

A Study of Employment in the State's Defense Industry

Prepared for
The Maryland Departments of Commerce, Labor, and Veterans Affairs

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HOUSE BILL 1542

Q3, C8, K3

(8lr3324)

ENROLLED BILL

— Economic Matters/Finance —

Introduced by Delegates Lisanti, Carey, Chang, Dumais, Jalisi, Jameson, Wilson,
K. Young, and P. Young

Read and Examined by Proofreaders:

Proofreader.

Proofreader.

Sealed with the Great Seal and presented to the Governor, for his approval this
_____ day of _____ at _____ o'clock, _____ M.

Speaker.

CHAPTER _____

1 AN ACT concerning

2 Department of Commerce – Employment in the State’s Defense Industry – ~~Army~~
3 ~~Alliance~~ Study

4 FOR the purpose of requiring, subject to the receipt of certain funding, the Department of
5 Commerce, in conjunction with the Department of Veterans Affairs and the
6 Department of Labor, Licensing, and Regulation, to conduct a study on employment
7 in the State’s defense industry; specifying the minimum requirements of the study;
8 requiring the Department of Commerce to consult with certain entities; requiring
9 the Department of Commerce to report, on or before a certain date, to the General
10 Assembly on the findings of the study; providing for the termination of this Act; and
11 generally relating to a study on employment in the State’s defense industry.

12 Preamble

EXPLANATION: CAPITALS INDICATE MATTER ADDED TO EXISTING LAW.

[Brackets] indicate matter deleted from existing law.

Underlining indicates amendments to bill.

~~Strike out~~ indicates matter stricken from the bill by amendment or deleted from the law by amendment.

Italics indicate opposite chamber / conference committee amendments.



HOUSE BILL 1542

1 WHEREAS, The State is home to 12 major military installations and 20 military
2 facilities; and

3 WHEREAS, The State is also home to a number of defense industry organizations
4 that, as major employers, provide substantial economic benefit to the State, accounting for
5 almost one-fifth of the Maryland economy; and

6 WHEREAS, The workforce required to support these organizations, both public and
7 private, is highly specialized and often requires a security clearance; and

8 WHEREAS, The personal income tax structure of the State may affect the
9 availability of qualified employees for the State's defense industry, including employees
10 with experience in cybersecurity matters; now, therefore,

11 SECTION 1. BE IT ENACTED BY THE GENERAL ASSEMBLY OF MARYLAND,
12 That:

13 (a) ~~The~~ Subject to the receipt of funding from a grant provided by the Office of
14 Economic Adjustment within the United States Department of Defense or from any other
15 source, the Department of Commerce, in conjunction with the Department of Veterans
16 Affairs and the Department of Labor, Licensing, and Regulation, shall conduct a study of
17 employment in the State's defense industry.

18 (b) The study required under subsection (a) of this section shall, at a minimum:

19 (1) identify the types, and estimate the approximate number, of jobs in the
20 State's defense industry facing shortages of qualified employees for employment in the next
21 decade at the qualification requirement for each broad occupational category;

22 (2) determine the factors affecting the availability of qualified employees
23 for employment in the State's defense industry;

24 ~~(3)~~ (3) calculate the approximate number of retired military personnel in the
25 State who are eligible for employment in the State's defense industry, including those
26 retired military personnel who hold, have held, or are qualified to hold security clearances;

27 ~~(4)~~ (4) identify and report any recommendations to facilitate the recruitment
28 of retired military personnel for positions in the State's defense industry;

29 ~~(5)~~ (5) identify, assess, and quantify the effects, if any, of the State's personal
30 income tax structure on the employment decisions of retired military personnel to:

31 (i) reside in the State for employment in the State's defense
32 industry;

33 (ii) not relocate to the State for employment in the State's defense
34 industry; and

1 (iii) leave the State for employment in another state's defense
2 industry; ~~and~~

3 ~~(5)~~ (6) examine the following issues related to the accessibility of positions in
4 the State's defense industry:

5 (i) the number of jobs in the State that require a security clearance;
6 and

7 (ii) the number of retired military personnel who are employed in
8 State defense industry jobs that require a security clearance; and

9 (7) consider implications on employment at military installations and
10 military facilities in the State that have been, or may be, under threat to close in a future
11 Base Realignment and Closure (BRAC) process.

12 (c) In conducting the study required under subsection (a) of this section, the
13 Department of Commerce shall consult with:

14 (1) the State's defense industry;

15 (2) State employers who employ individuals in positions where a security
16 clearance is required;

17 (3) public-private partnerships that serve to support military installations
18 in the State;

19 (4) nonprofit organizations that exist to support the mission of military
20 installations in the State; and

21 (5) nonprofit associations that serve to support retired military personnel.

22 (d) On or before ~~December 31, 2018~~ June 30, 2019, the Department of Commerce
23 shall report to the General Assembly, in accordance with § 2-1246 of the State Government
24 Article, the findings of the study required under subsection (a) of this section.

25 SECTION 2. AND BE IT FURTHER ENACTED, That this Act shall take effect July
26 1, 2018. It shall remain effective for a period of 1 year and, at the end of June 30, 2019, this
27 Act, with no further action required by the General Assembly, shall be abrogated and of no
28 further force and effect.

1.0 Executive Summary

Home to military installations and numerous defense contractors, Maryland plays a key role in the country's defense industry. However, there is concern that the economic and fiscal climate of the state may be discouraging for highly skilled defense workers, particularly those who have retired from the military.

Therefore, the Maryland legislature, via House Bill 1542 (HB 1542), directed the Department of Commerce, the Department of Veterans Affairs, and the Department of Labor to contract for a study of Maryland's defense industry.¹ The bill presents seven research questions for study, which the Regional Economic Studies Institute (RESI) of Towson University has examined.

1.1 Maryland's Defense Industry and its Workforce

Maryland's defense industry includes federal military employment, federal civilian employment, and a number of private contractors and supporting services. The state is home to multiple military installations, sizable defense contractors, and many small businesses that all comprise the defense ecosystem. In fact, a 2019 study found that the total economic impact of Maryland's military installations represented 15.4 percent of the state's gross domestic product (GDP).²

Though DoD funding supports a significant number of existing jobs in Maryland's economy, several occupations are expected to face employment shortages each year over the next ten

Each year, occupations in Maryland's defense industry face a shortage of 7,217 qualified workers, particularly for computer and mathematical, architecture and engineering, and science occupations.

years. Shortages are generally present in occupations related to Science, Technology, Engineering, and Mathematics (STEM) fields, such as software developers, computer programmers, and computer hardware engineers.

In addition to future projected shortages, Figure 7, companies in Maryland's defense industry are currently having difficulty identifying qualified employees. In the second quarter of 2019, there was a monthly average of 23,779 job postings advertised for Maryland occupations that contribute to the defense industry.³

¹ House Bill 1542—An Act Concerning Department of Commerce—Employment in the State's Defense Industry, approved by the governor May 18, 2018, http://mgaleg.maryland.gov/2018RS/Chapters_noln/CH_795_hb1542e.pdf.

² Daraius Irani, et al, "FY 2016 Economic Impact Analysis of Maryland's Military Installations," 8, Regional Economic Studies Institute of Towson University (December 18, 2018), accessed August 1, 2019, <http://commerce.maryland.gov/Documents/ResearchDocument/economic-impact-analysis-of-marylands-military-installations-fy-2016.pdf>.

³ "Maryland Workforce Exchange – Labor Market Information," Maryland Department of Labor, Licensing and Regulation, accessed July 10, 2019, <https://mwejobs.maryland.gov>.

1.2 The Defense Industry's Specific Workforce Needs

While Maryland has a robust defense industry ecosystem, it has several specific requirements for its workforce. In addition to a technical background in STEM, workers need an understanding of government operations, knowledge of military processes, and a security clearance.

As many as 305,199 total positions in Maryland require a security clearance.

Security clearances are particularly important for the defense industry. Given the sensitive nature of defense work as it relates to national security, clearances are generally required. Otherwise qualified employees cannot be hired, or cannot begin work, until they are cleared. This significantly hinders the potential defense industry workforce, as industry stakeholders noted that the majority of positions in the defense industry require a security clearance, and sometimes a top secret clearance.

RESI estimates that between 228,145 and 305,119 positions in Maryland's defense industry require a security clearance. Up to 170,566 of these jobs are with private-sector defense companies, with 9,187 positions unfilled.

During interviews, defense industry stakeholders noted that within the defense industry, many openings are characterized as "sold and funded:" a company has the resources to hire a qualified candidate immediately if they can find someone. However, if the candidate does not have a security clearance, they cannot be hired because it currently averages 468 days to process a security clearance.⁴

1.3 The Role of Retired Military Personnel in Maryland's Defense Industry

After 20 years of service in a branch of the armed forces, military personnel retire with a unique combination of significant technical knowledge, leadership experience, and a security clearance; this makes them uniquely qualified to enter Maryland's defense industry. There are 55,680 military retirees residing in Maryland, 60.8 percent of whom are under age 65.⁵ Since they are younger than the traditional retirement age, many military retirees enter a second career after leaving the armed forces.

While military retirees in Maryland often live near military installations and have access to ample employment opportunities, there are several other factors they consider when deciding where to live post-retirement, including tax burden, overall cost of living, personal preference, and

When compared to other states with a significant defense presence, Maryland has the second-highest cost of living.

⁴ Lindy Kyzer, "How Long Does It Take to Process a Security Clearance? Q1 2019 Update," ClearanceJobs, accessed July 17, 2019, <https://news.clearancejobs.com/2019/03/12/how-long-does-it-take-to-process-a-security-clearance-q1-2019-update/>.

⁵ Department of Defense Office of the Actuary, "Number of Military Retirees by State as of September 30, 2018," 24, accessed June 12, 2019, https://actuary.defense.gov/Portals/15/Documents/MRS_StatRpt_2018%20v5.pdf?ver=2019-05-14-220629-787.

family considerations. When compared to 11 other comparison states, Maryland has the second-highest cost of living, effectively reducing the value of a salary earned by any member of a military retiree household in the state. This is notable because the compensation for jobs requiring a security clearance in Maryland is lower than that of Maryland's neighbors of Virginia and Washington, D.C.

Another factor specific to military retirees is that of military pension exemptions: while some states exempt military pensions from taxation, Maryland exempts only a portion. This, combined with Maryland's higher overall state tax burden as compared to some other states, can make the state a less-attractive place of residence for retired military personnel, especially once they fully retire from the workforce and no longer require access to Maryland's robust employment opportunities. Fully exempting military pensions from taxation is one concrete step the state can take to counteract the relatively high cost of living.

1.4 Additional Considerations for the State's Defense Industry

In addition to being uniquely qualified to work in Maryland's defense industry, military retirees are an asset to the state's broader economy. Military retirees often reenter the workforce, thus earning income and generating economic activity in addition to receiving military pensions. Military retiree household spending—on items such as groceries, mortgage or rent payments, and recreation—benefits the economy. The spending associated with one military retiree's household—based on Maryland's median household income and the average military pension payment to a military retiree residing in Maryland—sustains nearly \$115,000 in economic activity and supports \$7,550 in state and local tax revenues. However, these economic "ripple effects" are only felt if the household resides in the state.

Spending by military retiree households has a ripple effect in Maryland's economy. On average, this spending supports an additional:

- 0.73 jobs,
- \$114,928 in output,
- \$32,986 in employee compensation, and
- \$7,550 in state and local tax revenues.

Given the importance of Maryland's defense industry on the state's economy and the ripple effects that it has, any changes to the defense industry landscape will be felt on a wider scale.

1.5 Recommendations to Strengthen Employment in Maryland's Defense Industry

Despite Maryland's strong defense industry, current and future demand for defense workers will outpace supply. This shortage is particularly pronounced for employees with many years of work experience. Additionally, since the defense industry is continuing to grow despite present shortages, future employment needs will only be exacerbated if today's entry-level workers are not gaining experience to fill future needs.

There are several actions the state can take to address employment gaps for both experienced and entry-level workers to keep Maryland competitive. More detail can be found in the full report.

To address entry-level employment gaps, Maryland can:

- Support STEM education initiatives, and
- Ensure traditionally underserved populations can access STEM education curriculum.

To encourage qualified military retirees to remain in the state and contribute to the defense industry, Maryland can take a number of actions. While there are potential solutions at various stages in the career trajectory of a retired member of the military, those related to Maryland's cost of living can improve circumstances for all retired military families.

To address the skilled employment gaps, Maryland can:

- Provide resources/training to help defense companies:
 - Target recruitment efforts to service members transitioning to civilian life,
 - Promote hiring policies that align with military values, and
 - Incorporate support services focused on the transition into civilian life throughout the onboarding process;
- Help to expand existing successful programs that aid in the transition to civilian employment; and
- Address the high cost of living for military retirees by:
 - Exempting military pensions from taxation and
 - Reframing Maryland's cost of living as an investment in a high quality of life.

The areas in Maryland with the highest concentrations of military retirees are those areas next

Fully exempting military pensions from taxation is one policy that the state of Maryland can take to encourage military retiree households to reside in and contribute to the state.

to military installations. Ensuring that Maryland's military installations are supported is critical, especially in the face of potential program loss. Efforts such as white papers and other publications can help Maryland lawmakers communicate the value of Maryland's military ecosystem.

2.0 Introduction

Located near the nation's capital of Washington, D.C., and with a sizable population and skilled workforce, Maryland is an important part of the U.S. military research and development landscape. Home to major military installations, additional military facilities, and a number of defense contractors, Maryland plays a key role in the country's defense industry.⁶ However, despite this natural relationship between Maryland and the defense industry, there is concern that the economic and fiscal climate of the state may be discouraging for highly skilled defense workers, particularly those who have retired from the military.⁷

As such, the Maryland legislature, via House Bill 1542 (HB 1542), directed the Maryland Department of Commerce (Commerce), in concert with the Maryland Department of Veterans Affairs and the Maryland Department of Labor (collectively, these agencies are "The Client"), to contract for a study of the defense industry in the state.⁸ The bill presents seven interrelated yet independent research questions for consideration. They are summarized below:

1. To identify the types and approximate number of jobs in Maryland's defense industry facing shortages;
2. To determine the factors that could affect the availability of qualified employees in the state's defense industry;
3. To estimate the number of retired military personnel in Maryland that could potentially work in the defense industry, taking note of their ability to hold or those who already hold security clearances;
4. To develop recommendations aiding in the recruitment of retired military personnel for jobs in Maryland's defense industry;
5. To consider and quantify the effects, if any, of the state's personal income tax structure on the employment and residence decisions of retired military personnel;
6. To estimate the number of jobs in the state economy that require a security clearance, as well as the number of retired military personnel employed in defense industry jobs that require a security clearance; and
7. To consider the implications of a potential future round of Base Realignment and Closure (BRAC) upon employment at military installations and facilities in the state.

In addition to the seven research questions described above, HB 1542 also stipulates that interviews be conducted with stakeholders, including the Maryland defense industry, employers who rely on workers with security clearances, public-private partnerships that support military installations, and nonprofit organizations that support military installations and retired military personnel. Furthermore, the bill indicates that the findings of the study be submitted to the General Assembly of the State of Maryland on or before June 30, 2019.

⁶ House Bill 1542—An Act Concerning Department of Commerce—Employment in the State's Defense Industry, approved by the governor May 18, 2018, http://mgaleg.maryland.gov/2018RS/Chapters_noln/CH_795_hb1542e.pdf.

⁷ *Ibid.*

⁸ *Ibid.*

To carry out the requirements of the bill, the Client contracted with the Regional Economic Studies Institute (RESI) of Towson University to complete the research study. Methods used to answer these research questions include a gap analysis comparing needed employment levels to available workers, interviews with defense industry stakeholders, a secondary data and literature review, and an economic and fiscal impact analysis. More detailed methodologies can be found in Appendix B.

Under the requirements of the bill, RESI submitted an executive summary to the Client on June 28, 2019, allowing the Client to deliver this document to the legislature by June 30, 2019. This executive summary served as a formal deliverable that provided preliminary findings for each research question presented in HB 1542 to fulfill the bill's requirements.

After the June 30 deadline, RESI continued with the research process, collecting additional primary and secondary data according to feedback provided by the Client. RESI then synthesized the findings from the research questions to develop a full report that reflects the spirit of the bill while providing additional content, context, and analysis.

This report serves as the draft deliverable for the full report and contains the following sections:

- Section 3.0 describes how RESI defined Maryland's defense industry, common occupations in the industry, and expected employment trends in these occupations;
- Section 4.0 presents workforce needs for the defense industry, including the need for security clearances;
- Section 5.0 considers the effects of any unmet needs of the state's defense industry;
- Section 6.0 suggests recommendations to strengthen employment in Maryland's defense industry; and
- Section 7.0 concludes the report.

In addition to the sections described above and a list of references, the report includes appendices containing a detailed methodology, additional research materials, and more detailed analyses.

For reference purposes, Figure 1 illustrates where each research question is answered in the report.

Figure 1: Report Section-to-Research Question Map

Section	Research Question
Section 3.0	One
3.1	One
3.2	One
3.3	One
Section 4.0	Two, Three, Five, Six
4.1	Two
4.2	Six
4.3	Five, Six
4.3.1	Three
4.3.2	Five
Section 5.0	Five, Seven
5.1	Five
5.2	Seven
Section 6.0	Four
6.1	Four
6.2	Four

Source: RESI

3.0 Defining the State's Defense Industry and Its Workforce

This section, which addresses Research Question One from HB 1542, first defines the defense industry, including a discussion of federal employment at installations and private-sector businesses that receive significant Department of Defense (DoD) funding. Next, important occupations for the state's defense industry are introduced, as well as current and future workforce trends. Key findings discussed in more detail in this section include:

1. Maryland's defense industry consists of military, federal civilian, and private-sector employment that all support national defense efforts; and
2. Many employment gaps exist in occupations common to the defense industry, particularly for computer occupations.

3.1 Defining the Industry

Maryland has a robust defense industry, hosting many military installations. Its location bordering Washington, D.C. means numerous private contractors are based in the state to be near the Department of Defense (DoD) and military installations. To fully and accurately capture Maryland's defense industry it is important to consider the needs and characteristics of both military installations and private defense contractors.

Maryland's military installations are a key component of the state's defense industry. In addition to the work performed on base by federal military and civilian employees, numerous private-sector suppliers and contractors support the work of the installations and are an integral part of the defense industry as well. Thus, the impact of military installations on Maryland's economy is substantial. In 2018, the Maryland Department of Commerce published

a report measuring the economic impact of 15 military installations in Maryland for fiscal year (FY) 2016.⁹ Combined, the 15 installations supported (directly and indirectly) over \$55.5 billion in economic output in FY 2016, or 15.4 percent of the state's economy in 2016.¹⁰

Figure 2 reports the on-installation employment, as of 2016, for each of these 15 sites.

Figure 2: On-Installation DoD Employment at Maryland's Military Installations, 2016¹¹

Installation	Employment
Aberdeen Proving Ground	14,806
Adelphi Laboratory Center	2,184
Army Corps of Engineers—Baltimore District	1,045
Coast Guard Yard	1,878
Fort Detrick	8,641
Fort Meade	55,568
Joint Base Andrews	15,506
Maryland Military Department	1,872
National Marine Intelligence Center	2,985
Naval Air Station Patuxent River	21,858
Naval Research Lab—Chesapeake Bay Detachment	12
Naval Support Activity Annapolis	8,197
Naval Support Activity Bethesda	10,204
Naval Support Facility Indian Head	3,278
Naval Surface Warfare Center—Carderock Division	1,558
Total	149,592

Source: Commerce

As seen in Figure 2, on-base employment at Maryland's military installations is substantial. Fort Meade, the state's largest employer, employed 55,568 military and federal civilian workers in FY 2016. Combined, the 15 installations directly employed nearly 150,000 military and federal civilian workers.

To fully execute its mission, each installation requires the support of private defense contractors, often located on-base or nearby. These contractors provide support for the installation's primary missions (e.g., private contractors that serve Fort Detrick often assist with biomedical research and contractors that serve Naval Air Station Patuxent River frequently

⁹ Daraius Irani, et al, "FY 2016 Economic Impact Analysis of Maryland's Military Installations," 12, Regional Economic Studies Institute of Towson University (December 18, 2018), accessed August 1, 2019, <http://commerce.maryland.gov/Documents/ResearchDocument/economic-impact-analysis-of-marylands-military-installations-fy-2016.pdf>.

¹⁰ Ibid., 8.

¹¹ Please note that these figures were reported by the installations to the Department of Commerce and then to RESI. While data validation efforts were employed, some on-installation employment totals may be over- or underestimated. Additionally, please note that these figures do not include embedded contractors, as they are private-sector workers.

assist with unarmed aerial vehicle support) as well as providing support services such as catering, administrative support, or maintenance.

While no publically available data exists that captures the direct spending or day-to-day activities of military personnel, analyzing the grants and contracts paid to defense contractors provides a foundation to define the activities that make up the defense industry. Additionally, analyzing grants and contracts allows for an understanding of how Maryland contractors help support the larger DoD mission, even if the contractor does not work directly with a military installation.

To examine defense contracting that occurs on- and off-site for military, RESI examined data from USASpending.gov, a government site that reports all non-classified grants and contracts made by various federal agencies. RESI examined all DoD grants and contracts with a place of performance in Maryland for FY 2017 and FY 2018. Each grant and contract captured within USA Spending data identifies the industry of the defense contractor through a North American Industrial Classification System (NAICS) code.

While the DoD provides grants and contracts to businesses in almost every type of industry, RESI restricted its analysis for this report to industries that received at least \$1.0 billion in DoD contract awards in either FY 2017 or FY 2018. This allowed RESI to focus solely on those industries which represent a significant proportion of Maryland's defense industry.

To verify that this method captures the missions of each military installation, RESI further refined its analysis to examine grants and contracts made to contractors located on or near each major military installation. RESI verified that the grants and contracts made to defense contractors near those installations captured the mission of the installation. For example, RESI verified that grants and contracts made to private defense contractors on or near Fort Detrick involved high levels of spending on research and development in biotechnology. Similarly, contractors on or near Joint Base Andrews and Naval Air Station Patuxent River received large contracts for support activities for air transportation. Thus, although RESI's definition of the defense industry relies on grants and contracts made to private companies, the definition appears to capture all expected industries based on the missions of Maryland's military installations.

A description of Maryland's private-sector defense industry at the six-digit NAICS level is found in Figure 3 below.

Figure 3: Maryland's Defense Industry as Defined by DoD Contract Awards (in Billions of 2017 Dollars) at the Six-digit NAICS Level

NAICS Code	Description	Contract Award (\$billions)	
		2018	2017
336611	Ship Building and Repairing	\$250.2	\$79.0
541330	Engineering Services	\$164.9	\$83.1
236220	Commercial and Institutional Building Construction	\$66.9	\$25.2
336411	Aircraft Manufacturing	\$57.2	\$23.2
541712	Research and Development in the Physical, Engineering, and Life Sciences (Except Biotechnology)	\$51.7	\$33.5
524114	Direct Health and Medical Insurance Carriers	\$50.9	\$7.1
541511	Custom Computer Programming Services	\$27.9	\$15.8
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	\$26.5	\$13.0
541512	Computer Systems Design Services	\$19.7	\$12.7
517110	Wired Telecommunications Carriers	\$17.4	\$14.3
221122	Electric Power Distribution	\$15.5	\$9.8
221310	Water Supply and Irrigation Systems	\$15.1	\$3.7
488190	Other Support Activities for Air Transportation	\$13.9	\$7.0
561210	Facilities Support Services	\$9.7	\$6.3
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	\$5.5	\$1.9
541711	Research and Development in Biotechnology	\$4.3	\$1.8
541519	Other Computer Related Services	\$3.9	\$2.3
541990	All Other Professional, Scientific, and Technical Services	\$3.2	\$1.3
541611	Administrative Management and General Management Consulting Services	\$2.4	\$1.2
541690	Other Scientific and Technical Consulting Services	\$2.1	\$1.4
541715	Research and Development in the Physical, Engineering, and Life Sciences (Except Nanotechnology and Biotechnology)	\$2.0	N/A
334290	Other Communications Equipment Manufacturing	\$1.5	\$0.9
517410	Satellite Telecommunications	\$1.5	\$0.7
483211	Inland Water Freight Transportation	\$1.4	\$0.3
517210	Wireless Telecommunications Carriers (Except Satellite)	\$1.3	\$0.6
541513	Computer Facilities Management Services	\$1.2	\$0.7
334111	Electronic Computer Manufacturing	\$1.0	\$0.5
332994	Small Arms, Ordnance, and Ordnance Accessories Manufacturing	\$0.6	\$1.4

Sources: USASpending, RESI

As seen in Figure 3, Maryland's private-sector defense industry contains a variety of types of companies that focus on cybersecurity, scientific research and development, and naval services.

In addition to NAICS codes such as these that are traditionally associated with the military, businesses associated with general business operations and employee support are also included.

3.2 Identifying Occupations in the Defense Industry

After defining the defense industry in Maryland, RESI considered the workers and the types of jobs they hold. In total, **67 occupations** were identified as being important to Maryland's defense industry, using the methodology discussed in Appendix B. The top ten occupations in terms of the total number of defense-reliant jobs are presented below in Figure 4. For additional information on all occupations included in the defense industry and considered in the analysis, please see Appendix C.3.

Figure 4: Top Ten Occupations with the Largest Number of Defense-reliant Jobs in Maryland

Detailed Occupation Code	Occupation Title	Defense-Reliant Jobs
15-1132	Software Developers, Applications	13,947
15-1121	Computer Systems Analysts	8,288
13-1111	Management Analysts	8,044
11-1021	General and Operations Managers	7,865
15-1133	Software Developers, Systems Software	7,080
17-2051	Civil Engineers	5,488
13-1199	Business Operations Specialists, All Other	4,833
11-3021	Computer and Information Systems Managers	4,628
15-1199	Computer Occupations, All Other	4,281
15-1131	Computer Programmers	3,941

Sources: Bureau of Labor Statistics (BLS), RESI

The ten occupations in the table above represent a total of 68,395 defense-reliant jobs in Maryland's economy. Of note, six of the top ten occupations are related to computer science. The Software Developers, Applications occupation has the largest number of defense-reliant jobs at 13,847. Computer Systems Analysts have the second-highest number of defense-reliant jobs, at 8,288. Other occupations rounding out the top ten include two occupations in business and financial operations: Management Analysts and Business Operations Specialists, All Other.

Notably, several of the top occupations identified in the state's private-sector defense industry align with the missions of many of the state's largest military installations in terms of employment. For example, Fort Meade is the largest employer in the state and houses the nation's information, intelligence, and cyber operations.¹² Fort Meade relies on a large number of workers in computer and mathematical occupations. Similarly, the mission of Aberdeen Proving Ground (APG) encompasses testing, technical services, and emerging technologies,

¹² "About Fort Meade," Fort Meade, accessed August 27, 2019, <https://www.ftmeade.army.mil/pages/about/about.html>.

which is also relevant for computer and scientific jobs.¹³ Naval Air Station Patuxent River focuses on research, development, testing, evaluation, and engineering of air systems and ship/shore/air operations. It thus relies on hiring workers (directly and indirectly through contractors) in scientific and engineering occupations.¹⁴

3.3 Identifying Employment Gaps in Maryland's Defense Industry

After identifying the occupations constituting the defense industry, RESI analyzed the current and potential future labor market structure for each occupation. Current job openings were measured from publically available job posting data, while projections were calculated using a methodology presented in Appendix B.1. For each of the 67 occupations defined in Section 3.2, RESI retrieved the number of job openings for the second quarter of 2019 from the Maryland Workforce Exchange. Figure 5 shows the ten occupations with the most average monthly job openings in this quarter.¹⁵

Some of the skillsets, especially in software, software design, cyber, as well as artificial intelligence and autonomy...those types of skillsets are where we compete quite a bit with the commercial industry. Cyber folks who graduate from college can make big money with some of the companies like Amazon and others.

-Retired Military Officer

Figure 5: Defense-Reliant Occupations with the Most Monthly Job Openings, Q2 2019

Occupation Title	Average Monthly Job Openings
Computer Programmers	3,175
Network and Computer Systems Administrators	2,220
Software Developers, Applications	1,554
Engineers, All Other	1,428
Software Developers, Systems Software	1,331
Computer Systems Analysts	1,253
General and Operations Managers	1,160
Sales Managers	1,110
Management Analysts	1,095
Business Operations Specialists, All Other	985

Source: Maryland Workforce Exchange

The highest number of job openings was for Computer Programmers, with an average of 3,175 job postings each month in the second quarter of 2019. Five of the top six occupations fall within the Computer and Mathematical Occupations group, suggesting that these positions dominate the current occupational shortages in Maryland's defense industry. While shortages

¹³ "Mission Statement," Aberdeen Proving Ground, accessed August 27, 2019, <https://home.army.mil/apg/index.php/about/mission>.

¹⁴ "Mission and Vision," CNIC Naval Air Station Patuxent River, accessed August 27, 2019, https://www.cnic.navy.mil/regions/ndw/installations/nas_patuxent_river/about/mission_and_vision.html.

¹⁵ Please note that the number of openings does not account for the number of applicants nor the number of qualified potential employees to fill these openings.

in this occupational group are felt across Maryland's defense industry and across branches of the military, they are perhaps most important for defense contractors operating on or near Fort Meade, as well as the military installation itself. The full list of occupations is in Appendix C.3.

RESI conducted a gap analysis to examine future employment levels and potential shortages. Results are presented below in Figure 6. The results are displayed for each defense-reliant occupation for which a projected shortage exists. Each gap—entry level, skilled, and total—represents the average annual expected jobs needed to meet demand over the most recent ten-year projection period (2016 – 2026). In the tables below, a negative gap indicates an oversupply for the given career-level and signals a potential skill imbalance.

Figure 6: Average Annual Employment Gaps in Maryland's Defense Industry, 2016-2026

Occupation Title	Entry Level Gap	Skilled Gap	Total Gap
General and Operations Managers	-1,647	3,029	1,382
First-Line Supervisors of Mechanics, Installers, and Repairers	21	764	784
Management Analysts	-765	1,538	773
Software Developers, Applications	535	156	691
Medical Scientists, Except Epidemiologists	257	374	631
Computer Occupations, All Other	-295	844	550
Civil Engineers	-113	461	348
Computer Systems Analysts	-79	379	300
Computer Hardware Engineers	11	246	256
Technical Writers	8	189	197
Computer Programmers	63	118	181
Computer Network Architects	-143	313	170
Electronics Engineers, Except Computer	-154	317	163
Information Security Analysts	-58	175	118
Chemists	-4	118	113
Software Developers, Systems Software	-701	805	103
Biochemists and Biophysicists	-13	113	100
Mechanical Engineers	-119	193	73
Environmental Engineers	-10	62	52
Materials Engineers	-1	50	49
Interpreters and Translators	-11	50	39
Environmental Scientists and Specialists, Including Health	-72	110	38
Geoscientists, Except Hydrologists and Geographers	-4	29	25
Commercial and Industrial Designers	0	25	24
Actuaries	-10	32	22
Biomedical Engineers	-20	39	19
Chemical Engineers	-21	36	16

Sources: Department of Labor, NCES, OES, RESI

The largest gap is for General and Operations Managers, with an expected shortage of 1,382 positions each year through 2026. However, the total shortage does not tell the full story. Each year, RESI projects that there will be a shortage of over 3,000 skilled workers in this position and an oversupply of roughly 1,600 entry-level workers. This indicates that while Maryland is producing many workers who may be technically qualified, perhaps through obtaining an MBA, these graduates lack the experience and specific skills needed to fill the more senior positions.

This pattern may also be seen with Management Analysts, the occupation with the third-highest projected shortage. Each year through 2026, RESI projects that there will be a total shortage of 773 workers in this occupation. Making up this total shortage is a shortage of over 1,500 skilled workers and an oversupply of 765 entry-level workers. These patterns indicate the need to attract and retain highly skilled workers in Maryland.

To better examine the trends shown in Figure 6, Figure 7 reports projected shortages at the broad occupational category.

Figure 7: Forecasted Annual Employment Gaps in Maryland's Defense Industry

Occupation Title	Entry Level Gap	Skilled Gap	Total Gap
Computer and Mathematical Occupations	-688	2,822	2,135
Management Occupations	-1647	3,029	1,382
Architecture and Engineering Occupations	-427	1,404	976
Life, Physical, and Social Science Occupations	164	744	907
Installation, Maintenance, and Repair Occupations	21	764	784
Business and Financial Operations Occupations	-765	1,538	773
Arts, Design, Entertainment, Sports, and Media Occupations	-3	264	260

Sources: Department of Labor, NCES, OES, RESI

As seen in Figure 7, the largest projected shortage is for Computer and Mathematical Occupations. Each year, this occupation has a slight oversupply of nearly 700 entry-level workers, but faces a shortage of over 2,800 skilled workers annually. Together, this means that the occupation grouping faces a projected shortage of 2,135 workers each year through 2026. Similarly, Management Occupations and Architecture and Engineering Occupations both experience high total shortages driven by a deficit of skilled workers.

The projected negative gap of entry-level workers does not mean that students in Maryland's colleges and universities should avoid majoring in many Science, Technology, Engineering, and Mathematics (STEM) fields such as engineering and computer science. Instead, the negative gap indicates that companies in Maryland would generally prefer to fill empty positions with skilled workers to minimize training time and any associated costs to replace retiring or other highly skilled workers. In the absence of skilled workers, Maryland companies will generally promote existing mid-level staff and hire entry-level workers to fill in as needed. Therefore, ensuring Maryland students graduate with STEM education should still remain a top priority, as discussed further in Section 6.1.

4.0 Addressing the Workforce Needs of Maryland's Defense Industry

The preceding section describes the defense industry as it exists in Maryland as well as how its need for workers is anticipated to change in the near future. This section addresses Research Questions Two, Three, Five, and Six in whole or in part. Key findings include:

1. Workers in the defense industry face a number of requirements, including technical knowledge of STEM fields and possession of a security clearance.
2. Since retired military personnel leave the armed forces with a security clearance and are highly trained in technical fields, they are prime candidates to address the needs of Maryland's defense industry.
3. In FY 2018, there were 55,680 retirees living in Maryland, the majority of whom are under age 65 (and thus younger than the traditional retirement age).
4. There are many factors that influence retired military personnel as they make decisions regarding employment and where to live, including:
 - Family preferences,
 - Job opportunities,
 - Educational opportunities, and
 - Cost of living (e.g., state income tax and taxes on military pension income).

4.1 Special Considerations for Employment in the State's Defense Industry

Throughout the interview process, a number of stakeholders, particularly those involved with military alliances, pointed to educational issues as a significant factor in determining the current and future availability of qualified employees in the defense industry. This specifically relates to jobs within STEM fields. Although these individuals did not discount the value of attracting older, experienced talent to fill current openings, they emphasized the importance of STEM education in filling the needs of Maryland's employers. If these issues, including the entry-level gaps described in the previous section, are not addressed at the beginning of career trajectories, they can only intensify for mid- and late-career occupations that require experience in concert with a STEM background.

I would say that the current state of affairs at many of the government labs is trying to fill the young talent.

-Leader of a military alliance

Furthermore, given this reliance on STEM knowledge (especially computer programming) issues regarding access to technology and computer literacy can become barriers to employment. For instance, even if someone has an aptitude for quantitative reasoning or an interest in mathematics, if they do not have the opportunity to learn coding languages or have access to these resources, they cannot gain these prerequisite skills.

In addition to requiring specialized technical expertise, Maryland's defense industry relies upon workers with unique qualifications. Given the nature of defense contracting work in particular, defense industry employers need workers with knowledge of government operations, a full understanding of the military ecosystem, and the ability to work with sensitive information.

4.2 Security Clearances and Maryland's Defense Industry

According to individuals involved in hiring for defense industry positions, as well as those involved in job placement and workforce development, one of the largest factors affecting the availability of qualified employees is the requirement of a security clearance for the majority of positions within Maryland's defense industry. While this requirement can confer an advantage to retired military personnel, who often leave the military with both the required skills and clearance needed for employment in the defense industry, there are also many cases noted in the interviews where the clearance obtained in the military is not of the level required for a particular position.

Interviewees involved with cybersecurity and information technology within the defense industry noted a particularly high need for a cleared workforce within those fields. Many stated that between 90 and 100 percent of the positions they hire for require a security clearance, and

I would say probably 9 out of 10 positions that I hire for require a clearance right off the bat.

-Defense industry program manager

that this was a typical percentage. One interviewee said, "The only positions that do not [require clearance] are back-office positions that are in essence support positions that could work in any industry." Given that six out of the top ten Maryland defense

occupations are related to computer science (please see Figure 4 in Section 3.2), these occupations align with the positions for which these interviewees would be hiring.

To estimate the total number of positions that require a security clearance in Maryland, RESI examined private-sector and public-sector data. To estimate the number of private-sector positions requiring a security clearance, RESI used two complementary methodologies to create lower and upper estimates based on publically available data (information regarding these methodologies and their assumptions can be found in Appendix B).

As shown in Figure 8, RESI estimates that the total number of jobs in Maryland requiring a security clearance may range from 115,951 to 170,566. This is mostly comprised of actively filled positions, which RESI estimates to range from 106,764 to 161,379. Total unfilled positions are estimated to be 9,187.

Figure 8: Estimates of Filled and Unfilled Private-Sector Positions Requiring a Security Clearance in Maryland

	Lower Estimate	Upper Estimate
Total Filled Positions	106,764	161,379
Total Unfilled Positions	9,187	9,187
Total Number of Private-Sector Jobs Requiring a Security Clearance	115,951	170,566

Sources: BLS, ClearanceJobs, MWE, RESI

As discussed in Section 3.1, a 2018 economic impact study found that nearly 150,000 military and federal civilian workers work directly on Maryland's military installations. During interviews, defense industry stakeholders were not sure of the precise ratio of jobs in the defense industry requiring a security clearance. However, stakeholders estimated that the percentage may range between 75 percent and 90 percent. As reported in Figure 9, this means that there may be between 112,194 and 134,633 military and federal civilians working on Maryland's military installations that have a security clearance.

Figure 9: Estimates of the Number of Public-Sector Positions Requiring a Security Clearance in Maryland

	Lower Estimate	Upper Estimate
Employment on Military Installations (Military and Federal Civilian)	149,592	149,592
Estimated Percentage of Workers With Security Clearance	75%	90%
Total Number of Public-Sector Jobs Requiring a Security Clearance	112,194	134,633

Sources: Commerce, RESI, Washington Post, Various

Figure 10 below combines the estimates of security clearances held by private-sector employees from Figure 8 with the estimates of security clearances held by Maryland military and federal civilian workers from Figure 9.

Figure 10: Estimates of the Number of Private-Sector and Public-Sector Positions Requiring a Security Clearance in Maryland

	Lower Estimate	Upper Estimate
Total Private and Public	228,145	305,199

Sources: BLS, ClearanceJobs, Commerce, MWE, RESI, Washington Post, Various

As seen above in Figure 10, when considering both private- and public-sector employees with a security clearance, RESI estimates that there are between 228,145 and 305,199 positions (filled and unfilled) requiring a security clearance in Maryland. Nationwide, there are approximately 3.4 million workers with a security clearance.¹⁶ This indicates that between 6.7 percent and 9.0 percent of all security clearances are for Maryland workers.

Based on data from the U.S. Bureau of Economic Analysis, the percentage of Maryland's gross domestic product (GDP) coming from government and government enterprises was 19.5 percent in the first quarter of 2019.¹⁷ The estimates of security clearances appear to be consistent with this proportion, Maryland's relatively high number of military installations, and

¹⁶ ClearanceJobs, "2018 Compensation Survey," 6, accessed June 17, 2019, https://clearance-jobs-assets.s3.amazonaws.com/customer/2018CompensationReport_ONLINE.pdf, 6.

¹⁷ "GDP by State," U.S. Bureau of Economic Analysis, accessed August 29, 2019, <https://www.bea.gov/data/gdp/gdp-state>.

the predominance of cybersecurity and engineering occupations within Maryland's defense industry.

Interview subjects noted that the lack of a security clearance keeps many otherwise qualified individuals from filling open positions. Multiple individuals stated that there is a significant number of unfilled positions that are "sold and funded," meaning that a new hire could start as soon as tomorrow if they were to be hired today. One industry expert noted that at his company, he had over 100 of these positions at one time needing to be filled, but for which there were not enough individuals with a security clearance to qualify.

Even in cases where a position may only require a preliminary clearance, increased process times have reduced the competitiveness of the defense industry against other industries which require the same skilled candidates. One interviewee explained, "In the past...if you found a qualified candidate that had a clean criminal background and a relatively reasonable financial profile, you could get them a [preliminary] clearance pretty quickly, 48 hours to a week." In the current environment, the same interviewee explained that the process for a preliminary clearance can take two to four months. For qualified candidates who may have multiple offers of employment, they are likely to choose a position they can start immediately over one for which they would have to "sit around for three months for one company to call [them] back."

The time to obtain a Top Secret security clearance averaged 543 days at the highest point in 2018.

In recent years, the gap created by this shortage of cleared workers has grown as a result of this drastically increased processing times for obtaining a clearance. Figures released in the first quarter of 2019 show

that the processing time for a Top Secret clearance currently averages 468 days, and averaged 543 days at the highest point in 2018.¹⁸ Given the length of this process, government contractors are very reluctant to sponsor a clearance for a job candidate who may not be able to fully contribute to the company until the clearance process is complete. Thus, it is important for Maryland to maintain a steady supply of workers who already possess security clearances to ensure that the defense industry's needs are met.

4.3 The Role of Retired Military Personnel in the State's Defense Industry

As noted previously, since the process of obtaining a security clearance can be expensive and slow, workers who already have security clearances are at an advantage for employment. Retired military personnel are uniquely qualified for employment in Maryland's defense industry given that they leave the military with a security clearance and have 20 or more years of experience. While a significant number of military retirees live

I feel like I see them in a green suit one day and then a tie the next.

-Defense industry small business owner

¹⁸ Lindy Kyzer, "How Long Does It Take to Process a Security Clearance? Q1 2019 Update," ClearanceJobs, accessed July 17, 2019, <https://news.clearancejobs.com/2019/03/12/how-long-does-it-take-to-process-a-security-clearance-q1-2019-update/>.

and work in Maryland, there are numerous factors that could entice them to relocate outside the state. This section addresses Research Questions Three and Five from HB 1542.

4.3.1 An Overview of Military Personnel in the State

To estimate the number of retired military personnel, RESI used the number of military retirees in the state as listed in the DoD Office of the Actuary Statistical Report on the Military Retirement System for FY 2018.¹⁹ RESI then estimated the number of personnel eligible for

55,680 military retirees were reported to be living in Maryland in 2018.

employment using labor force participation rates from the Bureau of Labor Statistics.²⁰

To use specific labor force participation rates for each age group, RESI approximated the

number of military retirees in the age groups by using the national breakdown of military retirees receiving retired pay, by age.²¹ Since the age breakdown of military retirees nationally differs from the breakdown of military retirees in Maryland, the approximation was weighted to match the number of military retirees in Maryland aged 65 or older.²²

As reported by the DoD Office of the Actuary, there are 55,680 military retirees residing in Maryland.²³ Based on the methodology discussed above, RESI estimates that 28,352 military retirees in Maryland are currently eligible for employment in Maryland's defense industry. Since people below 65 years of age have much higher labor force participation rates than those above 65, Maryland benefits from the fact that retired military personnel who live in the state are, on average, younger than all military retirees nationally. In Maryland, only 39.2 percent of military retirees are 65 years of age or older, compared to 50.6 percent of military retirees nationwide.

To have a more complete understanding of military retirees in the state, RESI also estimated the number of reservists who have retired. Although there is no direct reporting of the number of military retirees in Maryland in

11,474 of Maryland's military retirees are retired from the Reserves.

reserve retirement, this number can be estimated based on the national number of reserve retired as a proportion of all retired military personnel. Using these figures, RESI estimates that roughly 11,474 of the military retirees in Maryland were formerly in the reserves. The post-military careers of reservists differ from others who qualify for military pensions. Since reservists spend most of their time as civilians and have careers outside of the military, they are unlikely to be searching for a new career once they qualify for reserve retirement. However,

¹⁹ Department of Defense Office of the Actuary, "Statistical Report on the Military Retirement System," 24, accessed June 10, 2019, https://media.defense.gov/2019/May/14/2002131753/-1/-1/0/MRS_STATRPT_2018%20V5.PDF.

²⁰ U.S. Bureau of Labor Statistics, "2019 Labor Force Participation Rates," accessed June 10, 2019, <https://www.bls.gov/cps/cpsaat03.htm>.

²¹ U.S. Department of Defense Office of the Actuary, "Statistical Report on the Military Retirement System, 52.

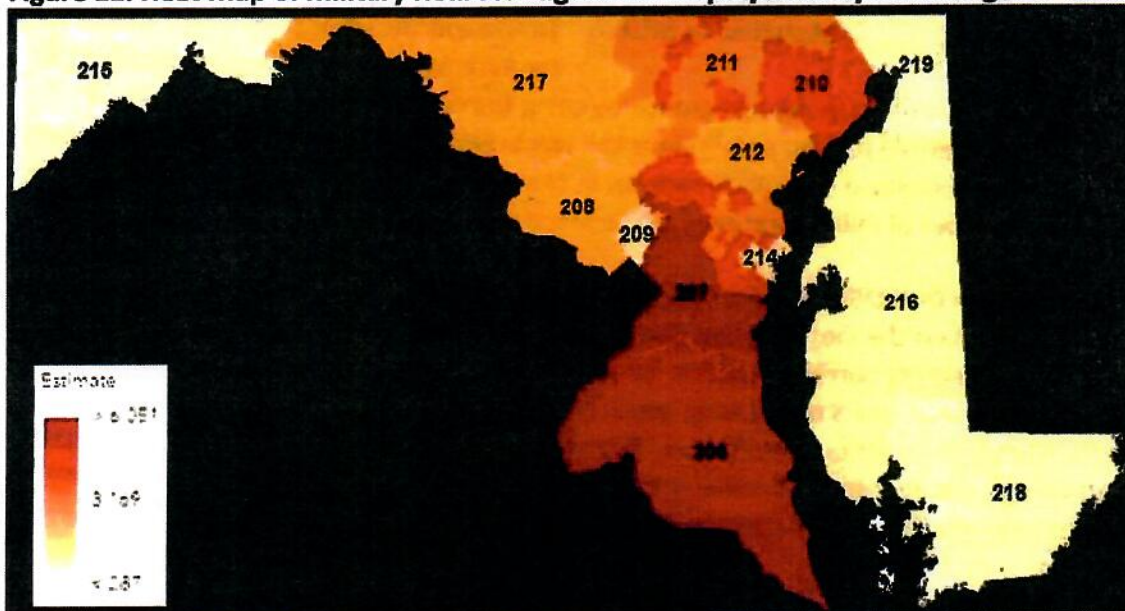
²² *Ibid.*, 27.

²³ *Ibid.*, 24.

many reservists may already work in Maryland's defense industry, and would continue to provide their skills even after retiring from the reserves.

The Statistical Report also provides a breakdown of military retirees by three-digit ZIP code.²⁴ The data shows that military retirees are not distributed evenly through the state. Figure 11 maps the distribution of the 28,352 military retirees eligible for employment by three-digit ZIP code.

Figure 11: Heat Map of Military Retirees Eligible for Employment by Three-Digit ZIP Code Area



Sources: DoD Office of the Actuary, ArcGis Online

Of the 13 three-digit ZIP codes within in Maryland, two areas lead in the total residency of military retirees. These are the neighboring codes of 206 and 207, which collectively cover Prince George's County, Calvert County, Charles County, St. Mary's County, and the southernmost portion of Anne Arundel County. Notably, military retirees are clustered in areas where military installations are located: ZIP codes 206, 207, and 210 contain installations such as Naval Support Facility Indian Head, Naval Air Station Patuxent River, Naval Research Laboratory Chesapeake Bay, Joint Base Andrews, Fort Meade, and APG.²⁵ Fort Meade is also the largest employer in the state.²⁶

Figure 12 below shows RESI's estimate of the number of military retirees eligible for employment within each of the areas, along with an estimate of retirees relative to the overall population.

²⁴ Department of Defense Office of the Actuary, "Number of Military Retirees by State as of September 30, 2018," 37

²⁵ Irani, et al, "FY 2016 Economic Impact Analysis of Maryland's Military Installations," 12.

²⁶ "About Fort Meade," Fort Meade.

Figure 12: Eligible Military Retirees by Three-Digit Zip Code

3-Digit Zip Code	Eligible Military Retirees	Estimated Population	Eligible Retirees Per Thousand
206	5,667	358,450	15.8
207	6,051	995,596	6.1
208	1,911	703,880	2.7
209	733	316,656	2.3
210	4,407	750,823	5.9
211	2,936	464,682	6.3
212	2,015	1,212,549	1.7
214	817	97,172	8.4
215	287	104,327	2.7
216	614	174,919	3.5
217	1,987	487,054	4.1
218	503	171,369	2.9
219	425	104,141	4.1

Sources: DoD Office of the Actuary, U.S. Census Bureau

As seen above, the 206 ZIP code clearly dominates in eligible military retirees relative to overall population, with nearly 16 eligible military retirees per thousand residents. This is likely due to the presence of two major military installations within the area, Naval Support Facility Indian Head and Naval Air Station Patuxent Bay, combined with a relatively low overall population. The area is also in close proximity to a number of installations located in the neighboring 207 ZIP code.

While military retirees are generally clustered around the state's military installations, there is additional context for consideration. As described during the interview process, Maryland's military installations employ a relatively large number of civilians, as opposed to "troop-heavy" bases. During interviews, the head of one defense-oriented small business stated; "the availability of retired military in Maryland is not great."

Compared to certain out-of-state installations that have a heavier focus on military personnel, this interviewee noted, "if you look at APG as an example, or even go to Fort Meade, those are very civilian-heavy and therefore the retired military are not readily available." On the other hand, this focus on civilian workers and scientific research and development makes Maryland unique and reliant on workers with STEM backgrounds.

In addition to considering where current military retirees live in Maryland, the number of military retirees living in the state and working in a defense industry job requiring a security clearance was estimated. As discussed previously, in 2018 there were roughly 55,680 retired military personnel in Maryland, 28,352 of whom are eligible for employment based on labor force participation rates. Of those retirees eligible for employment, RESI estimates the 27,514 military retirees are currently working, based on employment rates in the state (this implies that 838 are not currently working).

Of these 27,514 personnel estimated to be employed, interviewees in the state's defense industry estimated that 75 percent are expected to work in the defense industry. This yields 20,636 retired military personnel working in the defense industry in Maryland. Of those, 90 percent are assumed to require a security clearance based on interviews with defense industry stakeholders, bringing the total estimated number of retired military personnel working in defense industry jobs requiring a security clearance to 18,572.

Figure 13: Estimates of Retired Military Personnel in Maryland who Work in the State's Defense Industry

Metric	Estimate
Number of Retired Defense Personnel in Maryland	55,680
Estimated Employment Rate (Aged Weighted)	49%
Estimated number of Retired Military Personnel Working in Maryland	27,514
Probability of Working in the Defense Industry	75%
Estimated Number of Retired Military Personnel Working in Defense Industry in Maryland	20,636
Percent of Jobs Requiring Security Clearance	90%
Estimated Number of Retired Military Personnel Working in Defense Industry Jobs that Require a Security Clearance in Maryland	18,572

Sources: BLS, DoD Office of the Actuary, Interviews, RESI

As noted by ClearanceJobs in their 2018 Compensation Survey, the size of the cleared workforce across the U.S. has decreased every year between 2013 and 2018, with a total drop of approximately 27 percent over the five year period. At the same time, the number of jobs annually posted on their network has more than tripled between 2015 and 2018.²⁷

4.3.2 Location Decisions of Retired Military Personnel

After 20 years of service in a branch of the military, retirees are eligible to receive a monthly pension for the rest of their lives.²⁸ Depending on the type of retirement plan, retirees receive either 2.0 percent per year served or 2.5 percent of their highest 36 months of pay.²⁹ Considering that the maximum age for active-duty enlistment ranges from 28 for the Marines to 39 for the Air Force and Coast Guard, while the minimum age is 17 with parental consent, enlisted members of the military are likely to not be of traditional retirement age.

Instead, there is significant potential for military retirees to continue working in the civilian workforce and to make their residency decisions in accordance with this work.³⁰ These workers are highly skilled, bringing discipline and attention to detail into the labor force, and are attractive hires for companies looking to fill a variety of positions. In addition, these workers

²⁷ ClearanceJobs, "2018 Compensation Survey," 5.

²⁸ "Military Pay and Pensions—Pension Benefits for Military Retirees," USA.gov, last updated May 19, 2019, <https://www.usa.gov/military-pay#item-36297>.

²⁹ Ibid.

³⁰ "Join the Military," USA.gov, last updated May 31, 2019, <https://www.usa.gov/join-military>.

generally retire from the military with security clearances, which saves defense industry employers significant amounts of time and money if they do not have to fund the background investigation.³¹

When retiring from the military after 20 years of service, individuals have many considerations when deciding where to live. Factors include family preferences, work and educational opportunities for the retiree and their immediate family, climate preferences, and the cost of living.³² In addition, retirees may choose to settle near an installation to continue to utilize military benefits.³³

Military retirees are attractive to civilian employers due both to their skills and their security clearances.

While factors such as family considerations are unique to each retiree, others, such as work opportunities and the cost of living, are more location dependent. For example, as members of the military transition into the civilian labor force, they often enter occupations or industries that mirror their job in the military.

Where they move after retirement thus depends on job locations. Someone who retires in Maryland may stay in the state or be attracted to a state with a similar defense industry or military presence. While Maryland's robust defense industry, and its associated employment, are strong reasons for military retirees to stay in the state, they are not the only factors for consideration.

To gauge Maryland's attractiveness and understand ways to increase the number of military retirees locating in the state, RESI identified 11 comparison states. Three of these states border Maryland and compete geographically:

- Delaware,
- Pennsylvania, and
- Virginia.

A military retiree can live in any of these three states and take advantage of the strong defense industry in the mid-Atlantic. The other eight states identified as comparison states have strong defense industries, could offer high-paying stable employment to military retirees, and were referenced during interviews with industry stakeholders:

- Alabama,
- Arkansas,
- California,
- Colorado,

³¹ Interviews with stakeholders.

³² "Deciding Where to Live When You Leave the Military," Military OneSource, accessed July 16, 2019, <https://www.militaryonesource.mil/military-life-cycle/separation-transition/military-separation-retirement/deciding-where-to-live-when-you-leave-the-military>.

³³ *Ibid.*

- Massachusetts,
- New Mexico,
- South Carolina, and
- Texas.

One way of gauging Maryland's desirability as a state for military retirees is to examine where current military retirees choose to live. Figure 14 shows the current population of military retirees in Maryland and the 11 comparison states. It also provides a measurement of military retirees that accounts for the considerable variation of size between each state.

Figure 14: Current Military Retiree Comparison Among Competitor States, 2018

State	Total Military Retirees	Military Retirees Under 65	Percent of Military Retirees Under 65	Military Retirees Per Thousand Residents
Alabama	61,866	30,231	48.9%	12.66
Arkansas	25,352	10,525	41.5%	8.41
California	154,736	71,484	46.2%	3.91
Colorado	53,723	29,701	55.3%	9.43
Delaware	9,148	4,363	47.7%	9.46
Maryland	55,680	33,851	60.8%	9.21
Massachusetts	18,424	6,943	37.7%	2.67
New Mexico	21,053	10,049	47.7%	10.05
Pennsylvania	51,972	23,226	44.7%	4.06
South Carolina	61,196	29,237	47.8%	12.04
Texas	215,818	118,818	55.1%	7.52
Virginia	157,821	95,692	60.6%	18.53

Sources: DoD Office of the Actuary, U.S. Census Bureau

As seen in the above figure, the 55,680 military retirees that live in Maryland put the state near the middle among the 12 states chosen for this analysis. Not only is Maryland sixth out of 12 when considering the raw number of retirees, but the state is seventh out of 12 when controlling for the population of the state, as measured by the number of military retirees per thousand residents.

When controlling for population, Virginia has the most military retirees by a large margin, with more than twice the number of military retirees per capita than Maryland. In fact, Virginia has the largest number of military retirees per capita of any state in the country.

While Maryland sits in the middle when it comes to overall military retiree population, the state's workforce does have a major advantage when it comes to the age of military retirees. Among all comparison states, Maryland has the largest proportion of military retirees still of a working age, defined as being age 64 or younger.

While many individuals continue to work after turning 65, there is a very significant reduction in national labor force participation rates starting at that age.³⁴ Maryland's high number of working-age military retirees suggests that a larger proportion are either looking for work or have located in the state specifically for a job.

However, Virginia does have a similar proportion of military retirees under the age of 65 while attracting twice as many retirees per thousand residents as Maryland. This suggests that Virginia is able to attract larger amounts of retirees, both of working-age and retirement age, which implies that there may be other considerations beyond employment responsible for the location decisions of retirees in the region.

Throughout the interview process, participants noted that Maryland's high cost of living can be a deterrent for residing in the state, despite quality job opportunities. Figure 15 below contains a statewide cost of living measurement from the Bureau of Economic Analysis (BEA). This index sets the cost of living for the U.S. on average at 100. Any state that has a value over 100 is more expensive than the U.S. as a whole, while any state with an index value below 100 is cheaper than the U.S. on average.

Please note that since the index values are for entire states, there still may be cost-of-living variation within a state: for example, in Maryland, the suburbs of Washington, DC, are more expensive places to live than rural parts of the state.

Figure 15: Cost of Living Comparison Among Competitor States, 2017

State	Cost of Living
Alabama	86.7
Arkansas	86.5
California	114.8
Colorado	103.2
Delaware	100.1
Maryland	109.4
Massachusetts	107.9
New Mexico	93.3
Pennsylvania	97.9
South Carolina	90.4
Texas	97.0
Virginia	102.1

Sources: BEA, RESI

As seen above, Maryland is the second-most-expensive state, behind California, within the group. Neighboring Delaware (100.1) and Virginia (102.1) are above the national value but

³⁴ "Civilian Labor Force Participation Rate by Age, Sex, Race, and Ethnicity," Bureau of Labor Statistics, accessed August 23, 2019, <https://www.bls.gov/emp/tables/civilian-labor-force-participation-rate.htm>.

lower than Maryland, while Pennsylvania (97.9) is below U.S. average and significantly less expensive than Maryland.

Based on a ClearanceJobs 2018 survey, retiring military personnel with security clearances can expect a significant boost in pay as they enter the civilian workforce, as "active military" was the lowest paid employment category among those with a security clearance.³⁵ While these retiring personnel could expect a pay increase if they work in Maryland, on average, they could receive higher compensation in nearby states: while total compensation in Maryland exceeds \$100,000, this total compensation falls slightly behind Virginia and Washington, D.C.

Figure 16: Regional Total Compensation Figures for Jobs Requiring a Security Clearance

State	2018 Total Compensation	2017 Total Compensation	Growth
Virginia	\$104,914	\$99,829	5.1%
Washington, D.C.	\$103,725	\$98,894	4.9%
Maryland	\$101,608	\$96,771	5.0%

Sources: ClearanceJobs, RESI

As the cost of living and salary potential are important factors, tax policies can influence how families perceive the cost of living. For example, in states with low income tax burdens, income payments "go farther" because the recipient gets to keep more of the payment. Figure 17 shows how income tax rates vary between Maryland's competitor states.

Figure 17: Maximum State Income Tax Rate Among Competitor States, 2018

State	Maximum State Income Tax Rate
Alabama	5.0 percent
Arkansas	6.9 percent
California	12.3 percent
Colorado	4.63 percent
Delaware	6.6 percent
Maryland	5.75 percent
Massachusetts	5.05 percent
New Mexico	4.9 percent
Pennsylvania	3.07 percent
South Carolina	7.0 percent
Texas	No State Income Tax
Virginia	5.75 percent

Sources: Federation of Tax Administrators, RESI

Tax policies regarding military pensions can play a role as retirees and their families decide where to live next. While qualitative evidence does suggest that military pension tax exemptions can be a deciding motivation for determining state of residence, additional

³⁵ ClearanceJobs, "2018 Compensation Survey," 13.

research is mixed, and suggests that other factors, including overall income tax burden, are more important.^{36,37}

However, given the relatively small size of the state and geographic proximity of Maryland's military bases to state borders (for example, APG is approximately 25 miles from Pennsylvania and 30 miles from Delaware), military pension exemptions could have an outside impact upon location decisions given the relative ease to cross state lines for employment.³⁸ Furthermore, some research has shown that Delaware is attractive to retirees due to its proximity to other high-cost locations on the East Coast while maintaining a somewhat lower cost of living.³⁹

For comparison, research on state tax policies regarding military pensions has been gathered, and an overview is provided in Figure 18. Per Maryland tax regulations, the first \$5,000 of any military retirement pay is exempt from taxation; military retirees over age 55 may exempt \$15,000, and military retirees who are 65 or older may qualify for other pension exclusions.⁴⁰

³⁶ James Palma, "Memorandum: Senate Bill 1019 (2017) – Department of Commerce – Employment in the State's Defense Industry – Army Alliance Study," November 8, 2017.

³⁷ Levi Pace, "Analysis of Military Retirees in Utah: Impacts, Demographics, and Tax Policy," *Kem C. Gardner Policy Institute at the University of Utah* (January 2017): 15-16, accessed June 14, 2019, https://gardner.utah.edu/wp-content/uploads/2017/02/MilitaryRet.Report-final_2017.pdf.

³⁸ "Aberdeen Proving Ground," Google Maps, 2019, <https://goo.gl/maps/ymTsk1T5bJPKyJU36>.

³⁹ James Palma, "A Review of Migration Trends in Maryland," 27, Maryland Department of Commerce (December 2018).

⁴⁰ "Military Retirement Income," Comptroller of Maryland, 2019, https://taxes.marylandtaxes.gov/Individual_Taxes/Individual_Tax_Types/Income_Tax/Filing_Information/If_You_Are_Military_Personnel/Military_Retirement_Income.shtml.

Figure 18: Brief Multi-state Overview of Military Pension Tax Policies

State	Policy
Alabama	Military pension is not taxed
Arkansas	Military pension is not taxed
California	Full military pension is taxed
Colorado	Military pension is partially taxed: an exemption of up to \$10,000 is being phased in through 2021
Delaware	Military pension is partially taxed: residents under age 60 can exempt up to \$2,000; residents who are 60 or older can exempt up to \$12,500 (this applies to all pension, not just military pensions)
Maryland	Military pension is partially taxed: the first \$5,000 of any military retirement pay is exempt from taxation; military retirees over age 55 may exempt \$15,000, and military retirees who are 65 or older may qualify for other pension exclusions
Massachusetts	Military pension is not taxed
New Mexico	Military pension is taxed, though there are partial exemptions for low income
Pennsylvania	Military pension is not taxed
South Carolina	Military pension is partially taxed: residents under age 65 can exempt up to \$17,500; residents over age 65 can exempt up to \$30,000; there is a bill in committee to fully exemption military pensions
Texas	Military pension is not taxed (no state income tax)
Virginia	Military pension is taxed, though there is an exemption for medal of honor recipients

Sources: Various

Defense-industry stakeholders also discussed the financial considerations that can affect the decision of qualified employees to work in Maryland or in another state. For retired military personnel, a major part of these considerations is the amount to which their military pension will be taxed. If they choose not to live in Maryland for this reason, they have a number of alternative states in which to live and work. Many of the other states with a major defense industry presence do not tax military pensions, or simply do not tax income at all. Texas, Florida, and Alabama were specifically named as states that compete directly with Maryland for defense industry talent and do not tax military pensions.

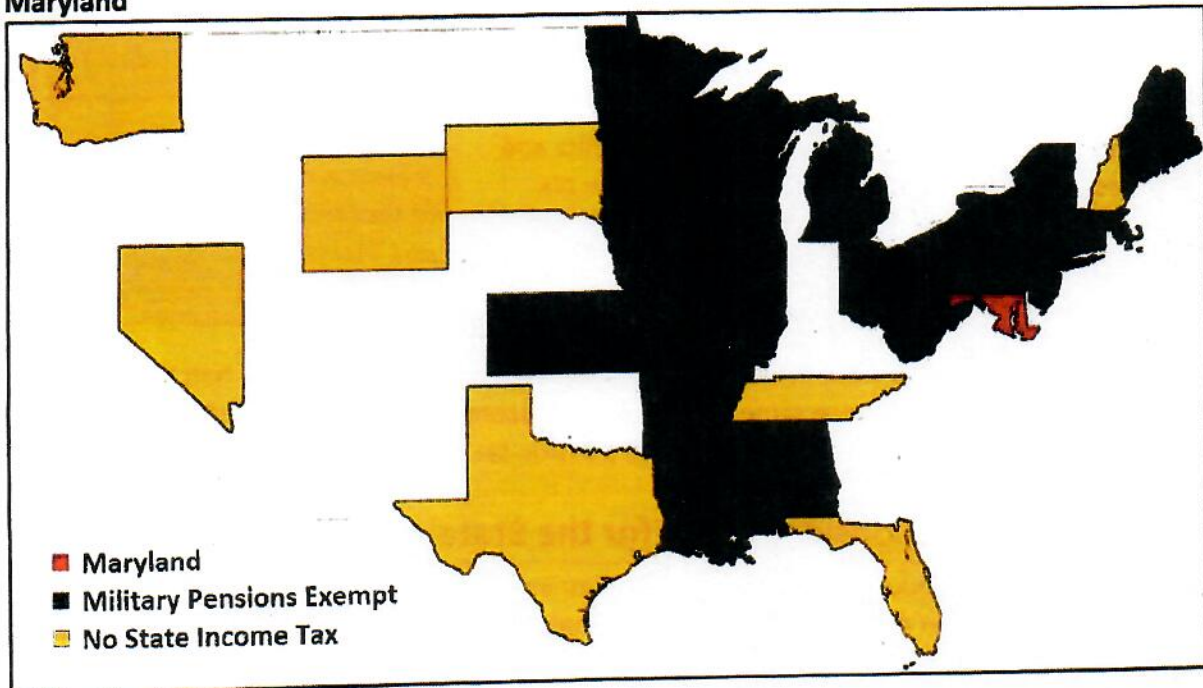
In total, 29 states do not tax military pensions, either because of a specific exemption or the absence of a state income tax in general. Figure 19 displays these states, excepting Alaska and Hawaii,

If they go to these states, can they telework, or is there work in that area? Obviously, they would love to not have to pay [Maryland] taxes, but also, if they have to be close to where they work, and they don't have any other opportunities, they'll tend to stay here until they fully retire. Then typically they'll move away so they don't have to pay [Maryland] taxes in full retirement.

-Retired Military Officer

both of which do not tax military pensions. Many of Maryland's regional neighbors are among those with no tax on military retirement pay.

Figure 19: States in the Continental US where Military Pensions are Not Taxed; Relative to Maryland



Sources: RESI, Tableau

Military pension taxation can become an even greater issue when specifically considering the most desirable job candidates, such as those with security clearances. Since a security clearance is in high demand for defense-industry jobs across the country, these candidates are likely to receive job offers from numerous companies. This makes it far more likely that a candidate will make an employment decision based on the tax laws in each state, since they have more freedom to choose their employer and their state of residence. This exacerbates the previously mentioned shortage of candidates to fill Maryland's unfilled positions.

You'll find all kinds of military people who will live in New Jersey or Pennsylvania and cross over the border to work.

—Interview participant

Even if a qualified military retiree takes a job in Maryland, they may still choose to live outside of the state and commute across state lines. This is particularly true of people who work at Aberdeen Proving Ground (APG). Multiple interviewees based around APG spoke of how a number of employees working on or around the base choose to live in Pennsylvania and commute into Maryland each day for work. This allows them to collect their military pension tax-free while still working a job within Maryland.

While this arrangement allows the state's defense industry to use their skills, it deprives the state of property taxes and other economic benefits that would be obtained by having the employee live in-state.

While the pension tax is an important issue for retired military personnel, this is only a single component of an individual's decision on whether to work or live in Maryland. For military retirees and other veterans, this decision is based on the combination of all benefits and services provided to veterans, including property tax benefits, available health care, and services to directly help with transitioning and the processing of claims. It is also a decision made based on the local job market.

Numerous individuals interviewed for this research stated that they live and work in Maryland simply because this is where they had the best job offer. However, many of these same individuals are planning to leave Maryland once they retire from the civilian workforce, citing the military pension tax as a primary reason.

There are lots of other states that have a friendlier tax approach to military retired pay that also have companies, whole industries, where the presence of a security clearance of that level is a plus. It's not just Maryland.

-Retired military officer

5.0 Additional Considerations for the State's Defense Industry

Maryland's defense industry is robust and plays an important role in the state's economy. However, as has been seen previously, it has unmet needs in terms of employment, and retired military personnel are uniquely qualified to address these shortages. Despite this potential, there are several factors that pull military retirees away from the state, as discussed previously.

Effects of these "pulls" away from Maryland extend beyond the defense industry workforce. In addition to employment gaps, military retiree families that choose to reside out of Maryland take their spending with them. This section will provide additional context about the impact that Military retiree families have on the state as well as the effect that a hypothetical future round of BRAC would have, per the requirements of HB 1542.

When a military retiree family chooses to live and work in Maryland, they support additional economic activity. However, if they choose to live elsewhere, Maryland's economy does not receive these benefits. Similarly, if a military installation or defense industry business changes location, there are additional ripple effects that would be felt throughout the economy.

Key findings of this section, which addresses Research Questions Five and Seven in whole or in part, are as follows:

1. On average, household spending for the typical military household supports an additional:
 - o 0.73 jobs,
 - o \$114,918 in economic output,
 - o \$32,986 in employee compensation, and
 - o \$7,550 in state and local tax revenues;

2. Any changes to Maryland's defense industry ecosystem can have ripple effects throughout the economy.

5.1 Economic and Fiscal Considerations Regarding Retired Military Personnel

When a family chooses to live and work in Maryland, they participate in the state economy by creating value through the work they do, spending money on goods and services to support their household needs, and paying state and local taxes. Beyond the money that the household directly spends, additional economic activity is supported—workers are needed to sell items to the family, and these workers earn wages that they then spend on goods and services. Furthermore, most of these transactions are taxed, increasing revenues for state and local coffers. However, if a family of a military retiree chooses to move outside of Maryland after their service, not only is the defense industry losing access to qualified, in-demand employees, the state economy is losing participants as well.

Based on data provided by the DoD Office of the Actuary, there are 55,680 military retirees residing in Maryland.⁴¹ Of these retirees, 51,724 are actively receiving pensions as of September 30, 2018; 31,303 of these pension recipients are under age 65.⁴² Total monthly payments to all retirees in the state equal \$132.8 million, with \$80.2 million going to retirees below age 65.⁴³ Given these figures, the average payment to a military retiree in the state of Maryland was \$30,803 annually in 2018; when only those retirees under age 65 are considered, the average annual payment was \$30,682.⁴⁴

To estimate the economic and fiscal impacts associated with a household receiving a military pension, RESI used the 2018 IMPLAN model for Maryland, the most recent data available. These data represent the additional economic activity or fiscal revenues that the household supports beyond their immediate spending. The results of the IMPLAN analysis are presented below. Figure 20 contains economic benefits, while Figure 21 contains fiscal benefits to state and local governments.

Figure 20: Economic Activity Associated with Household Spending of a Military Retiree Household

Benefit Type	Benefit
Employment	0.73
Output	\$114,918
Employee Compensation	\$32,986

Sources: IMPLAN, RESI

As seen above in Figure 20, household spending (for example, on groceries, rent/mortgages, healthcare, and recreational activities) of a single military retiree household supports an

⁴¹ U.S. Department of Defense Office of the Actuary, "Statistical Report on the Military Retirement System," 24.

⁴² Ibid., 24-25.

⁴³ Ibid.

⁴⁴ Ibid.

additional 0.73 jobs, \$114,918 in output, and \$32,986 in employee compensation in the Maryland economy. Please note that these figures do not account for any employment or work activities of the members of the household; rather, they only account for goods and services purchased by the household.

Figure 21: Fiscal Benefits Associated with Household Spending of a Military Retiree Household

Tax Type	Benefit
Property	\$2,651
Income	\$1,283
Sales	\$2,685
Payroll	\$54
Other	\$877
Total	\$7,550

Sources: IMPLAN, RESI

The economic benefits associated with a single military retiree household also support \$7,550 in state and local tax revenues in Maryland. Sales and property taxes form the majority of these fiscal impacts, at \$2,685 and \$2,651 respectively. Income taxes represent \$1,283, or roughly 17 percent, of the total.

Given that the estimates presented in Figure 20 and Figure 21 are based on median household income for the state, they are likely conservative. Military retiree households tend to have higher household income levels than median household income.⁴⁵ Additionally, median household income for householders aged 45-64 years (which generally encompasses military retirees who are not yet of traditional retirement age) is higher than the overall statewide median. On the other hand, households where the householder is older than 65 have lower incomes than the statewide median.⁴⁶ Please see Appendix B.4 for additional information.

5.2 Potential Changes to the Defense Industry Landscape

Given the contributions that military retiree households make to Maryland's economy, it is prudent that the state be a military-friendly place to work and live. This is especially important given that some factors impacting military retiree location decisions are outside of the state's control.

⁴⁵ Pace, "Analysis of Military Retirees in Utah: Impacts, Demographics, and Tax Policy," 11.

⁴⁶ "S1903: Median Income in the Past 12 Months (in 2017 Inflation-adjusted Dollars)," U.S. Census Bureau, accessed August 28, 2019, https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_17_5YR_S1903&prodType=table.

Maryland's military landscape has a significant economic impact in the state. Maryland's economy is particularly reliant on economic activity from military installations. In 2016, economic activity related to military installations amounted to 15.4 percent of the state's GDP.⁴⁷ In FY 2016, there were approximately 374,500 individuals employed directly and indirectly by military installations in Maryland.⁴⁸ Maryland's military installations are geographically dispersed throughout the state, including rural and metro locations alike. Thus, any changes to the defense landscape would have an effect on the state's economy.

I've had to source work in a couple of other locations simply because we couldn't find enough of the people that we needed here locally.

-Defense contractor program manager

For example, if a DoD program leaves a Maryland military installation to move to another state, not only would the workers on the base no longer be employed in Maryland, but supporting services would likely relocate as well. Interview participants noted that the availability of workers and proximity to customers play a role in determining where to locate. If there are changes to applicant pools or where DoD customers are located, even if the change is not directly related to a round of BRAC, there can be ripple effects in the wider economy.

On the other hand, if a program were relocated into Maryland, there would likely be additional new supporting economic activity in the state. For example, the 2005 round of BRAC increased civilian presence at APG while reducing military positions, bringing in high-skill civilian-held science and technology jobs with the introduction of the Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance, and Reconnaissance (C5ISR) Center.⁴⁹ Per the text of HB 1542, the impact of a potential future round of BRAC on employment at military installations is contained in Appendix A.

6.0 Recommendations for Strengthening Employment in Maryland's Defense Industry

Maryland's defense industry is an important driver of the state economy. And while Maryland is uniquely positioned to house and support a robust military ecosystem, it is not immune to competition from other states. As noted in Section 3.3 of this report, sustaining an appropriate workforce for the defense industry has been challenging for Maryland. However, this presents the opportunity for stakeholders to collaborate in addressing these challenges across all workforce levels including entry-level workers and skilled workers.

Recommendations are presented based on the two types of employment gaps highlighted in Section 3.3. Please note that they complement each other and are not mutually exclusive.

⁴⁷ Irani, et al, "FY2016 Economic Impact Analysis of Maryland's Military Installations," 8.

⁴⁸ Ibid.

⁴⁹ Erika Butler, "New commanding general sees 'nothing but promise' for Aberdeen Proving Ground in event of another BRAC," The Baltimore Sun, August 6, 2019, accessed August 28, 2019, <https://www.baltimoresun.com/maryland/harford/aegis/cng-ag-harford-brac-0807-20190806-bhbp6lavuzaeda5qpebasey5yi-story.html>.

Strengthening STEM educational initiatives and increasing access for underrepresented populations increases the pipeline of entry-level workers for the defense industry, which allows these workers to gain experience and then be qualified for positions that require higher levels of experience. Additionally, strengthening STEM education and opportunities can make the state a more attractive place to live, which can encourage skilled workers, for example retired military personnel, to live and work in the state.

Research Question Four is addressed in this section. Key findings are presented to address both the entry-level and the skilled gaps.

To address the entry-level gap:

1. Ensure that STEM education programs are comprehensive and prepare youth to hold careers in the defense industry; and
2. Expand STEM education programs to include traditionally underrepresented populations.

To address the skilled gap:

1. Provide guidance to private sector employers so that recruiting, hiring, and employment practices align with military culture;
2. Support service members during their transition into civilian life, for example by ensuring that retiring personnel obtain private certifications that align with their military experience;
3. Address Maryland's high cost of living, for example by abolishing the tax on military pensions in the state; and
4. Reframe Maryland's cost of living as an investment in quality of life.

The areas in Maryland with the highest concentrations of military retirees are those areas next to military installations. Ensuring that Maryland's military installations are supported is critical, especially in the face of potential program loss. Efforts such as white papers and other publications can help Maryland lawmakers communicate the value of Maryland's military ecosystem.

6.1 Addressing the Entry-Level Gap

As presented in Section 3.3, the largest gap for entry-level employees in Maryland through 2026 is in the "Software Developers, Applications" occupation. Each year, RESI forecasts a shortage of 536 entry-level workers. Notably, this is also the occupation with the largest number of defense-reliant jobs in the state. Thus, it is important to consider strategies to ensure Maryland produces a steady supply of cybersecurity graduates.

6.1.1 Strengthening STEM Educational Initiatives

Given the number of defense occupations that require a strong background in math and science, ensuring that students have access to quality STEM instruction in both K-12 systems and higher education is vital. Without a foundational understanding of math and science, students cannot gain the skills needed to excel in high-demand careers that exist now or will

exist in the future. Interview participants emphasized the importance of connecting with students at the K-12 and university levels to engage them with the STEM fields that the defense industry relies on.

We haven't done a good job, in my view, of promoting STEM education.

[The State of Maryland] can look at the kind of curriculum and relationships that need to be put in place between colleges and companies.

There should be more opportunities for internships and apprenticeships in the state; companies need to work with universities in the area to establish those relationships.

-Leader of a military alliance

While Maryland exceeds the national average for fourth grade math proficiency and is consistent with the national average for eighth grade math proficiency, less than half of Maryland students in each of these grades is actually proficient in math (at 44 percent and 33 percent, respectively).^{50,51} Thus, while Maryland's STEM education efforts are at least on par with national efforts, more can be done to strengthen the educational pipeline.

The National Science and Technology Council released a report presenting its strategy for STEM education in the U.S. in December 2018.⁵² This report presents "pathways to success" for STEM education, which include fostering partnerships between educational programs/schools and community partners, showing students how STEM fields align with other subjects/pursuits, and increasing computer literacy.⁵³ Numerous programs that align with these pathways already exist in Maryland, and a few examples include:

- Maryland STEM Connect, an online resource that provides information on STEM programs for PreK—12 students at federal and military agencies located throughout Maryland;⁵⁴
- The Towson University Center for STEM Excellence, located in downtown Baltimore, which provides outreach and hands-on learning experiences for K—12 students at Maryland schools;⁵⁵
- The Maryland STEM Festival, an annual month-long celebration that highlights the variety of STEM fields that includes events held statewide;⁵⁶ and

⁵⁰ "State Indicator S-2: Fourth Grade Mathematics Proficiency (Percent)," National Science Foundation, accessed July 31, 2019, <https://www.nsf.gov/statistics/state-indicators/indicator/fourth-grade-math-proficiency>.

⁵¹ "State Indicator S-6: Eighth Grade Mathematics Proficiency (Percent)," National Science Foundation, accessed July 31, 2019, <https://www.nsf.gov/statistics/state-indicators/indicator/eighth-grade-math-proficiency>.

⁵² National Science and Technology Council, "Charting a Course for Success: America's Strategy for STEM Education," 9, December 2018, accessed July 31, 2019, <https://www.whitehouse.gov/wp-content/uploads/2018/12/STEM-Education-Strategic-Plan-2018.pdf>.

⁵³ Ibid.

⁵⁴ "Maryland STEM Connect," Maryland Department of Commerce, accessed July 31, 2019, <https://commerce.knack.com/stemconnect>.

⁵⁵ "Center for STEM Excellence," Towson University, accessed July 31, 2019, <https://www.towson.edu/fcsm/centers/stem/>.

⁵⁶ "About," Maryland STEM Festival, accessed August 1, 2019, <https://marylandstemfestival.org/about>.

- Code in the Schools, a program that places full-time computer science teachers in Baltimore City Public Schools, in addition to offering after-school and summer programming. Code in the Schools also provides professional development for teachers.⁵⁷

Since Maryland already has programming that aligns with these pathways, programs such as these can receive additional support and/or be scaled or expanded as appropriate.

6.1.2 Increasing Access for Underrepresented Populations

As discussed in Section 6.1.1, encouraging students to enter STEM fields is one way for Maryland to encourage a steady supply of graduates for the defense industry. In addition to increasing the proportion of students entering STEM fields, increasing the raw number of graduates is another viable path.

I've developed really great relationships with the local community college here in Harford County, as well as Morgan State University, and I'm educating them on what certifications are required. And they give me, HCC in particular gives me their brightest and best.

They have cybersecurity programs, so when those folks graduate with their certs, I've traditionally have put them in for a security clearance about 6 months before they are available, so that by the time they graduate I've got a candidate and they've got a job.

-Defense industry business owner

Industry stakeholders highlighted in interviews that increasing STEM education among underrepresented populations is another way to help meet the needs of Maryland's defense industry. For example, one interviewee specifically mentioned that interventions to encourage students to pursue these careers and make life decisions that would ensure they were eligible for a security clearance could have long-term benefits. In addition to increasing the number of workers eligible to work in the state's defense industry, increasing diversity in the workforce can have secondary benefits, such as improving creative thinking and problem solving due to a mix of backgrounds and perspectives; this in turn leads to increased company profitability and performance.⁵⁸

One way to increase access for underrepresented populations is to ensure that public

Strong STEM education can provide students with the skills needed for a job in Maryland's defense industry.

education has strong and sustainable STEM programming both in the classroom and in all communities. In addition to the recommendations presented in Section

6.1.1, specific programming tailored to students who may not see themselves in the traditional STEM workforce is of utmost importance. As such, recommendations and programs highlighted in these two sections should be viewed in a complementary manner to support both goals.

⁵⁷ "What We Do—Partnerships," Code in the Schools, accessed August 1, 2019, <https://www.codeintheschools.org/partnerships>.

⁵⁸ Intel, "Decoding Diversity: The Financial and economic Returns to Diversity in Tech," 15-20, accessed August 1, 2019, <https://www.intel.com/content/dam/www/public/us/en/documents/reports/decoding-diversity-report.pdf>.

For example, the National Aeronautics and Space Administration's (NASA) Goddard Space Flight Center has a variety of programming, including STEM Boys Night In and STEM Girls Night In, which are sleepover events designed to engage with local public school students and show them the possibilities for a future in STEM fields.⁵⁹ Goddard also has programming that engages with students at Historically Black Colleges and Universities (HBCUs) and Minority Serving Institutions (MSIs) to help to close opportunity gaps for underrepresented students.⁶⁰

In addition to focusing on STEM education for youth, the entry-level defense industry gap can also be addressed by community education programs. Public libraries provide educational resources and basic computer classes, which can help community members gain skills for new employment opportunities.⁶¹ Although many public libraries throughout the state offer basic computer classes or provide access to some coding tutorials, there is the opportunity for more formal computer science training in local Maryland communities.⁶² For example, programs such as Code in the Schools could be expanded to public libraries; alternatively, students in collegiate STEM or STEM education programs could gain experience by leading community coding/STEM classes.

While improving STEM education for all Maryland residents will not immediately resolve the defense industry's entry-level gap, Maryland residents cannot work in these occupations without a solid STEM foundation.

6.2 Addressing the Skilled Gap

As noted in Section 3.3, the skilled gap for the state's defense industry is sizable. While having the technical knowledge to fill defense industry positions is important and is an area for improvement in the state (as reflected by the existing entry-level gap), the skilled gap can be more challenging to address since any initial career gaps will only be exacerbated over time. Given their areas of expertise and career experience, military retirees are uniquely qualified to step into these occupations. A variety of strategies for the private sector and government policies should be considered to address this gap.

⁵⁹ Tamsyn Brann, "High School Students Attend 'STEM Boys Night In' at NASA Goddard," NASA Goddard, June 11, 2019, accessed August 1, 2019, <https://www.nasa.gov/feature/goddard/2019/stem-boys-night-in-at-goddard>; Stephanie Zaller, Katy Cawdrey, and Isabelle Yan, "NASA Goddard Hosts Young Women for 'STEM Girls Night In'," NASA Goddard, November 8, 2018, accessed August 1, 2019, <https://www.nasa.gov/feature/goddard/2018/nasa-goddard-hosts-young-women-for-stem-girls-night-in>.

⁶⁰ Erin Majerowicz, "NASA's Goddard Hosts Winners of the Technology Implementation Market Engine (T.I.M.E.) Challenge," NASA Goddard, November 13, 2018, accessed August 1, 2019, <https://www.nasa.gov/press-release/goddard/2018/nasa-s-goddard-hosts-winners-of-the-technology-implementation-market-engine-time>.

⁶¹ "America Has a Digital Skills Gap. Libraries Can Help Fix That," The Atlantic, accessed August 1, 2019, <https://www.theatlantic.com/sponsored/grow-google-2019/america-has-digital-skills-gap-libraries-can-help/3091/>.

⁶² "Computer and Device Classes," Washington County Free Library, accessed August 1, 2019, <https://www.washcolibrary.org/computerclasses>; "Events Calendar—Computer Classes Events," Enoch Pratt Free Library, accessed August 1, 2019, https://calendar.prattlibrary.org/calendar?event_types%5B%5D=24058; "Learn to Code," Caroline County Public Library, accessed August 1, 2019, <https://www.carolib.org/coding>.

6.2.1 Aligning Private-Sector Recruiting, Hiring, and Employment Practices with the Values and Preferences of Military Retirees

Though military retirees are attractive candidates for many defense industry positions, defense contractors often have difficulty recruiting these individuals. While many factors that contribute to this difficulty are outside the control of these companies, there are actions that defense contractors can take. In addition to developing recruitment materials targeted specifically at service members as they approach retirement, companies can ensure that any current employees with military service are engaged in the recruitment process.⁶³

Furthermore, once a candidate accepts an offer, defense industry companies can ensure that the onboarding process includes both information relevant to employment specifically at the company as well as support for transitioning from military to civilian life and employment.⁶⁴ In addition, companies can ensure that their hiring and operational procedures comply with applicable military standards of conduct, and that human resources staff are well versed in them, as retirees are required to follow these standards in retirement.⁶⁵

Partnerships with existing workforce training programs could also help to align the needs of defense industry employers and military retirees. The Employment Advancement Right Now (EARN) program is an innovative program that is demand-driven and industry-led.⁶⁶ The success of the program relies on focusing on all the needs of companies—from training to placement. A successful EARN program targeted specifically to meeting the needs of the defense industry could be an excellent way to ensure that military retirees are trained and prepared to more easily make the transition to existing defense jobs.

If it's their first job out, it's pretty interesting, because you almost have to educate people and say 'here is what's really important to you and here is what's not.' That's military or right out of college.
-Defense industry small business owner

6.2.2 Supporting Members of the Military During the Transition into Civilian Life

In addition to the actions of the private-sector defense industry, Maryland can increase efforts marketing itself as a military-friendly state. As noted previously, the transition to civilian life can be difficult for retiring military personnel, both in terms of employment and other aspects of life, including access to resources for veterans. For example, service members who have retired from the military are eligible for DoD Identification Cards, which grant them access to services on military bases.⁶⁷ Given the number of military installations in Maryland, the state can

⁶³ "Five Things to Help Recruit Veterans to Your Business," Military.com, accessed June 18, 2019, <https://www.military.com/hiring-veterans/resources/how-to-recruit-veterans-for-your-business.html>.

⁶⁴ "Three Simple Ways to Recruit and Retain Top Military Talent," Yello, July 9, 2018, accessed June 18, 2019, <https://yello.co/blog/3-simple-ways-to-recruit-and-retain-top-military-talent/>.

⁶⁵ "An Overview of Retiree Restrictions," Military.com, accessed June 18, 2019, <https://www.military.com/spouse/military-life/retiring-from-military/overview-of-retiree-restrictions.html>.

⁶⁶ "EARN," Maryland Department of Labor, accessed August 30, 2019, <https://www.dlir.state.md.us/earn/>.

⁶⁷ "Department of Defense Identification Card—Am I Eligible for a DoD Identification Card?," U.S. Department of Veterans Affairs, accessed July 27, 2019, <https://www.va.gov/records/get-veteran-id-cards/>.

include this benefit in its marketing and publication materials to make sure that military retirees are aware of this benefit.

Maryland can also cultivate programs that help military retirees as they are transitioning into the civilian workforce. One program that numerous interviewees spoke about was the Military Corps Career Connect (C3), which focuses on the transition from military life into the civilian world. While the C3 program works with all veterans and not just those who have retired from the military, it helps to ensure former service members have the civilian certifications that align with their military work experience.

Military Corps Career Connect (C3) provides assistance to military retirees and veterans transitioning into civilian employment.

One interviewee noted that they had multiple highly qualified military program managers, but they did not have the Project Management Professional (PMP) certification; C3 helped them obtain this certification to transition into this civilian work role. This interviewee went on to say such services sell Maryland as a better "package deal" because they show that the state is invested in the professional development of its veterans. C3 works throughout the state and supports transitioning military members, spouses of active-duty military members, and recently separated veterans.⁶⁸ C3 is currently funded through a federal Department of Labor grant; the state can show its dedication to veterans and military retirees by supporting the C3 program at the state level and by using it as a model to develop similar programs specifically for military retirees. By supporting military retirees to be more competitive for civilian jobs, Maryland also helps to address the workforce needs of the state's defense industry.

6.2.3 Addressing Maryland's High Cost of Living

In addition to supporting military retirees as they transition into civilian life, Maryland can work to address some of the reasons that military retirees may choose not to live in Maryland. Maryland has a high cost of living compared to competitor states (please see Figure 15 in Section 4.3.2). While the state has little control over many cost of living components, for example home prices or the cost of groceries, it can take other actions to financially incentivize military retirees to live in the state. One way to do this is through exempting military pensions from taxation. This essentially gives military retiree families a pay increase, which can help to offset the state's high cost of living, especially when compared to neighboring states like Pennsylvania. This exemption, and ensuring that those retiring from the military are aware of such a policy change, could also help the defense industry recruit retired military personnel to work in Maryland.

Exempting military pensions from taxation would help to offset Maryland's high cost of living and encourage long-term residency.

Furthermore, considering that many of those retiring from the military who stay in Maryland for employment reasons would prefer to leave, exempting military pensions from state taxation could help encourage

⁶⁸ "About Us," Military Corps Career Connect (C3), accessed July 27, 2019, <http://militaryc3.org/about/>.