work in conjunction with the other ports to provide ideal access to water transport to several locations through the state.

Figure 8. Map of Mississippi Major Roads and Ports



Source:mmdd.org

Conclusion

The growing maintenance industry presents an opportunity for states with the necessary assets to perform this type of work. With foreign military sales also growing over the past few years, the market share is expected to become even larger. Mississippi boasts several assets that make it an enticing destination for defense maintenance contractors. There are a number of excellent military facilities located throughout the state that are available for both private and military use. Additonally, several private companies are already located in the state with the capabilities to perform maintenance in collaboration with the military. The infrastructure within the state is also more than adequate to support maintenance supply transport. The current maintenance workforce within the state is an area that requires some continued development but, with the education programs available, can be improved.

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Appendix A. Aircraft Maintenance Competitiveness in Mississippi

Several factors come into play when determining the location for an aircraft maintenance defense contractor (Wissman, 2020). First are the size and condition of the hangar facilities. Hangars need to be large enough to support the type of aircraft maintained at the facility. They need to comply with the codes set forth by the DoD to house *fueled* aircraft, particularly in terms of electrical systems and fire suppression.

Another important factor is the facilities and equipment available at the airport. Factors include runway length, the air traffic control facilities available, such as if a tower is present, or the availability of maintenance equipment, such as cranes, lifts, platforms, and stands.

The final factor that would increase the competitiveness of a site for an aircraft maintenance facility would be available housing for foreign servicemen whose countries purchased aircraft from U.S.-based companies and have maintenance performed in the US.

Major Civilian and Joint-Use (Military/Civilian) Airports in Mississippi

Name	Location	Runway Length (ft.)	Ramp Space (Sq. Ft.)	Number of Hangars	Total Hangar Area (Sq. Ft.)
Stennis International Airport	Hancock County, MS	8,497	540,000	36	183,155
Key Field (Joint-Use)	Meridian, MS	10,003 and 4,599	775,000	3	50,200
Bobby Chain Municipal	Hattiesburg, MS	6,100	566,280	7	80,000
Jackson-Evers Airport (Joint-Use)	Jackson, MS	8,500 (2 runways)	781,000 Military 2,165,754 Civilian	3 Military 8 Civilian	253,239 Military 64,000 Civilian
Trent Lott Airport	Moss Point, MS	6,500	307,500	14	53,300 (Open-Bay) 6,600 (T-Hangars)
Gulfport/Biloxi International Airport (Joint-Use)	Gulfport, MS	9,002 and 4,935	2,000,000 Military 975,000 Civilian	2 Military 4 Civilian	85,000 Military (across 2 Open-Bay) 35,000 Civilian (Open-Bay) 10,000 - divided into 16 bays (T-Hangar)
Tupelo Regional Airport	Tupelo, MS	6,502	844,200	12	183,356
Mid-Delta Airport	Greenville, MS	8,001 and 7,019	1,500,000	5	340,000

Source: Federal Aviation Administration (FAA), Interviews with Airport Personnel (Wissman 2020

Appendix B. Mississippi National Guard Maintenace Assets

Mississippi Air National Guard

Within the Mississippi Air National Guard, two unites with maintenance capabilities. The 172nd Airlift Wing, based at Allen C. Thompson Field in Jackson, MS, operates C-17 aircrafts. Within the 172nd Airlift Wing, the maintenance group is comprised of the 172nd Maintenance Squadron, Aircraft Maintenance Squadron, and Maintenance Ops Flight. The 186th Air Refueling Wing, based at Key Field Air National Guard base in Meridian, MS, support domestic counter-drug and emergency response missions. Maintenance within the unit is done by the 186th Maintenance Operations Squadron, Maintenance Group, Air Craft Maintenance Squadron and Maintenance Squadron.

The Mississippi National Guard is more structurally complex than the Air National Guard in the state. The National Guard is comprised of a total of four units and are individually supported by maintenance companies.

- Mississippi National Guard
    a. 184th ESC (Sustainment Command) - Laurel | Hattiesburg
        i. 298 Support Battalion – Philadelphia, MS
        ii. 367 MNT CO - Philadelphia, DeKalb, MS
        iii. 3656 MNT CO - Camp Shelby, Waynesboro, MS
    b. 155th Armored Brigade Combat Team
    c. 66th Troop Command
        i. 1108 Aviation Group - Gulfport, MS
    d. Joint Force Headquarters Jackson, MS
        i. RTS Maintenance (Camp Shelby)

Along with the units outlined above, Mississippi is the home to Camp Shelby and Camp McCain, ten Field Maintenance Shops, and 1st Theater Aviation Support Maintenance Group.

Field Maintenance Shops include the following locations:

- Senatobia
- Tupelo
- West Point
- Greenville
- Louisville
- Decatur
- Florence
- Brookhaven
- Camp Shelby
- Gulf Port

Readiness Sustainment Maintenance Academy Site, Camp Shelby