Educational Needs Assessment:
Supply and Demand of Educational Programs Likely to Support the DOD BRAC Movements into Maryland

Draft Report
June 27, 2006

Prepared on behalf of:
The Maryland Department of Business and Economic Development
Office of Military and Federal Affairs
217 East Redwood Street
Baltimore, MD 21202

Prepared by:
RESI of Towson University
Division of Economic and Community Outreach
8000 York Road
Towson, MD 21252-0001

Contents

1.0 Executive Summary

Background

RESI was tasked with assessing supply and demand of educational programs necessary to support the 2005 BRAC realignment. The scope of our study includes movements to the following bases: Aberdeen Proving Ground, Fort Meade, Bethesda National Navel Medical Center and Andrews Air Force Base. The geographic scope of this study includes the following Maryland jurisdictions: Harford, Cecil, Baltimore, Anne Arundel, Howard, Prince George's and Montgomery Counties as well as Baltimore City.

Study components include the identification of occupations slated to move to Maryland due to BRAC, the identification of educational requirements associated with these occupations and an inventory of the supply of such programs within the study area and finally the identification of curricula changes.

The results of this study should be viewed in the context of the available information as of the writing of this report. Namely, findings are based upon occupational series and associated employment figures for a portion of the civilian movement to APG as well as the preliminary identification of core occupational series identified by DISA.

Overall Findings

Based upon the available information, Maryland appears to be well positioned to accommodate increased demand associated with the positions moving to the State as a result of the BRAC realignment. The requisite educational programs necessary to support the occupations identified in this study are in place (within the study area). Workforce education needs for APG pose a challenge due to the Base's proximity to relevant programs; however this challenge can be met through current and planned institutions and initiatives. These initiatives include but are not limited to: the expansion of programs at the HEAT Center, the expansion of 2+2 programs at local community colleges and the planned construction of a Bainbridge Campus for Cecil Community College. These needs can also be met through institutions such as the University of Maryland University College and other schools that offer online and distance learning. It is possible that even with these new initiatives, APG's workforce may produce demand for the construction of additional satellite campuses or for a new, four year institution in the northeastern portion of the State.

The following section provides an overview of specific findings, some of which involve recommended curricular changes.

Finding #1: Identification of Occupations Moving to Maryland as a Result of BRAC
According to the information available as of the writing of this report, civilian movement to APG will be most heavily comprised of the following occupational series:

- Electronics Engineering Series
- Logistics Management Series
- Computer Engineering Series
- Contracting Series
- Management and Program Analysis Series
- Miscellaneous Administration and Program Series
- Computer Science Engineering
- Secretary Series
- Inventory Management Series
- General Supply Series
- Supply Program Management Series
- Budget Analysis Series
- Management and Program Clerical and Assistance Series
- Technical Writing and Editing Series
- Telecommunications Series
- General Engineering Series and
- Information Technology Management Series.

In fact, the above-listed occupational series comprise 3,490 or 89% of the 3,935 identified positions slated to move from Fort Monmouth to APG.

Preliminary occupational series information from the Defense Information Systems Agency (DISA) overlaps with the information supplied by Fort Monmouth to a large extent. The following list represents the occupations DISA[1] identified as currently comprising core occupations at the base.

- Computer Science Series
- Operations Research Series
- Electronics Engineering Series
- Computer Engineering Series
- General Engineering Series
- Telecommunications Series
- Information Technology Management Series
- Contracting Series
- Logistics Management Series
- Financial Administration and Program Series

[1] According to Nagle at the career management branch of DISA. A distribution of employment across these series was not available. These occupational series overlap with the expanded list of series identified as moving to APG with three additions including: Human Resources Assistance Series, Equipment Operator Series and the Data Transcriber Series.

- Financial Management Series
- Management and Program Analysis Series
- Program Management Series
- Miscellaneous Administration and Program Series
- Human Resources Management Series
- Human Resources Assistance Series
- Data Transcriber Series
- Equipment Operator Series
- Management and Program Clerical and Assistance Series
- Secretary Series
- Mail and File Series

The limited feedback RESI received from federal, private contractors with a presence in Maryland confirm that the following occupations are currently in demand and are expected to remain so going forward (independent of BRAC):

- Computer engineers;
- Software engineers;
- Electrical Engineers.

In addition, though occupations requiring a background in foreign languages and homeland security were not identified as of the writing of this report, anecdotal feedback RESI has received from Maryland institutions demand for these programs is anticipated to increase due to the 2005 BRAC realignment.

Finding #2: Educational Requirements Will Play an Increasingly Significant Role

As shown in the following figure, roughly 38 percent of the civilian positions scheduled to move from Fort Monmouth to APG consist of personnel with less than a bachelor's degree. Just 15 percent have obtained a master's degree or higher. This seems counterintuitive considering that nearly 2,200 or 56 percent of these positions are GS-12 and GS-13 positions.[2] According to OPM guidelines, GS-12 and GS-13 positions require either a doctorate degree or at least several years of progressively higher education beyond the bachelor's and in some cases beyond the master's level.

Figure A: Existing Educational Attainment Levels for Civilian Positions (Fort Monmouth)[3]

Level of Education	**Number**	**%**
High School	1,208	31%
Associate Degree	275	7%
Bachelor's Degree	1,869	47%
Master's Degree	547	14%
Doctorate Degree	40	1%
Total	***3,939***	***100%***

[2] Science Applied International Corporation (SAIC) Report, Exhibit 3, page 2-4.
[3] SAIC Report, Exhibit 6, page 2-6.

One probable explanatory factor for this is that these DOD civilian employees are highly experienced personnel.[4] According to SAIC, just 23 percent are under the age of 40.[5] The existing age distribution of these personnel affirms the notion that current personnel are highly experienced. Moreover, according to a 2002 report issued by the Pentagon, the average age of DOD civilian employees is 45.2 years. The aging of the workforce suggests that, at some point in the future, educational requirements associated with these positions will play a larger role (relative to experience requirements).

In fact, the following figure displays an estimate of the educational attainment distribution of positions slated to move from Fort Monmouth to APG, assuming that 100% of the OPM education requirements were to be met and that the existing GS-distribution of these positions is preserved. Results indicate that just 3.0 percent of the civilian occupations would require a high school diploma (as a maximum level of educational attainment). This is markedly different from the corresponding 31 percent listed in Figure A. Moreover, according to our scenario (100% of educational requirements to be filled), roughly 40 percent of positions will require a graduate degree of some sort (master's, other graduate degree or doctorate degree).

Figure B: Estimate of Educational Attainment

Level of Education	**%**
High School	3.0%
Some Education Beyond High School[6]	14.3%
Bachelor's Degree	10.6%
Some Education Beyond Bachelor's Degree[7]	30.9%
Master's Degree	16.5%
Other Graduate Degree[8]	11.1%
Doctorate Degree	13.7%
Total	***100.0%***

Realistically, the educational attainment distribution of civilian positions at APG would be expected to fall somewhere between the results shown in the previous two figures. As experienced personnel retire and are replaced by younger, less experienced candidates, however, the distribution is anticipated to move towards that shown in Figure B.

[4] It is important to note that OPM allows for a combination of education and experience to qualify a candidate for a given position. For example, a candidate may have attained only 50 percent of the educational requirements for a position, but as long as the candidate's experience is greater than or equal to 50 percent of the experience requirement associated with the position, the candidate meets the combined qualifications.
[5] SAIC Report, page 2-6.
[6] Includes Associate Degree as well as one or four years of education beyond the high school level.
[7] Includes one, two and three years of education beyond a bachelor's degree.
[8] Includes JD, LLB (Bachelor's of Law – more common in Countries outside of the U.S.) and LLM (beyond the J.D. level) degrees.

Finding #3: Maryland Has Requisite Educational Programs in Place

According to federal Office of Personnel Management (OPM) guidelines, the educational requirements associated with occupations identified as moving to Maryland vary significantly. A few of the occupational series, such as the Secretary and Management and Program Clerical and Assistance Series require only a high school degree or equivalent. The balance require a bachelor's degree; though it should be noted that most of these series do not require a specified field of study. Moreover, candidates can still qualify for most of these positions regardless of whether or not they have obtained a bachelor's degree. For example, in the event that a candidate has had only some college, OPM guidelines allow for relevant experience to offset the lack of a degree. Figure C lists these requirements for the top 89 percent of the 3,935 civilian positions slated to move from Fort Monmouth to APG.

Figure C: OPM Entry-Level Education Requirements

Series Number	Series Name	%	Entry Grade Position	Entry Level Education Requirement	Degree Concentration
855	Electronics Engineering Series	21.2%	GS-5	Bachelor's degree	Engineering
346	Logistics Management Series	12.1%	GS-5	Bachelor's degree	None Specified
854	Computer Engineering Series	8.7%	GS-5	Bachelor's degree	Engineering
1102	Contracting Series	7.8%	GS-5	Bachelor's degree OR 24 semester hours in any combination of: accounting, business, finance, law, contracts, purchasing, economics, industrial management, marketing, quantitative methods, or organization and management	None Specified
343	Management and Program Analysis Series	6.8%	GS-5	Bachelor's degree	None Specified
301	Miscellaneous Administration and Program Series	5.8%	GS-5	Bachelor's degree	None Specified
1550	Computer Science Series	4.8%	GS-5	Bachelor's degree	30+ semester hours in a combination of mathematics, statistics and computer science.
318	Secretary Series	3.9%	GS-2	High school diploma or equivalent	N/A
2010	Inventory Management Series	2.8%	GS-5	Bachelor's degree	None Specified
2001	General Supply Series	2.4%	GS-5	Bachelor's degree	None Specified

2003	Supply Program Management Series	2.2%	GS-5	Bachelor's degree	None Specified
560	Budget Analysis Series	2.0%	GS-5	Bachelor's degree	None Specified
344	Management and Program Clerical and Assistance Series	1.4%	GS-2	High school diploma or equivalent	N/A
1083	Technical Writing and Editing Series	1.2%	GS-5	Bachelor's Degree	At least 15 semester hours in appropriate scientific, technical or social science field(s) and at least one course above the introductory level in the field(s) covered by the position.
391	Telecommunications Series	1.1%	GS-5	Bachelor's degree OR communications/electronics or automatic data processing training in technical institutes or business schools above high school level OR advanced instruction at Armed Forces schools	One of the following: Electrical/electronic engineering, mathematics, physics, public utilities, statistics, computer science, telecommunications management, information systems management, business administration, industrial management or related.
801	General Engineering Series	1.0%	GS-5	Bachelor's degree	Engineering
2210	Information Technology Management Series	1.0%	GS-5	Bachelor's degree	Any field
1515	Operations Research Series	0.9%	GS-5	Bachelor's degree	Operations Research OR at least 24 semester hours in a combination of operations research, mathematics, probability, statistics, mathematical logic and/or science.
80	Security Administration Series	0.9%	GS-2	High school diploma or equivalent	N/A
1670	Equipment Specialist Series	0.7%	GS-5	Bachelor's degree	Any field

There are some exceptions to this rule; in fact four of these series do require a minimum educational attainment at the entry grade level, as shown in the following figure. These include:

- Electronics Engineering;
- Computer Engineering;
- Computer Science.
- General Engineering;

Entry grade levels for these positions are GS-5. The three engineering series require a Bachelor's of Science degree in any engineering field while the Computer Science series requires either a Bachelor's of Art or Science with courses in mathematics, statistics and computer science.[9]

The following series do not require a minimum education level but are associated with particular fields of study:

- Contracting Series;
- Telecommunications;
- Operations Research.[10]

Entry grade requirements for these positions vary; the contracting series requires study in fields ranging from accounting and economics to quantitative methods, while the telecommunications series requires study in one of a number of fields such as telecommunications management.

[9] It should be noted that graduate study in relevant fields is required for the higher grade positions within each of these series. For instance, for positions within the Computer Engineering Series, OPM guidelines call for 1 year of graduate-level education at the GS-7 level (in the same field specified at the entry grade level – Engineering). At the GS-9 level, requirements include 2 years of progressively higher level graduate education leading to a master's degree or master's or equivalent graduate degree. Education requirements are specified through the GS-11/GS-12 levels for the Engineering series. As with other series, however, a combination of experience and education will meet the qualifications for positions beyond the GS-5 level.

[10] The Technical Writing and Editing Series also requires study in "the appropriate scientific or technical" field.

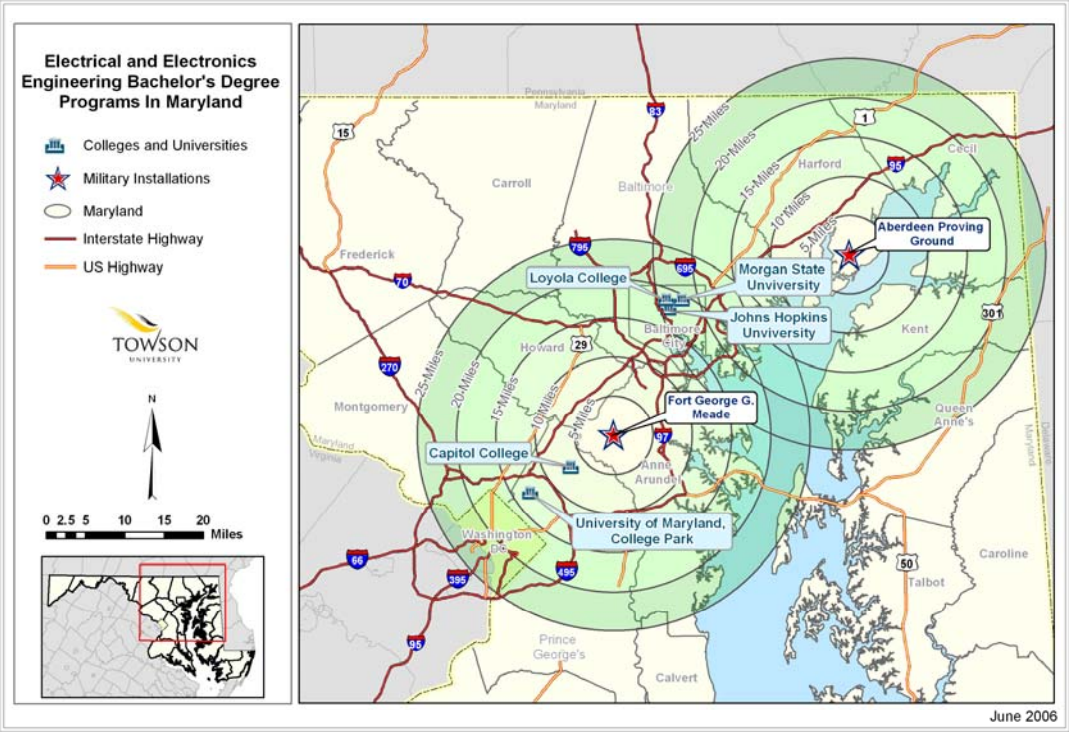
This study identifies the supply of bachelor's degree programs as well as graduate level programs corresponding to each of the seven above-mentioned occupational series (within the study area considered in this analysis). ***RESI determined that the Study Area has numerous programs in place which meet the criteria of each of the seven, above-named occupational series.***

Electronics Engineering Series

Technically, study in any engineering field will satisfy OPM requirements for Electronics Engineering Series positions. Electrical and Electronics Engineering programs, however, appear to be most relevant to this series[11] which comprises roughly 22 percent or more than 800 of the 3,935 occupations moving from Fort Monmouth to APG.

As shown in the following figure, five colleges and/or universities in the study area offer these programs at the bachelor's degree level.

Figure D: Map of Electrical/Electronics Engineering Bachelor's Degree Programs



[11] As identified by Mark Fuhring of Fort Monmouth.

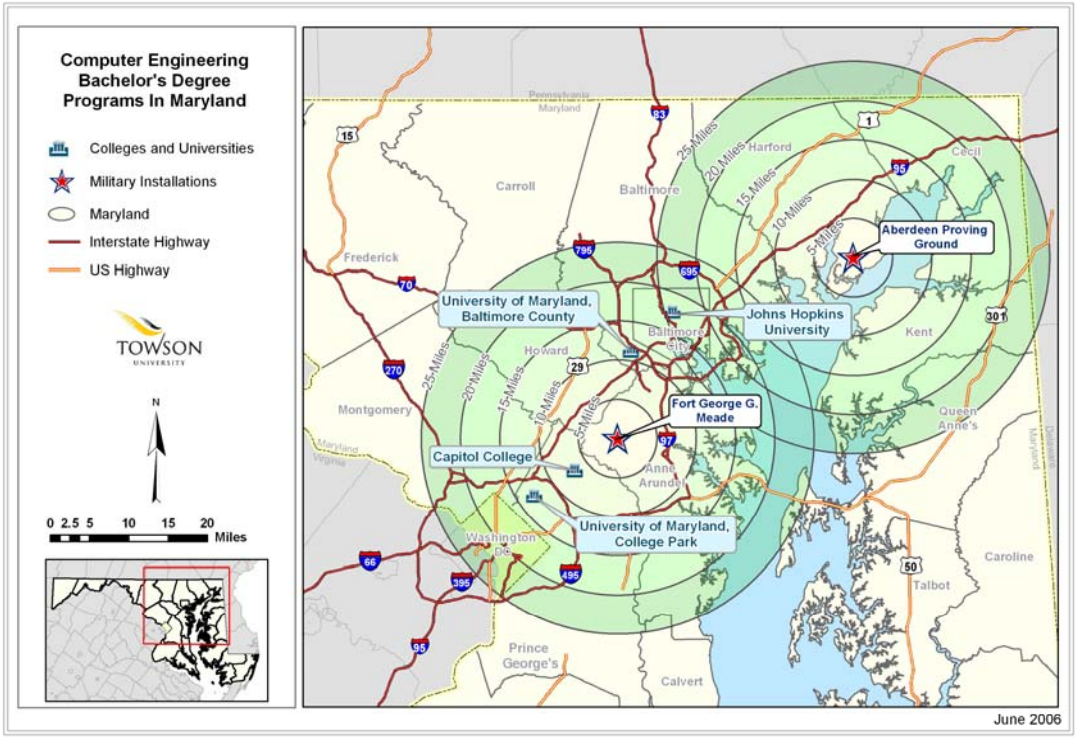
Moreover, there are four schools within the study area which offer master's degree programs in the electrical engineering field, including:

- Johns Hopkins University;
- University of Maryland-College Park;
- Capitol College; and
- University of Maryland-Baltimore County.

Computer Engineering Series

According to SAIC, the computer engineering series comprises 8.7 or roughly 340 of the 3,935 occupations identified as moving from Fort Monmouth to APG. As with the Electronics Engineering Series, OPM requirements are flexible in that they require a degree in any field of engineering. For the purpose of this analysis, supply of Computer Engineering programs is examined.

Figure E: Map of Computer Engineering Bachelor's Degree Programs



There are two master's degree programs located within the study area and they include:

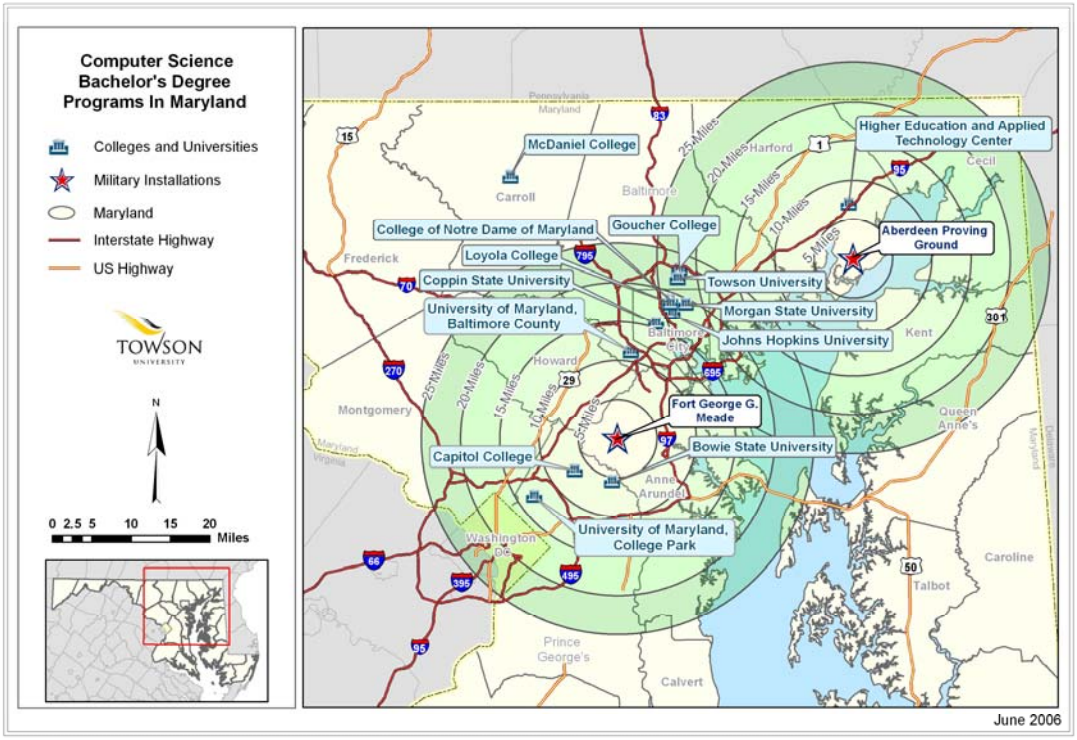
- Johns Hopkins University (with a 2004 enrollment level of 370); and
- University of Maryland-Baltimore County (with enrollment of 19).

Computer Science Series

This series constitutes 4.8 percent or fewer than 200 of the 3,935 positions identified as moving from Fort Monmouth to APG. While OPM requirements do specify a minimum education attainment level for entry grade positions within this series (a bachelor's degree), there is no specified field of study associated with this series. Specific course work including 30+ semester hours in a combination of mathematics, statistics and computer science is required however.

The study area is home to many computer science bachelor's degree programs including the institutions shown in the following figure:

Figure F: Bachelor's Degree Programs in Computer Science



Master's degree programs are shown in the following figure.

Figure G: Computer Science Master's Degree Programs

Program	School	Enrollment
Computer Science	Johns Hopkins University	545
	Towson University	147
	University of Maryland-Baltimore County	82
	Loyola College	51
	Bowie State University	27
	Capitol College	11
	University of Maryland-College Park	5
Total		***868***

General Engineering Series

Just 1.0 percent or roughly 40 of the positions slated to move from Fort Monmouth to APG fall within the general engineering series. As with the previously mentioned engineering series, these positions require a bachelor's degree in ***any*** engineering field.

Institutions with one or more program accredited by the Accreditation Board of Engineering and Technology (ABET) include:

- University of Maryland-College Park;
- Johns Hopkins University;
- Morgan State University;
- University of Maryland-Baltimore County;
- Loyola College; and
- Capitol College.

Contracting Series

This series constitutes 7.8 percent or just over 300 of the 3,935 identified occupations scheduled to transfer from Fort Monmouth to APG. OPM guidelines do not specify a field of study for these positions, however the series does require 24 semester hours in any combination of: accounting, business, finance, law, contracts, purchasing, economics, industrial management, marketing, quantitative methods, or organization and management. Many of these fields are popular undergraduate and graduate majors throughout Maryland. As of 2004, more than 10,000 students were enrolled in either accounting or business bachelor's degree programs at schools located within the study area. These institutions include the following:

- University of Maryland-University College;
- University of Maryland-College Park;
- Towson University;
- Morgan State University;
- Loyola College;
- Villa Julie College;
- University of Baltimore;
- College of Notre Dame of Maryland;
- Johns Hopkins University;
- Capitol College;
- Bowie State University; and
- McDaniel College.

Telecommunications Series

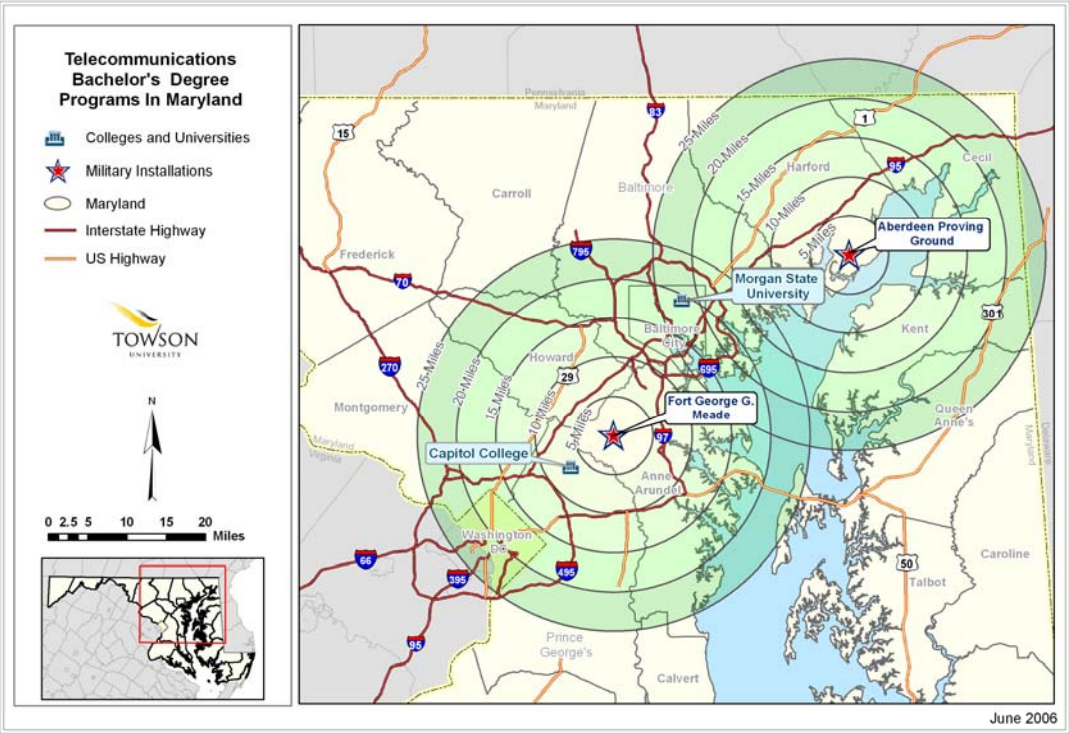
According to SAIC, positions within this series are expected to amount to just 1.1 percent, roughly 43, of the 3,935 positions identified as moving from Fort Monmouth to APG. OPM qualification standards for this series are quite flexible and require a bachelor's degree with study in one or more of the following fields[12]:

- Electrical/electronic engineering;
- Mathematics;
- Physics;
- Public utilities;
- Statistics;
- Computer Science;
- Telecommunications Management;
- Information Systems Management;
- Business Administration; or
- Industrial Management or related.

The majority of these programs are offered by institutions within the study area. For the purpose of this study, RESI focuses on telecommunications programs. Both Morgan State and Capitol College offer telecommunications bachelor's degree programs, as shown in the following figure. Master's degree programs are offered by Johns Hopkins University, Morgan State and UMCP.

[12] Alternatively, study beyond the high school level in a technical institute or study at the Armed Forces University also meet the education requirements for these positions.

Figure H: Telecommunications Bachelor's Degree Programs



Operations Research Series

These positions constitute less than 1 percent of the 3,935 positions identified as moving from Fort Monmouth to APG. OPM guidelines specify either a bachelor's degree in Operations Research or at least 24 semester hours in a combination of:

- Operations Research;
- Mathematics;
- Probability;
- Statistics;
- Mathematical logic; and/or
- Science.

While there are no programs in the study area that offer majors in Operations Research, there are a multitude of undergraduate and graduate degree programs in the balance of fields. Thus requirements for positions in this series can still be met by existing programs.

Figure I: Bachelor's Degree Programs Corresponding to the Operations Research Series

Program	School	Enrollment
Applied & Computational Mathematics	Johns Hopkins University	24
Applied Mathematics	Villa Julie College	8
Applied Mathematics & Statistics	Johns Hopkins University	51
Mathematics	University of Maryland -College Park	300
	Towson University	169
	University of Maryland -Baltimore County	166
	Morgan State University	36
	Coppin State University	36
	Goucher College	15
	College of Notre Dame of Maryland	12
	Columbia Union College	2
Mathematics Education	College of Notre Dame of Maryland*	NA
Mathematics, General	McDaniel College	41
Statistics	University of Maryland -Baltimore County	19
Total		***879***

Finding #4 Maryland Has Programs in Place Comparable to those offered to Fort Monmouth via Educational Partnerships.

Fort Monmouth has a number of educational partnerships with local colleges and universities as well as with schools located throughout the nation (via distance learning). Of particular relevance to this study are the (1) master's in software engineering program offered by Monmouth University and the (2) master's in systems engineering program offered by the Stevens Institute of Technology (SIT). According to Ruane, both the programs at Monmouth University and Stevens Institute of Technology are heavily utilized by the Base's engineer and scientist population.[13]

Monmouth University's Software Engineering Master's program is especially pertinent as this particular program was co-developed by the Base as well as by Monmouth University. According to James McDonald, Program Director for Software Engineering at Monmouth University, most Fort Monmouth students enrolled in the program are employees of the Base's software engineering center. Moreover, McDonald indicated that the distinguishing feature of Monmouth University's programs centers on the fact that all full time faculty within the program have worked in the software development industry for several years; these same faculty also have extensive academic expertise – all have PhDs. Students enrolled in the software engineering master's program at Monmouth University work on projects based on the faculty's background and experience as software developers. A secondary unique feature of the program (relative to comparable programs at other schools) is that it is offered on both a part time and full time basis. McDonald also indicated a desire on the part of Monmouth University to partner with appropriate Maryland institutions to ensure that Base needs associated with this program continue to be met.

Within the study area, there are two institutions that offer Software Engineering Master's programs including: Loyola College and University of Maryland, University College and

[13] Marianne Ruane, Chief of Training at Fort Monmouth.

RESI spoke with representatives from both of these institutions in order to get a sense of the nature and capabilities of each program and they appear to be comparable to that offered by Monmouth University.

Finding #5: Expanded 2+2 Programs (as well as Existing Programs) at the HEAT Center Could Help Address Workforce Needs at APG

While the study area does offer requisite educational programs, APG is not situated proximate to many of the campuses offering such programs. In fact, the base is located 34 miles from the nearest Electrical Engineering program and Telecommunications program (at Morgan State University), and 37 miles from the nearest Computer Engineering Program (at Johns Hopkins University).[14]

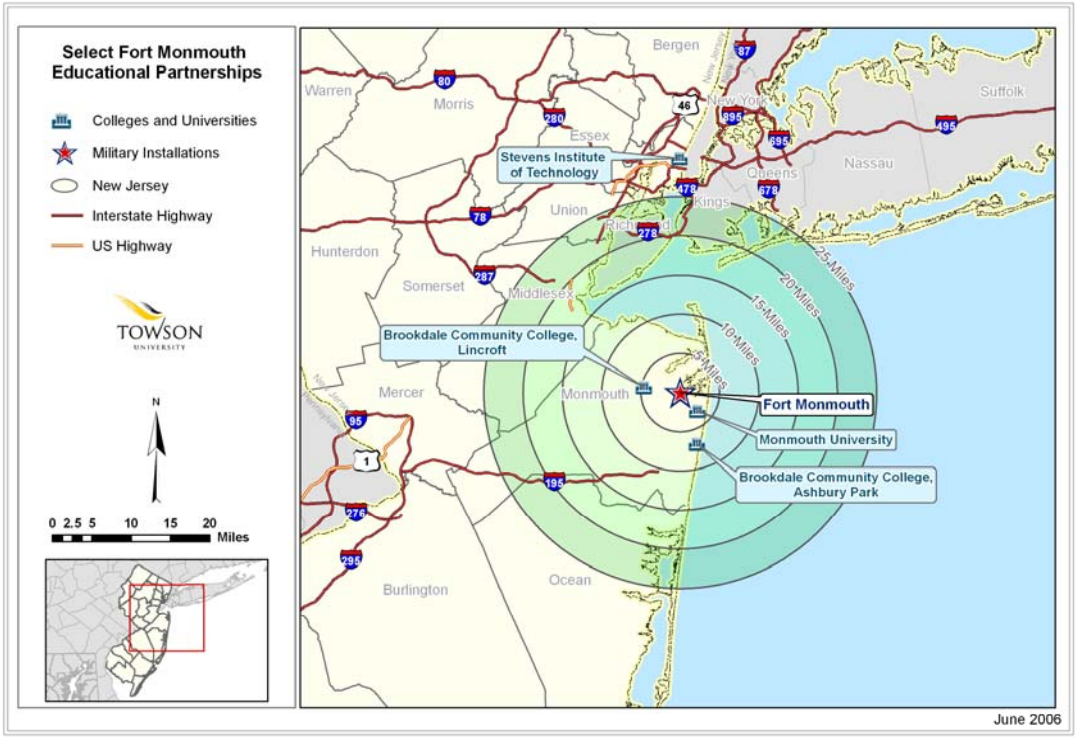
Figure J: Distance (in miles) to Schools/Universities Offering Bachelor's Degree Programs in Relevant Engineering & Computer Science Fields

School	Relevant Majors	Distance to Fort Meade	Distance to APG
Capitol College	Electrical/Electronics Engineering, Computer Engineering, Computer Engineering Technology, Computer Science, Telecommunications Engineering Tech	9	56
Morgan State University	Electrical Engineering, Computer Science, Telecommunications	24	34
Loyola College	Electrical Engineering, Computer Science	23	36
University of Maryland-College Park	Electrical Engineering, Computer Engineering, Computer Science	16	65
Johns Hopkins University	Electrical Engineering, Computer Engineering, Computer Science	22	37
University of Maryland-Baltimore County	Computer Engineering, Computer Science	15	43
University of Maryland-University College	Computer Science	N/A	N/A
Towson University	Computer Science	36	33
Bowie State University	Computer Science	12	59
Coppin State University	Computer Science	20	39
Goucher College	Computer Science	35	31
College of Notre Dame of Maryland	Computer Science	23	34
McDaniel College	Computer Science	47	62

[14] Though Figure J shows that APG is located 31 miles from the nearest Computer Science program (at Goucher College), the University of Maryland-University College (UMUC) is able to accommodate this gap. UMUC offers Computer Science bachelor's programs and can offer classes via distance learning and/or a presence at or near the Base.

In contrast, and as the following map shows, Fort Monmouth is located within five miles of Monmouth University (offers software engineering bachelor's and master's degree programs).

Figure K: Fort Monmouth & Educational Partnership Institutions



There are a number of initiatives and/or institutions in place and being planned that will help address this proximity issue, however. Perhaps the single most important initiative underway is the establishment of expanded, 2+2 articulation agreements at the Higher Education and Applied Technology Center (HEAT Center), which is located just minutes from APG. This initiative is being driven by the College of Notre Dame, among other institutions, and would allow all four years of undergraduate education to take place at the Heat Center (in lieu of traditional 2+2 programs in which the first two years of study are taken at a community college and the second two are taken at a four year institution). This model could help address APG's workforce education needs to the extent that it can be successfully replicated for relevant programs (especially engineering programs) at the HEAT Center or another location proximate to the Base.

Programs offered at the HEAT Center are coordinated by Harford Community College and program requirements are determined by each partnering institution. The following institutions currently have a presence at HEAT:

- The College of Notre Dame of Maryland;
- Johns Hopkins University;
- Towson University;
- University of Maryland-College Park;
- University of Phoenix.

A sample of the undergraduate and graduate programs offered including the following:

- Bachelor of Arts (B.A.) in Business Administration
- Bachelor of Science (B.S.) in Nursing
- Master of Science (M.S.) in Biotechnology
- Engineering and Applied Science Programs for Professional (includes graduate courses in Environmental Engineering Science and Management Program)[15]
- Master of Science (M.S.) in Instructional Technology
- Professional Master of Engineering (M. Eng)
- Graduate Certificate in Engineering
- Bachelor of Science (B.S.) in Information Technology
- Master of Business Administration (M.B.A.) in Technology Management

According to the Coordinator for Operations at HEAT, the Center is currently working in tandem with the Harford Community College on establishing articulation agreements for bachelor's level programs in mathematics, science, engineering and technology. HEAT is also working with the Susquehanna Workforce Network to build professional development programs which will train workers for technician positions that may be in demand as a result of the 2005 BRAC realignment. The proximity issue with respect to APG can be addressed significantly should the HEAT expand its offerings and capacity within programs that correspond to the seven main occupational series considered in this study (Electronics Engineering, Computer Engineering, Computer Science, General Engineering, Contracting, Telecommunications and Operations Research) as well as to the educational partnership programs utilized by Fort Monmouth currently (particularly Systems Engineering master's programs and Software Engineering bachelor's and master's programs).

[15] According to a 2006 higher education survey conducted by HEAT and targeted at DOD civilian employees at APG, nearly 200 respondents (out of a pool of 300) are planning to start degree programs (ranging from undergraduate to graduate and professional programs) within the next 3-5 years. Moreover, most popular fields of study indicated include Environmental engineering and management and business.

Finding #6: New and Existing 2+2 Programs at the Planned Cecil Community College, Bainbridge Campus Could Help Address Workforce Needs at APG

Cecil Community College's planned, Bainbridge Campus is another initiative which could serve to address the proximity issue with respect to APG. The planned Campus will house a Science, Math and Engineering Center aimed at meeting the workforce needs associated with the BRAC realignment at APG. A major objective of the campus is to create synergies and partnerships with four-year institutions thereby affording residents and workers the opportunity to obtain their undergraduate degrees locally. In total, the initiative is anticipated to represent an investment of more than $21 million and will create a 15-acre campus in the western edge of Cecil County.[16]

Finding #7: UMUC Could Help Address Workforce Needs at APG

The University of Maryland-University College (UMUC) will likely play a role in helping to address the needs of APG's workforce. UMUC offers a great deal of flexibility in its programs and has accumulated extensive experience in working to meet the educational needs of military personnel and civilian DoD personnel over the last 50 years. UMUC has a current enrollment of 60,000 military and civilian DoD students worldwide and 10,000 in the United States. Additionally, UMUC has a physical presence and/or personnel at all of the Maryland bases affected by the 2005 BRAC realignment, including a large presence within five miles of Ft. Meade. The University offers online courses as well as in-class courses (to a more limited extent) and is versed in developing specific courses or testing programs tailored for specific military installations. Current curricular programs offered by UMUC pertain to most of the occupational series previously identified, with the exception of engineering series.

Finding #8: Additional Higher Education Solutions for APG

Additional solutions could include a combination of distance learning at the Base (or a nearby center), the creation of satellite campuses and the possible establishment of a four-year institution in the northeast portion of Maryland. Within the study area, the nearest such institution is more than 30 miles from APG.[17] Many schools reported that they have distance and online learning capabilities in place and could easily make relevant courses available to base personnel through such means.

Finding #9: There Is a Need for Short-Term Training in Contract Management Areas

Feedback from at least one private contractor indicates an existing gap (or at least the perception thereof) of short-term, specialized courses in areas ranging from contract administration to program/project management. More specifically, the firm indicated a need for the development of non-credit training courses (tailored specifically to meet company needs) in the areas of government contract administration, negotiation skills, project development, management, and core elements of the contract process. This need is becoming increasingly relevant due to the age of staff in the contracts area of the

[16] Information provided by Stephanie Woods, Office of the President, Cecil Community College.

[17] The magnitude of this issue will also be mitigated to an extent by the location in which APG personnel moving to Maryland chose to reside in. For example, should personnel reside in Baltimore City, the distance from APG to these bachelor's and master's offerings will be less of an issue.

company in question (many of the experienced personnel are approaching retirement). Given that the DOD is also facing a similar retirement issue, in addition to other private, federal contractors, this is an area that should be examined in further detail.

The Naval Post Graduate (NPGS) program offered to Ft. Monmouth personnel pertains to this issue indirectly. The program offers courses to base personnel via video teleconferencing (the program is based in California) and is a Master's of Science Program in Contract Management and Program Management. It seems reasonable to assume that this program could also be offered to APG via distance learning as well. Even so, the need for short-term training for federal, private contractors is an issue that will likely need to be explored further.

Finding #10: Education Needs Associated with Secondary, BRAC Jobs Impacts Should be Explored

The influx of BRAC personnel as well as the resulting multitude of construction projects necessary to accommodate BRAC will result in increased demand for construction managers and workers, day care workers and hospitality workers, among others. While this study focuses solely on those positions that will move to Maryland as a result of BRAC, job growth in these areas will undoubtedly place additional demand on associated educational programs. This is a need that community colleges in Harford and Anne Arundel Counties are currently exploring and is an area that could be considered for future study.

2.0 Introduction

2.1 Objective

RESI was tasked with assessing supply and demand of educational programs necessary to support the 2005 BRAC realignment. The scope of our study includes movements to the following bases: Aberdeen Proving Ground, Fort Meade, Bethesda National Navel Medical Center and Andrews Air Force Base. The geographic scope of this study includes the following Maryland jurisdictions: Harford, Cecil, Baltimore, Anne Arundel, Howard, Prince George's and Montgomery Counties as well as Baltimore City.

Study components include the identification of occupations slated to move to Maryland due to BRAC, the identification of educational requirements associated with these occupations and an inventory of the supply of such programs within the study area and finally the identification of curricula changes.

2.2 Approach

RESI's approach to identifying educational demand consists of:

- Mapping occupational series to the educational requirements described by the Office of Personnel Management (OPM) Qualifications Standards Operating Manual;
- Quantifying estimates of educational attainment levels for civilian and contractor movements to Maryland as a result of BRAC; and
- Identifying existing educational partnerships at both Fort Monmouth and DISA.
- Eliciting information from private contractor firms regarding anticipated workforce and education needs, especially as they relate to BRAC realignment.

RESI's approach to assess supply consists of the following steps:

- The identification of schools and programs corresponding to occupational series that (a) require study in a specified field (or fields) and (b) will likely comprise a significant portion of the BRAC movements to APG and Fort Meade.
- The identification of programs that provide training and degree programs similar to those currently utilized by Fort Monmouth and DISA personnel.
- An inventory of relevant initiatives and/or new programs being undertaken by local educational institutions (both in response to and independent of BRAC.

3.0 Educational Demand

3.1 Aberdeen Proving Ground (APG)

According to the March 2006 report produced by Science Applications International Corporation (SAIC), BRAC-related movement to APG is estimated to exceed 10,400 positions.

The 2005 BRAC realignment calls for the following organizations to transfer to APG:

- Army Research Institute (Fort Knox, KY)
- Vehicle Technology Directorates (Langley, VA and Glenn, OH)
- Army Test and Evaluation Command or ATEC (Alexandria, VA)
- Chemical and Biological Research and Development and Acquisition (Brooks, TX, and Falls Church and Fort Belvoir, VA)
- Medical Chemical Defense Research (Walter Reed, Forest Glen Annex, Silver Spring, MD)
- Communications-Electronics Life Cycle Management Command or CE-LCMC (Fort Monmouth, NJ)
- Communications Electronics Command or CECOM (Fort Belvoir, VA)
- Information Systems Development and Acquisition or ISDA (Redstone Arsenal, AL)
- Communications Electronics Command Communications Security Logistics Activity or CSLA (Fort Huachuca, AZ)
- Communications-Electronics Research Development and Engineering Center or CERDEC (Fort Monmouth, NJ).

Civilian positions are expected to comprise fully 7,379 of the total movement into APG. An additional 2,662 embedded contractor positions as well as 385 military positions are also expected to move to APG.[18] SAIC estimates that between 3,000 and 5,000 non-embedded contractor positions are likely to locate proximate to APG as a result of the BRAC realignment.

[18] SAIC 2006 report entitled "BRAC Activities Affecting Aberdeen Proving Grounds, Andrews Air Force Base, Bethesda Naval Hospital and Fort Meade in the State of Maryland".

SAIC identifies the employment distribution for occupational series associated with 3,935 of the civilian positions scheduled to move from Fort Monmouth to APG.[19] This information, shown in the following figure, serves as the basis of RESI's analysis and drives our identification of educational requirements associated with the BRAC movements to APG. Figure 1 details the top twenty series (by employment level).

Figure 1: Civilian Series Moving from Fort Monmouth to APG

Series Number	Series Name	Number of Employees
855	Electronics Engineering Series	835
346	Logistics Management Series	476
854	Computer Engineering Series	343
1102	Contracting Series	306
343	Management and Program Analysis Series	268
301	Miscellaneous Administration and Program Series	228
1550	Computer Science Series	187
318	Secretary Series	152
2010	Inventory Management Series	109
2001	General Supply Series	94
2003	Supply Program Management Series	86
560	Budget Analysis Series	77
344	Management and Program Clerical and Assistance Series	55
1083	Technical Writing and Editing Series	46
391	Telecommunications Series	45
801	General Engineering Series	38
2210	Information Technology Management Series	38
1515	Operations Research Series	35
80	Security Administration Series	34
1670	Equipment Specialist Series	29

[19] The 3,935 figure constitutes roughly 53 percent of the total, expected civilian movement to APG.

3.1.1 Educational Requirements for Occupations Moving to APG

Using OPM Qualification Standards for General Schedule Positions[20], RESI was able to map the civilian occupational series[21] to OPM education requirements.

The OPM information referenced in this study was obtained from the agency's Qualification Standards Operating Manual. This manual organizes civil service positions according to broad categories referred to in this analysis as Qualification Standard Groups (e.g., Clerical and Administrative Group, Professional and Scientific Group, etc.) as well as by occupational series number. The manual identifies experience and education requirements for the Qualification Standard Groups as well as series-specific requirements. These requirements vary by GS level. It should be noted that the manual is intended to provide a broad guideline of the minimum requirements necessary to fill positions. Specialized requirements associated with a given position are often not included in the manual and are typically specified in OPM vacancy announcements or position descriptions.

OPM categorizes occupational series into several Qualification Standard Groups including the following (which are pertinent to APG):

- ***Administrative and Management*** – This group is comprised of occupational series ranging from Equipment Specialists to Paralegal Specialists. The typical entry grade for these positions is GS-5. Education requirements are specified for two-grade interval positions extending through the GS-11 level. A number of occupations within this group are also subject to series-specific education requirements in addition to the group requirements.

- ***Professional and Scientific*** – Examples of the occupational series comprising this category include the General Engineering series and the Computer Science series. The general entry grade for these positions is GS-5 and education requirements are provided for grade interval positions extending through the GS-12 level. Many occupations within this group are also subject to series-specific education requirements in addition to the group requirements. Moreover, certain occupations within the Professional and Scientific group require a minimum educational attainment level to qualify for entry grade positions.

- ***Clerical and Administrative Support*** – This group covers occupational series ranging from the Secretary series to the Budget Clerical and Technician Series. The entry grade for these positions begins at GS-1. Some occupational series within this group may require proficiency requirements such as a specific typing speed per minute for Stenographers and Data Transcribers.

[20] OPM is tasked with ensuring that the Federal Government has an effective civilian workforce. Essentially, the agency acts as the federal government's human resources department for civil service positions.

[21] These occupational series refer solely to the 3,935 positions moving from Fort Monmouth to APG.

- ***Technical and Medical Support*** – Safety Technician and Electronics Technician are examples of the occupational series that comprise this group. Education requirements for these positions are detailed for one-grade intervals beginning with GS-2 and extending through GS-6+ levels. Several series within this group are also subject to series-specific education requirements.

- ***Competitive Service Student Trainee Positions*** – Examples of occupational series within this group include the Medical and Health Student Trainee and Copyright and Patent Student Trainee series. These part time positions are typically filled by undergraduate students. Grade levels associated with occupational series in this group extend from GS-2 through GS-4. Positions within the Student Trainee group can serve as a point of entry to higher grade positions (once student trainees obtain their degree).

The following figure details the distribution of DOD civilian movement from Fort Monmouth to APG by OPM Qualification Standard Group. As Figure 2 indicates, the single largest category is the Administrative and Management Position Group (representing 42.3 percent of the civilian movement from Ft. Monmouth). Professional and Scientific Positions constitute another 38.5 percent of this movement.

Figure 2: Civilian Series Aggregated to OPM Qualification Standard Groups[22]

OPM Qualification Standard Group	**Employees**	**%**
Administrative and Management Positions	1,665	42.3%
Professional and Scientific Positions	1,516	38.5%
Contractor Series	306	7.8%
Clerical and Administrative Support Positions	294	7.5%
Competitive Service Student Trainee Positions	87	2.2%
Technical & Medical Support Positions	35	0.9%
No Qualification Standard	32	0.8%
Total	***3,935***	***100.0%***

[22] The Contractor Series is not affiliated with any OPM Group, but has series-specific education requirements which are discussed in further detail in this report. In addition, there are two occupational series, slated to move from Fort Monmouth to APG, for which OPM does not define qualification standards: series 905, General Attorney Series and 1222, Patent Attorney Series.

Educational requirements broken out by GS level are shown in the following chart. Figure 3 illustrates educational requirement at both the entry grade level (this varies across groups) as well as for higher grades.

Figure 3: Education Requirements for OPM Group Qualification Standards

GS Level	Administrative & Management	Clerical & Admin Support	Professional & Scientific	Technical & Medical Support	Student Trainee
GS-2		high school graduate or equivalent		High school graduation or equivalent	High school diploma or equivalent
GS-3		high school graduate or equivalent + 1 year above high school		1 year above high school with course(s) related to the occupation, if required	Completion of 1 academic year of post-high school study
GS-4		1 years above high school		2 years above high school with courses related to the occupation, if required	Completion of 2 academic years of post-high school study or associate's degree
GS-5	4-year course of study leading to a bachelor's degree	4 years above high school	Successful completion of a full 4-year course of study in an accredited college or university leading to a bachelor's or higher degree that included a major field of study or specific course requirements generally as stated in the individual occupational requirements.	4-year course of study above high school leading to a bachelor's degree with courses related to the occupation, if required	
GS-7	1 full year of graduate level education OR superior academic achievement		1 year of graduate-level education or superior academic achievement	One full year of graduate education (directly related to the work of the position) meets the requirements for GS-7	

GS-9	master's or equivalent graduate degree OR 2 full years of progressively higher level graduate leading to such a degree OR LL.B. or J.D. if related		2 years of progressively higher level graduate education leading to a master's degree or master's or equivalent graduate degree	Two full years of graduate education directly related to the work of the position or a master's degree meets the requirements for GS-9.	
GS-11	Ph.D. or equivalent Doctorate degree OR 3 full years of progressively higher level graduate education leading to such a degree OR LL.M., if related		3 years of progressively higher level graduate education leading to a Ph.D. degree or Ph.D. or equivalent Doctorate degree OR For research positions: Master's or equivalent graduate degree		
GS-12			For research positions: Ph.D. or equivalent Doctorate degree		
Series	Series: 18*, 28, 80, 132, 201, 260, 301, 340, 341, 343, 346, 391*, 501, 505*, 560, 950, 1020*, 1035, 1083*, 1101, 1670*, 1801, 1910*, 2001, 2003, 2010, 2032, 2130*, 2210*	Series: 86, 134, 303, 305, 318, 326, 335, 344, 361, 505*, 544, 561, 986, 1105, 1106, 2005	Series: 170*, 510*, 801*, 803*, 830*, 854*, 855*, 893*, 896*, 1301*, 1306*, 1515*, 1550*	Series: 802*, 856*	Series: 399, 599, 899, 999, 1199, 1599, 1699, 2099

*These occupational series also have additional, specialized educational requirements

These education requirements should be viewed in the correct context: it is important to note that OPM allows for a combination of education and experience to qualify a candidate for a given position. For example, a candidate may have attained only 50 percent of the educational requirements for a position, but as long as the candidate's experience is greater than or equal to 50 percent of the experience requirement associated with the position, the candidate meets the combined qualifications. ***In other words, as long as the applicant's education*** (as a percentage of the position's education requirement) ***and experience*** (as a percentage of the position's experience requirement) ***sums to 100 percent, the candidate is considered to be qualified for the position.***

There are exceptions to this rule. Certain occupational series, especially within the Professional and Scientific Group, require a minimum education attainment level at the entry GS level. The following figure details occupational series which fall into this category.

Figure 4: OPM Occupational Series with a minimum education requirement.

Series Number	**Series Name**	**Degree Required**
170	History Series	B.A. in history or related field that included at least 18 semester hours in history
510	Accounting Series	B.S. in accounting or related
801	General Engineering Series	B.S. in engineering
803	Safety Engineering Series	B.S. in engineering
830	Mechanical Engineering Series	B.S. in engineering
854	Computer Engineering Series	B.S. in engineering
855	Electronics Engineering Series	B.S. in engineering
893	Chemical Engineering Series	B.S. in engineering
896	Industrial Engineering Series	B.S. in engineering
1301	General Physical Science Series	B.A./B.S. in physical science, engineering or mathematics
1306	Health Physics Series	B.A./B.S. in natural science or engineering
1515	Operations Research Series	B.S. in operations research
1550	Computer Science Series	B.A./B.S. with courses in mathematics, statistics and computer science

Group educational requirements are general in that they do not specify a particular field of required study. However, in some cases, occupations are associated with series-specific requirements which often times do identify fields of required study. These series-specific requirements (shown in the following figures) are meant to be leveraged in conjunction with the Qualification Standard Group requirements (listed in the previous figure).

The Administrative and Management series with specific educational requirements constitute a combined 4.3 percent or just 168 of the 3,935 DOD civilian positions for which we have occupational series information. All of the series detailed in Figure 4 require a bachelor's degree for entry level (GS-5) positions save for the Telecommunications and the Technical Writing and Editing series for which instruction at armed forces schools or at business/technical schools beyond the high school level may also suffice. The Equipment Specialist Series and the Information Technology Management Series are distinguished from other series in this list by the fact that any field of study will suffice.

Figure 5: Series-Specific Education Requirements: Administrative and Management Group[23]

Series Number	Series Name	Employment as a % of Total Civilian Positions
18	Safety and Occupational Health Management Series	0.1%
391	Telecommunications Series	1.1%
505	Financial Management Series	0.0%
1020	Illustrating Series	0.0%
1083	Technical Writing and Editing Series	1.2%
1670	Equipment Specialist Series	0.7%
1910	Quality Assurance Series	0.1%
2130	Traffic Management Series	0.1%
2210	Information Technology Management Series	1.0%

The balance of series listed in Figure 5 requires a degree in specified fields. For example, the Telecommunications series requires a bachelor's degree in electrical/electronic engineering or in mathematics or in physics. The Telecommunications series requires study in one of nine fields including the following:

- electrical or electronic engineering;
- mathematics;
- physics;
- public utilities;
- statistics;
- computer science;
- telecommunications management;
- information systems management;
- business administration;
- industrial management.

[23] Detailed education requirements for these series are included in the Appendix.

All of the Professional and Scientific positions moving from Fort Monmouth to APG are subject to series-specific education requirements in addition to general group requirements. Figure 6 identifies the degree required for entry grade positions (GS-5) for these series. Also provided are the fields of study that meet the series-specific education requirements as well as the employment distribution of each series (as a percentage of the 3,935 civilian positions for which employment figures are available).

Collectively, these series comprise 39 percent or 1,516 of the total 3,935 civilian positions. Professional engineering positions (800 series), and the electronics engineering series in particular, constitute the bulk of this total. The Computer Engineering Series and the Computer Science Series also represent a significant portion of civilian positions in this group.

Figure 6: Series-Specific Education Requirements: Professional and Scientific Group[24]

Series Number	Series Name	Employment as a % of Total Civilian Positions	Degree Required for Entry-Level Grade (GS-5)	Specified Fields of Study
170	History Series	0.1%	Bachelor's degree	***1.*** History or ***2.*** Related Field.
510	Accounting Series	0.7%	Bachelor's degree	***1.*** Accounting or ***2.*** Business Administration, or ***3.*** Finance, or ***4.*** Public Administration
801 803 830 854 855 893 896	General Engineering Safety Engineering Mechanical Engineering Computer Engineering Electronics Engineering Chemical Engineering Industrial Engineering	31.9%	Bachelor's degree	***1.*** Engineering[25]
1301	General Physical Science Series	0.1%	Bachelor's degree	***1.*** Physical Science, ***2.*** Engineering, or ***3.*** Mathematics
1306	Health Physics Series	0.2%	Bachelor's degree	***1.*** Natural Science or ***2.*** Engineering
1515	Operations Research Series	0.9%	Bachelor's degree	***1.*** Operations Research or ***2.*** at least 24 semester hours in a combination of operations research, mathematics, probability, statistics, mathematical logic and/or science.
1550	Computer Science Series	4.8%	Bachelor's degree	***1.*** 30+ semester hours in a combination of mathematics, statistics and computer science.

[24] Figure 6 displays educational requirements for entry grade positions. Additional requirements for higher grade levels correspond to the general educational requirements for Professional and Scientific Positions listed in Figure 3 in the particular field(s) identified in the Series-Specific figure (Figure 6).

Figure 7: Series-Specific Education Requirements: Technical and Medical Support Group

Series Number	Series Name	% of DOD Civilian Positions	Degree Required for Entry-Level Grade (GS-3/GS-4)	Specified Field of Study
856	Electronics Technician Series	0.4%	1 year of study (beyond high school)	***1.*** at least 6 semester hrs in engineering & related courses
802	Engineering Technician Series	0.5%	Successful completion of 2 years of study (beyond high school)	***1.*** at least 12 semester hours in engineering, physical science, technology, or mathematics. At least 6 of the 12 semester hours must have been in electronics courses.

As previously noted, the Contractor Series (series 1102) while not affiliated with any of the previously listed OPM groups, is subject to its own education requirements as shown in the following figure. These positions comprise 306 or nearly 8 percent of the 3,935 civilian positions for which we have information.

Figure 8: Series-Specific Education Requirements: Contractor Series

Series Number	Series Name	% of DOD Civilian Positions	Degree Required for Entry-Level Grade (GS-5)	Specified Field of Study
1102	Contractor Specialist	7.8%	Bachelor's degree OR 24 semester hours in any combination of: accounting, business, finance, law, contracts, purchasing, economics, industrial management, marketing, quantitative methods, or organization and management	***1.*** any field

3.1.2 Quantifying Education Requirements Associated with Movements to APG

As previously noted, OPM allows for a combination of education and experience to qualify a candidate for a given position. This factor helps to explain the existing distribution of education levels for DOD civilians currently at Fort Monmouth. The following figure (obtained from SAIC's report) indicates that just 15 percent of personnel have attained a degree beyond the bachelor's level. This seems counterintuitive considering that nearly 2,200 or 56 percent of these positions are GS-12 and GS-13 positions.[26] According to the OPM educational requirements listed in Figure 8, GS-12 and GS-13 positions require either a doctorate degree or at least several years of progressively higher education beyond the bachelor's and in some cases beyond the master's level.

Figure 9: Existing Educational Attainment Levels for Civilian Positions (APG)[27]

Level of Education	**Number**	**%**
High School	1,208	31%
Associate Degree	275	7%
Bachelor's Degree	1,869	47%
Master's Degree	547	14%
Doctorate Degree	40	1%
Total	***3,939***	***100%***

It appears that these DOD civilian employees are highly experienced personnel. The existing age distribution of these personnel affirms this supposition; according to SAIC just 23 percent are under the age of 40.[28]

When assessing educational needs associated with these positions, it is necessary to question whether the current distribution of educational attainment levels is likely to be maintained going forward. Even in the event that a majority of the current personnel at Fort Monmouth should move to or commute to Maryland to fill these positions, the average age of this workforce dictates that at some point in the near future a substantial portion of these positions will likely be filled by persons with significantly less DOD experience. Alternatively, should experienced federal employees already located within and proximate to Maryland fill a substantial portion of these positions, the relatively high average age of federal government employees[29] indicates a similar outcome. In either case, it can be inferred that the educational requirements associated with these positions will play a larger role (relative to experience requirements) going forward.

With this in mind, RESI developed a rough framework with which to estimate an alternative educational attainment distribution. Namely, we mapped the OPM educational requirements to the occupational series and to the existing GS-level distribution of the civilian positions. This framework allows us to estimate the

[26] SAIC Report, Exhibit 3, page 2-4.
[27] SAIC Report, Exhibit 6, page 2-6.
[28] SAIC Report, page 2-6.
[29] According to a 2002 report issued by the Pentagon, the average age of DOD civilian employees is 45.2 years. http://www.stormingmedia.us/89/8946/A894604.html

educational attainment distribution of civilian positions assuming that 100 percent of the OPM education requirements will be met for personnel filling these positions. In all likelihood, some portion of these requirements will be offset by candidates' experience. Still, this scenario provides a frame of reference for our analysis.

Preliminary results (shown in the following figures) indicate that just 3.0 percent of the civilian occupations will require a high school diploma (as a maximum level of educational attainment). This is markedly different from the corresponding 30 percent listed in Figure 9. Moreover, according to our scenario (100% of educational requirements to be filled), roughly 40 percent of positions will require a graduate degree of some sort (master's, other graduate degree or doctorate degree).

Figure 10: Estimated Educational Attainment for Civilian Positions (APG)[30]

Level of Education	Number	%
High School	208	3.0%
Some Education Beyond High School[31]	1,001	14.3%
Bachelor's Degree	745	10.6%
Some Education Beyond Bachelor's Degree[32]	2,168	30.9%
Master's Degree	1,156	16.5%
Other Graduate Degree[33]	776	11.1%
Doctorate Degree	959	13.7%
Total	***7,014***	***100.0%***

It is important to view these figures in the context of the following data constraints and assumptions:

- As noted previously, the roughly 3,900 positions for which occupational series information is available constitutes a portion of the 7,379 civilian personnel scheduled to move to APG. ***For the purposes of this study, RESI assumes that the types and distribution of occupational series moving from Fort Monmouth are applicable to all civilian positions moving to APG.***[34]
- When estimating the educational attainment levels, RESI relies on the existing distribution of positions by GS level, with one exception; since OPM education requirements are specified through GS-11 and/or GS-12 levels only; we have modified the existing GS distribution to extend through the GS-11/GS-12 levels. In other words, we presume that GS-13+ positions will require the same educational attainment as GS-12 positions.

[30] Please note: these figures are preliminary and are based on the limited occupational series information available as of the writing of this report.
[31] Includes Associate Degree as well as one or four years of education beyond the high school level.
[32] Includes one, two and three years of education beyond a bachelor's degree.
[33] Includes JD, LLB (Bachelor's of Law – more common in Countries outside of the U.S.) and LLM (beyond the J.D. level) degrees.
[34] As of the writing of this report, information regarding the types and distribution of the balance of civilian jobs moving to APG was not available.

- If an OPM education requirement allows for more than one type of degree (i.e., occupations within the Administrative and Management group at the GS-9 level require either a master's degree ***or*** an LL.B. ***or*** J.D.), numbers were allocated evenly across all degree types.

RESI also produced a ***rough*** estimate of the educational attainment distribution associated with the anticipated contractor movements to APG. It should be noted that these estimates are based on the available information regarding contractor positions, which as of the writing of this document is very limited. SAIC cites secondary information indicating that roughly 72 percent of the embedded contractors associated with several firms working at Fort Monmouth have a bachelor's degree or higher.[35] SAIC further estimates that between 3,000 and 5,000 non-embedded contractor positions associated with Fort Monmouth are likely to move proximate to APG.

As shown in the following figure, the estimated distribution for contractor positions is somewhat different from that of civilian positions (shown in Figure 10): nearly 55 percent of positions are estimated to require a bachelor's degree and roughly 17 percent are estimated to require either a master's or doctorate degree.

Figure 11: Estimated Educational Attainment for Anticipated Contractor Movement (APG)

Level of Education	Number	%
High School	1,519	22.8%
Associate of Arts	346	5.2%
Bachelor of Arts/Bachelor of Sciences	3,650	54.8%
Master's	1,068	16.0%
PhD	78	1.2%
Total	6,662	100.0%

These estimates were derived by:

- Inflating the 2,600 embedded contractor figure to 6,000 (assumes 4,000 non-embedded contractors).
- Modifying the existing educational attainment distribution for civilian positions moving from Fort Monmouth to APG (shown in Figure 8) to reflect the previously mentioned 72 percent figure.

[35] SAIC report, 2-6.

3.1.3 Educational Partnerships at Fort Monmouth

RESI reviewed the types of educational partnerships currently in place at Fort Monmouth in an effort to better predict continuing education needs associated with the occupations scheduled to move to Maryland. Our primary goal was to identify any unique programs currently being utilized by the base that do not correspond to typical college/university offerings. A secondary goal was to identify those partnerships utilized most extensively by the Base.

Educational partnerships at Fort Monmouth include the following[36]:

- Brookdale Community College (BCC)
- Naval Postgraduate (NPGS)
- Monmouth University
- Florida Institute of Technology (ITT)
- Stevens Institute of Technology (SIT)

These programs are described briefly below:

The BCC programs target secretarial and administrative staff and allow them to upgrade job skills while earning one of the following degrees: Associates of Arts (AA), Associate of Science (AS) or Associate of Applied Science (AAS).

The NPGS program is a Master's of Science Program in Contract Management and Program Management. NPGS is based in Monterey, California and offers courses to Ft. Monmouth personnel via video teleconferencing.

FIT provides two programs to Ft. Monmouth personnel. The first allows base employees to earn a master's degree in Science in Management. This program, referred to as the Professional Development University Program (PDUP), conducts classes at the base both during on and off-duty hours. The second program offered through FIT is an MBA program which is also conducted on the base, during evenings.

The SIT program is a Master's of Science degree in Systems Engineering. Classes for this program are conducted both during work hours as well as in the evening.

Monmouth University offers a variety of programs to Fort Monmouth personnel including: graduate degree programs for computer science, psychology and history. A number of Fort Monmouth employees also attend undergraduate business courses at the University.

The University's Software Engineering Master's program is especially pertinent to the BRAC movements as this particular program was developed as part of a collaborative effort between Monmouth University and Fort Monmouth. According to James McDonald, Program Director for Software Engineering at Monmouth University, most

[36] It should be noted that this list does not represent an exhaustive inventory of all of the colleges and universities attended by Fort Monmouth personnel; it is simply a list of the Base's educational partnerships as identified by Fort Monmouth.

Fort Monmouth students enrolled in the program are employees of the Base's software engineering center. Moreover, McDonald indicated that, while the names of the courses that comprise the program are probably similar to courses offered at similar programs at other schools, the distinguishing feature of Monmouth University's programs centers on the fact that all full time faculty within the program have worked in the software development industry for several years; these same faculty also have extensive academic expertise – all have PhDs. Students enrolled in the software engineering master's program at Monmouth University work on projects based on the faculty's background and experience as software developers. A secondary unique feature of the program (relative to comparable programs at other schools) is that it is offered on both a part time and full time basis.

Figure 12: Overview of Monmouth University's Software Engineering Master's Program:

Credits Required:	30 credit program + 1-2 projects or thesis
Location:	Monmouth University Campus
Part time & Full time status offered?	Yes
Typical Completion Time:	2.5 years for part time students, 1.5-2 years for full time students
Program Origin	Monmouth University's computer science program was not meeting the Base's needs, which prompted Fort Monmouth and the University to co-develop the Software Engineering Master's Program in 1986.
# Students enrolled per year	15-20 Ft. Monmouth Students[37]
Program requirements	A Bachelor's degree in computer science (2/3 of students typically meet this requirement) OR A Bachelor's degree in an equivalent field (i.e., electrical engineering, mechanical engineering). *Monmouth University offers a 5-course preparatory curriculum in the event that neither of the above requirements are met
Core Curriculum (5 courses required)	(1) engineering, design and architecture of software systems, (2) verification, validation and software maintenance, (3) software development processes, (4) formal methods in software engineering (5) application of mathematical methods to the definition of highly reliable software
Elective Curriculum (5 courses required)	Examples include: (1) information systems applications, (2) real time software systems, (3) telecommunications, (4) management of technology

[37] McDonald's enrollment level for this program conflicts with the numbers provided by Ruane.

According to Ruane, both the programs at Monmouth University and Stevens Institute of Technology are heavily utilized by the Base's engineer and scientist population. Moreover, 2006 enrollment levels (see the following figure) are similar to levels recorded in previous years, with the exception of Brookdale Community College, for which enrollment has declined in recent years. This decline has been attributed to the fact that the majority of recent, new hires at Ft. Monmouth have college degrees. According to Fuhring, the most commonly used programs (by Fort Monmouth personnel) include master's degree programs in electrical and also computer engineering (Fuhring indicated that these programs correspond to the electronics engineer occupational series at Fort Monmouth).[38]

Figure 13: Snap shot of enrollment levels[39]

	Institution	Ft. Monmouth Enrollees (Estimated, 2006)
1	Brookdale Community College (BCC)	
	(AA)	10
2	Naval Postgraduate (NPGS)	
	(Masters)	12
3	Monmouth University	
	Software Engineering (graduate)	51
	Computer Science (graduate)	3
	Psychology (graduate)	3
	History (graduate)	1
	(Undergraduate)	8
4	Florida Institute of Technology (FIT)	
	(Master's)	5
5	Steven's Institute of Technology (SIT)	
	(Master's)	30
	Total	***123***

[38] Conversation with Mark Fuhring, Fort Monmouth.
[39] Marianne Ruane, Chief of Training at Fort Monmouth.

3.2 Fort Meade

The 2005 BRAC realignment calls for the following activities to transfer to Fort Meade:

- Adjudication Activities (transferring from several bases located throughout the country).
- Media Activities (transferring from Virginia, Washington D.C. and Texas bases).
- Defense Information Systems Agency (DISA) Activities (transferring from Virginia, Florida and New Jersey bases).

These transfers will result in the movement of roughly 5,600 military, civilian and embedded contractor positions to Fort Meade. The move from DISA to Fort Meade constitutes roughly 71 percent or nearly 4,100 of these positions. In addition, SAIC cites estimates calling for an additional 3,000 to 5,000 non-embedded (or off-base) contractor positions associated with DISA that are expected to move to Fort Meade.[40]

3.2.1 Educational Requirements for Occupations Moving to Ft. Meade

Information pertaining to the movements to Fort Meade is limited. SAIC identifies the following sample degree programs associated with the move from DISA:

- Business Administration/Management;
- Finance;
- Computer Science;
- Engineering;
- Electronic Engineering;
- Information Systems/Technology;
- Human Resources Management/Development;
- Operations Research.

In addition, Charleen Nagle, a supervisor in the Career Management Branch of DISA provided RESI with a list of the "core" occupational series currently in place at DISA. Nagle defines core series as those jobs that comprise the majority of DISA's current, 6,000+ workforce. Nagle identified the following examples of occupations that would ***not*** be considered core: physical security of DISA, clerical and administrative support positions, legal personnel and safety personnel.

While Nagle was unable to provide us with a distribution of employment across these series, she did indicate that the engineering field constitutes the highest proportion of core jobs at DISA and that the information technology field comprises the second highest proportion. Moreover, according to Nagle, a significant portion of the jobs within the Acquisition and Procurement/Logistics career fields are comprised of technology managers.

[40] SAIC Report, 5-1.

Figure 14: Core Occupational Series at DISA

Career Field	Series Number	Series Name
Acquisition	1550	Computer Science Series
Acquisition	1515	Operations Research Series
Acquisition	855	Electronics Engineering Series
Acquisition	801	General Engineering Series
Acquisition	391	Telecommunications Series
Acquisition	343	Management and Program Analysis Series
Acquisition	340	Program Management Series
Acquisition	301	Miscellaneous Administration and Program Series
Administrative Support	356	Data Transcriber Series
Administrative Support	350	Equipment Operator Series
Administrative Support	344	Management and Program Clerical and Assistance Series
Administrative Support	318	Secretary Series
Administrative Support	305	Mail and File Series
Administrative Support	303	Miscellaneous Clerk and Assistant Series
Engineering	1550	Computer Science Series
Engineering	1515	Operations Research Series
Engineering	855	Electronics Engineering Series
Engineering	854	Computer Engineering Series
Engineering	801	General Engineering Series
Financial Management	501	Financial Administration and Program Series
Financial Management	505	Financial Management Series
Financial Management	343	Management and Program Analysis Series
Human Resources Management	343	Management and Program Analysis Series
Human Resources Management	203	Human Resources Assistance Series
Human Resources Management	201	Human Resources Management Series
Information Technology	2210	Information Technology Management Series
Operations	2210	Information Technology Management Series
Operations	391	Telecommunications Series
Procurement/Logistics	1102	Contracting Series
Procurement/Logistics	346	Logistics Management Series

In order to identify the educational requirements associated with these series, RESI followed the same process used for the APG analysis; namely we mapped these civilian occupational series to OPM education requirements as detailed in the Qualification Standards Operating Manual.

The majority of occupational series listed in Figure 14 overlap with the series moving to APG. Exceptions include the following three series which map to the Clerical and Administrative Support Qualification Standard Group:

- Human Resources Assistance Series (203);
- Equipment Operator Series (350);
- Data Transcriber Series (356).

Educational requirements for the Qualification Standard Groups at DISA are broken out by GS level in the following chart. Figure 15 illustrates educational requirement at both the entry grade level (this varies across groups) as well as for higher grades.

Figure 15: Education Requirements for OPM Group Qualification Standards

GS Level	Administrative & Management	Clerical & Admin Support	Professional & Scientific
GS-2		high school graduate or equivalent	
GS-3		high school graduate or equivalent + 1 year above high school	
GS-4		1 years above high school	
GS-5	4-year course of study leading to a bachelor's degree	4 years above high school	Successful completion of a full 4-year course of study in an accredited college or university leading to a bachelor's or higher degree that included a major field of study or specific course requirements generally as stated in the individual occupational requirements.
GS-7	1 full year of graduate level education OR superior academic achievement		1 year of graduate-level education or superior academic achievement
GS-9	master's or equivalent graduate degree OR 2 full years of progressively higher level graduate leading to such a degree OR LL.B. or J.D. if related		2 years of progressively higher level graduate education leading to a master's degree or master's or equivalent graduate degree

GS-11	Ph.D. or equivalent Doctorate degree OR 3 full years of progressively higher level graduate education leading to such a degree OR LL.M., if related		3 years of progressively higher level graduate education leading to a Ph.D. degree or Ph.D. or equivalent Doctorate degree OR For research positions: Master's or equivalent graduate degree
GS-12			For research positions: Ph.D. or equivalent Doctorate degree
Series	Series: 201, 301, 340, 343, 346, 391*, 501, 505*, 2210*	Series: 203 303, 305, 318, 344, 350, 356, 544, 561, 986, 1105, 1106, 2005	Series: 510*, 801*, 854*, 855*, 1515*, 1550*
*These occupational series also have additional, specialized educational requirements			

As previously noted, the group educational requirements are general in so far as they do not specify a particular field of required study. The following figures list series-specific education requirements for relevant DISA occupational series.

Figure 16: Series-Specific Education Requirements: Administrative & Management Group

Series Number	Series Name	Degree Required for Entry-Level Grade (GS-5)	Specified Fields of Study
391	Telecommunications Series	Bachelor's degree OR communications/electronics or automatic data processing training in technical institutes or business schools above high school level OR advanced instruction at Armed Forces schools	One of the following: Electrical/electronic engineering, mathematics, physics, public utilities, statistics, computer science, telecommunications management, information systems management, business administration, industrial management or related.
505	Financial Management Series	Bachelor's degree	Positions involving accounting require a degree in: ***1.*** Accounting or ***2.*** Business Administration, or ***3.*** Finance, or ***4.*** Public Administration
2210	Information Technology Management Series	Bachelor's degree	Any field

Figure 17: Series-Specific Education Requirements: Professional and Scientific Group

Series Number	Series Name	Degree Required for Entry-Level Grade (GS-5)	Specified Fields of Study
510	Accounting Series	Bachelor's or higher degree	***1.*** Accounting or ***2.*** Business Administration, or ***3.*** Finance, or ***4.*** Public Administration
801 854 855	General Engineering Series Computer Engineering Series Electronics Engineering Series	Bachelor's or higher degree[41]	***1.*** Engineering
1515	Operations Research Series	Bachelor's or higher degree	***1.*** Operations Research or ***2.*** at least 24 semester hours in a combination of operations research, mathematics, probability, statistics, mathematical logic and/or science.
1550	Computer Science Series	Bachelor's or higher degree	***1.*** 30+ semester hours in a combination of mathematics, statistics and computer science.

As previously noted, the Contractor Series (series 1102) while not affiliated with any of the previously listed OPM groups, is subject to its own education requirements as shown in the following figure.

Figure 18: Series-Specific Education Requirements: Contractor Series

Series Number	Series Name	Degree Required for Entry-Level Grade (GS-5)	Specified Field of Study
1102	Contractor Specialist	Bachelor's degree OR 24 semester hours in any combination of: accounting, business, finance, law, contracts, purchasing, economics, industrial management, marketing, quantitative methods, or organization and management	***2.*** any field

[41] The degree should be from an institution with at least one curriculum accredited by the Accreditation Board for Engineering and Technology (ABET) or must include differential and integral calculus and courses (more advanced than first-year physics and chemistry) in five of the following seven areas of engineering science or physics: (a) statics, dynamics; (b) strength of materials (stress-strain relationships); (c) fluid mechanics, hydraulics; (d) thermodynamics; (e) electrical fields and circuits; (f) nature and properties of materials (relating particle and aggregate structure to properties); and (g) any other comparable area of fundamental engineering science or physics, such as optics, heat transfer, soil mechanics or electronics. Alternatively, candidates may meet basic requirements through a combination of college-level education, training and/or technical experience that furnished (1) a thorough knowledge of the physical and mathematical sciences underlying professional engineering and (2) a good understanding, both theoretical and practical, of the engineering sciences and techniques and their applications to one of the branches of engineering.

3.2.2 Quantifying Education Requirements Associated with Movements to Fort Meade:

Information on the current educational attainment levels of DISA civilian positions was not available as of the writing of this report. By using Fort Monmouth's education distribution for civilian positions as a proxy, however, RESI produced a rough estimate for Fort Meade. The framework used to produce these estimates is similar to that used to quantify education requirements for APG in that these estimates assume that 100 percent of the OPM education requirements will be met for personnel filling these positions.

Additional assumptions include the following:

- Existing civilian GS-levels at DISA (identified by SAIC) is assumed to persist with one exception: since OPM education requirements are specified through GS-11 and/or GS-12 levels only; we have modified the existing GS distribution to extend through the GS-11/GS-12 levels. In other words, we presume that GS-13+ positions will require the same educational attainment as GS-12 positions.
- If an OPM education requirement allows for more than one type of degree (i.e., occupations within the Administrative and Management group at the GS-9 level require either a master's degree or an LL.B. or J.D.), numbers were allocated evenly across all degree types.
- Using the OPM Qualifications Standards Operating Manual, RESI identified occupational series likely to comprise the adjudication and media movements to Fort Meade. We then evenly distributed employment across these occupational series.

Estimates (shown in the following figures) indicate that just 4.5 percent of the civilian occupations will require a high school diploma (as a maximum level of educational attainment). Moreover, according to our scenario (100% of educational requirements to be filled), roughly 36 percent of positions will require a graduate degree of some sort (master's, other graduate degree or doctorate degree).

Figure 19: Estimated Educational Attainment for Civilian Positions (Fort Meade) [42]

Level of Education	**Number**	**%**
High School	153	4.5%
Some Education Beyond High School[43]	476	14.0%
Bachelor's Degree	355	10.5%
Some Education Beyond Bachelor's Degree[44]	1,032	30.4%
Master's Degree	550	16.2%
Other Graduate Degree[45]	370	10.9%
Doctorate Degree	457	13.5%
Total	3,339	100.0%

[42] Please note: these figures are preliminary and are based on the limited occupational series information available as of the writing of this report.
[43] Includes Associate Degree as well as one or four years of education beyond the high school level.
[44] Includes one, two and three years of education beyond a bachelor's degree.
[45] Includes JD, LLB (Bachelor's of Law – more common in Countries outside of the U.S.) and LLM (Master's of Law) degrees.

RESI also produced a ***rough*** estimate of the educational attainment distribution associated with the anticipated contractor movements to Fort Meade. It should be noted that these estimates are based on the available information regarding contractor positions, which as of the writing of this document is very limited. SAIC cites secondary information indicating that roughly 72 percent of the embedded contractors associated with several firms working at Fort Monmouth have a bachelor's degree or higher.[46] SAIC further estimates that between 3,000 and 5,000 non-embedded contractor positions associated with DISA are likely to move proximate to Fort Meade.

As shown in the following figure, the estimated distribution for contractor positions differs from that of civilian positions. More than half of these positions are estimated to require a bachelor's degree as the maximum level of education.

Figure 20: Estimated Educational Attainment for Anticipated Contractor Movement (Fort Meade)

Level of Education	Number	%
High School	1,291	22.8%
Associate of Arts	294	5.2%
Bachelor of Arts/Bachelor of Sciences	3,101	54.8%
Master's	908	16.0%
PhD	66	1.2%
Total	5,660	100.0%

These estimates were derived by:

- Inflating the 1,660 embedded contractor figure to 5,660 (assumes 4,000 non-embedded contractors).

[46] SAIC report, 2-6.

3.2.3 DISA Educational Partnerships

According to Nagle, DISA enjoys the following educational partnerships.[47] Nagle indicated that many of these programs fall within DISA's Competitive Development Programs. As such, DISA can sponsor personnel to take these courses, however it is up to the employees to apply to and enroll in these programs.

Figure 21: DISA Educational Partnerships

	Institution	***Type of Partnership***	***Purpose of the Partnership***	***Frequency Offered***
1	Industrial College of the Armed Forces	To develop the Senior DoD Acquisition Corps		annually
2	Information Resources Management College	Certificate Programs	Certificate	multiple sessions per year
			Information Management Planning	multiple sessions per year
			Measures of Performance	multiple sessions per year
			Process Improvement and Investment Planning	multiple sessions per year
			Information Technology Acquisition	multiple sessions per year
			Assuring the Information Infrastructure	multiple sessions per year
3	Carnegie Mellon University	Designed to train mid-level managers in managing technology orgs.	Management of Technological Organizations	multiple sessions per year
4	Council for Excellence in Government	Designed with support from the National Science Foundation to address the technology transformation occurring in government and the leadership challenges it presents.	Excellence in Government Fellows Program	multiple sessions per year
5	Syracuse University/DoD	Executive Education in National Security Management	National Security Management Course	multiple sessions per year
6	Harvard University	Executive Education	Senior Executive Fellows Program	
7	University of Southern California	Telecommunications Management Training for senior managers	Advanced Management Program in Telecommunications	
8	LOGTECH University	MBA in Logistics and Technology	MBA in Logistics and Technology	annually
9	George Washington University	Succession Planning	DISA Executive Leadership Development Program	multiple sessions per year
10	George Mason University	Computer, Information, and Software Intensive Systems (CISIS)	Computer, Information, and Software Intensive Systems (CISIS)	annually

[47] DISA was unable to provide RESI with enrollment levels associated with these partnerships.

		Information Systems Security (ISS) Certificate Program	Certificate Program Information Systems Security (ISS) Certificate Program	multiple sessions per year
		Systems Administrator (SA) Certification Program.	Systems Administrator (SA) Certification Program.	multiple sessions per year
		Information Assurance (IA) Certification Program.	Information Assurance (IA) Certification Program.	annually
11	National Louis University	Mission-related Undergraduate Studies	Mission-related Courses	annually

RESI received anecdotal information suggesting that the George Mason University (GMU) partnership with DISA involves specialized instruction not available from typical college/university courses. RESI endeavored (unsuccessfully) to confirm this with both DISA and GMU representatives. Izer-Horn at GMU could not identify any programs within the University's Department of Information and Software Engineering that are tailored specifically for the base.[48]

RESI was able to obtain a description for one of the GMU certificate programs listed in the above table:

GMU Information Systems Security (ISS) Certificate Program Description
The ISS Graduate Certificate Program provides information on the "science and methods for ensuring secrecy, integrity, availability and legitimate use of information systems".[49] A Bachelor's of Science degree is necessary to enter the program, in addition to knowledge equivalent to the following "foundation" GMU courses:

- Discrete and Logical Structures for Information Systems
- Computer Organization
- Program Design and Data Structures

Nagle also provided information on education institutions throughout the nation which are part of the Federal Information Assurance Scholarship Program. DISA recruits personnel within such programs and offers scholarships to base personnel who attend these programs. These partnerships allow base personnel to obtain a master's or Ph.D. in Information Assurance. Maryland schools involved with this initiative include: Capitol College, Johns Hopkins University, Towson University, University of Maryland, Baltimore County and the University of Maryland, University College. A full list of the 65 Information Assurance Program schools DISA provided RESI is located in the Appendix.

[48] Conversation with Dolores Izer-Horn, George Mason University.
[49] GMU School of Information Technology and Engineering, http://ise.gmu.edu/ms-infs/security-cert.html

3.3 Bethesda National Naval Medical Center (NNMC)

SAIC notes that the realignment will involve all the transfer of tertiary medical services, legal medicine and additional personnel associated with establishing a Program Management Office from the Walter Reed Army Medical Center (AMC) to NNMC. Moreover, the move will result in the construction of a new medical facility at NNMC.[50]

As of the writing of this report, detailed information regarding the types and distribution of occupations moving to NNMC was not available.[51] This lack of information prevents us from assessing associated educational requirements. The absence of this analysis reflects current data constraints and does not preclude the possibility of increased demand for educational/continuing education programs to support the BRAC movement to Bethesda.

AMC's clinical Medicine department is composed of a wide array of sub-departments ranging from cardiology and endocrinology to pulmonary and critical care medicine. The Pediatrics department of AMC specializes in areas such as clinical genetics, pediatric infectious diseases and pediatric critical care services. Additional clinical departments at AMC include the following:

- Allergy/Immunology/Asthma/Immunization;
- 3-D Medical Applications Center;
- Neurology; and
- Preventative Medicine.[52]

RESI sought to identify institutions that AMC utilizes in order to meet its workforce training/continuing education needs. AMC's Chief of Staffing, Lisa Davis stated that civilian personnel must be fully certified at the time of their hiring. According to Davis, AMC does not have any partnerships with local colleges, universities or private career schools.

RESI obtained anecdotal information from Lt. Commander Mader of NNMC indicating that the move will likely involve providers such as registered nurses (RNs), paraprofessionals (i.e., medics) and physicians. In terms of the educational requirements associated with these positions, Mader indicated NNMC's medic population receives on-the-job-training provided by the base. Moreover, NNMC's RN and physician hires must be fully certified at the time of their hiring. RNs must be licensed by the State of Maryland (or by another state through Nurse Licensure Compact or similar agreements[53]) and must have accumulated a year or more of work experience. Mader notes that the BRAC realignment and movement of RNs from AMC to NNMC could result in the

[50] SAIC Report, 4-1.

[51] RESI contacted AMC's Chief of Staffing, Lisa Davis regarding this issue. Ms. Davis stated that the types of positions moving to NNMC are not known at this time. She also indicated that AMC employs both civilian and military personnel. To be hired, civilian staff must be fully certified. According to Davis, AMC does not have any partnerships with local colleges or universities or private career schools to meet workforce training needs.

[52] The Appendix details the entire list of clinical departments at AMC.

[53] This legislation allows nurses registered in their state of residence to practice across state lines (applies only to states that have enacted legislation to recognize this mutual recognition model).

possible elimination of NNMC's reliance on RN contractors. Education needs for physician positions at NNMC are met on the military side by the medical school located on the base. On the civilian side, hires must be fully certified and have accumulated a certain amount of experience as well.

In terms of continuing education for NNMC positions, RNs and physicians are required to meet Continuing Education Credits (CEUs) and Continuing Medical Education Units (CMEs) requirements in order to maintain valid licenses and keep up with emerging issues. CEUs and CMEs are typically obtained from the state that employees are licensed in. Additionally, NNMC often sends providers to conferences and also routinely relies on partnerships with local hospitals to allow employees to gain experience in specialized fields. An example is NNMC's trauma nursing and burn facility partnership. Mader indicates that these practices will likely continue after the movement from AMC takes place.

3.4 Andrews Air Force Base (AFB)

The 2005 BRAC realignment calls for the following organizations to transfer to Andrews AFB:

- Aerial Port Squadron (Martin State Aerial Guard Station, MD);
- Nine F-16s from 27th Fighter Wing (Cannon AFB, NM)
- AF and ANG Headquarters (Arlington, VA)
- Installation Management Functions of Naval Air Facility Washington, MD

These transfers will result in the movement of roughly 1,300 positions to Andrews AFB.[54] Officer and civilian positions will each constitute a third of this total. The balance of movement will be comprised of enlisted personnel positions (178 positions) and embedded contractors (271 positions).

Because information detailing the occupations moving to Andrews AFB is not available, RESI was unable to assess educational demand associated with these movements. The absence of this analysis reflects current data constraints and does not preclude the need for programs to support the BRAC movement to AFB.

[54] Net changes at Andrews AFB are estimated to be 431 (once functions/organizations moving out of Andrews AFB are taken into account).

We do know that Prince George's Community College, which is located just 7 miles from Andrews AFB, currently has a base presence. In addition to certificate programs, the Andrews Air Force Base Degree Center offers associate degrees in the following areas:

- Accounting,
- Business Management,
- Marketing Management,
- Business Administration,
- Criminal Justice, and
- General Studies.[55]

The Center's main function in supporting the Base is to provide general education courses to enlisted troops (thereby allowing the troops to complete their air force degree).[56] According to Luby, base personnel also take courses at the College's main campus. It can be reasonably assumed that demand for some portion of the Center's offerings will increase as a result of the 2005 BRAC realignment.

3.5 Additional Contractor Demand

Another objective of this study was to identify anticipated private contractor movement to Maryland as a result of the 2005 BRAC realignment. Specifically, we were interested in:

1. Identifying the types of (contractor) jobs likely to move to Maryland;
2. Identifying the educational requirements associated with these positions;
3. Identifying any longer term workforce training needs.

RESI contacted the following DOD contractors[57] in an effort to answer these questions:

- Arinc Inc;
- BAE Systems North America Inc;
- Batelle Memorial Institute;
- BearingPoint Inc.;
- Boeing Co.;
- Booz Allen Hamilton Inc.;
- CACI International Inc.;
- Computer Sciences Corp.;
- Harris Corp.;
- Lockheed Martin Corp.;
- ManTech International Corp.;
- Northrop Grumman Corp.;
- Raytheon Co.;
- Science Applications International Corp.;
- Titan Corp.

[55] http://academic.pgcc.edu/instruction/if/gillett3/extensioncenters-vol20-1-04.htm
[56] Conversation with Lynn Luby, Director for Prince George's Community College Andrews Air Force Base Programs.
[57] These contractors represent a random sample of the top 100 DOD contractors (in terms of contract value).

RESI received feedback from one corporation indicating that, while they did not expect to be impacted by the 2005 BRAC realignment, they do work closely with one or more of the Bases considered in this analysis. Moreover, the corporation's Maryland's workforce, with respect to the bases consists mainly of the following occupations:

1. Electrical Engineers;
2. Computer Hardware Engineers;
3. Computer Software Engineers.

The following figure, which details O*NET[58] position requirements associated with these positions, indicates that the majority of these positions require a bachelor's degree or higher.

Figure 22: O*NET Occupational Information

	Electrical Engineer	Computer (Hardware)Engineer	Computer (Software) Engineer
Educational Attainment[59]			
High school or less	4%	6%	4%
Some college	13%	25%	13%
Bachelor's degree or higher	83%	69%	83%
Position Summary	Design, develop, test, or supervise the manufacturing and installation of electrical equipment, components, or systems for commercial, industrial, military, or scientific use	Research, design, develop, and test computer or computer-related equipment for commercial, industrial, military, or scientific use. May supervise the manufacturing and installation of computer or computer-related equipment and components.	Research, design, develop, and test operating systems-level software, compilers, and network distribution software for medical, industrial, military, communications, aerospace, business, scientific, and general computing applications. Set operational specifications and formulate and analyze software requirements. Apply principles and techniques of computer science, engineering, and mathematical analysis.
Education	Most of these occupations require a four - year bachelor's degree, but some do not.	Most of these occupations require a four - year bachelor's degree, but some do not.	Most of these occupations require a four - year bachelor's degree, but some do not
Overall Experience	A minimum of two to four years of work-related skill, knowledge, or experience is needed for these occupations. For example, an accountant must complete four years of college and work for several years in accounting to be considered qualified	A minimum of two to four years of work-related skill, knowledge, or experience is needed for these occupations. For example, an accountant must complete four years of college and work for several years in accounting to be considered qualified.	A minimum of two to four years of work-related skill, knowledge, or experience is needed for these occupations. For example, an accountant must complete four years of college and work for several years in accounting to be considered qualified.

[58] O*NET is an online database developed and operated by the U.S. Department of Labor. The system's objective is to identify and organize information describing occupations and the workplace.

[59] O*NET's educational attainment information is derived from Bureau of Labor Statistics (BLS) survey of employees aged 25-44.

In terms of needs associated with contractor positions, Northrop Grumman[60] indicated an existing gap (or at least the perception thereof) in terms of short-term, specialized courses in areas ranging from Contract Administration to Program/Project management. Obringer indicated interest in working with local educational institutions to develop specialized courses aimed at providing trainees and new hires with skill acquisition/enhancement in the area of government contract administration, particularly as it relates to the nature of government contracts processed through Northrop Grumman. This would be a non-credit training program that would provide trainees with skill acquisition/enhancement in the area of government contract administration, particularly as it relates to the nature of government contracts processed through Northrop Grumman, and use of sub-contractors. Northrop Grumman has experienced in recent years an increasing difficulty in filling positions such as these, as many recent college graduates have not received training in negotiation skills, project development, management, and core elements of the contract process. Additionally, many of the experienced staff in the contracts area of the company are nearing retirement, affecting a loss of knowledge and experience, and the internal and unique processes of contract establishment in the company. As these same workforce employment issues are seen as a result of the BRAC process, a program such as the one outlined below may aid in the filling of positions on the four targeted bases in Maryland.

Proposed courses that could meet Northrop Grumman's needs include:

1. Contract Administration;
2. Cost Estimating;
3. Contract Negotiating Techniques; and
4. Program/Project Management.

Obringer further identified two components critical to the efficacy of such prospective programs including:

1. The integration of Northrop Grumman senior staff into the training experience, to effect a useful program that is tailored to the unique contractual processes of the company (e.g. Advanced Technology Support Program);
2. Comprehensive program content, reflecting government and industry standards of contract development and administration.

[60] EEOL conversation with Vic Obringer, President, NG Support Services Corporation.

4.0 Educational Supply

Identifying educational infrastructure gaps is a fairly straightforward process that involves assessing whether or not the educational programs identified in our demand analysis are currently offered by institutions in the study area.[61] Quantifying supply and areas of undersupply is more difficult, however. RESI received feedback from many institutions indicating that program capacity is elastic and will fluctuate to accommodate existing need.[62] In other words, we recognize that educational supply is not finite; especially as more and more schools increase their distance and on-line learning capacities and abilities to create satellite campuses.

In light of this recognition, RESI's approach to assess supply consists of the following steps:

1. The identification of schools and programs corresponding to occupational series that (a) require study in a specified field (or fields) and (b) will likely comprise a significant portion of the BRAC movements to APG and Fort Meade.
2. The identification of programs that provide training and degree programs similar to programs that are currently utilized by Fort Monmouth and DISA personnel.
3. An inventory of relevant initiatives and/or new programs being undertaken by local educational institutions (both in response to and independent of BRAC.

To accomplish these tasks, RESI relied on information provided by colleges and universities in the study area. We also relied upon published by the Maryland Higher Education Commission (MHEC) including the 2005 report entitled "Trends in Enrollment by Program" to identify these programs. RESI also utilized MHEC's Academic Program Inventory database.

[61] The study area is comprised of the following Maryland jurisdictions: Harford, Cecil, Baltimore, Anne Arundel, Howard, Prince George's and Montgomery Counties as well as Baltimore City.
[62] There were some exceptions to this rule; certain schools limit capacity in order to maintain the selectivity associated with a particular program, for instance.

4.1 Identification of Programs Corresponding to OPM Education Requirements

According to federal Office of Personnel Management (OPM) guidelines, the educational requirements associated with occupations identified as moving to Maryland vary significantly. A few of the occupational series, such as the Secretary and Management and Program Clerical and Assistance Series require only a high school degree or equivalent. The balance require a bachelor's degree; though it should be noted that most of these series do not require a specified field of study. Moreover, candidates can still qualify for most of these positions regardless of whether or not they have obtained a bachelor's degree. For example, in the event that a candidate has had only some college, OPM guidelines allow for relevant experience to offset the lack of a degree. The following figure lists these requirements for the top 89 percent of the 3,935 civilian positions slated to move from Fort Monmouth to APG.

Figure 23: OPM Entry-Level Education Requirements[63]

Series Number	Series Name	%[64]	Entry Grade Position	Entry Level Education Requirement	Degree Concentration
855	Electronics Engineering Series	21.2%	GS-5	Bachelor's degree	Engineering
346	Logistics Management Series	12.1%	GS-5	Bachelor's degree	None Specified
854	Computer Engineering Series	8.7%	GS-5	Bachelor's degree	Engineering
1102	Contracting Series	7.8%	GS-5	Bachelor's degree OR 24 semester hours in any combination of: accounting, business, finance, law, contracts, purchasing, economics, industrial management, marketing, quantitative methods, or organization and management	None Specified
343	Management and Program Analysis Series	6.8%	GS-5	Bachelor's degree	None Specified
301	Miscellaneous Administration and Program Series	5.8%	GS-5	Bachelor's degree	None Specified

[63] The previous figure displays education requirements for entry grade positions. As previously noted, however, the existing GS distribution levels for movement to both APG and Fort Monmouth is heavily comprised of higher grade positions. Graduate study in relevant fields is required for the higher grade positions within each of these series.

[64] The percent distribution figures refer to the series employment as a percentage of the 3,935 civilian positions for which occupational series information is available.

1550	Computer Science Series	4.8%	GS-5	Bachelor's degree	30+ semester hours in a combination of mathematics, statistics and computer science.
318	Secretary Series	3.9%	GS-2	High school diploma or equivalent	N/A
2010	Inventory Management Series	2.8%	GS-5	Bachelor's degree	None Specified
2001	General Supply Series	2.4%	GS-5	Bachelor's degree	None Specified
2003	Supply Program Management Series	2.2%	GS-5	Bachelor's degree	None Specified
560	Budget Analysis Series	2.0%	GS-5	Bachelor's degree	None Specified
344	Management and Program Clerical and Assistance Series	1.4%	GS-2	High school diploma or equivalent	N/A
1083	Technical Writing and Editing Series	1.2%	GS-5	Bachelor's Degree	At least 15 semester hours in appropriate scientific, technical or social science field(s) and at least one course above the introductory level in the field(s) covered by the position.
391	Telecommunications Series	1.1%	GS-5	Bachelor's degree OR communications/electronics or automatic data processing training in technical institutes or business schools above high school level OR advanced instruction at Armed Forces schools	One of the following: Electrical/electronic engineering, mathematics, physics, public utilities, statistics, computer science, telecommunications management, information systems management, business administration, industrial management or related.
801	General Engineering Series	1.0%	GS-5	Bachelor's degree	Engineering
2210	Information Technology Management Series	1.0%	GS-5	Bachelor's degree	Any field
1515	Operations Research Series	0.9%	GS-5	Bachelor's degree	Operations Research OR at least 24 semester hours in a combination of operations research, mathematics, probability, statistics, mathematical logic and/or science.
80	Security Administration Series	0.9%	GS-2	High school diploma or equivalent	N/A
1670	Equipment Specialist Series	0.7%	GS-5	Bachelor's degree	Any field

There are some exceptions to this rule; in fact four of these series do require a minimum educational attainment at the entry grade level, as shown in the following figure. These include:

- Electronics Engineering;
- Computer Engineering;
- Computer Science.
- General Engineering;

Entry grade levels for these positions are GS-5. The three engineering series require a Bachelor's of Science degree in any engineering field while the Computer Science series requires either a Bachelor's of Art or Science with courses in mathematics, statistics and computer science.

The following series do not require a minimum education level but are associated with a particular field(s) of study:

- Contracting Series;
- Telecommunications;
- Operations Research.[65]

Entry grade requirements for these positions vary; the contracting series requires study in fields ranging from accounting and economics to quantitative methods, while the telecommunications series requires study in one of a number of fields such as telecommunications management.

This balance of this section identifies the supply of bachelor's degree programs as well as graduate level programs corresponding to each of the seven above-mentioned occupational series (within the study area considered in this analysis).

Electronics Engineering Series

Technically, study in any engineering field will satisfy OPM requirements for Electronics Engineering Series positions. Electrical and Electronics Engineering programs, however, appear to be most relevant to this series[66] which comprises roughly 22 percent or more than 800 of the 3,935 occupations moving from Fort Monmouth to APG.

Five colleges and/or universities in the study area offer these programs at the bachelor's degree level. Current capacity at these programs (enrollment for 2004, the most recent year this information is published) amounts to more than 1,200 collectively.[67] The University of Maryland-College Park (UMCP) and Morgan State University offer the largest programs in electrical engineering (in terms of enrollment levels). Loyola College, Capitol College and Morgan State University also offer these programs.

---

[65] The Technical Writing and Editing Series also requires study in "the appropriate scientific or technical" field.

[66] As identified by Mark Furhing of Fort Monmouth.

[67] MHEC.

Moreover, there are four schools within the study area which offer master's degree programs in the electrical engineering field, including:

- Johns Hopkins University;
- University of Maryland-College Park;
- Capitol College; and
- University of Maryland-Baltimore County.

Collective 2004 enrollment within these programs exceeds 500. With 2004 enrollment level of more than 370, Johns Hopkins University offers the single largest electrical engineering program at the master's degree level. Doctorate programs are offered at the institutions shown in the following figure.

Figure 24: Electrical/Electronics Engineering Master's & Doctorate Degree Programs

Master's Programs		
Program	**School**	**Enrollment**
Electrical and Computer Engineering	Johns Hopkins University	370
Electrical Engineering	University of Maryland -College Park	80
Electrical Engineering	Capitol College	29
Electrical Engineering w/ UMCP	University of Maryland -Baltimore County	38
Total		***517***
Doctorate Programs		
Program	**School**	**Enrollment**
Electrical Engineering	University of Maryland -College Park	372
	Johns Hopkins University	126
	University of Maryland -Baltimore County	47
Total		***545***

Computer Engineering Series

According to SAIC, the computer engineering series comprises 8.7 or roughly 340 of the 3,935 occupations identified as moving from Fort Monmouth to APG. As with the Electronics Engineering Series, OPM requirements are flexible in that they require a degree in any field of engineering. For the purpose of this analysis, supply of Computer Engineering programs is examined.

Bachelor's degree programs in computer engineering are offered at the following institutions:

- Johns Hopkins University;
- University of Maryland-Baltimore County;
- University of Maryland-College Park; and
- Capitol College.
-

The two largest programs, in terms of 2004 enrollment, include UMCP and the University of Maryland-Baltimore County (UMBC).

There are two master's degree programs located within the study area and they include:

- Johns Hopkins University (with a 2004 enrollment level of 370); and
- University of Maryland-Baltimore County (with enrollment of 19).

The University of Maryland-Baltimore County also offers a doctorate program in Computer Engineering.

Computer Science Series

This series constitutes 4.8 percent or fewer than 200 of the 3,935 positions identified as moving from Fort Monmouth to APG. While OPM requirements do specify a minimum education attainment level for entry grade positions within this series (a bachelor's degree), there is no specified field of study associated with this series. Specific course work including 30+ semester hours in a combination of mathematics, statistics and computer science is required however.

The study area is home to many computer science bachelor's degree programs including:

- University of Maryland-College Park;
- University of Maryland-Baltimore County;
- University of Maryland-University College;
- Towson University;
- Morgan State University;
- Bowie State University;
- Coppin State University;
- Johns Hopkins University;
- Loyola College;
- Capitol College;
- Goucher College;
- College of Notre Dame of Maryland; and
- McDaniel College.

Collective 2004 enrollment in these programs amounts to more than 3,000. The University of Maryland system schools (UMCP, UMBC and UMUC) are home to the largest programs (in terms of enrollment).

Graduate degree programs are shown in the following figure.

Figure 25: Computer Science Master's & Doctorate Degree Programs

Program	School	Enrollment
Computer Science	Johns Hopkins University	545
	Towson University	147
	University of Maryland-Baltimore County	82
	Loyola College	51
	Bowie State University	27
	Capitol College	11
	University of Maryland-College Park	5
Total		***868***
Doctorate Programs		
Computer Science	University of Maryland-College Park	224
	Johns Hopkins University	141
	University of Maryland-Baltimore County	82
Total		***447***

General Engineering Series

Just 1.0 percent or roughly 40 of the positions slated to move from Fort Monmouth to APG fall within the general engineering series. As with the previously mentioned engineering series, these positions require a bachelor's degree in ***any*** engineering field.

Institutions with one or more program accredited by the Accreditation Board of Engineering and Technology (ABET) include:

- University of Maryland-College Park;
- Johns Hopkins University;
- Morgan State University;
- University of Maryland-Baltimore County;
- Loyola College; and
- Capitol College.

The following figure lists all bachelor's level engineering programs offered by institutions within the study area.

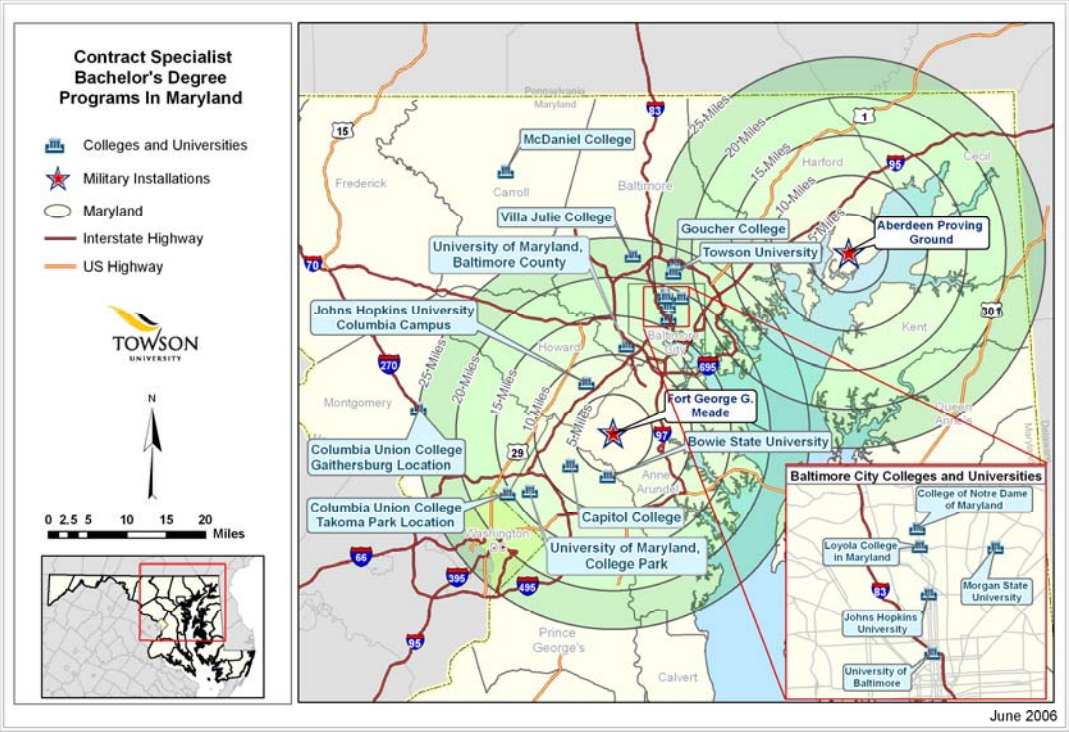
Figure 26: Engineering Bachelor's Degree Programs

Program	School	Enrollment
Aerospace Engineering	University of Maryland -College Park	353
Astronautical Engineering	Capitol College	10
Biological Resources Engineering	University of Maryland -College Park	137
Biomedical Engineering	Johns Hopkins University	478
Chemical Engineering	University of Maryland -Baltimore County	128
	University of Maryland -College Park	119
Chemical and Biomolecular Engineering	Johns Hopkins University	187
Civil Engineering	University of Maryland -College Park	233
	Johns Hopkins University	43
	Morgan State University	130
Computer Engineering	Capitol College	19
	University of Maryland -Baltimore County	301
	University of Maryland -College Park	323
	Johns Hopkins University	70
Computer Engineering Technology	Capitol College	21
Electrical Engineering	Johns Hopkins University	101
	University of Maryland -College Park	611
	Capitol College	79
	Loyola College	5
	Morgan State University	446
Electronics Engineering Technology	Capitol College	38
Engineering (BA)	Johns Hopkins University	4
	University of Maryland -College Park	11
	University of Maryland -Baltimore County	167
Engineering Mechanics	Johns Hopkins University	12
Engineering Science	Loyola College	49
	Johns Hopkins University	9
Environmental Engineering	Johns Hopkins University	19
Environmental Science	University of Maryland -Baltimore County	55
	Towson University	73
	University of Maryland -College Park	180
Fire Protection Engineering	University of Maryland -College Park	110
Industrial Engineering	Johns Hopkins University	NA
	Morgan State University	76
Materials Science & Engineering	University of Maryland -College Park	35
	Johns Hopkins University	36
Mechanical Engineering	University of Maryland -College Park	660
	Johns Hopkins University	125
	University of Maryland -Baltimore County	308
Software Engineering	Capitol College	6
Telecomm. Engineering Tech	Capitol College	32

Contracting Series

This series constitutes 7.8 percent or just over 300 of the 3,935 identified occupations scheduled to transfer from Fort Monmouth to APG. OPM guidelines do not specify a field of study for these positions, however the series does require 24 semester hours in any combination of: accounting, business, finance, law, contracts, purchasing, economics, industrial management, marketing, quantitative methods, or organization and management. Many of these fields are popular undergraduate and graduate majors throughout Maryland. As of 2004, more than 10,000 students were enrolled in either accounting or business bachelor's degree programs at schools located within the study area. These institutions are shown in the following figure:

Figure 27: Institutions with Bachelor's Degree Programs Corresponding to the Contractor Series



Samples of programs (at the undergraduate and graduate levels) that meet the OPM qualifications of these positions are shown in the following figures.

Figure 28: Bachelor's Programs Corresponding to the Contractor Series

Program[68]	School	Enrollment
Accounting	University of Maryland-University College	1071
	University of Maryland-College Park	427
	Towson University	387
	Morgan State University	263
	Loyola College	105
	Villa Julie College	104
Agriculture and Resource Economics	University of Maryland-College Park	51
Business	University of Baltimore	956
	College of Notre Dame of Maryland	280
	Johns Hopkins University	89
Business Administration	Capitol College	n/a
	University of Maryland-University College	2641
	Towson University	1940
	Bowie State University	995
	Morgan State University	427
	Villa Julie College	293
	McDaniel College	167
Business Communication	Villa Julie College	115
Business Technology Administration	University of Maryland-Baltimore County	n/a
E-Business	Towson University	31
Economics	University of Maryland-College Park	836
	University of Maryland-Baltimore County	284
	Towson University	95
	Loyola College	34
	Morgan State University	21
	Goucher College	8
	McDaniel College	5
Finance	University of Maryland-University College	n/a
	University of Maryland-College Park	749
	Morgan State University	109
Financial Economics	University of Maryland-Baltimore County	239
General Business	University of Maryland-College Park	765
	Loyola College	686
Global Business and Public Policy	University of Maryland-University College	n/a
International Business	University of Maryland-College Park	n/a
Law and American Civilization	Towson University	48
Marketing	University of Maryland-College Park	573
	University of Maryland-University College	227
	Morgan State University	183
Total		***15,204***

[68] The following were deleted from the table due to zero enrollment reported in 2004: Columbia Union College (Accounting), Columbia Union College (Business Administration), Villa Julie College (Business Information Systems), College of Notre Dame of Maryland (Economics), University of Maryland –College Park (Law-Combined Program).

Figure 29: Master's Degree Programs corresponding to the Contractor Series

Program	School	Enrollment
Accounting and Business Advisory Services	University of Baltimore	42
	Towson University/University of Baltimore	22
Accounting and Financial Management	University of Maryland-University College	329
Accounting and Information Technology	University of Maryland-University College	165
Agriculture and Resource Economics	University of Maryland-College Park	11
Applied Economics	Johns Hopkins University	102
Business	University of Baltimore	62
Business Administration	University of Baltimore	489
	University of Maryland-College Park	1385
	Loyola College	812
	Bowie State University	118
	Columbia Union College	29
	Morgan State University	28
	Capitol College	17
	University of Maryland-University College	1229
	Johns Hopkins University	829
Business and Management	University of Maryland-College Park	20
Business and Technology Management	Villa Julie College	12
Economics	Morgan State University	2
	University of Maryland-College Park	1
Economic Policy Analysis	University of Maryland-Baltimore County	19
Finance	Johns Hopkins University	90
	Loyola College	76
Global Master of Business Administration	University of Maryland-University College	n/a
International Business	Loyola College	n/a
Marketing	Johns Hopkins University	101
Taxation	University of Baltimore	25
Total		***6,057***

Figure 30: Doctorate Programs Corresponding to the Contractor Series

Program	School	Enrollment
Business Administration	Morgan State University	17
Business and Management	University of Maryland-College Park	108
Agriculture and Resource Economics	University of Maryland-College Park	47
Economics	University of Maryland-College Park	169
Total		***341***

Telecommunications Series

According to SAIC, positions within this series are expected to amount to just 1.1 percent, roughly 43, of the 3,935 positions identified as moving from Fort Monmouth to APG. OPM qualification standards for this series are quite flexible and require a bachelor's degree with study in one or more of the following fields[69]:

- Electrical/electronic engineering;
- Mathematics;
- Physics;
- Public utilities;
- Statistics;
- Computer Science;
- Telecommunications Management;
- Information Systems Management;
- Business Administration; or
- Industrial Management or related.

The majority of these programs are offered by institutions within the study area. For the purpose of this study, RESI focuses on telecommunications programs. Both Morgan State and Capitol College offer telecommunications bachelor's degree programs, as shown in the following figure. Master's degree programs are offered by Johns Hopkins University, Morgan State and UMCP.

Figure 31: Telecommunications Bachelor's & Master's Degree Programs

Bachelor's		
School	**Program**	**Enrollment**
Capitol College	Telecommunications Engineering Tech	32
Morgan State University	Telecommunications	493
Total		***525***
Master's		
School	**Program**	**Enrollment**
Johns Hopkins University	Information & Telecommunication System	297
Morgan State University	Telecommunications	6
University of Maryland -College Park	Telecommunications	72
Total		***375***

[69] Alternatively, study beyond the high school level in a technical institute or study at the Armed Forces University also meet the education requirements for these positions.

Operations Research Series

These positions constitute less than 1 percent of the 3,935 positions identified as moving from Fort Monmouth to APG. OPM guidelines specify either a bachelor's degree in Operations Research or at least 24 semester hours in a combination of:

- Operations Research;
- Mathematics;
- Probability;
- Statistics;
- Mathematical logic; and/or
- Science.

While there are no programs in the study area that offer majors in Operations Research, there are a multitude of undergraduate and graduate degree programs in the balance of fields. Thus requirements for positions in this series can certainly be met by existing programs.

Figure 32: Bachelor's Degree Programs that Meet the OPM Qualifications for Operations Research Series

Program	School	Enrollment
Applied & Computational Mathematics	Johns Hopkins University	24
Applied Mathematics	Villa Julie College	8
Applied Mathematics & Statistics	Johns Hopkins University	51
Mathematics	University of Maryland -College Park	300
	Towson University	169
	University of Maryland -Baltimore County	166
	Bowie State University	74
	Morgan State University	36
	Coppin State University	36
	Goucher College	15
	College of Notre Dame of Maryland	12
	Columbia Union College	2
Mathematics Education	College of Notre Dame of Maryland	NA
Mathematics, General	McDaniel College	41
Mathematical Sciences	Loyola College	66
Statistics	University of Maryland -Baltimore County	19
Total		***1019***

Figure 33: Master's Degree Programs that Meet the OPM Qualifications for Operations Research Series

Program	School	Enrollment
Applied & Computational Mathematics	Bowie State University	9
	Johns Hopkins University	NA
Applied Math & Scientific Computation	University of Maryland -College Park	15
Applied Mathematics	University of Maryland -Baltimore County	10
Applied Mathematics & Statistics	Johns Hopkins University	NA
Mathematical Statistics	University of Maryland -College Park	5
Mathematics	University of Maryland -College Park	15
	Morgan State University	9
Mathematics Education	Towson University	43
	Morgan State University	NA
Mathematics of Advanced Industrial Tech.	University of Maryland -College Park	NA
Measurement, Statistics and Evaluation	University of Maryland -College Park	NA
Statistics	University of Maryland -Baltimore County	12
Total		***118***

Additional – Engineering AS Programs

Among the occupations slated to move from Fort Monmouth to APG are the following series:

- Engineering Technician;
- Electronics Engineering Technician.

Though these series collectively constitute less than 1 percent of the 3,935 positions for which occupational series information is available, it seems reasonable to assume that the need for these and other technicians will increase due to the 2005 BRAC realignment. OPM requirements for these positions include some study (beyond high school) in engineering and related fields. A number of institutions within the study area, including community colleges, offer these programs, as shown in the following figure.

Figure 34: Engineering AS Programs

Program	School	Enrollment
Civil Engineering	Montgomery College	1
Computer Engineering Tech	Prince George's Community College	94
	Capitol College	3
Electromechanical Systems Engineering Tech	Montgomery College	4
Electronic Engineering Tech	Anne Arundel Community College	65
	Prince George's Community College	48
	Capitol College	1
Engineering	Columbia Union College	1
	Community College of Baltimore County	214
Engineering Science	Montgomery College	740
Engineering Technologies	Montgomery College	13

Engineering Transfer	Anne Arundel Community College	171
	Baltimore City Community College	23
	Harford Community College	95
	Howard Community College	146
	Prince George's Community College	105
Network Engineering	Montgomery College	66
OptoElectronics Engineering Tech	Capitol College	0
Telecommunications Engineering Tech	Capitol College	3

Additional Programs

Though they do not necessarily correspond to OPM guidelines, anecdotal feedback RESI has received from Maryland institutions suggests that Homeland Security programs as well as foreign languages programs will also be in demand as a result of the 2005 BRAC realignment.

The following figure displays homeland security programs available within the study area (excluded are Johns Hopkins University's Master's degree and Post-Baccalaurate Certificate programs which are offered at their Washington D.C. location.

Figure 35: Homeland Security Programs

Program Name	**Institution**	**Degree Offered**
Homeland Security Management	Anne Arundel Community College	Associate of Arts Degree
Integrated Homeland Security Management	Towson University	Master's Degree
Homeland Security Management	University of Maryland - University College	Post-Baccalaureate Certificate

Various foreign language programs are offered by many institutions located within the study area.

4.2 Identification of Programs Similar to those Utilized by Fort Monmouth and DISA

Software Engineering – Master's Program (Fort Monmouth)
As previously noted, Monmouth University's software engineering master's program is unique in that it was co-developed by Fort Monmouth. Additional distinguishing features of the program include its technical emphasis and the fact that faculty have extensive background and experience as software developers. In addition, the flexibility of the program (the fact that it is offered for both full time and part time students) is noteworthy.

Within the study area, there are two institutions that offer Software Engineering Master's programs including: Loyola College and University of Maryland, University College and RESI spoke with representatives from both of these institutions in order to get a sense of the nature and capabilities of each program.

Loyola College's Master's of Science in Software Engineering program is geared for experienced individuals who have worked or are working in the software engineering field. Bachelor's degree holders who do not have a background in computing must take a series of foundation courses prior to enrolling in the program. Benokraitis[70] indicates that Loyola's program is technically oriented and is less focused on the management side of software engineering compared to similar programs at other schools. Moreover, he confirmed that instructors consist of full time faculty members (all faculty associated with the program have Ph.Ds), who are specialists in either software engineering or programming. All adjunct/affiliate instructors within the program have accumulated extensive work experience as well.

UMUC provides the following description for its Software Engineering Master's Program: "The MSwE was developed to provide a foundation in technical concepts and design techniques as well as management and teamwork approaches. The mission of the program is to prepare students to engineer the development of software products and services for industry and government in a cost-effective manner. The emphasis of the program is on implementing software engineering projects within cost and schedule by applying proven and innovative practices that overcome the shortcomings of the current paradigm." According to Jones,[71] UMUC's program emphasizes both the technical and managerial aspects of software engineering.[72]

The following figure compares the features of these Maryland programs to that of Monmouth University.

[70] Conversation with Ben Benokraitis, Director of Graduate Programs in Computing at Loyola College.
[71] John Jones, UMUC
[72] http://www.umuc.edu/grad/mswe/mswe_home.shtml

Figure 36: Characteristics of Software Engineering Master's Programs: Monmouth University, Loyola College and UMUC

	Monmouth University	Loyola	UMUC
Credits Required:	30 credit program + 1-2 projects or thesis	33 credit hours	36 credit hours
Location:	Monmouth University Campus	On campus; Loyola has distance learning capabilities.	UMUC has capabilities to offer distance/online learning as well as classes on the base.
Part time/Full time status	Both	Part-time	Both
Typical Completion Time:	2.5 years for part time students, 1.5-2 years for full time students	2.5-3 years	
Program Origin	Monmouth University's computer science program was not meeting the Base's needs, which prompted Fort Monmouth and the University to co-develop the Software Engineering Master's Program in 1986.	Informally developed in 1977; formally implemented in 2003.	
# Students enrolled per year	15-51[73]	16	253
Program requirements	A Bachelor's degree in computer science (2/3 of students typically meet this requirement) OR A Bachelor's degree in an equivalent field (i.e., electrical engineering, mechanical engineering). *Monmouth University offers a 5-course preparatory curriculum in the event that neither of the above requirements are met	Work experience in the software engineering and/or computing fields OR Bachelor's degree and the completion of several "foundation" courses prior to enrollment.	At least one year of experience in software design OR A Bachelor's degree in engineering or computer science AND Completion of a course in discrete mathematics
Required Core Curriculum	(1) Engineering, design and architecture of software systems, (2) Verification, validation and software maintenance, (3) Software development processes, (4) Formal methods in software engineering (5) Application of mathematical methods to the definition of highly reliable software	1) Database systems, (2) Software Engineering, (4) Software System Specification, (5) Human Computer Interaction, (6) Software reliability and testing, (7) Software Architecture and integration	(1) Issues in software engineering, (2) Systems engineering, (3) Software systems development, (4) Software Project Management (5) Systems and software standards and requirements, (6) Software Design and Implementation (7) Software Verification and Validation (8) Software Maintenance
Elective Curriculum	Five required - examples include: (1) Information systems applications, (2) Real time software systems, (3) Telecommunications, (4) Management of technology	Five required – at least one must be a business and management elective; examples include: (1) Advanced Operating Systems (2) Engineering Systems and analysis (3) Cost estimation and Management	Three required – can include either technical or managerial (or a combination) of electives including the following examples: (1) Object oriented database systems, (2) Local area networking systems, (3) telecommunications, (4) IT acquisitions management

[73] McDonald's enrollment figures range from 15-20; Ruane's 2005 figure for this program is 51.

Systems Engineering – Master's Program (Fort Monmouth)

As previously mentioned, the SIT program is a Master's of Science degree in Systems Engineering. Classes for this program are conducted both during work hours as well as in the evening. According to Ruane, 30 base personnel were enrolled in this program in 2006.

The following figure inventories systems engineering programs located within the study area.

Figure37: Systems Engineering Master's Degree Programs

Program	School	Enrollment
Systems Engineering	Johns Hopkins University	325
	University of Maryland-College Park	14
Total		***339***

Both of these programs are offered at several satellite locations. UMCP's program is similar to SIT's in that it requires 30 credit hours and a thesis and is offered to both part-time and full-time students. The Johns Hopkins University program requires the completion of 10 courses and is offered on a part time basis. Core curricula for these programs appear similar. The UMCP program is currently under review and new students will not be admitter for the 2006-07 academic year.

The following figure compares these programs in further detail.

Figure 38: Characteristics of Systems Engineering Master's Programs: Stevens Institute of Technology, Johns Hopkins University and University of Maryland-College Park

	Stevens Institute of Technology	**Johns Hopkins University**	**University of Maryland-College Park**
Credits	30 hours, thesis option can be substituted for up to 6 credit hours	10 courses - credit hours are not assigned	30 credit hours + thesis or 36 credit hours (non-thesis)
Location (on campus, online, etc.)	on campus and most courses are offered online, grad courses are taught on the post	At several satellite locations: Applied Physics Laboratory (Laurel), Dorsey Center (Elkridge), Montgomery County Campus, Southern MD Higher Education Center	not online but at several satellite locations
Part time & Full time status offered	yes, both	Part-time classes offered on evenings and weekends only	yes, both
Completion Time	varies whether part time or full time	must be completed within 5 years	2 years full time 3 years part time must be completed within 5 years
Year developed/origin	2001		1987
# Students enrolled per year	not clear since there are many different sites and delivery methods	325	14
Program requirements	Undergraduate degree in engineering or related field	a degree in a technical field and at least 2 years of relevant professional work experience	3.25 GPA and/or significant professional experience; Bachelor's degree in engineering, mathematics or physical science.
Core Curriculum	ALL students must take the following two-course sequence: SYS 625 Systems Operational Effectiveness and Life Cycle Analysis SYS 650 System Architecture and Design OR, the following two-course sequence: SDOE 651 Agile Systems Engineering and Architecting SDOE 780 Agile Development Strategies Plus, two additional options.	Introduction to Systems Engineering Introduction to Project Management Project Planning and Control Software Engineering Management System Conceptual Design System Design and Integration System Test and Evaluation Systems Engineering Project	Systems Engineering Principles System Modeling and Analysis Systems Engineering Design Project Human Factors in Systems Engineering Systems Financial and Contract Management Systems Life Cycle Cost Estimation Quality Management in Systems
Elective Curriculum	Life Cycle Cost and Economic Analysis Supportability and Logistics Advanced Decision Analysis Life Cycle Cost and Economic Analysis	2 electives (no thesis option) e.g. Technical Group Management, Communications in Technical Organizations,	3 courses in one specialization area + thesis or 5 courses in no more than two specialization areas (non-thesis)
Additional	Not an OR program but a true SE program designed by industry		The program is currently under review and new students will not be admitter for the 2006-07 academic year.

Technology Certificate Programs (DISA)

As previously noted, the four certificate programs shown in the following figure were identified as programs offered to DISA through a partnership with George Mason. RESI identified the following schools within our study area that offer similar programs.

Figure 39: Computer Science/Information Technology Certificate Programs[74]

Institution	Computer, Information, & Software Intensive Systems (CISIS)	Information Systems Security (ISS) Certificate Program	Systems Administrator (SA) Certification Program	Information Assurance (IA) Certification Program
Anne Arundel Community College		X		
Community Colleges of Baltimore County			X	X
Harford Community College	X			X
Prince George's Community College			X	
University of Maryland-University College				X
Towson University[75]				X

[74] Figure 25 does not necessarily represent an exhaustive inventory of schools in the study area that offer these programs; it lists only those schools that responded affirmatively to RESI's information request on this subject.

[75] Towson University offers an IA certificate as part of its Master's degree program in Applied Information Technology.

4.3 Inventory of Local Initiatives/New Programs

A multitude of initiatives (at both primary and secondary educational institutions) are in various stages of planning and deployment throughout Maryland. Some of these projects are occurring as a direct result of the 2005 BRAC realignments, while others are developing coincidentally. This section of the study highlights some of the initiatives that will support the missions of activities moving to the four Maryland bases considered in this analysis.

- Cecil Community College Bainbridge Campus

Cecil Community College is in the process of planning a Bainbridge Campus which will house a Science, Math and Engineering Center to meet the workforce needs associated with the BRAC realignment at APG. The Cecil County Community College Master Plan calls for the new campus to be developed in three stages, the first of which would include the construction of the Center (estimated to comprise 20,000 square feet of building space and to cost $6.5 million to develop). The second phase of the campus development will consist of the development of another 20,000 square feet of space to house University partners. A major objective of the campus is to create synergies and partnerships with four-year institutions thereby affording residents and workers the opportunity to obtain their undergraduate degrees locally. The final phase of development will result in an expansion of the Center. In total, the initiative is anticipated to represent an investment of more than $21 million and will create a 15-acre campus in the western edge of Cecil County.[76]

- Homeland Security and Emergency Preparedness Magnet Program at Joppatowne High School, Harford County

Harford County Public Schools is planning to launch a magnet program at Joppatowne High School in the fall of 2007. The program will be the first of its kind and will focus on Homeland Security and Emergency Preparedness and will be comprised of three curricular tracks including the following:

1. Criminal Justice/Law Enforcement
2. Information/Communications and Technology
3. Homeland Security Sciences

The Information/Communications and Technology track is particularly relevant as courses will address the key areas of Network Security and Geospatial Technologies, and will allow students to attain certification in both Cisco and SPACESTARS professional programs. Students will be enrolled in both Cisco I and Cisco II classes, addressing Networking Basics and Routers/Routing Basics (courses are presently offered in Joppatowne H.S.) in 11th grade. They will then enroll in Cisco III and Cisco IV classes in 12th grade, which will introduce them to switching basics and intermediate routing, and WAN technologies.

While the program aims to prepare high school students for careers in the homeland security field, it will also create a network of partnerships with government and industry

[76] Information provided by Stephanie Woods, Office of the President, Cecil Community College.

in order to develop internship/mentorship programs and to more effectively address local, state and national needs. The program will be embedded in the Maryland Career and Technology Education Program.

- New programs at Harford Community College (HCC)

Harford Community College is currently exploring ways to address education needs associated with BRAC. For instance, as a consequence of the BRAC realignment at APG, HCC has hired a consultant to conduct a needs assessment in order to identify areas of appropriate curriculum development.[77] Chliwniak also indicated that HCC is planning on submitting a new Associate Degree program in Engineering Technology to its Board and then subsequently to MHEC. The new program will replace Colleges "High Performance Manufacturing" program. Initially the program will be focused on mechanical engineering. Chliwniak indicated that HCC will look to see if the school can shift toward offering software engineering and electrical engineering programs as well. In addition, MHEC has just recently approved a new degree program at HCC in Network Security. HCC is also looking to articulate a clean 2+2 program with Towson University, which would result in Towson coming to Harford in the fall of 2007. And finally, HCC expects to move toward offering a homeland security program at some point going forward.

- Sciences and Mathematics Academy at Aberdeen High School

This program was launched in the fall of 2004 after several years of planning and with the investment of federal, state and local funds. The program originated with the Army Alliance and other professionals affiliated with APG. A critical program component provides students with the opportunity to regularly interact with professional scientists and mathematicians. Another unique feature allows high school seniors to perform original research with the guidance of a program mentor. The third class to enter the academy is expected to be comprised of 150 students. The program has a current capacity of 200 students per entering class.

- New Information Assurance Major at Anne Arundel Community College[78]

This program is being established to address the shortage of cyber-security professions and will transition well into undergraduate programs and graduate programs such as Towson University's Computer Science Department or the renowned graduate and Doctorate programs in Applied Information Technology.

- Anne Arundel Workforce Development Corporation BRAC Planning Grant

The Anne Arundel County Workforce Development Cooperation was awarded a BRAC planning grant in FY06 from The Department of Labor. The local transitional committee assisting in the development of plans and policies is focusing on identifying curricula changes and partnering with employers to offset the cost of curriculum development for necessary training and degree programs.

.

[77] Conversation with Dr Luba Chliwniak, Mr. Henderson & Deborah Roble of Harford Community College..

[78] Additional information regarding plans/initiatives at AACC is pending.

- Prince George's Community College Proposed Information Security Program

Prince George's Community College has submitted a proposed Associate of Applied Science Degree program in Information Security to the Maryland Higher Education Commission. The proposed objective of the program is to prepare students for entry-level positions in the following fields:

1. Data Security Analysis;
2. Systems Security Administration;
3. Network Security Administration.

The program will require roughly 40 credit hours within the concentration (examples of concentration courses include: Computer Literacy, Computer Security and Router Technology) as well as additional 20-23 general education credit hours.[79]

- Coppin State University – New Programs

According to Sommerfeldt, Coppin State University is planning to add concentrations within the computer science major in the following areas:

1. System/network and database administration and security;
2. Web and database programming.
3. Moreover, the University is exploring the possibility of adding certificate programs (such as Microsoft, Cisco, etc.)80

- University of Maryland, College Park – New Programs
  1. According to Halperin,[81] the University is planning on offering a professional master's program in applied mathematics.
  2. Halperin stated that UMCP certainly has the capacity to create specialized master's programs.

- College of Notre Dame of Maryland – New Programs
  1. Franklin[82] indicated no new programs in the general fields of mathematics, science and/or technology, aside from a new undergraduate concentration (biotechnology) within the College's Biology major. She further indicated that the College's math and science programs could certainly sustain modest growth in the near-term.

[79] Information provided by Cynthia-Mason Posey.
[80] Conversation with Edward Sommerfeldt, Mathematics/Computer Science, Coppin State University.
[81] Dean of Computer, Mathematics and Physical Sciences at UMCP.
[82] Associate Academic Dean at the College.

- Community Colleges of Baltimore County (CCBC)- New Programs
  1. Linksz[83] indicated that MHEC has approved a new Associate of Applied Science program in Geospatial Applications (GEOA).[84] CCBC is currently in the process of preparing articulation agreements with the following schools:
     Towson University;
     University of Maryland, Baltimore County; and
     Salisbury State University.

- Towson University – New Programs Planned and Being Considered

  Graduate level programs include the following:

  1. M.S. Forensic Science (new program that has already been approved and will begin in fall 06)
  2. Ph.D. Applied Biology (this would be a Doctorate program offered jointly with the University Maryland Biotechnology Institute (UMBI) and possibly involve a partnership with Aberdeen Proving Ground)
  3. M.S. Applied Physics (could have concentrations in such areas as materials science, nanotechnology, geophysics, applied optics)
  4. M.S. Molecular Biology, Biochemistry, Bioinformatics (MB3) (This program would be an extension of the current undergraduate MB3 program)
  5. M.S. Applied Statistics and Financial Mathematics (or as a new track under the existing M.S. in Applied and Industrial Mathematics program)
  6. M.S. Environmental Management (might be a joint program with the College of Business and Economics)
  7. M.S. Science Education (a new track in Earth-Space Science to begin in fall 06)

  Bachelor's Degree Programs include:

  1. B.S. Computational Science (an interdisciplinary program)
  2. A new Biotechnology track under the exiting B.S. MB3 program[85]

[83] Conversation with Donna Linksz, Academic Dean for Mathematics and Science at CCBC.
[84] Additional information on this program is pending.
[85] Jerry Intemann, Towson University

5.0 Contacts

Charleen Nagle, Career Programs Branch, DISA, 703-607-6298

Susan Nappi, Fort Monmouth

Mark Fuhring, Fort Monmouth

Mariane Ruane, Chief of Training at Fort Monmouth

Ben Benokraitis, Director of Graduate Programs in Computing, Loyola College

John F. Jones, University of Maryland University College

Stephanie Woods, Office of the President, Cecil Community College, 410-287-1025

Michael J. Keller, Director of Policy Analysis and Research, Maryland Higher Education Commission

Clark Turner, SAIC

James McDonald, Program Director for Software Engineering at Monmouth University

Dolores Izer-Horn, George Mason University School of Information Technology and Engineering

Lisa Davis, Chief of Staffing, Walter Reed Army Medical Center

Lt. Commander Mader, National Naval Medical Center

Lynn Luby, Director for Prince George's Community College Andrews Air Force Base Programs

Vic Obringer, President, Northrop Grumman Support Services Corporation, 410-993-2098, victor.obringer@ngc.com

Jack Martin, Northrop Grumman, 410-765-4441, jack.martin@ngc.com

Dr. Luba Chliwniak, Harford Community College, 410 836 4244

Mr. Henderson, Harford Community College

Deborah Roble, Harford Communicty College

Cynthia Mason-Posey, Associate Professor, Prince George's Community College, CMASON-POSEY@PGCC.EDU

Dr. Edward Sommerfeldt, Mathematics/Computer Science, Coppin State University, 410-951-3479

Dr. Halperin, Dean of Computer, Mathematics and Physical Sciences at University of Maryland-College Park

Dr. Franklin, Associate Dean at the College of Notre Dame of Maryland

Donna Linksz, Academic Dean for Mathematics and Science at the Community College of Baltimore County, 410-455-4183

Michael Netzer, Dean of the School of Applied & Information Technology, 410-455-6978

Dr. Aaron Stucker, Dean, Division of Sciences, Technology, Engineering and Mathematics, Prince George's Community College, 301-322-0419

Amanda M. Thomas, Ph.D., Associate Dean, College of Arts and Sciences Professor of Psychology, Loyola College in Maryland

Barb Giniger Cooper, Cooper Communications, 301-384-5933

Eric M. Seleznow, Division Director, Montgomery County Division of Workforce Services, 240-777-2047

Kathleen Beauman, Anne Arundel Community College, kmbeauman@aacc.edu

Brian Darmody, Assistant Vice President, Research and Economic Development
University of Maryland, 301-405-1990

Kenneth Fiscus, DISA, kenneth.fiscus@disa.mil

Pamela Clay, Chief of the Professional Development Branch, DISA, 703-607-6600

Rita Aissi-Wespi, UB Office of the Provost, raissi-wespi@ubalt.edu

Theresa Holmes, College of Liberal Arts, University of Baltimore, tholmes@ubalt.edu

Linda Kazinetz. Standards Department of Office of Personnel Management, 202-606-1814

Terri Morris, Coordinator for Operations, HEAT Center, 410-638-2500

Don Schultz, Uniformed Services University of the Health Sciences (USUHS), 301-295-3301

Bill Lauffer, Engineering Technology, Chair at Prince George's Community College, 301-322-0778
Diane Webb, Center for Academic Resource Development, Prince George's Community College, 301-322-0452

Tom Kelliher, Mathematics Department, Goucher College, 410-337-6044

Dr. Kimberly Whitehead, Special Asst. to Provost, Bowie State University, 301-860-3464

Bryan Zervos, Director of Development, Columbia Union College, 301-891-4151

Diane Hughes, School of Computers, Mathematics and Natural Sciences, Morgan State University.

Dr. Poppavitch, Morgan State University, 443-885-3372.

Cheryl Rawlins, Institutional Research, Morgan State University.

Dean Jean Turner Schreier, Science and Math, Anne Arundel Community College, jturner@aacc.edu

Baltimore City Community College, Biological and Physical Sciences Department, 410-462-7645

Dr. Ron Liss, Academic Office, Montgomery College, 301-251-7267, ron.liss@montgomerycollege.edu

R. Roverson, CEO of Academic Programs at Howard Community College, 410-772-4807

Dr. Sullivan, ECE, the Johns Hopkins University,

Dr. Cranston, the Johns Hopkins University, pcranston@jhu.edu

Dr. Moira, Vice Provost for Academic Affairs, University of Maryland-Baltimore County, 410-455-6576

Mr. McHugh, University of Maryland-Baltimore

Paula Berger, Institutional Research, the Johns Hopkins University

Gil Harootunian Institutional Research, McDaniel College

Jane Akers, Institutional Research, Towson University

President Manning's Office, Villa Julie College

Jide Odubiyi, Bowie State University

Fred Klappenberg, Chair COSC, Anne Arundel Community College
References

William Reuling, Towson University

Jerry Intemann, Towson University, gintemann@towson.edu

Dr. Ali Behforooz, Towson University, Center for Applied Information Technology

Mike Schroeder, Towson University, Extended Education and Online Learning

Nicole Marano, Villa Julie College, **DEA-NICO@mail.vjc.edu**

Titan Corporation, Press Office, 703-434-4000

Raytheon Corporation, Press Office 781-522-3000

Lockheed Martin Corporation, Media and Press Inquiries, 301-352-2692

Don Winter, Harris Corporation, 301-585-3304

Adam Sullivan, Harris Corporation, 703-739-1835

Computer Sciences Corporation, Recruiter, 703.318.2800

ManTech International Corporation, 703.273.3262

Battelle, Memorial Institute, Dean Ertwine, 410-306-8520

Sue Frazier, University of Maryland-College Park, 301-405-6599

Dr. John Farr, Stevens Institute of Technology, jfarr@stevens.edu

Rosemary Williams, Johns Hopkins University, 410.540.2960

Cindy Phillips, Arinc Incorporated, Human Resources, 410-266-4056

BAE Systems North America Incorporated, 301-838-6000

BearingPoint Incorporated, 866-276-4768

Boeing Corporation, Employee Headquarters, 312-544-2000

Marie Lerch, Media Relations, Booz Allen Hamilton Incorporated, 703-902-5559

Jody Brown, CACI International Incorporated, 703-841-7801

Joy Johnson, Advancement, Capitol College, 301-369-2800 x3097

Dave Odett , Academic Dean, Capitol College, 301-369-2542

6.0 References

Accreditation Board of Engineering and Technology, http://www.abet.org/

Altbach, Philip G, et al. *American Higher Education in the Twenty-First Century*. 2nd ed. Johns Hopkins University Press, April 2005.

Barlow, ED. "Storm Warnings and What You Can Do To Prepare." 2006 Governor's Workforce Conference, Maryland, May 8, 2006.

Barrow, Clyde W. "The New Economy and Restructuring Higher Education." *The NEA Higher Education Journal,* 1996.

College of Notre Dame Accelerated College website
http://www.ndm.edu/weekendcollege/overview/wk_overview.cfm

Defense Base Closure and Realignment Committee, "Final Report to the President," Appendix O: Final Commission Recommendations, September 2005.

Duderstadt, James J. "Leading Higher Education In an Era of Rapid Change." July 2001.

ElBoghdady, Dina. "DISA Fights Turnover With Telecommuting." *The Washington Post,* January 25, 2006.

GMU School of Information Technology and Engineering, website
http//ise.gmu.edu/ms-infs/security-cert.html

Heat Center, website http://www.heatcentermaryland.com/

Huffman, Dennis et al. "ACCESS: *N*/ PERMISSION, LIBERTY, OR ABILITY TO ENTER, APPROACH, COMMUNICATE WITH, OR PASS TO AND FROM." Prince George's Community College, website
http://academic.pgcc.edu/instruction/if/gillett3/extensioncenters-vol20-1-04.htm

Johns Hopkins University Systems Engineering Website
http://www.epp.jhu.edu/catalog/se.html

Karoly, Lynn A. and Constantijn W. A. Panis. *The 21st Century at Work: Forces Shaping the Future Workforce and Workplace in the United States.* RAND Corporation, 2004.

Keller, Michael J. "A Study of the Capacity of Maryland's Teacher Preparation Programs." Maryland Higher Education Commission, March 2006.

Lifelong Learning Trends: A Profile of Continuing Higher Education. 7th ed. University Continuing Education Association, April 2002.

Loyola College Software Engineering Website
http://graduate.loyola.edu/graduate/academics/csse/se.asp

Maryland Department of Business and Economic Development, "BRAC Activities Affecting Aberdeen Proving Ground, Andrews Air Force Base, Bethesda Naval Hospital, and Fort Meade and in the State of Maryland," March 2006.

Maryland Higher Education Commission, "Trends in Degrees Awarded at Maryland Higher Education Institutions," March 2005.

Maryland Higher Education Commission, "Trends in Enrollment by Program Maryland Higher Education Institutions", April 2005.

McGowan, Phillip. "Differing outlooks on military realignment." *Baltimore Sun,* January 25, 2006.

Mittuch, Eugene W. "Averting a Pending Department of Defense Civilian Personnel Crisis: The Need for a Corporate Recruiting Strategy." May 2002. Online at: http://www.stormingmedia.us/89/8946/A894604.html

Occupation Information Network, O*Net Online http://online.onetcenter.org/

Pond, W. K. *Lifelong Learning–The Changing Face of Higher Education*. eLearning Summit, 2003. La Quinta Resort, California.

"Protecting Maryland's Competitive Edge," An Action Summit Hosted by the University of Maryland.

United States Office of Personnel Management Operating Manual.
http://www.opm.gov/qualifications/

University of Maryland-College Park Systems Engineering Website
http://www.isr.umd.edu/ISR/education/MSSE/

University of Maryland University College, Master of Software Engineering, website
http://www.umuc.edu/grad/mswe/mswe_home.shtml

Walter Reed Army Medical Center Website http://www.wramc.amedd.army.mil/

"Western Kentucky looks to meet needs of realigned Army base." A.P. State and Local Wire, April 9, 2006. Online at http://web.lexis-nexis.com/universe

What Schools for the Future? OECD Centre for Education Research and Innovation, 2001.

7.0 Additional Tables

Figure A: Expanded Series-Specific Education Requirements: Administrative & Management Group (APG)

Series Number	Series Name	% of DOD Civilian Positions	Degree Required for Entry-Level Grade (GS-5)	Specified Field of Study
18	Safety and Occupational Health Management Series	0.1%	Bachelor's Degree	***1.*** safety or ***2.*** occupational health fields (safety, occupational health, industrial hygiene)
391	Telecommunications Series	1.1%	Bachelor's Degree OR communications/electronics or automatic data processing training in technical institutes or business schools above high school level OR advanced instruction at Armed Forces schools	***1.*** electrical or electronic engineering, ***2.*** mathematics, ***3.*** physics, ***4.*** public utilities, ***5.*** statistics, ***6.*** computer science, ***7.*** telecommunications management, ***8.*** information systems management, ***9.*** business administration, ***10.*** industrial management
505	Financial Management Series	0.0%	Bachelor's Degree	***1.*** accounting or ***2.*** business administration, or ***3.*** finance or ***4.*** public administration
1020	Illustrating Series	0.0%	Bachelor's Degree	***1.*** illustrative design, or ***2.*** commercial art or ***3.*** fine arts or ***4.*** industrial design or ***5.*** architecture or ***6.*** drafting or interior design
1083	Technical Writing and Editing Series	1.2%	Bachelor's Degree OR For technical manuals and specifications writers or editors, the equivalent of 15 semesters may have been gained through vocational or educational training above the high school level at a public, private or Armed Forces School	***1.*** appropriate scientific, technical or social science field(s)
1670	Equipment Specialist Series	0.7%	Bachelor's Degree	***1.*** any field
1910	Quality Assurance Series	0.1%	Bachelor's Degree	***1.*** quality assurance or ***2.*** statistics or ***3.*** mathematics or ***4.*** production management or

				5. industrial management or ***6.*** computer science or ***7.*** engineering or ***8.*** engineering technology or ***9.*** physical sciences, or ***10.*** textiles, or related
2130	Traffic Management Series	0.1%	Bachelor's Degree	***1.*** accounting or ***2.*** business administration or ***3.*** business or commercial law or ***4.*** commerce or ***5.*** economics or ***6.*** engineering or ***7.*** finance or ***8.*** industrial management or ***9.*** statistics or ***10.*** traffic management or ***11.*** transportation or ***12.*** motor mechanics, or other fields related to the position.
2210	Information Technology Management Series	1.0%	Bachelor's Degree	4. any field

Figure B: DISA Educational Partnerships - Information Assurance Scholarship Program Partnership Institutions.

1. Air Force Institute of Technology
2. Auburn University
3. Boston University
4. California State Polytechnic University, Pomona
5. Capitol College
6. Carnegie Mellon University
7. Dakota State University
8. DePaul University
9. Drexel University
10. East Carolina University
11. East Stroudsburg University
12. Eastern Michigan University
13. Florida State University
14. George Mason University
15. George Washington University
16. Georgia Institute of Technology
17. Idaho State University
18. Iowa State University
19. Information Resources Management College (NDU)
20. Iowa State University
21. James Madison University
22. Johns Hopkins University
23. Kennesaw State University
24. Mississippi State University
25. Naval Postgraduate School
26. New Jersey Institute of Technology
27. New Mexico Tech
28. North Carolina State University
29. Northeastern University
30. Norwich University
31. Nova Southeastern University
32. Oklahoma State University
33. Pace University
34. Pennsylvania State University
35. Polytechnic University
36. Portland State University
37. Purdue University
38. Stanford University
39. State University of New York, Buffalo
40. State University of New York, Stony Brook
41. Stevens Institute of Technology
42. Syracuse University
43. Texas A&M University
44. Towson University
45. University of California, Davis
46. University of Dallas
47. University of Detroit, Mercy
48. University of Idaho
49. University of Illinois, Urbana-Champaign
50. University of Maryland, Baltimore County
51. University of Maryland University College
52. University of Massachusetts, Amherst
53. University of Nebraska, Omaha
54. University of North Carolina, Charlotte
55. University of North Texas
56. University of Pennsylvania
57. University of Pittsburgh
58. University of Texas, Dallas
59. University of Texas, San Antonio
60. University of Tulsa
61. University of Virginia
62. University of Washington
63. Virginia Polytechnic Institute and State University
64. Walsh College
65. West Chester University of Pennsylvania

Figure C: Walter Reed AMC Clinical Departments

- 3-D Medical Applications Center
- Allergy/Immunology/Asthma/Immunization
- Army Audiology & Speech Center
- Army Substance Abuse Program
- Dental Clinic
- Department of Clinical Investigation
- Deployment Health Clinical Center
- Infection Control Service
- Managed Care Division
- Medicine
  - Cardiology
  - Dermatology
  - Endocrinology
  - Gastroenterology
  - General Medicine
  - Hematology/Oncology
  - Infectious Disease
  - Nephrology
  - Pulmonary & Critical Care Medicine
  - Sleep Disorders Center
  - Rheumatology
  - Outpatient IV Infusions
  - Faculty Development
- Ministry and Pastoral Care
- Neurology
- Nuclear Medicine
- Nursing
  - Ambulatory Nursing
  - Critical Care Nursing
  - Medical, Psychiatric Nursing
  - Pediatric Nursing
  - Research
  - Surgery and Neuroscience
  - Nursing
- Nutrition
- Obstetrics and Gynecology
- Optometry
- Orthopedics and Rehabilitation
  - Orthopedic Surgery Service
  - Occupational Therapy Service
  - Physical Therapy Service
  - Physical Medicine and Rehabilitation
- Pediatrics
  - Adolescent Medicine
  - Pediatric Cardiology
  - Development Pediatrics
  - Pediatric Endocrinology
  - Exceptional Family Member Program
  - Pediatric Gastroenterology
  - Clinical Genetics
  - Pediatric Hematology Oncology
  - Pediatric Infectious Diseases
  - Pediatric Inpatient Service
  - Child Life Program
  - Pediatric Nephrology
  - Pediatric Critical Care Services
  - Child Neurology
  - Pediatric Outpatient Clinic
  - Pediatric Pulmonary
  - Child Psychiatry
- Pharmacy
- Preventive Medicine
  - Environmental Health Section
  - Health Physics Office
  - Community Health Nursing
  - Industrial Hygiene Section
  - Occupational Health Clinic
- Psychiatry
- Psychology
- Radiology
- Research
  - Clinical Investigation
  - Coronary Calcium Project
  - Nursing Research
  - Telemedicine
- Social Work
- Surgery
  - Anesthesiology
  - Army Audiology and Speech Center
  - General Surgery
  - Oral and Maxillofacial Surgery
  - Colon and Rectal Surgery
  - Neurosurgery
  - Ophthalmology

▪ Orthotics & Prosthetics Services Pathology and Laboratory Services Patient Appointment System Patient Representative Office	▪ Refractive Eye Center ▪ Otolaryngology ▪ Ear, Nose and Throat Surgery ▪ Head and Neck Surgery ▪ Facial Plastic and Reconstructive Surgery ▪ Plastic and Reconstructive Surgery ▪ Cardiothoracic Surgery ▪ Organ Transplant ▪ Urology ▪ Peripheral Vascular Surgery Telemedicine Directorate Wellness Service