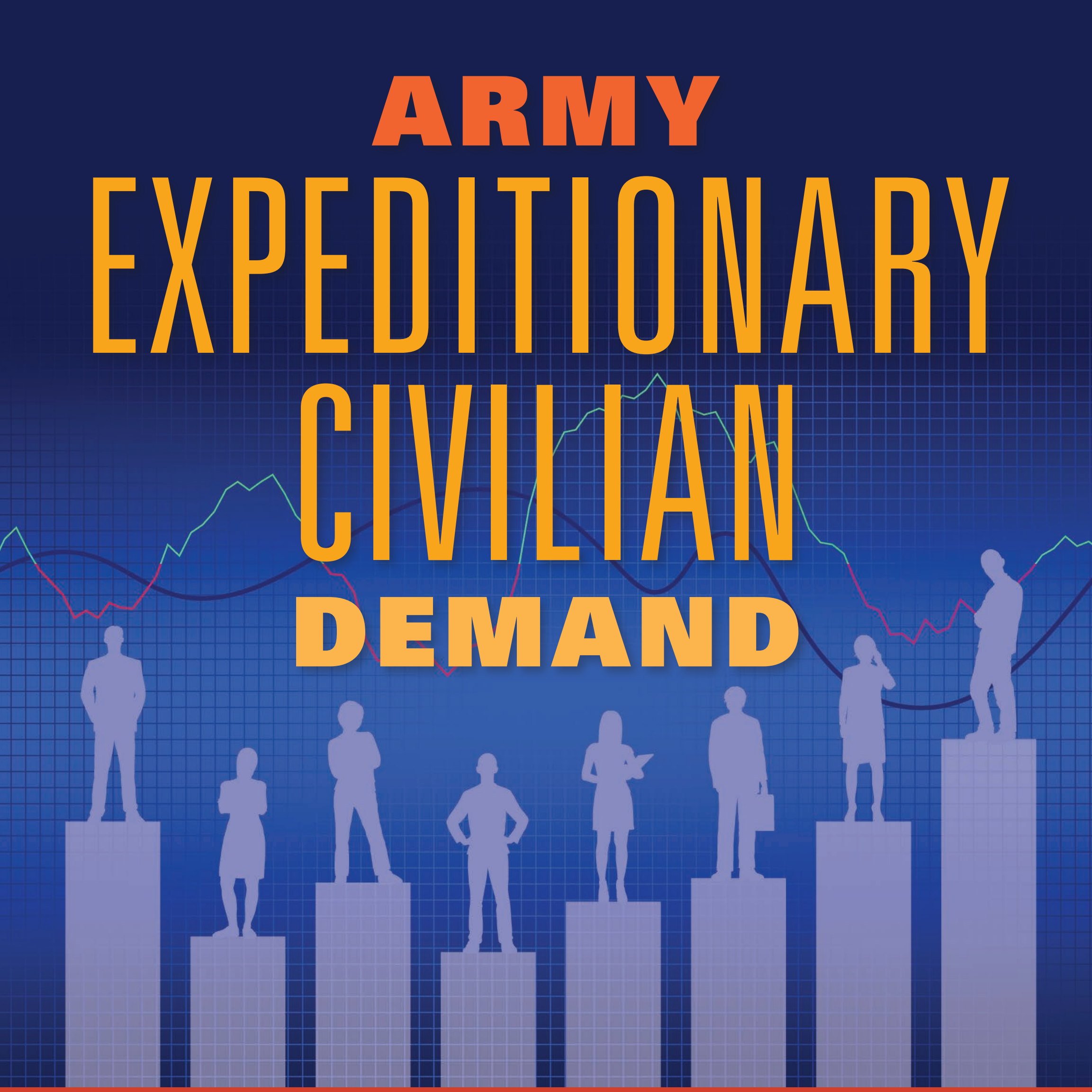
ARMY EXPEDITIONARY CIVILIAN DEMAND



FORECASTING FUTURE REQUIREMENTS FOR CIVILIAN DEPLOYMENTS

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Preface

This report documents research and analysis conducted as part of the project *Assessing Army Requirements for Expeditionary Civilians in Contingency Operations*, sponsored by the U.S. Army's Office of the Assistant G-1 for Civilian Personnel. The purpose of the project was to develop a method for forecasting Army requirements for expeditionary civilians to deploy to contingency operations, apply this method to assess near-term demand in operational scenarios, and identify policies or processes that would enable the more efficient and effective management of these personnel.

This research was conducted within RAND Arroyo Center's Personnel, Training, and Health Program. RAND Arroyo Center, part of the RAND Corporation, is a federally funded research and development center (FFRDC) sponsored by the United States Army.

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Summary

Although the U.S. Department of Defense (DoD) has long turned to its civilian employees to support overseas contingency operations and emergencies, the use of this workforce has been subject to various revisions in policy over the years. DoD expeditionary civilians (DoD-ECs) fill roles that would otherwise be performed by service members or U.S. government contractor employees, reducing both the burden on service members and DoD's reliance on contractors. However, maintaining sufficient numbers of civilians who are prepared to deploy has remained a challenge for DoD.

In 2017, DoD issued Directive-Type Memorandum (DTM) 17-004, which included expeditionary civilians in the Global Force Management (GFM) process, an initiative to ensure that organizations across DoD share information about force structure and manpower availability to facilitate planning and timely sourcing of personnel.[1] The policy, which was expected to take effect in fiscal year (FY) 2019, directs DoD force providers to develop a pool of expeditionary civilian employees capable of meeting the requirements of a projected future "demand signal." This demand signal is to be developed by the Chairman of the Joint Chiefs of Staff using data on civilian requirements in past operations. Both the force pool and demand signal are to be reviewed annually as part of the GFM process to ensure that expeditionary civilian availability aligns with anticipated requirements.

[1] DTM 17-004, *Department of Defense Expeditionary Civilian Workforce*, January 25, 2017, incorporating change 1, January 4, 2018.

As the largest provider of civilians for DoD-wide operations, the U.S. Army has established organizations and processes to fulfill its staffing mix obligations, but there is some question of whether these organizations and processes have been efficient and effective and whether the Army's current approach to providing civilian personnel will be appropriate for future conflicts. To answer these questions, it is important to examine DoD's targets for civilian staffing, how these needs may change, and what policies and procedures should be in place to ensure that the Army can continue to meet these demands.

Study Approach

The goal of this study was to support the Army and—by extension—other DoD civilian force providers in aligning their available expeditionary civilian workforces with the future demand for this capability and to help them prepare to deploy civilians to a range of future scenarios. RAND Arroyo Center was asked to create a demand model for expeditionary civilians that would take into account the bulk of historical data available on civilian deployments. Although this model was never intended to be the *only* suitable means of modeling expeditionary civilian demand, this research aims to make a substantial contribution in the form of rigorous analysis applied to calculations of demand. Our study was designed to answer three interrelated research questions:

1. What is a viable method for modeling demand for Army civilians, given the range of operational contexts that this workforce is called upon to support?
2. According to this method, what is the demand for Army expeditionary civilian capabilities across potential future operational scenarios?
3. Given the demand signal for Army expeditionary civilian personnel, what policies or processes are necessary to more efficiently and effectively manage this workforce?

In the process of identifying an appropriate methodology and in modeling demand for an expeditionary civilian capability, we explored three additional questions: Where, and in what numbers, have Army expeditionary civilians deployed? What methods has the Army used, historically, to model or project demand requirements for expeditionary civilian capabilities? And in what potential future operational scenarios are Army expeditionary civilians likely to deploy?

It is critical at the outset to note that this research was limited in several respects and that the model we developed and the demand figures reported here should be considered in light of such limitations. While this study did attempt to break new ground by considering a comprehensive range of data inputs relevant to expeditionary civilian demand, our analysis was constrained to available personnel data sets covering the period 2009–2016. These data sets omitted operational contractors as a potential source of manpower for required positions and contained information on "filled demand" rather than initial requirements (or "raw demand") for each position in question. For these reasons, our model is necessarily limited to operational scenarios resembling active operations worldwide during the 2009–2016 time frame, omits considerations of potential contractor substitution for civilian positions, and specifies a level of demand that is potentially at the lower bound of actual future raw demand requirements. This lack of data on numbers of deployed forces across various scenarios therefore injects some uncertainty into the statistical results presented throughout this report. However, our modeling represents the most extensive effort to date to calculate demand for expeditionary civilian personnel in modern conflicts and should be viewed as a point of departure for further analyses as more data are collected over time.

Policies Guiding the Use of Expeditionary Civilians

DoD Directive (DoDD) 1400.31, *DoD Civilian Work Force Contingency and Emergency Planning and Execution*, and DoD Instruction (DoDI) 1400.32, *DoD Civilian Workforce Contingency and Emergency Planning Guidelines and Procedures*—both promulgated in 1995—

provide broad guidance on the deployment and mobilization of civilians. These two policies define the DoD civilian workforce as civilians hired directly or indirectly, permanently or temporarily, by DoD and exclude U.S. government contractor employees from this definition. DoDD 1400.31 further specifies that DoD civilians will be treated in the same manner as military personnel with regard to processing and support. DoDI 1400.32 outlines preparedness planning and procedures for civilian expeditionary deployment, stating that

> plans and procedures for the civilian work force during contingencies and emergencies shall be based on sound assessments of the number of employees, skills, experience and geographical dispersion required to perform essential operational missions.[2]

This earlier guidance is echoed in the demand signal described in DTM 17-004.

DoDD 1404.10, *Civilian Expeditionary Workforce*, was issued as part of a statutory requirement in the National Defense Authorization Act for FY 2007 with the goal of creating a standing cadre of 20,000–30,000 civilians who were prepared to mobilize quickly to fill high-demand roles for which there was a shortage of qualified uniformed personnel. The program was to serve as the primary source of civilian manpower across DoD organizations.[3] However, over time, it shifted to a more reactive model, responding to requirements for expeditionary civilians as they arose.

DTM 17-004 reflected this shift, effectively canceling DoDD 1404.10 and laying out a new framework for the deployment of expeditionary civilians. Under this policy, the demand signal and force pool (the number and mix of civilians required) establish the baseline for planning and are supposed to draw on historical demand, projected requirements, and available civilian capabilities across DoD force providers.

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[2] DoDI 1400.32, *DoD Civilian Workforce Contingency and Emergency Planning Guidelines and Procedures*, April 24, 1995, p. 8.

[3] DoDD 1404.10, *Civilian Expeditionary Workforce*, January 23, 2009.

However, it is unclear whether the new force pool system will meet future demand for expeditionary civilians and improve the sourcing process and fill rates for these positions (which were estimated at less than 70 percent for ongoing security operations in Afghanistan as of June 2018).[4] As part of this research, we conducted interviews with 71 representatives from 21 DoD organizations and offices, including the Office of the Secretary of Defense, the military services, the Joint Staff, and several geographic combatant and service component commands. In interviews with individuals involved in calculating the demand signal and creating force pool requirements, we learned that the actual force pool numbers reflect a compromise among the respective defense components responsible for sourcing these requirements, rather than the actual historical or modeled demand.

Current Expeditionary Civilian Deployment Processes Across DoD

Currently, civilians deploy in support of contingency operations in one of two ways: through agency-programmed requirements or through what was known as the Civilian Expeditionary Workforce program in DoDD 1404.10, now the DoD-EC program. Army agencies that routinely deploy civilians as part of their central missions, such as the Center for Army Analysis, the Army Audit Agency, and the U.S. Army Corps of Engineers, have long relied on programmed requirements to mobilize expeditionary civilians.

Early in our study, we attempted to identify the approaches that various organizations used to plan for requirements for future expeditionary civilian deployments. However, with the exception of a "demand signal" for expeditionary civilians devised by the International/Expeditionary Support (IES) Office (formerly the CEW Program Office) within the Office of the Deputy Assistant Secretary of Defense for Civilian Personnel Policy, we learned that none of the

4 James N. Mattis, Secretary of Defense, "Immediate Need to Increase Department of Defense Expeditionary Civilian Fills in Afghanistan," memorandum, June 29, 2018.

organizations interviewed employed a rigorous approach to forecast demand.[5] To the extent that these various DoD entities planned ahead for civilian deployments at all, they used ad hoc methods to predict future demand for expeditionary civilians.

Calculating Historical Demand for Expeditionary Civilians

To develop a model for future demand for Army expeditionary civilian capabilities, we needed to assemble our own estimates of historical demand based on documentation collected from force providers and individual-level deployment data from the Defense Manpower Data Center (DMDC). We used the DMDC data to characterize historical deployments by both civilians and uniformed personnel across DoD. Because civilian deployments are not explicitly recorded as such, we used several variables to deduce deployments, including danger pay, foreign differential pay, and location, as well as to determine where and for how long an individual was deployed. DMDC's Civilian Pay File provided information on foreign differential and danger pay, as well as dates and the location initiating the payments.

To estimate how many civilians are likely to be needed in a given operational scenario, we collected data on military deployments, as well as three regional parameters associated with the country in which an operation had taken place: economic austerity, regime type, and fragility, and state strength. These regional characteristics are useful proxies for identifying differences in country-level characteristics and can be used to make robust predictions about future demand for expedition-

[5] The IES Office–created demand signal was based on combatant command (CCMD) requirements from Operation Iraqi Freedom (OIF), Operation Enduring Freedom (OEF), and humanitarian assistance/disaster relief (HA/DR) missions, as delineated in eight data sources spanning the period 2008–2014. Additionally, the IES Office relied on deployable civilian capability requirements to support future contingency and HA/DR operations, as identified by U.S. Southern Command, U.S. Northern Command, U.S. Africa Command, and U.S. Pacific Command (USPACOM) as part of a strategic review directed by the Deputy Assistant Secretary of Defense for Program Support in 2013. See Office of the Assistant Secretary of Defense for Logistics and Materiel Readiness, "Future Combatant Command Requirements for Deployable DoD Civilians," memorandum, April 11, 2013.

ary civilians. We chose these categories because they capture many of the characteristics that military planners consider. They also roughly align with the U.S. military's framework for assessing an operational environment.[6]

We used World Bank data to assess *austerity*, measured in terms of real gross domestic product per capita. We assessed regime type using a *polity* score developed by the Center for Systemic Peace that identifies a given government's status on the autocracy–democracy spectrum. Specifically, we grouped polity scores into three bins: democracy, transitional, and autocracy. Finally, we assessed *fragility* based on Fragile States Index data, which measure how stable or fragile a country is according to a range of political, social, economic, and cohesion characteristics. We identified country status as fragile, warning, or stable. These data allowed us to identify scenarios in which civilian expertise would likely be needed in future operations under a range of assumptions about other variables.

Table S.1 summarizes the operations that made up our historical data profiles. For the purposes of our study, we characterized each historical operation in one of the following ways: counterinsurgency (COIN), counterterrorism, stability/security, or HA/DR.

The majority of Army expeditionary civilian deployments between 2009 and 2016 were to the U.S. Central Command area of responsibility. These deployments ranged from one month to several years, with a median deployment length of six months, as shown in Figure S.1.

Between 2009 and 2016, the Army filled between 60 and 70 percent of DoD-wide civilian deployments, with administrators, mechanical and electrical equipment personnel, and logisticians being the

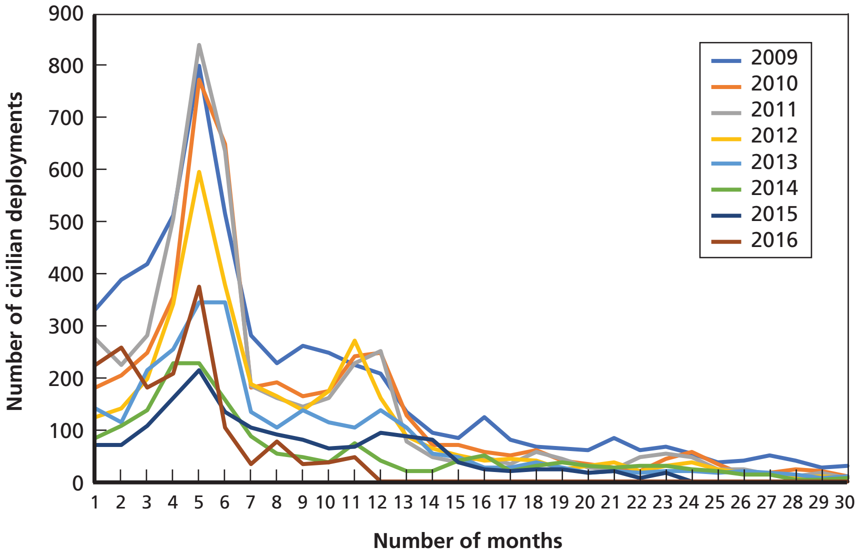
[6] Although other variables may also affect demand, including terrain and population (often a serious consideration in military planning), we did not explicitly include them for several reasons. First, this is a macro-level analysis performed at the country level and, depending on the country, both terrain and population may vary drastically among regions and cities. Thus, although the four country-related parameters are truly captured at the country level, such variables as terrain and population would likely need to be captured at a more granular level (e.g., region or city), which would require more-specific assumptions regarding the locations of future scenarios. Second, we assumed that terrain and population would directly affect the number of military personnel deployed to a given operation. Thus, our use of military deployments as inputs to the model indirectly captured the effects of such parameters.

Table S.1
Historical Missions and Characteristics

Operation Type	Historical Operation	Countries Involved (core countries in italics)	Dates Examined
COIN	OEF-Afghanistan	*Afghanistan*, Egypt, Kyrgyzstan, Oman, Pakistan, Tajikistan, Uzbekistan, Yemen	2009–2014
COIN	OIF	Bahrain, *Iraq*, Israel, Jordan, Kuwait, Qatar, Saudi Arabia, Turkey, United Arab Emirates (UAE)	2009–2010
Counterterrorism	OEF–Horn of Africa (HOA)/Combined Joint Task Force (CJTF)–HOA	*Djibouti*, Ethiopia, Kenya, Somalia, Uganda	2009–2016
Counterterrorism	OEF-Philippines	*Philippines*	2009–2015
Counterterrorism	Operation Freedom's Sentinel	*Afghanistan*, Egypt, Kyrgyzstan, Oman, Pakistan, Tajikistan, Uzbekistan, Yemen	2015–2016
Counterterrorism	Operation Inherent Resolve	Bahrain, *Iraq*, Israel, Jordan, Kuwait, Qatar, Saudi Arabia, Turkey, UAE	2015–2016
Counterterrorism	Operation New Dawn	Bahrain, *Iraq*, Israel, Jordan, Kuwait, Qatar, Saudi Arabia, Turkey, UAE	2010–2016
HA/DR	Operation Tomodachi	*Japan*	2011
HA/DR	Operation Unified Response	*Haiti*	2010
HA/DR	Operation United Assistance	Guinea, *Liberia*, Nigeria, Senegal, Sierra Leone	2014
Stability/security	Counternarcotics	*Colombia*, Honduras, Mexico	2009–2016
Stability/security	Serbia/Kosovo peacekeeping	*Kosovo*, *Serbia*	2009–2016
Stability/security	USPACOM stability and preparation	Marshall Islands, *South Korea*	2009–2016

NOTE: The dates listed in the table reflect dates of operational activity for which data were available.

Figure S.1
Deployment Length for Army Expeditionary Civilians, 2009–2016



SOURCE: DMDC data, September 2017.

occupations in highest demand. Army intelligence and data-processing professionals have also seen high levels of demand for specific types of missions and in specific theaters. Civilians with the General Schedule (GS) pay grades GS-11, GS-12, and GS-13 deployed in the largest numbers during this period, indicating that most were midlevel, skilled professionals.

Calculating Demand for Expeditionary Civilians in Future Operational Scenarios

We developed two models to forecast future demand for expeditionary civilian deployments. The first allowed us to determine the likelihood of civilian deployments to an operation. If a given scenario was likely to require civilian deployments, we employed the second model to predict the number of such deployments.

A predictive model is only as strong as the predictor variables identified and utilized by the model. As mentioned, we predicted civilian deployments under a range of notional future scenarios by identifying relationships between civilian deployments and other features of historical campaigns, including military deployments and location-specific characteristics.

We ultimately chose to use a statistical/machine-learning approach to model the available data. This allowed us to automatically identify a subset of predictors and interaction terms in a statistical model that yielded the best predictions. A standard regression model requires an analyst to select predictor variables, which is a time-consuming and complex task when there are many predictors and possible interaction terms. The goal of machine learning is to reduce the need for human intervention and to allow the model to automatically discover how best to process a large number of possible predictor variables. Thus, we were able to use information on military deployments, in addition to other scenario characteristics, to directly forecast expeditionary civilian deployments in total and by occupation.

We created 11 notional future scenarios across the four types of operations covered in our historical analysis (COIN, counterterrorism, HA/DR, and stability/security), as well as major combat operations (MCOs), using them to forecast future demand for expeditionary civilians. Note that operations classified as MCOs in our future scenarios align most closely with COIN operations in our historical data. In addition, most of the counterterrorism and stability/security operations in our historical data carried forward into this notional future.

Using our two models, we described civilian deployments (in person-months per quarter) as a function of our input variables: operational characteristics, country characteristics, and military deployment data obtained through our interviews and from DMDC.[7] Because we developed and tested our models using historical data, it

7 We opted to predict civilian deployments in person-months per quarter for a variety of reasons. First, the analysis used civilian data reported on either a biweekly or quarterly basis. Second, there were fewer cases of zero civilian deployments at the quarterly level than at the monthly level. Large numbers of zero value observations can cause difficulties in modeling, as discussed in Appendix B. Finally, we did not consider a time frame longer than one quar-

was possible to compare our predicted civilian deployments to historical data to identify the predictor variables that provided the best predictions.

Table S.2 shows the range of notional future scenarios that we modeled, noting the countries envisioned to be involved in each, as well as the point estimate and range estimate for expeditionary civilian demand in each scenario.[8]

The projected demand for civilian deployments in Table S.2 can lead to estimates of the size of a cadre of deployable civilians that should be maintained. Our model also revealed that, across all operation types and scenarios, the occupations that accounted for the highest number of deployments in our 12 historical scenarios also accounted for the highest number of deployments in our future scenarios.

Conclusions

As we began this study, we learned that force providers were not collecting data on civilian deployments in a standardized, systematic fashion, nor did they use sophisticated approaches to model demand for expeditionary civilians. Thus, the demand signal outlined in DTM 17-004 relied on a limited subset of data. We also learned that the force pool numbers, which should reflect demand signal calculations, were the result of a compromise among the various DoD components. These shortcomings speak to the need for a new, more comprehensive, and more accurate method of modeling demand for expeditionary civilian capabilities over time.

As the largest force provider for DoD-wide civilian deployments, the Army stands to benefit the most from a more robust process for

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ter because it was possible that an individual's characteristics (e.g., pay grade, occupation) varied across consecutive quarterly data reports.

[8] As noted earlier, model predictions are only as reliable as the input data used to generate them. The resulting civilian deployment estimates shown in Table S.2 are based on the best available unclassified data for the location-specific parameters and possible military deployment levels. The results may have differed if we had access to more-accurate data (including, e.g., countries involved or classified estimates of military deployments).

Table S.2
Future Operational Scenario Profiles and Data Inputs

Operation Type	Notional Future Scenario	Countries (core countries in italics)	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
COIN	"Operation Redline" (large-scale war with Russia)	Belgium, Denmark, *Estonia*, Finland, Germany, Italy, *Latvia*, *Lithuania*, Poland	288	(227, 343)
Counterterrorism	Counter–Islamic State of Iraq and the Levant	Bahrain, *Iraq*, Israel, Jordan, Kuwait, Qatar, Saudi Arabia, Turkey	1,243	(820, 2,065)
Counterterrorism	Counter-Taliban	*Afghanistan*, Egypt, Kyrgyzstan, Oman, Pakistan, Tajikistan, Uzbekistan, Yemen	1,137	(492, 1,980)
Counterterrorism	OEF-HOA/ CJTF-HOA	Djibouti, Ethiopia, Kenya, *Somalia*, Uganda	31	(15, 45)
HA/DR	"Operation Castle" (swine flu in Southeast Asia)	*Cambodia*, Thailand	3	(1, 6)
HA/DR	"Operation Elemental" (large earthquake in El Salvador)	*El Salvador*	0	(0, 0)
HA/DR	"Operation Interval" (large tsunami in India)	*India*	0	(0, 0)
MCO	"Operation Indigo" (war with Iran)	*Iran*, Iraq, Kuwait, Oman, UAE	23,133	(16,026, 33,978)
MCO	"Operation Neptune Knight" (war with North Korea)	Japan, Marshall Islands, *North Korea*, South Korea	11,917	(8,166, 17,714)
Stability/security	Counternarcotics	*Colombia*, *Honduras*, *Mexico*	107	(53, 128)
Stability/security	USPACOM stability and preparation	*Marshall Islands*, *South Korea*	2,624	(1,235, 2,958)

forecasting future demand for its civilian workforce. After assessing the number and type of potential data inputs relevant to expeditionary civilian demand and the range of potential operational scenarios to which civilians may be called to deploy, we determined that an appropriate method for modeling demand for Army expeditionary civilians was a multistage statistical model capable of pulling in numerous inputs specific to a particular deployment scenario.

Several specific findings concerning levels of demand for expeditionary civilians emerged from our model development. Our fitted regression model revealed which variables were most important in predicting civilian deployments: the type of operation and the differences between core and ancillary countries. For example, COIN operations in core countries had the highest levels of demand for civilian deployments. We also observed that high levels of military deployments coincided with high levels of civilian deployments across operation types. The most striking example was demand for expeditionary civilians in stability/security operations when military deployments in noncivilian occupations were high. Our model showed that, as military deployments in noncivilian occupations increased, the expected number of civilian deployments in stability/security operations also increased—to a greater extent than in other operations. Not surprisingly, we observed that civilian deployments increased, in general, when military deployments increased.

We also found that civilian deployments were inversely related to countries' fragility and polity categorizations. That is, countries categorized as fragile and having transitional governments tended to demand more civilian deployments than other locations. Stable democracies had the fewest civilian deployments in the historical data.

Using the predictions from our model, we found high demand for specific occupations in the future scenarios: Administrators and logisticians were in high demand in almost all scenarios, intelligence was in especially high demand in future counternarcotics scenarios and in OEF-HOA/CJTF-HOA, and data processing was in high demand in the USPACOM stability and preparation scenario. Administrators, mechanical and electrical equipment personnel, and logisticians were the occupations in highest demand across all Army civilian deployments between 2009 and 2016. This speaks to a potentially high demand for these occupational specialties in future scenarios as well.

Recommendations

We offer two general recommendations to help the Army more efficiently and effectively manage its expeditionary civilian capability.

Improve Data Collection and Demand Signal Modeling to Better Understand Expeditionary Civilian Demand Moving Forward

We recommend that all Army components seek to more systematically collect and maintain data from across the Army and other DoD organizations on the location, duration, and operational and occupational characteristics of civilian deployments. Moreover, data on the numbers of expeditionary civilians *required* by various commands for particular billets should be systematically collected and reported in a manner distinct from data on the numbers of expeditionary civilian billets actually *filled*. These data can then be used as inputs into rigorous models of Army expeditionary civilian demand, such as the one described in this report. Demand for expeditionary civilians should be modeled on an annual or semiannual basis to help decisionmakers better understand and plan for the impact of such demands on the total force.

We also recommend that, once such modeling practices are in place, the Office of the Secretary of Defense (OSD) and the defense components and services consider revising the DTM-17-004 force pool numbers to more accurately reflect demand based on such modeling. In the near term, OSD and the various defense components should consider revising force pool numbers based on the estimates presented in this report, with the understanding that such numbers may represent a lower bound on required numbers of expeditionary civilians across potential future operational scenarios and occupational specialties.

Although doing so was not within the scope of this analysis, future modeling efforts may find it fruitful to further perform detailed historical case-study analyses related to the various scenarios outlined here or to perform additional variable testing on the full range of hypothetical futures.

Implement a Strategic Plan to Fill Expeditionary Civilian Skill Sets That Are in High Demand

Particular civilian occupations tend to be in high demand for expeditionary roles, both in general and across specific types of operations. Civilian administrators, logisticians, intelligence personnel, and data processing specialists face particularly high demand. To ensure that such high-demand expeditionary positions do not drain overall Army civilian manpower in these occupations, Army manpower officials should proactively consider how and to what extent to substitute high-demand skill sets across different occupational codes. This should include deliberation across the Army and other defense components on the methods and process of backfilling high-demand expeditionary civilian positions. Officials should also consider incentivizing recruitment for these positions, such as with higher pay, recognition, awards, or options for career promotion.

Finally, to ensure that sufficient numbers of civilians with the requisite skill sets are deployable, the Army should work with OSD to standardize the definition and coding of emergency-essential positions and to widely educate the force about this definition.

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Abbreviations

AOR	area of responsibility
CA	combat arms
CCMD	combatant command
CEW	Civilian Expeditionary Workforce
CJTF	combined joint task force
COIN	counterinsurgency
CS	combat support
CSS	combat service support
CTS	Contingency Tracking System
DEERS	Defense Enrollment Eligibility System
DMDC	Defense Manpower Data Center
DoD	U.S. Department of Defense
DoDD	U.S. Department of Defense directive
DoD-EC	U.S. Department of Defense expeditionary civilian
DoDI	U.S. Department of Defense instruction
DTM	U.S. Department of Defense directive-type memorandum
E-E	emergency-essential
FM	Army field manual

FY	fiscal year
GDP	gross domestic product
GFM	Global Force Management
GS	General Schedule
HA/DR	humanitarian assistance/disaster response
HOA	Horn of Africa
IES	International/Expeditionary Support
ISIL	Islamic State in Iraq and the Levant
LASSO	least absolute shrinkage and selection operator
MCO	major combat operation
MOS	military occupational specialty
NATO	North Atlantic Treaty Organization
OEF	Operation Enduring Freedom
OEF-A	Operation Enduring Freedom–Afghanistan
OIF	Operation Iraqi Freedom
OSD	Office of the Secretary of Defense
PMESII	political, military, economic, social, information, and infrastructure
PMESII-PT	political, military, economic, social, information, infrastructure, physical environment, and time
UAE	United Arab Emirates
USAFRICOM	U.S. Africa Command
USCENTCOM	U.S. Central Command
USEUCOM	U.S. European Command
USFOR-A	U.S. Forces–Afghanistan
USPACOM	U.S. Pacific Command
USSOUTHCOM	U.S. Southern Command

CHAPTER ONE

Introduction

The U.S. Department of Defense (DoD) has long turned to its civilian workforce to support overseas contingency operations and emergencies, but the use of expeditionary civilians has changed significantly over time and has been subject to various revisions in policy.[1] The most recent significant changes occurred during Operation Iraqi Freedom (OIF) and Operation Enduring Freedom in Afghanistan (OEF-A), when DoD civilians were called upon in large numbers to staff provincial reconstruction teams—originally the responsibility of the U.S. Department of State. By 2007, what was intended as a stop-gap measure became one of several long-term approaches to reducing stress on the uniformed military force. This is exemplified in a June 2018 memo from Secretary of Defense James Mattis to the leadership of numerous DoD components citing a DoD expeditionary civilian (DoD-EC) fill rate of less than 70 percent and requesting their immediate support in providing a one-time surge capability of DoD-ECs in Afghanistan.[2]

In 2017, DoD issued a new policy establishing procedures to include expeditionary civilians in the Global Force Management (GFM) process, an initiative to ensure that organizations across DoD share information about force structure and manpower availability to facilitate planning and timely sourcing of personnel to fill expedi-

1 The term *expeditionary civilians* refers to deployable civilian personnel employed by DoD, excluding U.S. government contractor staff. See Chapter Two for an expanded definition and policy discussion of this workforce.

2 James N. Mattis, Secretary of Defense, "Immediate Need to Increase Department of Defense Expeditionary Civilian Fills in Afghanistan," memorandum, June 29, 2018.

tionary civilian positions. The policy, Directive-Type Memorandum (DTM) 17-004, directed that DoD force providers develop a pool of expeditionary civilian employees capable of meeting the requirements of a projected future "demand signal." Both the force pool and demand signal were to be reviewed annually as part of the GFM process to ensure that expeditionary civilian availability aligned with anticipated requirements.[3] The policy change was intended to take effect in fiscal year (FY) 2019.

The demand signal, as described in DTM 17-004, is developed by the Chairman of the Joint Chiefs of Staff using Joint Staff data on civilian requirements averaged over four years (two prior years, the current year, and the next year), plus 10 percent. Responsibility for meeting the requirements of the demand signal is allocated to the combatant commands (CCMDs), the Joint Staff, and civilian force–providing organizations according to the size and composition of their civilian expeditionary workforces. Both the demand signal and the force pool are to be reviewed annually and updated as appropriate.

Yet, we found in interviews with individuals involved in calculating the demand signal and creating force pool requirements that the actual force pool numbers reflect compromise among the respective defense components responsible for sourcing these requirements, rather than actual historical or modeled demand. It is unclear, therefore, whether the force pool system of planning for expeditionary civilian requirements will meet the true demand for such individuals or improve the sourcing process and fill rate for these positions. To prepare to meet DoD's needs for expeditionary civilians in contingency operations, it is important that the organizations providing expeditionary civilians are able to ensure the availability of an adequate number of civilians eligible for deployment with the relevant skill sets. To do so, it is critical that these organizations have some reasonable expectation of the actual demand for various expeditionary civilian skill sets across different contingency scenarios.

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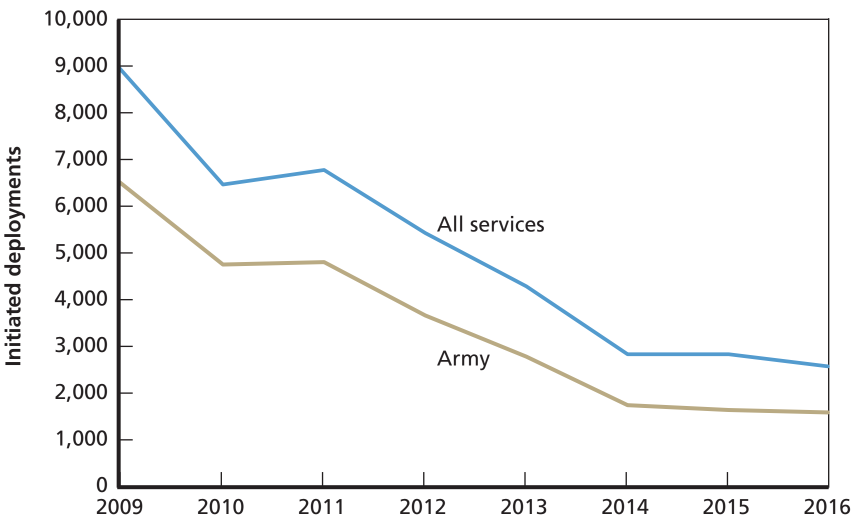
[3] DTM 17-004, *Department of Defense Expeditionary Civilian Workforce*, January 25, 2017, incorporating change 1, January 4, 2018.

Overview of the Expeditionary Civilian Deployment Process

Civilians currently deploy to contingency operations in one of two ways: through agency-programmed requirements or through what used to be known as the Civilian Expeditionary Workforce (CEW) program, now the DoD-EC program. Between 2009 and 2016, the U.S. Army filled the bulk of DoD-wide civilian deployments (averaging 60–70 percent; see Figure 1.1), with administrators, mechanical and electrical equipment personnel, and logisticians being the occupations in highest demand.[4] In addition, Army intelligence professionals have seen high demand, specifically for counternarcotics missions and oper-

Figure 1.1
Expeditionary Civilian Deployments, 2009–2016

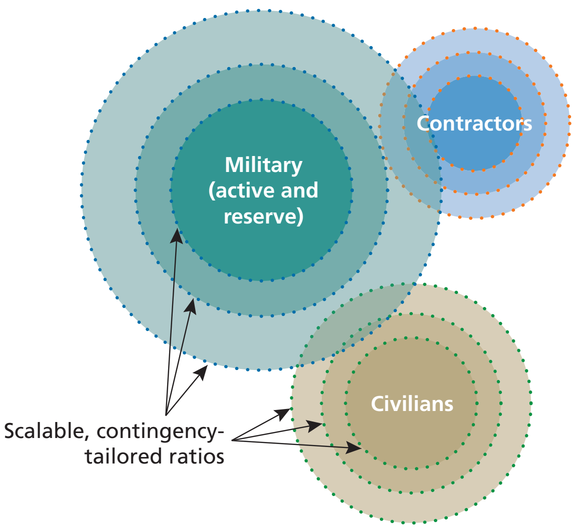


4 Figure 1.1 displays the total number of distinct deployments initiated each year between 2009 and 2016. So, for example, if an individual deployed on three separate occasions (to the same location or to different locations), with each deployment beginning in 2009, then each of these three deployments would be captured in our counts. The figure does *not* show the number of personnel who deployed each year or the total months of civilian deployments each year.

ations in the Horn of Africa, and Army data-processing professionals have been used extensively to support stability and security missions in the U.S. Pacific Command (USPACOM) area of responsibility (AOR).

Over the past four decades, DoD's Total Force concept has come to include civilians as one of its three component workforces, as shown in Figure 1.2.[5] As the largest provider of civilians for DoD-wide operations, the Army has established organizations and processes to fulfill its Total Force staffing mix obligations, but there is some question of whether these organizations and processes have been efficient and effective and whether the Army's current approach to providing civilian personnel will be appropriate for future conflicts. To answer these questions, it is important to examine DoD's targets for civilian staff-

Figure 1.2
The Total Force Concept as a Set of Overlapping, Scalable Workforces Offering Distinct Capabilities



SOURCE: Dunigan et al., 2016, p. 24, Figure 2.1.

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[5] For more on the history and evolution of total force management in DoD, see Molly Dunigan, Susan S. Sohler Everingham, Todd Nichols, Michael Schwille, and Susanne Sondergaard, *Expeditionary Civilians: Creating a Viable Practice of Department of Defense Civilian Deployment*, Santa Monica, Calif.: RAND Corporation, RR-975-OSD, 2016, chapter 2.

ing, how these needs may change, and what policies and procedures should be in place to ensure that the Army can continue to meet these demands. The goal of this study was to support the Army and—by extension—other DoD civilian force providers in aligning their available expeditionary civilian workforces with the future demand for this capability and to help them prepare to deploy civilians to a range of future scenarios.

Study Objectives

At the request of the Office of the Assistant G-1 for Civilian Personnel, RAND Arroyo Center developed a demand model for Army expeditionary civilian capabilities required to deploy to various contingency scenarios in the near future (five years). To do so, we created a demand model for expeditionary civilians that took into account available historical data on civilian deployments. Although the model was never intended to be the *only* suitable means of modeling expeditionary civilian demand, this research makes substantial strides in a field which has thus far been quite limited in terms of any rigorous calculation of demand.

Study Approach

With these objectives, this study was designed to answer three interrelated research questions:

1. What is a viable method for modeling demand for Army civilians, given the range of operational contexts that this workforce is called upon to support?
2. According to this method, what is the demand for Army expeditionary civilian capabilities across potential future operational scenarios?
3. Given the demand signal for Army expeditionary civilian personnel, what policies or processes are necessary to more efficiently and effectively manage this workforce?

In seeking to determine the most appropriate method of modeling demand for this capability, we explored three additional questions: Where, and in what numbers, have Army expeditionary civilians deployed? What methods has the Army used historically to model or project demand requirements for expeditionary civilian capabilities? And in what operational scenarios are Army expeditionary civilians likely to deploy in the future?

We employed a multidisciplinary, multimethod approach to answer these questions. This approach comprised a literature review, semistructured interviews, historical scenario analysis, statistical regressions, and machine-learning methods.

We first reviewed more than 80 relevant statutory, doctrinal, policy, and academic documents on Army civilian deployments, best practices for modeling demand for civilian deployments, and hiring authorities for Army civilians, as well as historical case analyses of civilian deployments. This material provided an understanding of what policies have been established within DoD regarding the use of deployable civilians. It also clarified the challenges that both deployable civilians and the office that routinely deploy them, routinely face. These documents allowed a base assessment of how civilians were supposed to be deployed, the characteristics of the current policies and processes, and the decision factors for the use of civilians.

We then conducted interviews with 71 representatives from 21 DoD organizations and offices, including the Office of the Secretary of Defense, the military services, the Joint Staff, and several geographic combatant and service component commands (as shown in Table 1.1).[6]

Our interviewees fell into three general categories: (1) those who were involved in establishing the CEW program or who currently oversee policy development related to DoD-ECs, (2) those based at

[6] Information from interviews is attributed anonymously throughout this report in compliance with the Federal Policy for the Protection of Human Subjects (also known as the Common Rule). General organizational affiliation is included to give a sense of the interviewee's background and expertise. Although interviewees were asked to respond based on their professional experience, they were, in all cases, speaking for themselves rather than for their organizations in an official capacity.

Table 1.1
Interviewees, by Organization

Organization	Number of Interviews
U.S. Army Pacific	9
U.S. Africa Command (USAFRICOM)	7
U.S. Central Command (USCENTCOM)	7
U.S. Army Africa	6
U.S. Army Europe	5
Joint Staff	4
Office of the Deputy Chief of Staff of the Army, G-2	4
U.S. Army Sustainment Command	4
Office of the Deputy Assistant Secretary of Defense for Civilian Personnel Policy	3
U.S. Army Audit Agency	3
U.S. Forces–Afghanistan	3
USPACOM	3
Other Army offices	7
Other Army geographic combatant and functional commands	6

CCMDs who are responsible for generating requirements for expeditionary civilians for joint operations and those on the Joint Staff who are responsible for approving those requirements, and (3) representatives from Army offices that deploy civilians through non-CEW or DoD-EC mechanisms (i.e., as part of an enduring requirement). We processed information from our interviews using qualitative coding software to identify trends and aggregate statistics. These data subsequently informed the remainder of our study and our overall findings.[7]

[7] Further analysis from the literature review and interview findings can be found in Chapter Two.

We asked interviewees for their perspectives on whether there would likely be an increase or a decrease in demand for expeditionary civilians (or whether they thought demand would remain unchanged). We also asked interviewees to share relevant data on the factors that triggered demand for expeditionary civilian deployments in contingency operations. Finally, we sought to determine the extent to which the organizations deployed civilians as part of programmatic requirements, through the CEW program or as DoD-ECs, or both. Over the course of our interviews, we learned that none of the organizations employed a systematic, data-driven modeling approach to forecast future demand for expeditionary civilians.

To address this shortfall and meet the study's larger objective, the second component of this research involved building a set of predictive models to forecast Army expeditionary civilian deployments in future scenarios. In doing so, we employed both linear regression analysis and machine-learning techniques. As the basis for our modeling effort, we used historical data to clarify the relationship between civilian deployments and operational characteristics, such as the location of the contingency and other factors unique to these historical scenarios. Specifically, we collected information on three parameters of the country locations of these historical operations: austerity, polity, and fragility. These characteristics are useful proxies for identifying differences in country-level characteristics and can be used to make robust predictions about future demand for expeditionary civilians. We chose these categories because they capture many of the characteristics that military planners consider. They also roughly align with the U.S. military's political, military, economic, social, information, and infrastructure (PMESII) framework for assessing an operational environment.

We used World Bank data to assess *austerity*, measured in terms of real gross domestic product (GDP) per capita. We assessed *polity* using a score created by the Center for Systemic Peace that identifies a given government's status on the autocracy–democracy spectrum. Specifically, we grouped polity scores into three bins: democracy, transitional, and autocracy. Finally, we assessed *fragility* based on Fragile States Index data, which measure how stable or fragile a country is according to a number of political, social, and economic and cohesion characteristics. We identified country status as fragile, warning, or stable. These data allowed us to identify scenarios in which civilian expertise would likely be needed in future operations under a range of assumptions about other variables.

We ultimately used two models to forecast future demand for expeditionary civilian deployments.[8] The first allowed us to determine the likelihood of civilian deployments to an operation. If a given scenario was likely to require civilian deployments, we employed a second model to predict the number of such deployments.

It is critical to note that this research was limited in several respects, and the model and demand figures presented here should be considered in light of such limitations. Although this study did attempt to break new ground by considering a comprehensive range of data inputs relevant to expeditionary civilian demand, the research team was nonetheless constrained to available personnel data sets, which were limited to a particular period (2009–2016), omitted operational contractors as a potential source of manpower for required positions, and captured filled demand rather than initial requirements (or raw demand) for each position in question. Because of this, the model necessarily has limited relevance to operational scenarios resembling operations conducted worldwide in the 2009–2016 time frame, does not consider potential contractor substitution for civilian positions,[9] and specifies a level of demand that is potentially at the lower bound

[8] The use of the phrase *civilian deployments* differs from its use in the discussion of Figure 1.1. With respect to Figure 1.1, recall that *civilian deployments* represented the number of distinct deployments that were initiated each year. Here, and throughout the remainder of this report, we use the phrase *civilian deployments* to refer to the total number of months of civilian deployments required during a given period (one quarter of one year, for the purposes of this report). This allows the reader to ascertain the magnitude of civilian deployments without having to make assumptions about deployment length or the number of times an individual deploys.

[9] Our analysis also does not capture cases in which contractors were used completely *in place of* civilians. Assuming similar proportions of contractor-for-civilian substitution in future scenarios, the omission of contractors should not substantially affect the predictions. However, if civilians are favored over contractors in future scenarios, this model will admittedly underestimate the need for civilians.

of actual future raw demand requirements.[10] This lack of data regarding numbers of deployed forces across various scenarios does therefore inject some uncertainty into the statistical results throughout this report. However, our models represent the most extensive effort to date to calculate demand for expeditionary civilian personnel in modern conflicts and should be viewed as a point of departure for further analyses as more data on total force deployments are collected over time.

Organization of This Report

The remainder of this report is organized as follows. Chapter Two provides an overview of relevant policies on the use of expeditionary civilians and an analysis of relevant practices derived from interview findings, culminating in an identification of gaps that the Army and DoD more broadly should address to clarify when and where civilians can be deployed and in what numbers. Chapter Three explains how we developed the scenarios that formed the basis for our models and includes details on these historical operations. Chapter Four presents the details of our modeling effort and the conclusions from our interviews that informed its development. It also describes our approach to modeling future demand for expeditionary civilian deployments across a range of notional scenarios. Chapter Five presents our conclusions and recommendations to improve data collection, policy, and processes for forecasting expeditionary civilian deployment requirements for the Army and DoD more broadly.

The report includes two supporting appendices: Appendix A presents our interview protocol, and Appendix B provides additional technical details on our demand model.

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[10] There are no reliable data on the *extent* of the distinction between filled demand and actual, raw demand for expeditionary civilian positions across the spectrum of operational types and occupational specialties in question. It is therefore difficult to determine to what degree the predicted demand figures represent a low estimate of demand. However, it is important to note that these figures still provide decisionmakers with estimates of *at least* these lower-bound numbers of expeditionary civilians that are more specific and fine-grained than previously available analysis.

CHAPTER TWO

Key Policies and Practices Pertaining to the Use of Expeditionary Civilians

Despite DoD's long history of relying on expeditionary civilians to support contingency operations, policy and doctrine on this practice remain limited.[1] However, DoD Directive (DoDD) 1400.31, *DoD Civilian Work Force Contingency and Emergency Planning and Execution*, and DoD Instruction (DoDI) 1400.32, *DoD Civilian Work Force Contingency and Emergency Planning Guidelines and Procedures*—both promulgated in 1995—provide broad guidance on the deployment and mobilization of civilians. Both state that the "civilian work force shall be prepared to respond rapidly, efficiently, and effectively to meet mission requirements for all contingencies and emergencies."[2] These two policies define the DoD civilian workforce as civilians hired directly or indirectly, permanently or temporarily, by DoD and exclude U.S. government contractor employees from this definition.

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1 For early policy on the use of expeditionary civilians, see U.S. War Department Field Manual 30-27, *Regulations for Civilian Operations Analysts, Scientific Consultants, and Technical Observers Accompanying U.S. Army Forces in the Field*, August 31, 1944.

2 DoDD 1400.31, *DoD Civilian Work Force Contingency and Emergency Planning and Execution*, April 28, 1995, certified current as of December 1, 2003, p. 2.

Similarly, DoDI 1400.32 directs the heads of DoD components to

> Develop, maintain, and exercise civilian contingency and emergency plans and procedures . . . to implement the latest Defense planning guidance and DoD policy. Such plans and procedures shall prepare the civilian work force for employment and deployment to support all contingencies and emergencies rapidly, efficiently, and effectively. (DoDI 1400.32, *DoD Civilian Work Force Contingency and Emergency Planning Guidelines and Procedures*, April 24, 1995, p. 3).

DoDD 1400.31 further explains that DoD civilians will "remain in or deploy to areas of contingencies and emergencies to provide essential support to military operations, as required," and that they will be treated in the same manner as military personnel with regard to processing and support.[3] DoDI 1400.32 outlines preparedness planning and procedures for civilian expeditionary deployment, stating that

> plans and procedures for the civilian work force during contingencies and emergencies shall be based on sound assessments of the number of employees, skills, experience and geographical dispersion required to perform essential operational missions.[4]

Civilians can deploy in support of contingency operations in one of two ways: through agency-programmed requirements or through what was formerly known as the CEW program, now the DoD-EC program. Army agencies that routinely deploy civilians as part of their central missions, such as the Center for Army Analysis, the Army Audit Agency, and the U.S. Army Corps of Engineers, have long relied on programmed requirements to mobilize expeditionary civilians. However, there is little specific policy guidance regarding these requirements. In contrast, current voluntary deployments of DoD-ECs and their predecessors, the formal, cadre-focused CEW, have both been guided by specific doctrine.

The Civilian Expeditionary Workforce Program and Expeditionary Civilian Deployments

The vision for the CEW program was first described in 2009 in DoDD 1404.10, *Civilian Expeditionary Workforce*.[5] This policy was issued as part of a statutory requirement in the National Defense Authorization Act for FY 2007 with the goal of creating a standing cadre of

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[3] DoDD 1400.31, 2003, p. 3.

[4] DoDI 1400.32, 1995, p. 8.

[5] DoDD 1404.10, *Civilian Expeditionary Workforce*, January 23, 2009.

20,000–30,000 civilians who were prepared to mobilize quickly to fill high-demand roles for which there was a shortage of qualified uniformed personnel. DoDD 1404.10 outlined a program that would rely on a mix of military and civilian employees who would be "organized, ready, trained, cleared, and equipped in a manner that enhances their availability to mobilize and respond urgently to expeditionary requirements."[6] It also included plans to develop mechanisms to track deployments and the readiness of the civilian workforce, with the intention that the program would serve as the primary source of civilian manpower across DoD organizations. However, neither the deployment index nor the readiness index was ultimately realized as envisioned in the policy and, over time, the CEW program shifted to a more reactive model in which it responded to requirements for expeditionary civilians as they arose.[7] As a result, the Office of the Deputy Assistant Secretary of Defense for Civilian Personnel Policy, which oversaw the CEW Program Office, made the decision to eliminate the cadre-based focus of the CEW program and to focus on a more volunteer-based program aimed at meeting individual requirements for deployable civilians as they arose.

As part of this shift in focus, DoD issued DTM 17-004, *Department of Defense Expeditionary Civilian Workforce*, in January 2017. This DTM effectively canceled DoDD 1404.10, laying out a new framework for the deployment of expeditionary civilians.[8] The DTM's aim is to incorporate expeditionary civilians into the GFM process in a more complete and rigorous way, by directing DoD components to "identify and maintain civilian employees who are available to meet contingency requirements" as part of a civilian force pool. This force pool "defines the number and types of civilian requirements that each [force provider] must be prepared to source" in alignment with the DoD-EC demand signal.[9]

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6 DoDD 1404.10, 2009, p. 2.

7 For more on the intent of DoDD 1404.10, see Dunigan et al., 2016.

8 DTM 17-004, 2018.

9 DTM 17-004, 2018, p. 6. As outlined in Joint Publication (JP) 5-0, *Joint Planning*, the GFM process serves three primary functions:

This demand signal for expeditionary civilians—devised by the International/Expeditionary Support (IES) Office (formerly the CEW Program Office) within the Office of the Deputy Assistant Secretary of Defense for Civilian Personnel Policy—was based on CCMD requirements from OIF, OEF, and humanitarian assistance/disaster relief (HA/DR) missions, as delineated in eight data sources spanning the period 2008–2014. Additionally, the IES Office relied on deployable civilian capability requirements needed to support future contingency and HA/DR operations, as identified by U.S. Southern Command (USSOUTHCOM), U.S. Northern Command, USAFRICOM, and USPACOM as part of a strategic review directed by the Deputy Assistant Secretary of Defense for Program Support in the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics in 2013. Such future requirements were, in turn, directed to be based on campaign plans and historical data from operations in Haiti and areas affected by Hurricane Katrina and Hurricane Sandy, as well as to consider where DoD civilian skill sets or contracted support could augment or substitute for military personnel.[10]

- It allows the Secretary of Defense to make proactive, risk-informed force management decisions.
- It guides the global sourcing processes of CCMD force requirements.
- It provides the Joint Staff and force providers with a decision framework for making assignment and allocation recommendations to the Secretary of Defense and apportionment recommendations to the Chairman of the Joint Chiefs of Staff (see JP 5-0, *Joint Planning*, Washington, D.C.: Joint Chiefs of Staff, June 16, 2017, pp. II-5, II-8).

The GFM process is rather lengthy and complicated. It assigns, allocates, and apportions military force structure for military operations approved by the President or Secretary of Defense, but it is also the vehicle through which DoD civilians are authorized to deploy. The force requirements-generation process does not make specific distinctions between military and civilian personnel because it involves requesting and validating *capabilities*. Allocation functions of the GFM process (specifically, requests for forces and joint individual augmentees) have served as the vehicles through which DoD civilians were identified as sourcing solutions to CCMD needs. However, some expeditionary civilian requirements—those relevant to ad hoc or provisional organizations not anticipated in the GFM process—have historically not been visible to GFM planners, and thus have not been assigned to force providers as part of this process (see Dunigan et al., 2016). The intent of DTM 17-004 was to remedy this issue.

10 Office of the Assistant Secretary of Defense for Logistics and Materiel Readiness, “Future Combatant Command Requirements for Deployable DoD Civilians,” memorandum, April 11, 2013.

Utilizing these data and a methodology devised through a working group comprising officials from across the Office of the Secretary of Defense (OSD), the services, and the fourth estate, the deployable civilian demand signal was devised to be "the number of civilians in particular career fields who should be available to deploy in support of a broad range of expeditionary requirements." The demand signal is expressed as the percentage of civilians in the "top deployed civilian career fields" to be designated as deployable to support expeditionary requirements.[11] Specifically, the demand signal for expeditionary civilians is divided among force-providing organizations "based on the size of their civilian workforce for identified skill groups and grades, with consideration and adjustment made for workforce capability and projected future civilian deployment demand to establish the Force Pool."[12]

Together, the demand signal and force pool are intended to establish the baseline for planning and consider historical demand, projected requirements, and capabilities of civilian force providers across DoD. The force pool numbers are supposed to be revisited annually and adjusted according to the demand for civilian capabilities.

DoD Workforce Rationalization Plan

In September 2017, DoD submitted its Workforce Rationalization Plan to the Office of Management and Budget. The plan emphasized the importance of DoD civilians as part of the Total Force concept and noted that uniformed military personnel "must be complemented by a well-reasoned, balanced, and appropriately sized cadre of government civilians and contracted support."[13] Despite the mention of contractors, the plan has been largely interpreted to expand the DoD civil-

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11 Office of the Deputy Assistant Secretary of Defense for Civilian Personnel Policy and Defense Civilian Personnel Advisory Service, "Deployable Civilian Demand Signal," briefing slides, April 23, 2014.

12 DTM 17-004, 2018, p. 9.

13 U.S. Department of Defense, *DoD Workforce Rationalization Plan*, September 13, 2017b, p. 3.

ian workforce. For example, it called for inherently governmental (but not inherently military) tasks to be performed by government civilians, with those that could be performed by civilians or contractors assigned on the basis of cost savings.[14] It also proposed a review of military authorizations and demands to determine whether reassignment to the civilian workforce would be appropriate. Similarly, it suggested that some contracted work could be more cost-effectively insourced. To free up a larger number of civilian personnel to carry out this potentially expanded slate of activities, the plan recommended eliminating caps on government civilian staffing.[15]

In terms of first steps, each component was required to submit a "detailed explanation and rationalization of its manpower size and composition." Specifically, these reports should "identify opportunities for balancing/optimizing the workforce mix."[16]

The plan remained under review by the Office of Management and Budget at the time of this writing. Previous legislation had imposed caps alongside significant cuts in DoD's civilian workforce.

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[14] This guidance is largely in line with preexisting DoD policy on workforce mix, which states,

> [E]ven if a function is not [inherently governmental] or exempted from private sector performance, it shall be designated for DoD civilian performance . . . unless an approved analysis for either of the following exceptions has been addressed consistent with the DoD Component's regulatory guidelines:
>
> (1) A cost comparison . . . or a public-private competition . . . shows that DoD civilian personnel are not the low-cost provider.
>
> (2) There is a legal, regulatory, or procedural impediment to using DoD civilian personnel. This shall include determination by Human Resources officials that DoD civilians cannot be hired in time, or retained to perform the work. (DoDI 1100.22, *Policies and Procedures for Determining Workforce Mix*, incorporating change 1, December 1, 2017, pp. 2–3)

The policy goes on to explain, "Manpower shall be designated as civilian" except under a specific set of conditions, including a requirement for "military-unique knowledge and skills," to meet legal or treaty obligations, when military-specific duties are involved, or when "working conditions or costs are not conducive to civilian employment" (DoDI 1100.22, 2017, p. 3).

[15] DoD, 2017b, p. 3.

[16] DoD, 2017b, p. 3.

The Army, like other force providers, will need to remain responsive both to changes in demand for expeditionary civilians and to changes in policy on their use and numbers.

Expeditionary Civilian Processes in Practice

To clarify the processes through which expeditionary civilians are used in practice, we conducted 71 interviews across 21 DoD organizations. We employed a snowball sampling technique, in which interviewees were asked to provide recommendations for additional potential interviewees. We interviewed personnel from organizations representing three distinct perspectives: OSD, the Joint Staff, and the Department of the Army; CCMDs, Army service component commands, and subunified commands; and organizations that routinely deploy civilians both as DoD-ECs and as part of programmed requirements.

We conducted interviews with 15 individuals from organizations within OSD, the Joint Staff, and the Department of the Army. These interviewees provided insight into the policy governing expeditionary civilians and other considerations for the use of civilians. Specific organizations interviewed included the Office of the Deputy Assistant Secretary of Defense for Civilian Personnel Policy; Office of the Deputy Chief of Staff of the Army, G-2; Office of the Deputy Chief of Staff of the Army, G-1; Office of the Assistant Secretary of the Army for Manpower and Reserve Affairs; and the Joint Staff.

We similarly interviewed 43 individuals from the CCMDs, Army service component commands, and subunified commands. These personnel provided insights into the factors considered when using civilians as a sourcing solution. Organizations interviewed included USAFRICOM, USCENTCOM, USPACOM, USSOUTHCOM, U.S. Special Operations Command, U.S. Army Africa, U.S. Army Europe, U.S. Army Pacific, and U.S. Forces–Afghanistan.

Finally, we interviewed 13 representatives from organizations that routinely provide civilians as a sourcing solution, as part of programmed requirements. These interviews helped clarify the issues surrounding sourcing requirements for deployable civilians and potential challenges related to maintaining a deployable civilian workforce. Organizations included in this tranche of interviews included the Center for Army Analysis, U.S. Army Medical Command, U.S. Army Corps of Engineers, U.S. Army Space and Missile Defense Command, U.S. Army Tank-Automotive and Armaments Command, U.S. Army Audit Agency, and U.S. Army Sustainment Command.

We entered the interview transcripts into a qualitative coding software program (Dedoose) to conduct a thematic analysis. We then generated an initial set of critical topics, which became the initial iteration of "codes" underlying the analysis. The primary coders then took the transcribed interview notes and highlighted portions of text with one code to indicate a single thought. These codes were continually refined throughout the interview process, allowing us to extract more-nuanced information from the interviews. The team ultimately developed nine primary codes, covering the following topics: civilian expeditionary workforce, command philosophy, decision factors for using civilians, future changes in the use of civilians, E-E coding, the DTM-121 force pool, and barriers and facilitators to using civilians. We created 22 subcodes to provide additional clarity on the themes covered in the interviews. Using the primary and secondary codes, we were able to systematically extract key themes from each of the three interview groups.

Practices Related to Expeditionary Civilians in OSD, the Joint Staff, and the Department of the Army

Organizations in this category are responsible for the overarching policy governing the use of expeditionary civilians. The Office of the Deputy Assistant Secretary of Defense for Civilian Personnel Policy and the Defense Civilian Personnel Advisory Service initiate the creation of policies governing the use of DoD civilians. These organizations are responsible for issuing civilian personnel policies and providing human resources solutions and advisory services for DoD's 900,000 civilian employees. The Department of the Army uses these policies as guidance to develop its own policies tailored to the Army's role within the joint force. We included Joint Staff in this category because it implements these policies, specifically in relation to the DTM and the use of civilians as a sourcing solution through the GFM process. These interviews focused on the generation of the numbers of expeditionary civilians specified in the DTM force pool.

DTM 17-004: Changing the Expeditionary Civilian Sourcing Process

There have been multiple organizations responsible for the deployment of civilians since 2007. The Civilian Expeditionary Workforce Program Office, the Army G-1, and, most recently, USCENTCOM have had this responsibility.[17] As noted, DTM 17-004 again changed the process to gain better control of nonprogrammed expeditionary civilian requirements by including civilians as a sourcing solution in the GFM process. However, interviewees disagreed on how well the process was working and on the comprehensiveness of the DTM. For example, one interviewee stated that the DTM was a good "first-start" document in trying to codify the expeditionary civilian process and that it was long overdue.[18] Indeed, the DTM was created because there was a recognition that the previous processes to address expeditionary civilian deployments were insufficient. Generally, a DTM is not a permanent policy document; rather, it is just a precursor to a DoDI, which is more formal and long lasting.

However, another interviewee mentioned that there was no need for the DTM or the associated force pool numbers, because the demand for civilians was distorted. This individual argued that the process to replace military personnel with civilians had come full circle, and force providers were looking to substitute the requirements for civilian personnel with military bodies.[19] This interviewee argued that there was a false demand signal for the use of civilians and that the services still default to using military capabilities first. Another interviewee from the Joint Staff agreed with this sentiment, saying, "We standardized a zero-sum game [in terms of trading military personnel for civilian personnel], where false demand led to an inflated [force] pool."[20]

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[17] Multiple expeditionary civilian deployment and sourcing models exist. For more information, see Dunigan et al., 2016, chapter 3.

[18] Interview with an OSD official, March 7, 2017.

[19] Interview with a U.S. Army official, March 7, 2017.

[20] Interview with a Joint Staff official, April 27, 2017.

Regardless, the Joint Staff is now formally involved and is using civilians as a sourcing solution for validated civilian requirements. This has prompted a cultural shift whereby military planners have started thinking more about civilians as a sourcing solution. Indeed, one interviewee noted, "I see the civilian deployment process being put into big plans now. General officers are talking more and more about this."[21] Under the previous CEW system, which relied fully on volunteers, it was difficult to fill certain requirements. Often, particular billets would go unsourced for an extended period, with some positions never being filled. Under the new process, the services will not be able to decline to source a requirement. If they fail to source a requirement, the Joint Staff can hold the service in question accountable, looking at that service's total workforce to identify another sourcing solution.

Contention Surrounding the Force Pool Numbers

As mentioned earlier, the creation of DTM 17-004 in January 2017 was the first concrete step toward incorporating expeditionary civilians into the GFM process as a sourcing solution. Central to this document are the force pools, constructs aimed at ensuring some level of guarantee that DoD will have a pool of civilians ready and able to deploy. Originally, officials determined the force pool's size by examining three years of data and conducting analyses averaging civilian deployments over that time frame. These demand-side analyses were then aligned with the skill sets in various organizations' existing workforces. The identified DoD components had 18 months to plan to fill those deployable civilian positions. Once identified, this "bench" of deployable staff was to become the ready expeditionary civilian force for those organizations.

However, interviews conducted for this study indicated that the true process of generating the force pool specifications actually entailed protracted negotiations among OSD, the services, and other force providers.[22] One interviewee summed up the inherent issues with the process:

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[21] Interview with an OSD official, March 7, 2017.

[22] Interview with a U.S. Army official, March 6, 2017; Interview with an OSD official, March 7, 2017.

> They looked at how many personnel had been deployed over a period of time, and how many civilian employees with those skill sets were in the Army inventory. Then they compared what was in Army inventory for those occupational series to support this demand. I didn't think that was a good way of looking at it, considering that many civilians who had been deployed weren't actually in the Army inventory. They counted individuals that were hired specifically to support CEW requirements. They were temporary hires, specific for a deployment. A lot of these positions were for OSD positions, not Army positions; this made our demand signal actually higher.[23]

Other interviewees expressed support for the methodology and process of assigning force pool numbers. One individual acknowledged the inherent challenges in generating the force pool numbers and agreed that they could have been further altered, but explained that the rationale and methodology behind force pool number generation was appropriate and "seemed about right."[24] Regardless, various interviewees engaged the study team in considerable discussion about the demand signal and the data that should feed into force pool generation. One overarching observation across at least two interviews was a recognition that the numbers were likely at least partially incorrect and that they would certainly be adjusted in the future. The argument was that the size of force pool was not as important as the establishment and implementation of the force pool generation process. Interviewees also noted that the force pool numbers could be adjusted over time. Indeed, there was a recommendation for a 10-percent increase in the force pool size.[25]

Combatant Commands and Army Service Component Commands

The CCMDs are responsible for generating plans and conducting operations which protect U.S. interests in a given area of responsibil-

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[23] Interview with a U.S. Army official, March 30, 2017.

[24] Interview with a U.S. Army official, March 7, 2017.

[25] Interview with an OSD official, March 7, 2017.

ity. As part of the planning process, DoD civilians are to be used as the preferred sourcing solution when appropriate for nonwarfighting CCMD requests for forces. Prior RAND research has explored the CCMDs' respective utilization of expeditionary civilians, the requirements generation process, and use of civilians as a sourcing solution (through past deployment models and through the GFM process).[26] Building on that foundation, we sought to determine whether the current requirements-generation process accurately identified the need for civilian capabilities and the factors that influence those decisions. Interview perspectives varied substantially across CCMDs, yet several overarching themes emerged: (1) expeditionary civilians are one of the resource options available to meet source requirements, (2) expeditionary civilians play a key role in the planning and execution of military operations, and (3) expeditionary civilians are often used to get around force management limits.

Preferences Vary for Military Versus Civilian Personnel

Civilians bring experience and special skill sets that are widely needed to augment military capabilities. However, preferences vary across commands as to how and why civilians are used. Central to this issue was the theme of the particular areas of expertise that civilians brought to a command. For example, one interviewee mentioned that civilians supported a host of activities, including planning, linguistics, contracting activities, and cultural advisory roles, and that their expertise was essential to mission success.[27] Another interviewee mentioned civilian experience in relation to junior military officers, noting that civilians brought years of experience to a mission—experience that junior military personnel typically do not possess.[28] Yet, for many planners, civilians were still considered a secondary option to using a military capability.[29]

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[26] For more on the history and evolution of total force management in DoD, see Dunigan et al., 2016, chapter 3.

[27] Interview with a U.S. Army official, June 16, 2017; interview with a USCENTCOM official, May 31, 2017; interview with a functional command official, January 9, 2017.

[28] Interview with a USCENTCOM official, June 8, 2017.

[29] Interview with a USAFRICOM official, June 14, 2017.

Whereas well-defined mission parameters should dictate the type of person (military or civilian) to be used to source a requirement, this is not always the case. Indeed, multiple considerations surround the use of civilians, including pay, benefits, funding sources, deployment-related incentives, handling of performance or disciplinary actions, personnel accountability, chain-of-command issues, security concerns, and medical evacuation coverage.[30] Many of these concerns are not present when using a military capability; several interviewees therefore noted that the use of civilians is more onerous than the use of U.S. military personnel for particular requirements.

Emergency-Essential Coded Billets

Section 1580, Title 10, of the U.S. Code designates a position emergency-essential (E-E) if

- an employee is needed to provide support to a combat operation or combat-essential system
- an employee must perform that duty in a designated combat zone after the evacuation of nonessential personnel
- the position cannot be filled by a member of the armed forces.[31]

Personnel coded E-E are required to either remain in a theater or deploy into a theater to support an operational plan. E-E coding is a method to designate critical skills and capabilities needed for a plan. It is a concept that originated during the Cold War and was used to indicate which U.S. personnel would stay in the conflict zone in the event of a war with Russia on the European continent.[32]

The CCMDs and Army service component commands vary in how they identify billets for E-E designations, as well as in how they use such personnel. Several of the organizations interviewed for this

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30 Interview with USAFRICOM official, June 14, 2017.

31 10 U.S.C. 1580, Emergency Essential Employees: Designation; Defense Civilian Personnel Advisory Service, *Department of Defense Expeditionary Civilian (DOD-EC) Codes in DCPDS: Instruction Guide*, March 2017.

32 Interview with a USSOUTHCOM official, April 13, 2017; interview with a U.S. Army Europe official, June 13, 2017; .

research were struggling with the concept, others were updating their E-E coding, and still others did not rely on it at all. For example, U.S. Army Europe is in the process of updating its position descriptions so that they can be coded as E-E positions; this will include those in joint manning documents, which are needed to support operational plans.[33] USAFRICOM has already designated a number of its personnel as E-E and intends to use them heavily in support of its operational plans.[34] From the U.S. Army Pacific perspective, the use of E-E personnel has been discouraged because of additional requirements for the use of civilians, such as the provision of additional security for them.[35] As one USCENTCOM official noted, "There is a lot of confusion about the E-E program. People don't really get it, and it's only as sufficient as the department makes it. If you don't enforce the rule [to code people correctly], then the rule doesn't mean much."[36] Indeed, there have been few occasions in which E-E–coded personnel were forced to deploy to support an operation.[37] The overarching perception among our interviewees was that the E-E coding would not be enforceable in a true emergency, because civilians could just resign instead of deploying.[38]

Force Management Levels

Our research indicated that a restriction on the number of U.S. military personnel on the ground was the main reason civilians were asked to deploy. Interviewees from USCENTCOM, U.S. Army Africa, and U.S. Forces–Afghanistan (USFOR-A) all agreed that force management levels, or force restrictions, artificially created the demand to use deployable civilians instead of military personnel. According to one USCENTCOM official,

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33 Interview with a U.S. Army Europe official, June 13, 2017.

34 Interview with a USAFRICOM official, June 14, 2017.

35 Interview with a U.S. Army Pacific official, July 19, 2017.

36 Interview with a USCENTCOM official, June 8, 2017.

37 During the period we examined, only three individuals were required to deploy in an E-E–coded billet. They deployed to Liberia in support of Operation United Assistance (interview with a U.S. Army Africa official, June 16, 2017).

38 Interview with a U.S. Army Pacific official, July 19, 2017.

> The big reason civilians are required is they don't count against boots-on-the-ground [numbers] when you have a restriction on how many troops you can bring. What the civilians should really be required for are those skill sets you can't get in the military, or just not enough of them in uniform—high-utilization, low-density skill sets. That's what it really ought to be, but right now it's about providing capability to a commander without having to count as boots on ground.[39]

Force management levels establish the legal parameters governing the number of foreign military personnel in a given country at a given time. These restrictions exist against the backdrop of continued requests for capabilities. According to DoD business rules surrounding force management levels, contractors and DoD civilians do not count against those levels. Even as the current process for determining these levels is being reviewed, the fact remains that their existence elevates demand for civilian capabilities to augment and offset military requirements for personnel.

Army Organizations That Routinely Deploy Civilians as Part of Programmed Requirements

Several Army organizations routinely deploy personnel to support operations. These organizations provided clarity on the differences between civilians deployed to support programmed requirements and those requested and deployed in a more ad hoc fashion through the CEW (now DoD-EC) program. This set of interviewees also highlighted the barriers to using civilians as a sourcing solution.

Differences in Deployment Approaches

Some civilians are deployed through programmed requirements—as part of a deployable cadre of specialists whose deployments are incorporated into the organization's workforce planning—and some have deployed to fill ad hoc requirements, often for an organization other than their home organization, through the CEW or DoD-EC program. Interviewees indicated that organizations that routinely deploy

[39] Interview with a USCENTCOM official, April 14, 2017.

their personnel via programmed requirements tended to have well-established systems and processes to facilitate deployments. Civilians deployed either individually or in teams. Deployment requirements were often known well in advance, and employees understood that deploying was part of their job. "When people deployed for our deployment team, they were doing our audits; we had oversight of the work," said one interviewee. [40] However, when civilians deployed for ad hoc requirements, these processes did not work in the same way: The home organization often lost all visibility over its employee's work, performance, and sometimes even location while deployed.[41]

One potential solution to facilitate management of all expeditionary civilian personnel is exemplified by the U.S. Army Corps of Engineers: To maintain visibility over personnel deployed with the CEW or DoD-EC program and to help address issues as they arise, it assigns these employees to a centralized unit, the Trans-Atlantic Division. This command then places the employees on one centralized roster and helps support and facilitate their predeployment processing.[42]

Barriers to Civilian Deployments

One of the most significant challenges with regard to ad hoc deployments identified both in our interviews and in prior RAND research was that there was no backfill for the deployee's position in the home organization. Given the ongoing reduction in the size of headquarters elements, many organizations are already operating without needed personnel. One interviewee postulated that most current civilian staff who wish to deploy have already deployed at least once, and the Army is now stretched thin. Another argued that most civilians who were willing to volunteer did not have colleagues able to pick up their work.[43] Another concurred with this sentiment, stating, "I think also it could be that organizations aren't in positions to allow employees to

[40] Interview with a U.S. Army Audit Agency official, February 24, 2017.

[41] Interview with a U.S. Army Audit Agency official, February 15, 2017.

[42] Interview with a U.S. Army official, March 6, 2017.

[43] Interview with a U.S. Army official, March 7, 2017.

deploy as much as they did. They have their home missions to accomplish also."[44]

In our analysis of the DoD policies and our interview data, it was readily apparent that DoD—particularly the Army, given its strong representation as a force provider of expeditionary civilians—requires a more robust method to measure demand for expeditionary civilians. Issues highlighted in this chapter, such as the method for creating the force pool numbers, plans to use civilians as a sourcing solution, and artificial limits imposed by force management levels, underscore deficiencies in the current system.

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44 Interview with a U.S. Army official, March 7, 2017.

CHAPTER THREE

Developing Historical and Future Operational Scenario Profiles

Key to the modeling approach described later in this report are assumptions regarding operational scenario characteristics. To develop an accurate understanding of potential future operational scenarios, we first created historical data profiles to clarify the various characteristics of operational scenarios in which expeditionary civilians had served in the past.

To build these historical profiles, we collected data on three regional parameters associated with the country in which an operation had taken place: economic austerity, regime type, and fragility or state strength.[1] These categories capture many of the characteristics that military planners consider when planning operations and force requirements. They also roughly align with the PMESII framework used to assess an operational environment, and they serve as useful proxies for identifying differences in country-level characteristics.[2]

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[1] We sought 2001–2017 data for Afghanistan, Colombia, Djibouti, Egypt, Honduras, Kosovo, Kyrgyzstan, the Marshall Islands, Mexico, Oman, Pakistan, Serbia, South Korea, Tajikistan, Uzbekistan, and Yemen; 2002–2017 data for Bahrain, Ethiopia, Iraq, Israel, Jordan, Kenya, Kuwait, Qatar, Saudi Arabia, Somalia, Turkey, Uganda, and the United Arab Emirates (UAE); 2002–2015 data for the Philippines; 2014 data for Guinea, Liberia, Nigeria, Senegal, and Sierra Leone; 2011 data for Japan; and 2010 data for Haiti. We also sought the most recent available data for Cambodia, El Salvador, India, Laos, Malaysia, Thailand, and Vietnam.

[2] See John D. Lowrance and Janet L. Murdoch, *Political, Military, Economic, Social, Infrastructure, Information (PMESII) Effects Forecasting for Course of Action (COA) Evaluation*, Rome, N.Y.: Air Force Research Laboratory, Information Directorate, June 2009.

To measure levels of economic growth versus austerity, we used World Bank data on real GDP per capita. GDP is a useful, if imperfect, reference point for the health of a nation's economy.[3] For more than 50 years, it has been the "dominant economic indicator" and is a proxy for the economic and infrastructure components of the U.S. military's PMESII framework.[4] The economy is important to consider for the deployment of civilians. In a less economically developed country, a DoD civilian presence may be limited to the capital or U.S. installations, whereas a more robust economy could support civilians deployed across the country.

To measure regime type, we used the Polity IV score generated by the Polity Project, led by investigators at the Center for Systemic Peace. The data set is continuously updated with changes in regime authority characteristics.[5] Again, these characteristics align with the political, social, and information components of the PMESII framework. The polity score is generated by calculating both an autocracy score and a democracy score, then subtracting the autocracy score from the democracy score. The democracy indicator is derived from coding the competitiveness of political participation, the openness and competitiveness of executive recruitment, and constraints on the chief executive.[6] The autocracy score is derived from coding the competitiveness of political participation, the regulation of participation, the openness and competitiveness of executive recruitment, and constraints on the chief executive.[7] The polity score captures the "regime authority spectrum on a 21-point scale ranging from –10 (hereditary monarchy) to

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3 Tim Callen, "Gross Domestic Product: An Economy's All," International Monetary Fund, last updated December 18, 2018.

4 Jeroen C. J. M. van den Bergh, "The GDP Paradox," *Journal of Economic Psychology*, Vol. 30, No. 2, April 2009, p. 118.

5 Center for Systemic Peace, "The Polity Project: About Polity," webpage, undated.

6 Monty G. Marshall, Ted Robert Gurr, and Keith Jaggers, *Polity™ IV Project: Political Regime Characteristics and Transitions, 1800–2016, Dataset Users' Manual*, Vienna, Va.: Center for Systemic Peace, July 25, 2017, p. 14.

7 Marshall, Gurr, and Jaggers, 2017, p. 16.

+10 (consolidated democracy)."[8] We coded various states' polity scores into three categories: democracy (4 to 10), transitional (–3 to 3), and autocracy (–4 to –10).[9]

To measure fragility, we relied on the Fragile State Index (previously known as the Failed States Index), "an annual ranking of 178 countries based on the different pressures they face that impact their levels of fragility."[10] Each country is scored on 12 indicators. The indicators are divided into four components (cohesion, economic, social, and political). A higher score means the country is more fragile. The Fragile States Index is a commonly used measure of state fragility.[11] For the purposes of this research and the modeling effort, we coded states' fragility scores into three categories: fragile, transitional, and stable.

At the time of our analysis, the World Bank had not released 2017 GDP data. Fragile States Index data were available for the period 2006–2017. Polity scores were available from Center for Systemic Peace only through 2016. Notably, the polity score data were missing for some countries in certain years, notably during wartime.[12] Both Fragile States Index and polity scores were also missing for the Marshall Islands for all periods.

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8 Center for Systemic Peace, undated.

9 See, e.g., Netherlands Scientific Council for Government Policy, *Dynamism in Islamic Activism: Reference Points for Democratization and Human Rights*, Amsterdam, Netherlands: Amsterdam University Press, 2006, p. 63.

10 Fund for Peace, *Fragile States Index and CAST Framework Methodology*, Washington, D.C., May 13, 2017, p. 1.

11 See, e.g. Michael J. McNerney, Jennifer D. P. Moroney, Peter Mandaville, and Terry Hagen, *New Security and Justice Sector Partnership Models: Implications of the Arab Uprisings*, Santa Monica, Calif.: RAND Corporation, RR-604-DOS, 2014; Lars Carlsen and Rainer Bruggemann, "Fragile State Index: Trends and Developments. A Partial Order Data Analysis," *Social Indicators Research*, Vol. 133, No. 1, August 2017; Casey M. Graves, Annie Haakenstad, and Joseph L. Dieleman, "Tracking Development Assistance for Health to Fragile States: 2005–2011," *Globalization and Health*, Vol. 11, No. 12, 2015.

12 Polity scores were not available for Afghanistan for the entire evaluation period, Iraq for 2003–2009, Somalia for 2002–2011, and Yemen for 2014–2016. For some country-year combinations, data were missing; according to the Polity Index manual, this indicates foreign interruption. For other locations, the polity score was "0," meaning interregnum or anarchy.

In the absence of data on particular countries in our years of interest, we made several assumptions: The Marshall Islands was a stable democracy during the period in question, Afghanistan was an autocracy in the 2009–2013 time frame, Iraq was an autocracy up to and including 2009 and a democracy from 2010 on, Somalia was an autocracy up to and including 2011 and a democracy from 2012 on, and Yemen was transitional for the entire time frame.[13] (See Appendix B for more information on the input variables for our historical scenario analysis.)

Background and Context of Historical Operations

The 12 historical operations on which we sought deployment data varied in terms of start date, scale, objective, end date, and partner-nation involvement; however, all were active in the 2009–2016 time frame. As described in further detail in Chapter Four, we relied heavily on Defense Manpower Data Center (DMDC) data to characterize individual historical deployments by both civilians and uniformed personnel across DoD. Because civilian deployments are not explicitly recorded as such, we used several variables to deduce deployments, including danger pay, foreign differential pay, and location, and to determine where and for how long an individual was deployed. In each description that follows, we differentiate between countries that were central to the operation (i.e., core) and those that functioned as secondary or supportive countries (i.e., ancillary). This distinction was particularly necessary for compound campaigns, such as OEF-A and OIF, in which multiple countries in the region played a part.

For the purposes of our study, we characterized each historical operation in one of the following ways: counterinsurgency (COIN),

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[13] Polity data were unavailable for Afghanistan for the period 2001–2013. Prior to this time, the country was classified as an autocracy, so we assumed that this classification would hold until 2014, at which time polity data showed Afghanistan as transitional. Polity data were also not available for Yemen for 2014–2016. However, polity scores from 1992–2013 categorize Yemen as transitional, so we assumed that this status held for the remaining three years of our historical time frame and would hold in the near future.

counterterrorism, stability/security, or humanitarian assistance/disaster response (HA/DR).

Three of the 12 historical cases were less country-to-country military campaigns than protracted security cooperation operations: counternarcotics operations in Colombia, Honduras, and Mexico; USPACOM stability and preparation operations; and Serbia/Kosovo peacekeeping. As of this writing, these were still active operations, and U.S. forces continued to play a role. Table 3.1 summarizes the operations that made up our historical data profiles.

Historical COIN Operations

Operation Enduring Freedom–Afghanistan

Afghanistan was the core country involved in OEF-A. Ancillary countries connected to the military campaign included Egypt, Kyrgyzstan, Oman, Pakistan, Tajikistan, Uzbekistan, and Yemen. Osama bin Laden and al Qaeda operatives—working from a Taliban-sheltered safe haven in Afghanistan—orchestrated a complex attack on U.S. mainland targets on September 11, 2001. OEF-A officially began on October 7, 2001, with President George W. Bush announcing that U.S. and British forces had begun airstrikes on Taliban and al Qaeda targets in Afghanistan.[14] Until its conclusion in December 2014, the military campaign was (1) a joint operation drawing on U.S. Army, Air Force, Navy, and Marine Corps resources, with Army personnel making up the majority of the U.S. force; (2) a collaborative, multinational effort involving 51 troop-contributing countries; and (3) a considerable source of U.S. government civilian and contractor employment.

Both OEF-A and OIF (discussed next) began as limited wars for which the United States had tailored military objectives that many believed were quickly achievable.[15] President Bush described the initial military objectives in Afghanistan as including the destruction of ter-

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[14] See Associated Press, "A Timeline of U.S. Troop Levels in Afghanistan Since 2001," *Military Times*, July 6, 2016.

[15] Walter L. Perry and David Kassing, *Toppling the Taliban: Air-Ground Operations in Afghanistan, October 2001–June 2002*, Santa Monica, Calif.: RAND Corporation, RR-381-A, 2015, p. xi.

Table 3.1
Historical Missions and Characteristics

Operation Type	Historical Operation	Countries Involved (core countries in italics)	Dates Examined
COIN	OEF-A	*Afghanistan*, Egypt, Kyrgyzstan, Oman, Pakistan, Tajikistan, Uzbekistan, Yemen	2009–2014
COIN	OIF	Bahrain, *Iraq*, Israel, Jordan, Kuwait, Qatar, Saudi Arabia, Turkey, UAE	2009–2010
Counterterrorism	OEF–Horn of Africa (HOA)/Combined Joint Task Force (CJTF)–HOA	*Djibouti*, Ethiopia, Kenya, Somalia, Uganda	2009–2016
Counterterrorism	OEF-Philippines	*Philippines*	2009–2015
Counterterrorism	Operation Freedom's Sentinel	*Afghanistan*, Egypt, Kyrgyzstan, Oman, Pakistan, Tajikistan, Uzbekistan, Yemen	2015–2016
Counterterrorism	Operation Inherent Resolve	Bahrain, *Iraq*, Israel, Jordan, Kuwait, Qatar, Saudi Arabia, Turkey, UAE	2015–2016
Counterterrorism	Operation New Dawn	Bahrain, *Iraq*, Israel, Jordan, Kuwait, Qatar, Saudi Arabia, Turkey, UAE	2010–2016
HA/DR	Operation Tomodachi	*Japan*	2011
HA/DR	Operation Unified Response	*Haiti*	2010
HA/DR	Operation United Assistance	Guinea, *Liberia*, Nigeria, Senegal, Sierra Leone	2014
Stability/security	Counternarcotics	*Colombia*, Honduras, Mexico	2009–2016
Stability/security	Serbia/Kosovo peacekeeping	*Kosovo*, *Serbia*	2009–2016
Stability/security	USPACOM stability and preparation	*Marshall Islands*, *South Korea*	2009–2016

NOTE: The dates listed in the table reflect dates of operational activity for which data were available.

rorist training camps and infrastructure within the country, the capture of al Qaeda leaders, and the cessation of terrorist activities.[16] However, OEF-A adopted an unforeseen trajectory. The Taliban and other groups mounted a sustained effort to overthrow the newly installed Afghan government in 2002, and the conflict became a full-blown insurgency. Between 2002 and 2006, when the insurgency was fully underway, the number of insurgent-related attacks rose by 400 percent.[17] COIN operations began earnest in Afghanistan and Iraq after the 2006 drafting of Army Field Manual (FM) 3-24, *Counterinsurgency*, by GEN David Petraeus and a group of advisers. In 2009, a U.S. troop surge added 30,000 new service members and reoriented military operations toward "population-centric" missions. OEF-A officially ended in December 2014. However, at the time of our model development, the U.S. Army was finalizing plans to deploy 1,000 personnel to Afghanistan in late 2018 in the form of a security force assistance brigade.[18]

Operation Iraqi Freedom

Iraq was the core country involved in OIF. Ancillary countries connected to the military campaign included Bahrain, Israel, Jordan, Kuwait, Qatar, Saudi Arabia, Turkey, and the UAE. Prewar planning began after the September 11, 2001, terrorist attacks.[19] The initial military objectives in Iraq were numerous and included the destabilization, isolation, and overthrow of Saddam Hussein's regime and support for a new, broad-based government; destruction of Iraqi weapons of mass destruction and related infrastructure; protection of allies and supporters from Iraqi threats and attacks; destruction of terrorist networks

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[16] White House, Office of the Press Secretary, address by President George W. Bush before a joint session of Congress, September 20, 2001.

[17] Seth G. Jones, "The Rise of Afghanistan's Insurgency: State Failure and Jihad," *International Security*, Vol. 32, No. 4, Spring 2008, p. 7.

[18] Thomas Gibbons-Neff, "Training Quick and Staffing Unfinished, Army Units Brace for Surging Taliban," *New York Times*, January 26, 2018.

[19] Nora Bensahel, Olga Oliker, Keith Crane, Rick Brennan, Jr., Heather S. Gregg, Thomas Sullivan, and Andrew Rathmell, *After Saddam: Prewar Planning and the Occupation of Iraq*, Santa Monica, Calif.: RAND Corporation, MG-642-A, 2008, p. 6.

in Iraq; gathering of intelligence on global terrorism; detainment of terrorists and war criminals and the liberation of individuals unjustly detained under the regime; and support for international efforts to set the conditions for long-term stability in Iraq and the region.[20] Initial combat operations were brief, spanning March 20–June 23, 2003, with the official fall of Baghdad on April 10, 2003.[21]

The U.S.-international military coalition in Iraq was colloquially referred to as the "coalition of the willing" and consisted of 26 countries at its height.[22] Like the war in Afghanistan, OIF was a joint operation that relied on U.S. Army ground forces and special operations units, airmen, sailors and U.S. Navy SEALs, and conventional and reconnaissance Marine Corps personnel. As in Afghanistan, the vast majority of deployed personnel were from Army. For example, from September 2001 to January 2005, 307,019 active-duty Army personnel were deployed to both Iraq and Afghanistan, compared with 160,508 active-duty Air Force personnel, 185,538 active-duty Navy personnel, 104,244 active-duty Marine Corps personnel, and 1,602 active-duty Coast Guard personnel during the same time frame.[23] OIF also relied on a considerable amount of U.S. civilian and contractor labor.

The trajectory of OIF was similar to OEF-A but with different data points. After initial combat operations concluded in mid-2003, a complex insurgency developed in Iraq—the hallmark of which was resistance and violence among disenfranchised Sunni Arabs. The insurgencies in Iraq and Afghanistan coincided with a rash of improvised explosive device–related violence against U.S. and coalition forces in both theaters. Negotiations with Sunni tribal leaders in 2005 quelled only a fraction of the insurgent activities in Iraq. The Sunni insurgency and the subsequent Shia-Sunni civil war that began in 2005 prompted President Bush to announce a COIN-focused U.S. military

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20 Kevin Benson, "A War Examined: Operation Iraqi Freedom, 2003," *Parameters*, Vol. 43, No. 4, Winter 2013.

21 Bensahel et al., 2008, p. 83.

22 Brookings Institution, *Iraq Index: Tracking Variables of Reconstruction and Security in Post-Saddam Iraq*, Washington, D.C., May 19, 2005, p. 17.

23 Brookings Institution, 2005, p. 19.

surge of 17,500 troops to Baghdad and 4,000 to Al Anbar Province on January 10, 2007.[24] The primary purpose was to stem the mounting violence. Bush also committed additional resources for reconstruction efforts and the expansion of provincial reconstruction teams.[25] The U.S. combat mission in Iraq officially ended on August 31, 2010.

Historical Counterterrorism Operations

Operation Enduring Freedom–HOA/Combined Joint Task Force–HOA

Somalia is the core country involved in OEF-HOA, also referred to as CJTF-HOA. The operation launched in October 2002 and was ongoing as of mid-2019. It brought together U.S. military personnel, DoD civilians, and representatives from partner and coalition nations to provide security force assistance and counter violent extremist organizations in the region. Ancillary countries involved in the operation have included Ethiopia, Djibouti, Kenya, and Uganda. The operation's goals are to "promote regional stability and protect U.S. interests while maintaining operational access."[26] In 2015, USAFRICOM reported that CJTF-HOA included "approximately 2,000 U.S. service members from each branch of the U.S. military, civilian employees and representatives of coalition and partner countries."[27]

Operation Enduring Freedom–Philippines

The United States has maintained a close but complex relationship with the Philippines since the 1898–1946 period of U.S. colonial rule.[28] The United States continued to play a significant role in the country's affairs after its independence in 1946 and the signing of the Mutual Defense Agreement between the two countries in 1952. The agreement provided "a security umbrella and military assistance to

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[24] Anthony H. Cordesman, *Iraq's Sectarian and Ethnic Violence and the Evolving Insurgency*, Washington D.C.: Center for Strategic and International Studies, January 26, 2007, p. 2.

[25] Cordesman, 2007, p. 5.

[26] Combined Joint Task Force–Horn of Africa, "About," webpage, undated.

[27] Combined Joint Task Force–Horn of Africa, "U.S. Africa Command: Combined Joint Task Force–Horn of Africa," fact sheet, November 2015.

[28] Linda Robinson, Patrick B. Johnston, and Gillian S. Oak, *U.S. Special Operations Forces in the Philippines, 2001–2014*, Santa Monica, Calif.: RAND Corporation, RR-1236-OSD, 2016, p. 9

the Philippine government."[29] With the closure of U.S. military bases in the Philippines in the early 1990s, the relationship between the two countries "atrophied," in the words of a RAND study of OEF-Philippines. However, in 2001, joint special operations task forces began a 14-year effort to help the Philippine government address transnational terrorist threats, including from the Abu Sayyaf Group, in the historically restive southern territories. "Under laboriously negotiated terms, approximately 1,300 U.S. forces deployed to the southern Philippines in 2002; thereafter, the effort averaged 500 to 600 troops."[30]

Joint Special Operations Task Force–Philippines officially ended in February 2015. Both the U.S. and Philippine military commands characterized the transnational terrorist threat as having been reduced to a largely criminal phenomenon. The number of Abu Sayyaf militants was reported to have declined from 1,270 to 437 over the course of the conflict.[31]

Operation Freedom's Sentinel

Afghanistan is the core country involved in Operation Freedom's Sentinel. Ancillary countries include Egypt, Kyrgyzstan, Oman, Pakistan, Tajikistan, Uzbekistan, and Yemen. The counterterrorism mission began on January 1, 2015, when the USFOR-A combat mission, OEF-A, formally ended.[32] According to a June 2017 DoD report, "The United States currently maintains approximately 8,400 military personnel in Afghanistan as part of Operation Freedom's Sentinel, down from approximately 9,800 personnel in 2016."[33] The North Atlantic Treaty Organization's (NATO's) contribution—comprising 41 partner

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[29] Robinson, Johnston, and Oak, 2016, p. 10.

[30] Robinson, Johnston, and Oak, 2016, p. xv.

[31] Linda Robinson, "The SOF Experience in the Philippines and the Implications for Future Defense Strategy," *PRISM*, Vol. 6, No. 3, 2016.

[32] Lead Inspector General for Overseas Contingency Operations, *Operation Freedom's Sentinel: Report to the United States Congress, October 1, 2017–December 31, 2017*, Washington, D.C., February 16, 2018, p. 41.

[33] U.S. Department of Defense, *Enhancing Security and Stability in Afghanistan*, Washington, D.C., June 2017a, p. 6.

nations—was called Resolute Support and focused primarily on training, advising, and assisting the Afghan Ministry of Defense, Ministry of the Interior, and National Defense and Security Forces to build up their capabilities and to ensure their sustainability.[34]

Operation Inherent Resolve

Iraq was the core country involved in Operation Inherent Resolve. On October 15, 2015, USCENTCOM announced that all U.S. and coalition counterterrorism operations against the Islamic State in Iraq and the Levant (ISIL) would be conducted under the banner of Operation Inherent Resolve.[35] The operation's strategy, which included military and nonmilitary objectives, pursued the following lines of effort to degrade and defeat ISIL: supporting effective governance in Iraq, denying ISIL safe haven, building partner capacity, enhancing intelligence collection on ISIL, disrupting ISIL's finances, exposing ISIL's true nature, disrupting the flow of foreign terrorist fighters, protecting the U.S. homeland, and providing humanitarian support to the local population.

Operation New Dawn

Iraq was the core country involved in Operation New Dawn, with ancillary countries including Bahrain, Israel, Jordan, Kuwait, Qatar, Saudi Arabia, Turkey, and the UAE. On September 1, 2010, OIF transitioned into Operation New Dawn to reflect the reduced role that U.S. troops would play in the country—an operational change that included a shift from a predominantly military to a predominantly civilian presence.[36] The 52,000 service members deployed to Iraq at the time of the transition were directed to engage in stability operations, focusing on advising, training, and assisting Iraqi Security Forc-

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[34] Barbara Salazar Torreon, *U.S. Periods of War and Dates of Recent Conflicts*, Washington, D.C.: Congressional Research Service, October 11, 2017, p. 10.

[35] Torreon, 2017, p. 9.

[36] U.S. Forces–Iraq, "Operation New Dawn," blog post, U.S. Army, August 31, 2010; "Operation Iraqi Freedom and Operation New Dawn Fast Facts," CNN, last updated March 8, 2018.

es.[37] The U.S. Army contributed its six advisory and assistance brigades that were in Iraq at the time to Operation New Dawn stability operations.[38] On October 21, 2011, President Barack Obama announced that virtually all U.S. troops would leave Iraq by the end of the year, and December 15, 2011, marked the official end to the U.S. military mission in Iraq.

Historical HA/DR Operations

Operation Tomodachi

Operation Tomodachi was a U.S. military assistance operation to support the government of Japan in the aftermath of three large earthquakes that struck 250 miles northeast of Japan's mainland on March 11, 2011. The Japanese government acted swiftly. At 3:30 p.m., 44 minutes after the tremors ceased, Japan's Ministry of Defense established an emergency headquarters for response operations. By 7:30 p.m., the ministry had mobilized 8,400 Japanese Self-Defense Force personnel, a number that expanded to 107,000 just a few days later.[39] Responding to a request for assistance from the Japanese government, U.S. Forces Japan and USPACOM initiated a three-phase operation known as Tomodachi. The U.S. Agency for International Development, the lead federal agency for HA/DR, worked closely with the U.S. Embassy in Tokyo to establish a disaster assistance response team. A cross-service response was also mounted, with more than 24,000 U.S. military personnel, 24 ships, and 89 aircraft supporting Japan's HA/DR efforts.[40]

Operation Unified Response

On January 12, 2010, a 7.0-magnitude earthquake struck Haiti, killing more than 316,000 people and injuring 300,000 others. The earth-

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[37] "Operation Iraqi Freedom and Operation New Dawn Fast Facts," 2018.

[38] U.S. Forces–Iraq, 2010.

[39] Rockie K. Wilson, *Operation TOMODACHI: A Model for American Disaster Response Efforts and the Collective Use of Military Forces Abroad*, thesis, Cambridge, Mass.: John F. Kennedy School of Government, Harvard University, January 2012, pp. 2–4.

[40] Wilson, 2012, p. 13.

quake caused 100,000 structures to collapse, damaged 200,000 more, and displaced more than 1 million people, including 45,000 Americans.[41] The earthquake also destroyed a large proportion of Haiti's infrastructure, leaving the majority of air and sea transport facilities inoperable, hospitals in ruins, and key access roads blocked with debris, all of which greatly hampered rescue and aid efforts.[42] The Haitian government was rendered close to inoperable as the presidential palace and buildings housing 14 of 16 government ministries were destroyed. Fatalities included numerous government officials and employees, as well as the head of the United Nations Stabilization Mission in Haiti and his principal deputy.[43]

In the immediate aftermath of the earthquake, the Haitian government made an urgent request for U.S. assistance. The U.S. military applied a "whole-of-government" approach, and resources arrived within days, including 3,000 soldiers from the 82nd Airborne Division. By day 3, a total of 17,000 U.S. military personnel were in Haiti.[44] Operation Unified Response was the largest HA/DR operation conducted by the U.S. military and the largest international humanitarian response to a natural disaster in history, with more than 140 countries and 500 nongovernmental organizations contributing to the relief effort.[45] The operation concluded on June 1, 2010.

Operation United Assistance

Operation United Assistance in West Africa began on August 5, 2014, with the establishment of the Ebola Task Force at the Pentagon after

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[41] Gary Cecchine, Forrest E. Morgan, Michael A. Wermuth, Timothy Jackson, Agnes Gereben Schaefer, and Matthew Stafford, *The U.S. Military Response to the 2010 Haiti Earthquake: Considerations for Army Leaders*, Santa Monica, Calif.: RAND Corporation, RR-304-A, 2013.

[42] See David R. DiOrio, "Operation Unified Response—Haiti Earthquake 2010," Norfolk, Va.: Joint Forces Staff College, November 2010.

[43] DiOrio, 2010.

[44] DiOrio, 2010.

[45] Cecchine et al., 2013, p. 43; Rhoda Margesson and Maureen Taft-Morales, *Haiti Earthquake: Crisis and Response*, Washington, D.C.: Congressional Research Service, February 2, 2010.

it became clear that the region was seeing a resurgence of Ebola infections and deaths.[46] By June 30, 2015, more than 1,000 personnel from the Centers for Disease Control and Prevention, two U.S. Northern Command medical support teams, and a host of other services and organizations mobilized resources in support of Operation United Assistance.[47] The U.S. Army also contributed a deployable area support laboratory to the operation, the 1st Area Medical Laboratory, which it task-organized into four additional labs.[48] USAFRICOM oversaw the operation under tight time constraints, and the short-notice deployment of forces created challenges.[49] In total, the United States sent 3,000–4,000 service members to West Africa in support of Operation United Assistance to provide medical, logistical, and security support.[50] By the time the outbreak slowed, Ebola had infected more than 28,000 and killed more than 11,000.[51]

Historical Stability/Security Operations

Counternarcotics Operations in Colombia, Honduras, and Mexico

For several decades, the United States has engaged in joint counternarcotics missions in Colombia, Honduras, and Mexico. The U.S. Army has a long history of military-to-military links with the Colombian armed forces dating back to the 1950s; however, the most concentrated period of bilateral partnership "was between 1998 and 2006, when U.S. Army Special Forces played a key role in training and assisting partner units in counternarcotics, counterinsurgency, and

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46 Joint and Coalition Operational Analysis, *Operation United Assistance: The DoD Response to Ebola in West Africa*, January 6, 2016.

47 Centers for Disease Control and Prevention, "CDC's Response to the 2014–2016 Ebola Epidemic—West Africa and the United States," *Morbidity and Mortality Weekly Report*, Vol. 65, No. 3, July 8, 2016.

48 Joint and Coalition Operational Analysis, 2016, p. 20.

49 Joint and Coalition Operational Analysis, 2016, p. 28.

50 J. Freedom du Lac, "The U.S. Military's New Enemy: Ebola," *Washington Post*, October 13, 2014.

51 U.S. Agency for International Development, "West Africa—Ebola Outbreak," fact sheet, November 2015.

counterterrorism."[52] As of 2016, the Army's 7th Special Forces Group was partnering with Colombian counternarcotics military personnel on training and interdiction operations and began training soldiers from the Colombian National Army's Special Anti-Drug Brigade in 2014.[53]

Joint Task Force–Bravo operates out of Soto Air Base in central Honduras. First stood up in 1983 as Joint Task Force–11, it comprises more than 500 U.S. military personnel and more than 500 U.S. and Honduran civilians. Joint Task Force–Bravo's operations span Central America, South America, and the Caribbean and range from supporting U.S. government operations, countering transnational organized crime, and providing humanitarian assistance and disaster relief to building partner capacity.[54] For example, in spring 2017, as part of the U.S.-Colombia Action Plan, highly trained U.S. Army instructors taught the "Joint Operations and Procedures to Counter Transnational Organized Crime" course to Honduran army, navy, and air force commissioned and noncommissioned officers.[55]

The United States has provided a broad range of assistance to the Mexican government in its counternarcotics efforts since 1973.[56] Beginning in 1996, the majority of this U.S. assistance has been provided by DoD to the Mexican military, which was given a larger role in counternarcotics and law enforcement. An August 2011 *New York Times* article described the United States as playing a more expansive

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[52] Austin Long, Todd C. Helmus, S. Rebecca Zimmerman, Christopher M. Schnaubelt, and Peter Chalk, *Building Special Operations Partnerships in Afghanistan and Beyond: Challenges and Best Practices from Afghanistan, Iraq, and Colombia*, Santa Monica, Calif.: RAND Corporation, RR-713-OSD, 2015, p. 59.

[53] Long et al., 2015, pp. 59–60; Osvaldo Equite, "Colombian Army Counter-Narcotics Brigade Honors U.S. Special Forces," U.S. Southern Command, December 19, 2016.

[54] See Joint Task Force–Bravo, "About Us," webpage, undated.

[55] Julieta Pelcastre, "Honduras and the United States Disrupt Organized Crime," *Diálogo*, May 10, 2017.

[56] Benjamin Nelson, U.S. General Accounting Office, *Drug Control: Update on U.S.-Mexican Counternarcotics Efforts*, statement to the Caucus on International Narcotics Control, U.S. Senate, Washington, D.C.: U.S. General Accounting Office, GAO/T-NSIAD-99-86, February 24, 1999, p. 3.

role in Mexico's "bloody fight against drug trafficking organizations," by sending "new [Central Intelligence Agency] operatives and retired military personnel to the country and considering plans to deploy private security contractors in hopes of turning around a multibillion-dollar effort that has so far shown few results."[57] In addition to these other components of DoD's Total Force structure, DoD-ECs played a role in this operation in 2009–2016.

Serbia/Kosovo Peacekeeping

Since October 1999, U.S. forces have contributed to a NATO-led international peacekeeping force in Kosovo known as Kosovo Force.[58] Still ongoing at the time of this research, it is the longest peacekeeping mission in NATO history.[59] An early objective of the U.S. Army and Marine Corps was to assist Kosovo Force in making the region safe so that displaced ethnic Albanians could return to their homes.[60] Following the withdrawal of U.S. troops from Iraq and Afghanistan beginning in 2012, more active-duty soldiers became available for the Kosovo mission.[61] In 2013, the U.S. contingent was estimated at 773 service members.[62] After Kosovo declared independence in 2008, the NATO mission assumed the additional task of building the Kosovo Security Force. To date, Kosovo Force continues to incrementally transfer selected peacekeeping responsibilities to the Kosovo Police and other local authorities.[63]

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[57] Ginger Thompson, "U.S. Widens Role in Battle Against Mexican Drug Cartels," *New York Times*, August 6, 2011.

[58] U.S. Army Center of Military History, *Operation Joint Guardian: The U.S. Army in Kosovo*, undated.

[59] Martin Egnash, "US Soldiers Deploy to Kosovo Amid Enduring Tensions," *Stars and Stripes*, July 12, 2017.

[60] "U.S. Troops Join NATO in Kosovo," CNN, June 14, 1999.

[61] Steven Beardsley, "Active-Duty Troops to Deploy to Kosovo for the First Time in a Decade," *Stars and Stripes*, March 13, 2013.

[62] Beardsley, 2013.

[63] Beardsley, 2013.

USPACOM Stability and Preparation in South Korea and the Marshall Islands

The United States has maintained a military presence in South Korea since July 27, 1953, when the North Korea and China signed the armistice agreement establishing the demilitarized zone along the 38th parallel.[64] Since that day, the United States has honored its commitment to deter aggression and, if necessary, defend South Korea to maintain stability in the region.[65] Since 1966, numerous status-of-forces agreements have codified core elements of the U.S.–South Korea military partnership.[66] Currently, the Eighth Army is the designated U.S. Army service component command for U.S. Forces Korea. Other component commands include the Seventh Air Force, U.S. Naval Forces Korea, and U.S. Marine Corps Forces Korea.[67] DMDC active-duty, reserve, and civilian deployment data for September 2017 indicated that 27,123 U.S. personnel were deployed in South Korea (of whom 1,873 were Army civilians).[68]

The United States acquired military control of the geographically strategic Marshall Islands from Japan in 1944 and assumed administrative control under the auspices of the United Nations after the end of World War II.[69] According to the U.S. Department of State,

> The United States has full authority and responsibility for security and defense of the Marshall Islands, and the Government of the Marshall Islands is obligated to refrain from taking actions that would be incompatible with these security and defense responsibilities.[70]

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64 U.S. Army Asymmetric Warfare Group, *Korea Handbook: The Complex Operating Environment and Asymmetric Threats*, June 2017, p. vi.

65 See U.S. Forces Korea, "About," webpage, undated(a).

66 U.S. Forces Korea, "SOFA Documents," webpage, undated(c).

67 U.S. Forces Korea, "Organization," webpage, undated(b).

68 See DMDC, "DoD Personnel, Workforce Reports and Publications," webpage, undated.

69 See U.S. Department of State, Bureau of East Asian and Pacific Affairs, "U.S. Relations with Marshall Islands," fact sheet, July 15, 2018.

70 U.S. Department of State, 2016.

U.S. Army Garrison Kwajalein Atoll houses the Ronald Reagan Ballistic Missile Defense Test Site, in addition to military personnel, Army civilians, and contract personnel, and their families.[71] DMDC active-duty, reserve, and civilian deployment data for September 2017 indicated that 84 U.S. Army personnel were deployed to the Marshall Islands: 66 civilians and 18 active-duty soldiers.[72]

Characteristics of Army Expeditionary Deployments in Historical Operations

Despite the breadth of historical operations to which expeditionary civilians have deployed, it is instructive to note that the majority of Army expeditionary civilian deployments between 2009 and 2016 were to operations in the USCENTCOM AOR, as shown in Table 3.2.

These deployments ranged in length from one month to several years, with a median civilian deployment length of six months during this time frame, as shown in Figure 3.1.

Table 3.3 shows demand for the top ten most in-demand Army expeditionary civilians occupational types across the range of historical operations. Over the time frame for which historical data were available (2009–2016), administrative personnel, mechanical and electrical equipment specialists, and logistics personnel constituted the most in-demand occupations for Army expeditionary civilians.

During this period, as shown in Figure 3.2, the majority of Army expeditionary civilians fell within the GS-11, GS-12, and GS-13 pay grades, indicating that most were midlevel, skilled professionals.

Future Operational Scenario Profiles

The Army doctrine framework is a cognitive tool for commanders and staffs to visualize and describe the application of power in terms of

71 DMDC, undated.

72 DMDC, undated.

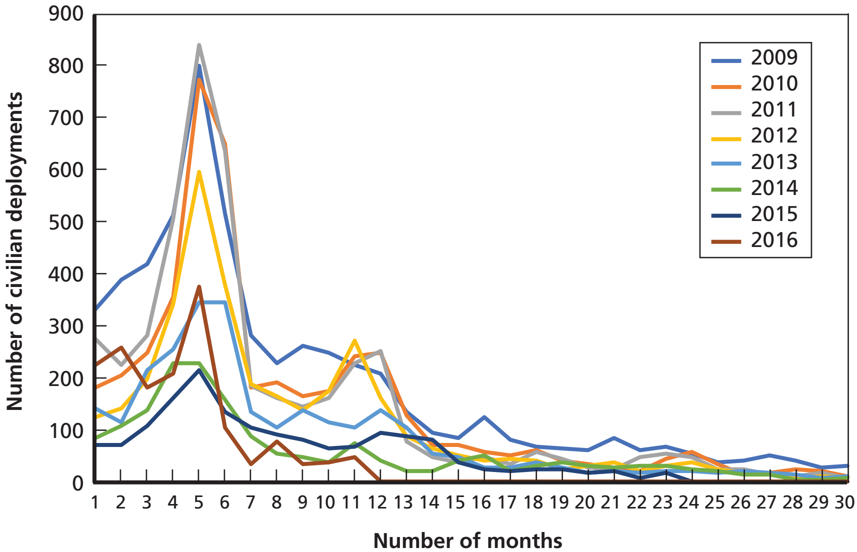
Table 3.2
Army Expeditionary Civilian Deployments, by Country, 2009–2016

	Number of Army Expeditionary Civilians Deployed									
Year	**Afghanistan**	**Iraq**	**Kuwait**	**South Korea**	**Saudi Arabia**	**Qatar**	**Marshall Islands**	**Jordan**	**Honduras**	**Bahrain**
2009	1,438	2,878	738	905	201	62	50	3	28	17
2010	2,094	1,619	568	252	51	33	16	1	10	5
2011	2,880	841	675	188	51	32	10	3	10	15
2012	2,915	51	354	167	44	39	8	5	4	7
2013	2,146	18	246	162	58	27	8	22	7	7
2014	981	5	216	262	46	31	21	32	8	12
2015	726	54	294	297	72	25	26	9	6	7
2016	569	116	395	287	83	14	18	7	9	11
Total	13,749	5,582	3,436	2,520	606	263	157	82	82	62

SOURCE: DMDC data, September 2017.

NOTE: Shading indicates that the country is in the USCENTCOM AOR. The table includes the top ten countries in terms of number of Army deployments.

Figure 3.1
Deployment Length for Army Expeditionary Civilians, 2009–2016



SOURCE: DMDC data, September 2017.

Table 3.3
Army Expeditionary Civilian Deployments, by Ten Most Common Occupations, 2009–2016

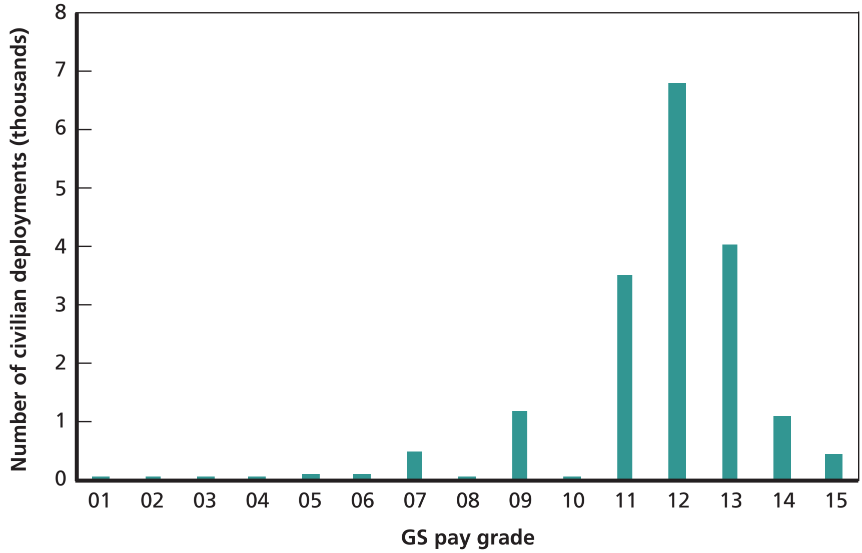
	Civilian Deployments	
DoD Occupation Group	Number	Share of Deployments DoD-Wide (%)
2701: Administrators, General	3,171	11.6
1690: Other Mechanical and Electrical Equipment, General	3,152	11.5
2801: Logistics, General	2,343	8.6
1612: Construction Equipment	1,863	6.8
2401: Construction and Utilities	1,605	5.9
2708: Intelligence, General	1,104	4.0

Table 3.3—Continued

DoD Occupation Group	Civilian Deployments	
	Number	Share of Deployments DoD-Wide (%)
1557: Production and Quality Control	1,072	3.9
2804: Procurement and Production	969	3.6
2705: Data Processing	879	3.2
2511: Educators and Instructors	862	3.1

SOURCE: DMDC data, September 2017.

Figure 3.2
Army Expeditionary Civilian Deployments, by GS Pay Grade, 2009–2016



SOURCE: DMDC data, September 2017.

time, space, purpose, and resources in the concept of operations.[73] Similarly, our future scenarios were the framework we used to visualize and describe the use of civilians in future Army contingency operations. The operational environment is a composite of the conditions, circumstances, and influences that affect the employment of capabilities and the commander's decisions.[74] Interacting within the operational environment is a set of operational and mission variables, which leaders must understand to plan, prepare, execute and assess operations. The operational variables consist of political, military, economic, social, information, infrastructure, physical environment, and time (collectively known as PMESII-PT) factors.[75] These variables interact with the variables of mission, enemy, terrain and weather, troops and support available, time available, and civil considerations. Understanding how these variables interact in a specific situation gives the commander a clearer perspective on the area of operations, what capabilities are needed, and how best to accomplish the mission.

We used a similar process to identify variables to include in our conceptualization of future scenarios. We first considered current and former operations to ensure that we accurately identified the types of operations to which Army civilians would likely deploy along the conflict continuum, from peace to war (see Figure 3.3).

Using JP 3-0 as a guide for types of military operations and activities, we chose to model the following types of activities:

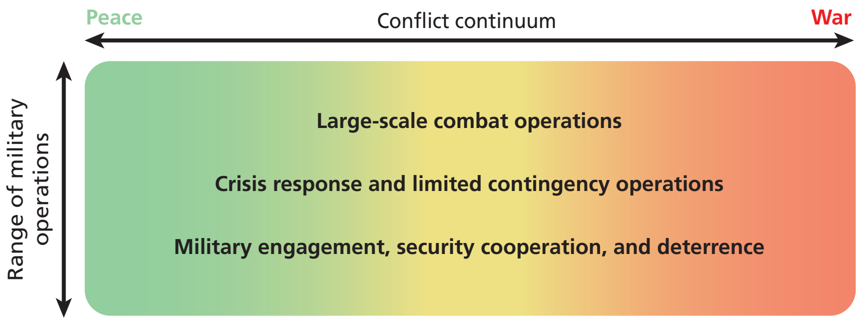
- *Stability activities*, which include "various military missions, tasks, and activities conducted outside the US in coordination with other instruments of national power to maintain or reestablish a safe and secure environment and to provide essential gov-

[73] Army Doctrine Publication 1-01, *Doctrine Primer*, Washington, D.C.: Headquarters, U.S. Department of the Army, July 2019.

[74] JP 3-0, *Joint Operations*, Washington, D.C.: U.S. Joint Chiefs of Staff, incorporating change 1, October 22, 2018.

[75] Army Doctrine Publication 3-0, *Operations*, Washington, D.C.: Headquarters, U.S. Department of the Army, July 2019.

Figure 3.3
Operations Across the Conflict Continuum as Depicted in Joint Doctrine



SOURCE: JP 3-0, 2018, p. V-4, Figure V-2.

ernmental services, emergency infrastructure reconstruction, and humanitarian relief."[76]

- *Foreign humanitarian assistance*, or DoD activities that are typically conducted "in support of the United States Agency for International Development or [the U.S. Department of State], conducted outside the US and its territories to relieve or reduce human suffering, disease, hunger, or privation."[77]
- *Large-scale combat operation*, "a series of tactical actions (battles, engagements, strikes) conducted by combat forces of a single or several Services, coordinated in time and place, to achieve strategic or operational objectives in an OA. The term can also refer to a noncombat operation of significant size and scope."[78]

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[76] JP 3-0, 2018, p. V-2.

[77] JP 3-0, 2018, p. V-2; also see JP 3-29, *Foreign Humanitarian Assistance*, Washington, D.C.: U.S. Joint Chiefs of Staff, May 14, 2019.

[78] JP 3-0, 2018, p. V-5. Such operations are typically part of a broader campaign:

> A campaign is a series of related major operations aimed at achieving strategic and operational objectives within a given time and space. Usually associated with large-scale combat, a campaign also can comprise predominately limited combat and noncombat operations of extended duration to achieve theater and national strategic objectives. (JP 3-0, 2018, p. V-5)

- *COIN operation*, encompassing "comprehensive civilian and military efforts taken to defeat an insurgency and to address any core grievances."[79]

We opted to further disaggregate these operation types to provide a higher level of specificity in modeling demand for expeditionary civilians across various types of operational activities. We therefore aimed to forecast civilian deployments for 11 notional future scenarios across five types of operations: COIN, counterterrorism, HA/DR, stability/security, and MCO. Most of our future stability/security and counterterrorism missions carried the historical data forward. We predicted demand for one large-scale COIN scenario: Operation Redline, a proxy war with Russia in the Baltics involving unconventional warfare tactics, with European partners participating heavily. We also predicted demand for two possible MCOs: Operation Neptune Knight, an MCO-like ground intervention in North Korea, with an assumed 200,000 U.S. military troops on the ground, and Operation Indigo, a large-scale effort to counter Iran's anti-access/area-denial and unconventional warfare threat through internal strike, with an assumed 120,000 U.S. military ground troops. Finally, three notional future HA/DR scenarios drew military deployment specifications from historical data by matching new countries to those in the data: an earthquake in El Salvador, a tsunami in India, and a swine flu outbreak in Cambodia and Thailand. Table 3.4 describes the characteristics of this range of notional future scenarios, noting the countries envisioned to be involved in each.

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[79] JP 3-0, 2018, p. V-3; also see JP 3-24, *Counterinsurgency Operations*, Washington, D.C.: U.S. Joint Chiefs of Staff, April 25, 2018.

Table 3.4
Future Operational Scenario Profiles and Data Inputs

Operation Type	Notional Future Scenario	Countries (core countries in italics)
COIN	"Operation Redline" (large-scale war with Russia)	Belgium, Denmark, *Estonia*, Finland, Germany, Italy, *Latvia*, *Lithuania*, Poland
Counterterrorism	Counter-ISIL	Bahrain, *Iraq*, Israel, Jordan, Kuwait, Qatar, Saudi Arabia, Turkey
Counterterrorism	Counter-Taliban	*Afghanistan*, Egypt, Kyrgyzstan, Oman, Pakistan, Tajikistan, Uzbekistan, Yemen
Counterterrorism	OEF-HOA/CJTF-HOA	Djibouti, Ethiopia, Kenya, *Somalia*, Uganda
HA/DR	"Operation Castle" (swine flu outbreak in Southeast Asia)	*Cambodia*, Thailand
HA/DR	"Operation Elemental" (large earthquake in El Salvador)	*El Salvador*
HA/DR	"Operation Interval" (large tsunami in India)	*India*
MCO	"Operation Indigo" (war with Iran)	*Iran*, Iraq, Kuwait, Oman, UAE
MCO	"Operation Neptune Knight" (war with North Korea)	*North Korea*, Japan, Marshall Islands, South Korea
Stability/security	Counternarcotics	*Colombia*, *Honduras*, *Mexico*
Stability/security	USPACOM stability and preparation	*Marshall Islands*, *South Korea*

CHAPTER FOUR

Development and Results of the Demand Model

Identifying Current Expeditionary Civilian Deployment Processes Across DoD

Early in our study, we attempted to identify the approaches that various organizations used to plan for requirements for future expeditionary civilian deployments. However, with the exception of the demand signal developed by the IES Office, we learned that none of the organizations interviewed employed a sophisticated modeling approach to forecast these demands. To the extent that these various DoD entities planned ahead for civilian deployments at all, they used ad hoc methods to predict future demand.[1]

We also asked interviewees about demand triggers for deploying civilians in an attempt to gauge which triggers were most important. The top trigger mentioned by interviewees was the type of job and the need for civilian expertise, followed by force management levels (or "force caps" within a particular theater), and then the timing or phase of the military operation. Other, less important triggers mentioned were, in descending order, a lack of expertise among military personnel, changes in policy or the political environment, the value of civilians for continuity, cost concerns, and future warfare scenarios.

1 A small group of interviewees shared, based on the information available to them, whether they thought demand would increase, decrease, or remain unchanged in the future. Of these 14 interviewees, seven were from DoD, four were from Army organizations, two were from USCENTCOM, and one was from USAFRICOM. The group was approximately evenly split on whether demand would increase or decrease, with a few interviewees expressing that demand was unlikely to change.

As mentioned in Chapter One, DoD civilians deploy to contingency operations in one of two ways: through agency-programmed requirements or through what used to be known as the CEW program, now the DoD-EC program. We asked our interviewees whether their organizations deployed civilians in cadres as part of programmed requirements, through the CEW program or as DoD-ECs, or both.

The Army Audit Agency, Center for Army Analysis, U.S. Army Corps of Engineers, USCENTCOM, USPACOM, U.S. Army Special Operations (Aviation Command), USFOR-A, U.S. Army Space and Missile Defense Command, and the Office of the Secretary of Defense used both, although some interviewees reported that perhaps only one employee from their organizations had deployed via the CEW program in the previous several years.

The following organizations reported that they relied solely on programmed requirements: Army Materiel Systems Analysis Activity; Office of the Deputy Chief of Staff of the Army, G-1; U.S. Army Europe; U.S. Army Pacific; Office of the Deputy Chief of Staff, G-2; USSOUTHCOM; and USAFRICOM. Only two organizations—U.S. Army Medical Command and U.S. Army Pacific—deployed civilians exclusively via the CEW program.

Grouping the offices by AOR, where applicable, we found that organizations within the USPACOM and USCENTCOM AORs generally deployed civilians via both CEW and programmed requirements, while those in the USSOUTHCOM, USAFRICOM, and U.S. European Command (USEUCOM) AORs deployed civilians via programmed requirements.

We also asked interviewees to share relevant data on their civilian deployment practices, with the goal of incorporating these data into our demand models. We ultimately received 32 documents, of which 17 contained force-level deployment data. Other documents included explanations of the process for civilian deployment, CEW procedures and guidance, a CEW sourcing plan, and instructions for coding and categorizing CEW personnel. We ultimately determined that the 17 documents that included data could not be incorporated into the models, but we used seven of them for reference as we developed our models:

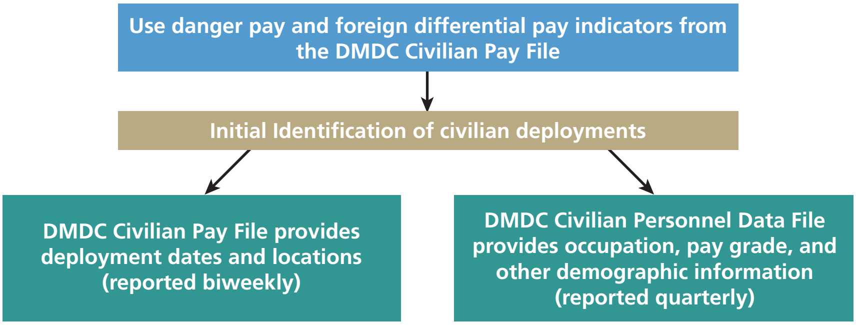
1. a USAFRICOM joint manning document
2. a USFOR-A roster of civilians deployed to Afghanistan
3. a CEW deployment history chart specifying the number of deployments in the top ten occupational series in each military service
4. an overview of the GFM process, which included figures on joint manning requirements and joint individual augmentees
5. a document outlining the FY 2019 civilian demand signal, including tallies by position type and activity
6. a table of deployment requests for personnel actions, by service, from 2009 to 2013
7. a document containing incomplete individual-level CEW deployment data on Army civilians and contractors from 2000 to September 2016.

Five of these documents contained information pertaining to the number of civilians deployed to specific locations or military operations. We used these numbers to cross-reference individual-level data collected from DMDC, as discussed next.

Collecting Individual-Level Data on Civilian Deployments

We relied heavily on DMDC data to characterize historical deployments by both civilians and uniformed personnel across DoD (see Figure 4.1). Because civilian deployments are not explicitly recorded as such, we used several variables to deduce deployments (including danger pay, foreign differential pay, and location) and to determine where and for how long an individual was deployed. DMDC's Civilian Pay File provided biweekly information on foreign differential and danger pay, as well as dates and the location initiating the payments. We also used DMDC's Civilian Personnel Data File, which is available quarterly, to obtain information on position characteristics—for example, occupation code, pay grade, and demographic characteristics. We were limited by the availability of the two pay variables and the

Figure 4.1
Process for Identifying and Validating Data on Civilian Deployments



corresponding location information from the Civilian Pay File, which constrained the period of evaluation to 2009–2016.

Using the reference data provided by our interviewees, we compared organizational deployment numbers with those pulled from the DMDC data to evaluate how well our DMDC approximation worked. This step indicated that we had used appropriate methods to identify the population of deployed civilians: Of the CEW deployments captured in organizational deployment reporting, 95 percent were picked up by our method of identifying civilian deployments at large (not just CEW) in the DMDC data.

Identifying a Modeling Approach

A predictive model is only as strong as the predictor variables identified and utilized by the model.[2] As mentioned, we predicted civilian deployments under a range of notional future scenarios by identifying relationships between civilian deployments and other features of

[2] As noted previously, our analysis included four country-specific parameters: per capita GDP, polity, fragility, and core/ancillary status. Although we could have considered numerous other variables, we selected these four because they broadly captured the parameters affecting civilian deployments. Additional key parameters affecting demand (e.g., terrain and population) are likely captured indirectly in our analysis via the inclusion of military deployment variables.

historical campaigns, including military deployments and location-specific characteristics.

We ultimately selected a statistical machine-learning framework to model the available data. This approach allowed us to automatically identify a subset of predictors and interaction terms in a statistical model that yielded the best predictions for the given data and was still sufficiently interpretable. The advantage of this framework over a standard linear regression model is that the latter requires an analyst to select predictor variables, which is a time-consuming and complex task when there are many predictors and possible interaction terms. The goal of machine learning is to reduce the need for human intervention and decisionmaking and to allow the model to automatically discover, from the data, how best to utilize a large number of possible predictor variables. Thus, this method allowed us to use information on military deployments, in addition to other scenario characteristics, to directly forecast expeditionary civilian deployments in total and by occupation.

For each of the 12 historical operations considered, we identified the countries involved and the time period of the operation. Our analysis considered several characteristics of each operation, which served as the input variables for our modeling effort. These variables included the type of operation, the deployment location (using the geographic CCMD AOR), the austerity level of the country where the operation occurred, the country's score on the Fragile States Index, the type of government in the country, whether the country was considered a core or ancillary country in the operation, and a set of discrete variables indicating the number of civilian and active-duty military deployments by occupation. Several of these variables and the requisite data sources informing their use are discussed later in this chapter.

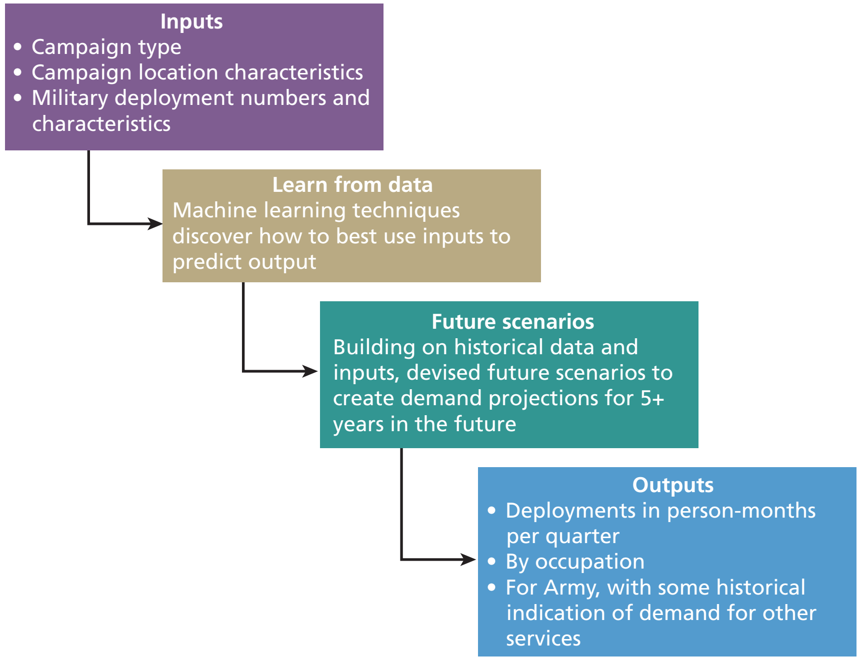
Appendix B explains the model development, fitting, and validation process in greater detail and provides further insight into how we settled on this approach as a reasonable way to model the data and predict future deployments. It also provides more detail on the input variables used in our analysis.

Creating the Demand Model

As discussed in Chapter Three, we defined our selected historical operations by a set of location-specific variables, supplemented by military deployment data and observed civilian deployments. These deployments were the variable for which we wanted to develop forecasts, by both person-months per quarter and occupation. Although our effort focused on Army deployments, we also collected deployment data for other services, which provided additional context for our scenarios. Figure 4.2 provides an overview of our modeling approach.

Location-specific variables are largely known, or information about them is available from external, widely available sources (e.g., per capita GDP date are readily available from the World Bank). However, it can be more difficult to acquire sufficient data on military and civilian deployments.

Figure 4.2
Overview of Modeling Approach



Military deployments are well tracked, and we obtained comprehensive military deployment data for active-duty service members from a variety of files in the DMDC database. The Contingency Tracking System (CTS) Deployment File contains information on deployments related to the Global War on Terrorism since September 11, 2001. Unit location information found in the Defense Enrollment Eligibility Reporting System (DEERS) served as a proxy for individual deployment location and was used to supplement locations not covered by the CTS Deployment file. Additionally, we used the Active Duty Master File to obtain information on service members' DoD occupations during deployment.[3] Data on the DoD occupations allowed us to determine the distribution of deployed service members across civilian (mil_{civ}) and noncivilian occupations (mil_{nonciv}), as well as the distribution across combat arms (mil_{CA}), combat support (mil_{CS}), and combat service support occupations (mil_{CSS}).[4] This was critical, as we hypothesized that (1) military deployments would have some impact on civilian deployments (either positive or negative), and (2) the impact would vary by occupation. Furthermore, we hypothesized that civilians would be more likely to deploy in place of CS and CSS occupations (i.e., mil_{CS} and mil_{CSS}), and, as such, there would be an inverse relationship between military deployments in those occupations and civilian deployments.

We would be remiss if we did not address the omission of contractors from this analysis. As noted in Chapter One, although reliable data are available that can be used to estimate both civilian and military deployments across occupational specialties on a quarterly basis and across numerous geographic locations, such data do not exist for contractors writ large. Information on individual contracts (e.g.,

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[3] We identified the DoD occupation codes of deployed military personnel rather than their military occupational specialty (MOS) so that we could examine both civilian and military deployments by occupation, and civilians are assigned DoD occupation codes only.

[4] See Appendix B for a more complete discussion of the definitions of the mil_{civ}, mil_{nonciv}, mil_{CA}, mil_{CS}, and mil_{CSS} variables. Note, in particular, that milnonciv is defined as the number of military deployments in DoD occupations for which we also observed civilian deployments somewhere in our data set (not necessarily in the same quarter or for the same scenario).

vendor, type of service, amount of contract, place of performance, and period of performance) is available from the Federal Procurement Data System–Next Generation, but the number of contractor personnel used to fulfill a contract is not available because contracting firms are not required to report these data. Furthermore, the fact that direct labor costs cannot be distinguished from the total contract value at this time complicates efforts to estimate contractor numbers.[5] Some estimates of contractor numbers exist for various activities and locations during operations in Iraq and Afghanistan,[6] but these numbers cannot be verified with certainty, nor do they capture all occupational specialties or non-USCENTCOM locations. Indeed, the occupations of contractors identified within these reports are broader than the DoD occupations considered in this analysis, which makes alignment and comparison of civilian or military deployment estimates and contractor estimates difficult.

We considered this issue carefully, as contractors are, by definition, part of the Total Force concept and could theoretically be used as a substitute for expeditionary civilians (or vice versa). However, we ultimately determined that contractors could not be included in this analysis in any systematic manner due to these data limitations and that it was a more robust option to omit them and caveat the model accordingly.

We used two models to forecast future demand for expeditionary civilian deployments. The first allowed us to determine the likelihood of civilian deployments to an operation. If a given scenario was likely to require civilian deployments, we employed a second model to predict the number of such deployments.

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[5] Nancy Y. Moore, Molly Dunigan, Frank Camm, Samantha Cherney, Clifford A. Grammich, Judith D. Mele, Evan D. Peet, and Anita Szafran, *A Review of Alternative Methods to Inventory Contracted Services in the Department of Defense*, Santa Monica, Calif.: RAND Corporation, RR-1704-OSD, 2017.

[6] Sarah K. Cotton, Ulrich Petersohn, Molly Dunigan, Q Burkhart, Megan Zander-Cotugno, Edward O'Connell, and Michael Webber, *Hired Guns: Views About Armed Contractors in Operation Iraqi Freedom*, Santa Monica, Calif.: RAND Corporation, MG-987-SRF, 2010. Also see Office of the Assistant Secretary of Defense for Logistics and Materiel Readiness, U.S. Central Command quarterly contractor census reports, various dates.

To estimate civilian deployments, we used variables corresponding to foreign differential pay, danger pay, and location in the Civilian Pay File.[7] We assumed that an individual was deployed to a location if the selected location variable was not missing and the individual received either foreign differential pay or danger pay. We then used the Civilian Personnel Data File to obtain demographic information on deployed individuals. Most important of the demographic information was the individuals' DoD occupations.

To validate this method and ensure that we were capturing as many civilian deployments as possible, we compared our estimated deployments with a variety of manning documents delineating requirements for expeditionary civilians.[8] Deployment numbers found in these files were similar to our estimates, suggesting that our method of capturing civilian deployments was appropriate. Furthermore, we obtained access to individual-level data on CEW deployments tracked internally by the Army. Although the data were not complete, this provided another source of comparison, and we found that our method was able to account for approximately 95 percent of the CEW deployments captured in the organizational reporting shared with us.[9]

Limitations of the Data

Given that there are no single data sources with accurate records of deployments, there are bound to be limitations in the data that we used

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7 Note that we used the location variable associated with the pay received (i.e., danger pay or foreign differential pay). Although the DMDC data included a more general geographic location variable, that variable seemed to be the location where the service member was based (administratively) rather than the location where the service member was physically present.

8 We examined USAFRICOM, USFOR-A, and CEW manning and personnel documents from 2012, 2013, and 2016.

9 This does not imply that the method described in this report for identifying civilian deployments accounted for 95 percent of civilian deployments. DMDC data contain information on all types of civilians and civilian deployments, not just on civilians who have deployed as part of the CEW. Although the method we applied to the DMDC data accounted for roughly 95 percent of CEW deployments, we also identified many more civilian deployments that were not part of the CEW.

to identify the relationships between campaigns and deployments and hence to predict deployments. Here, we describe some of those limitations and what they imply for our predictions.

Again, the method for identifying civilian deployments using the Civilian Pay File was validated to the extent that 95 percent of CEW deployments included in DoD reporting were captured by our method of identifying civilian deployments at large (not just via the CEW program) in the DMDC data. However, the two pay variables of interest—the foreign differential and danger pay variables—were only populated back to 2009. Thus, we were able to estimate civilian deployments for the 2009–2016 period only, which limited the scope of our historical analysis. This also yielded a smaller data set than if we had been able to obtain information on earlier civilian deployments; hence, there is some uncertainty in the estimates because the model relied on this limited data set.

Moreover, in identifying military deployments for the historical operations, it was difficult to accurately capture data for "quick-response" missions, such as Operation Unified Response. The available data did not necessarily track short-term missions, and, for certain countries, it was challenging to distinguish between individuals who were permanently stationed at a location and those who were deployed for a short-term mission.

Relatedly, the data we analyzed showed very low numbers of deployed civilians to Army and DoD operations involving limited-term, short-notice deployments; in these cases, expeditionary civilians were either not used to support these operations, or the short-term deployments did not appear in our data. Also, non-Army, non-DoD organizations (such as the Office of Foreign and Disaster Assistance in the U.S. Agency for International Development) technically take the lead in HA/DR response efforts, which are also typically short in duration, making it less likely that DoD or Army civilians will be involved in such contingencies in large numbers.[10] Because of this feature of the data, our model yielded very few predicted deployments to

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[10] U.S. Agency for International Development, "Office of U.S. Foreign Disaster Assistance," webpage, last updated May 2019.

HA/DR operations. If the available data did not represent true numbers of deployments to HA/DR operations, then the model's predictions will not be useful for these operations.

In addition to the limited time frame of consideration for historical operations, the data that we obtained on civilian deployments represented filled demand only and did not capture total *requirements* (raw demand) for civilians. Because we used DMDC as our data source for civilian deployments, we collected information only on civilians who actually deployed to fill a requirement for a particular operation. Information on the overall requirements for civilians that was submitted at the time of the request was not available through DMDC, so we were not able to capture requirements that went unfilled.[11] Thus, our civilian deployments represent only a subset of requirements, suggesting that the predictions obtained using the resulting model accurately represent the number of civilians who *would* deploy in a future scenario, not necessarily the total that may be *needed* for a scenario. Thus, the predictions cannot be assumed to represent the total demand requirements for civilian deployments. Because we could not observe the portion of requirements represented by our identified civilian deployments, we could not ascertain the fraction of total requirements for future scenarios in the predictions.

Model Details

To estimate deployment demands for future scenarios, we applied two statistical models of civilian deployments (in person-months per quarter) as a function of a set of input variables (e.g., the operation descriptors, location-specific information, military deployment data). The first model determined the likelihood of civilian deployments to an operation. Given a probability of civilian deployments to an operation (i.e., the probability of civilian deployments is nonzero), we used

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[11] To our knowledge, there is no data source of data on historical, unfilled requests. We did obtain one file containing request information, but it was simply a snapshot in time and included only then-current requests. It did not capture prior, unfilled requests that may have been closed.

the second model to predict the magnitude of deployments in person-months per quarter.[12]

We developed the models using data from historical operations and applied machine-learning techniques to identify the subset of input variables that yielded the best predictions and to tune the model appropriately for the given data. Because the set of predictor variables that may explain civilian deployments contained some highly correlated variables (e.g., the mil_{civ} variable was correlated with the mil_{nonciv} variable), it was unclear whether all of the variables identified earlier in this chapter were needed to explain civilian deployments. In addition to the set of "basic" predictor variables identified earlier (the operational variables, military deployment counts, and country-specific parameters), it was important to consider the relationship between pairs of variables across the operations. For example, as the value of mil_{nonciv} increased, civilian deployments increased more quickly in stability/security operations than in other types of operations. This implies that the effect of mil_{nonciv} is not constant across the range of other input variables. Therefore, to capture as many nuances as possible, we also considered all pairwise interactions between the collection of input variables. including these pairwise interaction terms greatly increased the size of the set of the set of predictor variables under consideration. However, only some of these variables were likely necessary to sufficiently explain civilian deployments, and we let the model automatically determine which of the possible variables yielded the best predictions.

Because the models were developed and tested with historical data, it is possible to compare the predicted civilian deployments with the historical data to determine the predictor variables that provide the best predictions. In this case, the "best" prediction model is that which yields the lowest average prediction error averaged across all subsets of the test data. (The notion of "training" and "test" subsets are explained in the discussion of cross-validation in Appendix B.) The resulting two-part model can then be applied to predict civilian deployments for future scenarios. The quality of the model fit is

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[12] Recall that the Civilian Inventory File provides quarterly data on civilian demographics, restricting the time frame for our analysis to quarterly snapshots.

discussed in Appendix B. Here, we note that, in the stage 1 model, 87 percent of the predicted "zero civilian deployments" are truly "zeroes," while 69 percent of the predicted "nonzero civilian deployments" are truly nonzero.[13] Visual inspection and goodness-of-fit metrics suggested that the variables included in the stage 2 model explained a large proportion of the variation in civilian deployments.

Drivers of Civilian Demand

The coefficients of a fitted regression model reveal how various predictors affect the output variable. In this case, the coefficients of the various operation characteristic–related variables provide insight into whether a particular variable causes an increase or a decrease in civilian deployments and the corresponding magnitude of the increase or decrease (see Tables B.3 and B.4 in Appendix B). In this section, we highlight important findings about the relationships between the predictors and civilian deployments, describing the variables that are most important in predicting civilian deployments.

The operation type and core status of a country had large effects on civilian deployments. We observed high numbers of civilian deployments to countries classified as core in COIN operations. Additionally, stability/security operations were positive drivers of civilian demand, particularly when mil_{nonciv} deployments were high. We observed a higher degree of (positive) interaction between the stability/security operational classification and mil_{nonciv} deployments than for any other operation type. This means that as mil_{nonciv} increased, the expected number of civilian deployments in stability/security operations increased more than in other operations. Not surprisingly, we observed that civilian deployments increased, in general, when military deployments increased.

[13] This implies that, in 31 percent of instances when the stage 1 model predicted "non-zero deployments," there were actually zero deployments. Thus, the model may have overestimated the civilian demand requirement. However, we caution that these incorrect estimates may be tied to HA/DR scenarios, which often have very low civilian demand.

Additionally, operations in USPACOM were associated with a higher number of civilian deployments relative to other CCMDs. This is not surprising, given the nature of steady-state operations in the AOR and the fact that USPACOM is structured to have an extensive number of assigned forces, unlike most other CCMDs.

Countries categorized as fragile and having transitional governments tended to have lower numbers of civilian deployments than locations with other fragility and polity classifications. There was a lower rate of increase in civilian deployments as military deployments increased in democracies. This is to be expected, given that the majority of expeditionary civilian deployments during the time frame of our historical data set occurred in the USCENTCOM AOR. To some extent, therefore, these findings may be contingent on the nature of U.S. operations in the 2009–2016 time frame.

Forecasting Civilian Deployments

After fitting the models based on the historical data, we used them to forecast civilian deployments for our notional future scenarios. Forecasting involves specifying values for each of the input variables and then applying the fitted model to estimate deployments. For each scenario, we applied the two models to predict civilian deployments (in person-months per quarter). We present these predictions at the occupation level and in total to give an indication of the overall scale of the forecasted civilian deployments by scenario.

As previously discussed, we aimed to forecast civilian deployments for 11 notional future scenarios across five types of operations (COIN, counterterrorism, HA/DR, MCO, and stability/security).[14] As with the historical operations, we classified these future scenarios across a

[14] Although the historical operations are categorized into four types of operations, for the future scenarios we include a new category of "MCO-like." The single COIN and two MCO-like scenarios are both intended to represent large-scale warfare. However, the two MCO-like scenarios differ enough in terms of operational goals, as well as the nature of the "fight," that they aligned better with the definition of an MCO than with that of COIN operations. Thus, we placed them in their own category. Because these scenarios must be

number of dimensions, including military deployments and location-specific variables. To estimate military deployments to the 11 future scenarios, we used different techniques, depending on the degree to which the scenarios were based on actual historical or ongoing operations. (The techniques for each type of scenario are discussed next.) It is straightforward to collect location-specific information for historical time periods, but it can be difficult to predict with certainty the GDP, fragility index, or polity index of a given country in the future. Thus, rather than trying to predict future values, we used the most recent data available for these variables as proxies for future values (October 2016), as it is unlikely that these values will change significantly in the near term.[15]

Table 4.1 presents civilian deployment estimates across our notional future missions, developed by applying the model, with core countries denoted by italics. The point estimates for civilian deployments that we obtained by assuming the average military deployment values are shown as the topline estimates in the fourth column, and the ranges of possible civilian deployments that resulted from applying the lower and upper bounds on military deployment values are shown in the parentheses.

We briefly describe the methodology for estimating military deployments in each of the future scenario types. We discuss the counterterrorism and stability/security scenarios first, because we considered these scenarios to be extensions of current ongoing operations and the technique was straightforward.[16] We then present our approach for the envisioned future HA/DR scenarios, which were based on similar operations considered in our historical analysis. We conclude by discussing the approach for the notional future COIN and MCO scenarios. These three scenarios were not explicitly based on prior or ongoing

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classified according to one of four types of operations in the model, for our purposes, we classified the MCO scenarios as COIN operations.

[15] Comprises data available as of the time of collection in October 2016.

[16] It is likely that these operations will continue into the near future, which is why we considered them to be extensions of ongoing operations.

Table 4.1
Predicted Civilian Deployments Across Notional Future Missions

Operation Type	Notional Future Scenario	Countries (core countries in italics)	Predicted Civilian Deployments, Point Estimate and Range Estimates (person-months per quarter)
COIN	Operation Redline (large-scale war with Russia)	Belgium, Denmark, *Estonia*, Finland, Germany, Italy, *Lithuania*, *Latvia*, Poland	288 (227, 343)
Counterterrorism	Counter-ISIL	Bahrain, *Iraq*, Israel, Jordan, Kuwait, Qatar, Saudi Arabia, Turkey	1,243 (820, 2,065)
Counterterrorism	Counter-Taliban	*Afghanistan*, Egypt, Kyrgyzstan, Oman, Pakistan, Tajikistan, Uzbekistan, Yemen	1,137 (492, 1,980)
Counterterrorism	OEF-HOA/ CJTF-HOA	Djibouti, Ethiopia, Kenya, *Somalia*, Uganda	31 (15, 45)
HA/DR	Operation Castle (swine flu outbreak in Southeast Asia)	*Cambodia*, Thailand	3 (1, 6)
HA/DR	Operation Elemental (large earthquake in El Salvador)	*El Salvador*	0 (0, 0)
HA/DR	Operation Interval (large tsunami in India)	*India*	0 (0, 0)
MCO	Operation Indigo (war with Iran)	*Iran*, Iraq, Kuwait, Oman, UAE	23,133 (16,026, 33,978)
MCO	Operation Neptune Knight (war with North Korea)	Japan, Marshall Islands, *North Korea*, South Korea	11,917 (8,166, 17,714)
Stability/security	Counternarcotics	*Colombia*, *Honduras*, *Mexico*	107 (53, 128)
Stability/security	USPACOM stability and preparation	*Marshall Islands*, *South Korea*	2,624 (1,235, 2,958)

operations but instead represent plausible scenarios identified in the U.S. national security strategy.[17]

Future Counterterrorism and Stability/Security Scenarios

The three counterterrorism operations for which predicted future civilian deployments were counter-ISIL, counter-Taliban, and OEF-HOA/CJTF-HOA; we also predicted civilian deployments for two stability/security scenarios, counternarcotics and USPACOM stability and preparation. OEF-HOA/CJTF-HOA, counternarcotics, and USPACOM stability and preparation are clearly continuations of their respective historical operations, while the counter-ISIL and counter-Taliban scenarios are assumed to be continuations of Operation New Dawn/Operation Inherent Resolve and Operation Freedom's Sentinel, respectively. Estimates for future military deployments to the notional future scenarios—total military deployments, as well as the distribution of military deployments across civilian/noncivilian occupational categories and the CA, CS, and CSS categories—were based directly on deployment numbers to these historical operations.

For each scenario, we used observed average military deployments (by country) to determine the single point estimates (by country) for future military deployments. However, because deployment levels vary over time, and because the average deployment value can be drastically skewed by outliers (i.e., quarters with extremely high or low numbers of deployments), we also considered a range of possible military deployments. We additionally considered the fifth- and 95th-percentile values for military deployments in the historical operations to identify lower and upper bounds for military deployments (e.g., mil_{nonciv}, mil_{civ}, mil_{CS}) to future scenarios.[18]

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[17] White House, *The National Security Strategy of the United States of America*, December 2017.

[18] The fifth-percentile value represents a level of military deployments for which only 5 percent of quarters saw fewer person-months of military deployments in the scenario. For example, if three person-months per quarter was the fifth-percentile value, then 5 percent of quarters had fewer than three person-months of military deployments. Using the fifth- and 95th-percentile values identifies a range that accounts for deployment levels in 90 percent of all quarters for a given scenario. Also note that, because the relationship between

As shown in Table 4.1, the model estimated that, for example, an average of 1,137 civilian person-months per quarter may be required by the counter-Taliban scenario, but demand may be as low as 492 person-months per quarter and as high as 1,980 person-months per quarter.

Because the counterterrorism and stability/security scenarios are extensions of current operations, we were able to assess the accuracy of these estimates by comparing them with observed average civilian deployment levels in the historical operation. For example, from 2015 to 2016, total civilian deployments to Operation Freedom's Sentinel (the historical equivalent of the future counter-Taliban scenario) averaged 1,617 person-months per quarter, which is within the range identified for the future scenario.

The only future scenario for which the historically observed civilian deployment levels did not fall within the predicted range was the counter-ISIL scenario. Between 2010 and 2016, civilian deployments to this operation averaged 2,491 person-months per quarter, which is well above the upper bound of 2,065 person-months per quarter predicted by the model. In this case, however, we believe that the difference was caused by the polity variable for Iraq, the core country in this operation. By 2014, Iraq was considered a democracy, whereas it was classified as an autocracy in 2009 and transitional from 2010 to 2013. During the time frame when Iraq was considered either an autocracy or transitional, we observed large numbers of civilian deployments. As noted previously, our model uncovered the relationship between polity and civilian deployments and associated more stable forms of government with lower numbers of civilian deployments. We see that trend explicitly reflected in this particular scenario.

Future Humanitarian Assistance/Disaster Relief Scenarios

We now turn our attention to potential future HA/DR scenarios. For these three notional scenarios, we based our military deployment estimates on those observed in similar operations. For Operation Castle,

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military deployments and civilian deployments is not necessarily linear, it is not necessarily the case that the lower bound on military deployments yields the lower bound on civilian deployments.

an outbreak of swine flu in Southeast Asia, we used data from Operation United Assistance, which sent aid to various African countries during the Ebola outbreak in 2014. For Operation Elemental, a large earthquake in El Salvador, we used data on military deployments to Operation Unified Response, which sent aid to Haiti in the aftermath of the earthquake in 2010. Finally, deployments to Operation Interval, an imagined large tsunami in India, were based on military deployment data from Operation Tomodachi, which sent aid to Japan after earthquakes and a tsunami in 2011. In each case, we inferred a theoretical alignment of proxy countries in the historical operations with assumed countries in the notional scenarios. (Table B.5 in Appendix B shows this alignment and the assumed military estimates.) As before, we used the average person-months of military deployments to develop a point estimate, as well as the fifth- and 95th-percentile values for military deployments to develop a range of predicted civilian deployments. Table 4.1 shows the estimated civilian deployments to notional HA/DR scenarios.

As noted, HA/DR operations often involve limited-term, short-notice deployments, and non-Army, non-DoD organizations, such as the Office of Foreign and Disaster Assistance, typically take the lead in HA/DR response efforts. Either DoD-ECs were often not used in these contingencies or the short-term deployments did not appear in our data. Both of these reasons help explain why both the historical data and the predictions for our future scenarios showed relatively low levels of demand for expeditionary civilians in HA/DR operations.

Future Counterinsurgency and Major Combat Operations Scenarios

The final category of notional future scenarios for which we predicted deployments were large-scale conflicts, which we classified as either COIN operations or MCOs.[19] We considered three such scenarios identified as plausible by the defense-planning community: war with

[19] Although we refer to these scenarios as *MCOs*, we technically categorized them as large-scale COIN operations for the purposes of applying the model. Because there were no MCOs in our historical profiles, the model could accept only small-scale COIN, large-scale COIN, HA/DR, or stability/security as operation types. Thus, because MCOs most closely resemble large-scale COIN conflicts, we categorized these three notional scenarios as such.

Iran (Operation Indigo), war with North Korea (Operation Neptune Knight), and war with Russia (Operation Redline).

Operation Redline is somewhat different from Operation Indigo and Operation Neptune Knight in that it involves large-scale partnered operations, with the United States working with and through capable military partners in Europe and the Baltic states. We assumed that U.S. forces would mostly play a supporting role in Operation Redline, with partner forces taking the lead.

Because Operation Redline is essentially a COIN-like operation, we drew military estimates from observed deployments to OEF-A, and countries involved in OEF-A served as proxies (for the purposes of estimating military deployments only) for countries involved in Operation Redline. We used deployments to Afghanistan as a proxy for deployments to the core countries in Operation Redline, evenly distributed across Estonia, Latvia, and Lithuania. We used deployments to the ancillary countries of OEF-A as proxies for deployments to the six ancillary countries in Operation Redline. Specifically, we matched Egypt to Poland, Kuwait to Germany, Oman to Finland, Pakistan to Denmark, and Qatar to Belgium and Italy.[20]

For Operation Indigo and Operation Neptune Knight, we used predictions from prior work by RAND and the Center for Strategic and Budgetary Assessments that formally modeled requirements for these operations to identify estimates of total military deployments in each scenario.[21] We distributed deployments across the involved countries using scenario details from these existing publications. Not surprisingly, this resulted in the majority of deployments being directed to the core countries. Estimated *military* deployments to Operation

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20 We matched countries from OEF-A to countries in Operation Redline by (1) matching the U.S. footprint in OEF-A countries with predicted U.S. presence in Operation Redline countries and (b) roughly matching the relative land mass and population size of countries in OEF-A and Operation Redline. We used these two factors to provide a rough, subjective heuristic for country matches between the historical campaign and the future scenario.

21 Timothy M. Bonds, *Limiting Regret: Building the Army We Will Need*, Santa Monica, Calif.: RAND Corporation, CT-437, 2015; Mark Gunzinger and Chris Dougherty, *Outside-In: Operating from Range to Defeat Iran's Anti-Access and Area-Denial Threats*, Washington, D.C.: Center for Strategic and Budgetary Assessments, 2011.

Indigo and Operation Neptune Knight are shown in Table 4.2. These values served as the basis for the point-estimate military data inputs to the model.

Because we did not have historical data from which to identify fifth- and 95th-percentile military deployment numbers in these scenarios, we used a different approach to determine lower and upper bounds on military deployment numbers. In this case, we halved and doubled the military point estimates in Table 4.2 to determine lower and upper bounds, respectively, on total military deployments. We then used these values to derive the subcomponents of total military deployments: numbers of deployments by civilian or noncivilian occupation and numbers of deployments by CA, CS, or CSS occupation.

Just as we lacked historical data from which to derive estimates of military deployments to Operation Indigo and Operation Neptune Knight, historical data on the distribution of military deployments across civilian and noncivilian occupations, as well as CA, CS, and CSS occupations, were not readily available. In this case, we assumed that these distributions would likely be similar to those observed in OIF, the closest analogue to an MCO (in terms of troop numbers and level of military effort) in the available historical data. In OIF, we observed that 55 percent of military deployments were in civilian occupations and 45 percent were in noncivilian occupations. Additionally, 28 percent of military deployments were considered CA occupations, 36 percent CS occupations, and 36 percent CSS occupations. We applied these percentages to our estimated military deployments to determine total deployments in each category. For example,

Table 4.2
Military Deployment Inputs for MCO-Like Scenarios

Notional Future Scenario	Countries (military deployments in person-months per quarter)
Operation Indigo (war with Iran)	*Iran* (200,000), Iraq (50,000), Kuwait (50,000), Oman (30,000), UAE (30,000)
Operation Neptune Knight (war with North Korea)	Japan (50,000), Marshall Islands (50,000), *North Korea* (300,000), South Korea (200,000)

NOTE: Core countries appear in italics.

assuming a deployment point estimate of 200,000 person-months per quarter to Iran during Operation Indigo produced an estimate of 110,000 person-months per quarter in civilian occupations and 90,000 person-months per quarter in noncivilian occupations. With respect to the distribution across CA, CS, and CSS positions, this suggests a demand of 56,000 person-months per quarter in CA occupations and 72,000 person-months per quarter each in CS and CSS occupations.

Note that the deployment forecasts for Operation Redline were significantly lower than those for either Operation Indigo or Operation Neptune Knight. Although this may seem strange, considering that all three are considered large-scale conflicts, there are two somewhat obscured factors that play an important role in the results: how the model classified the operation types and the countries assumed to receive the deployments.

Recall that Operation Redline is not actually categorized as an MCO but, rather, as a COIN operation. This suggests that we should examine historical civilian deployments to COIN operations as a means of validating these predictions. In the historical COIN operations, nearly 25 percent of observations for civilian deployments were very close to zero (no person-months per quarter), and the median value was eight person-months per quarter. The mean, on the other hand, was 596 person-months per quarter, but this value is skewed by some instances of very large numbers of civilian deployments. Furthermore, most of the historical COIN operations involved countries that were categorized as fragile autocracies according to the fragility and polity variables in the model—and this was particularly true of the core countries. In Operation Redline, however, all associated countries are categorized as stable democracies, which suggests a lower number of civilian deployments.

In addition to the operation type and fragility and polity ratings of the associated countries, the size of *military* deployments also played a significant role in predictions of civilian deployments to Operation Indigo and Operation Neptune Knight. Estimated military deployments to Operation Indigo ranged from 180,000 to 720,000, and deployments to Operation Neptune Knight ranged from 300,000 to

1.2 million. In general, these scenarios are assumed to be much larger-scale than the large operations in the historical data (e.g., total military deployments to OIF averaged approximately 30,000 person-months per quarter, with the maximum observed deployments being approximately 270,000 person-months per quarter).

Although the estimated military deployments to Operation Neptune Knight exceeded those observed in historical (large-scale) COIN operations, the effects of military deployments on civilian deployments were counteracted by the fact that only the core country, North Korea, ranks unfavorably in terms of both fragility and polity scores (warning and autocracy, respectively), while two of the three ancillary countries (South Korea and Japan) have favorable fragility and polity ratings (both are categorized as stable democracies). The third ancillary country, the Marshall Islands, has a favorable polity rating (democracy) but an unfavorable fragility rating (warning). There were relatively few military deployments to the Marshall Islands (approximately 8 percent of the total estimated military deployments to Operation Neptune Knight), so its fragility categorization did not have much of an impact on our overall estimates of civilian deployments.

Operation Indigo, on the other hand, required fewer military deployments than Operation Neptune Knight, but all of these deployments were to countries with unfavorable polity and fragility statuses. None of the five countries associated with Operation Indigo rank favorably in terms of either fragility or polity. Iraq is the only country characterized as a democracy, but it is also considered a fragile country. Iran, Kuwait, Oman, and the UAE are all characterized as autocracies; three of these countries (Kuwait, Oman, and the UAE) are considered stable, and one (Iran) is considered in warning. Thus, although we estimated fewer military deployments to Operation Indigo than to Operation Neptune Knight, these deployments would be to less-stable countries, resulting in a larger demand for civilian deployments.

Converting Demand to Number of Persons

The civilian deployment estimates in Table 4.1 are given in person-months per quarter. Converting these estimates to estimates of the number of individuals required to deploy in a given period (e.g., one year) requires making assumptions about the length of deployments and the number of times a given individual deploys. For example, consider the estimate of 1,137 person-months per quarter required for the counter-Taliban scenario. If the deployment length is assumed to be one year, then 379 civilians would be required to deploy each year to fulfill this need. If the deployment length is only six months, then 758 civilians would be needed each year.[22] In the case of partial-year deployments, additional assumptions and calculations may be necessary because it would be possible for one civilian to engage in, say, two six-month deployments, which may affect the total number of individuals required to deploy each year.

Projected estimates of demand for civilian deployments presented in this section are beneficial for planning because they can lead to estimates of the overall numbers of DoD-ECs expected to deploy for a given type of operation. However, these estimates provide information only on the total civilian population and do not lend insight into the *types* of civilians needed for a particular scenario. Next, we discuss the approach we used to generate predictions for specific occupations.

Forecasting Civilian Deployments by Occupation

Before conducting any analyses for our future scenarios, we looked at the historical data to determine which occupations seemed to deploy the most civilians and which occupations may have been deploying a large portion of their available deployable civilian workforces. Across the 12 historical operations, deployed civilians represented 76 of a possible total of 133 DoD occupations. We used a concept similar to low-density/high-demand to identify occupations that deployed a large portion of their available workforce. *High-relative-demand* occupations

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[22] To convert the civilian deployment estimates from person-months per quarter to persons per year, simply multiply the stated estimate by four and then divide by the assumed deployment length in months. For example, the 1,137 person-months per quarter estimated for the counter-Taliban scenario yields an estimate of 1,137 × 4 / 12 persons per year when deployment lengths are assumed to be 12 months. Note that multiplying the "person-months per quarter" estimate by four determines the total number of person-months required each year.

were those with a deployment rate of more than 1 percent of their available civilian person-months over the 2009–2016 time frame, and *high-absolute-demand* occupations were those with a deployment rate above 1,000 person-months overall. We categorized high-relative-demand occupations as such because a comparatively significant portion of the workforce was deployed to fill requirements. We identified 44 occupations across these two categories, as shown in Table 4.3 (sorted in terms of decreasing number of person-months of deployment). We note that no occupation outside these categories up more than 1 percent of total deployments to particular types of operations (e.g., COIN, HA/DR) or in any one of the 12 historical scenarios. For all operation types and scenarios, the occupations that accounted for 1 percent or more of total deployments were already included in the 44 occupations listed. Thus, these 44 occupations may deserve the most attention when planning for the future.

Table 4.3
High-Relative-Demand and High-Absolute-Demand Occupations

Occupation Code	Occupation	Total Person-Months of Deployment	Relative Demand (%)
2701	Administrators, General	41,541.117	1.4
280	Logistics, General	26,531.392	3.4
169	Other Mechanical and Electrical Equipment	21,677.476	4.5
155	Other Functional Support	20,552.956	1.6
2401	Construction and Utilities	19,207.919	2.2
2705	Data Processing	15,851.926	1.1
161	Automotive	14,501.955	1.1
171	Construction	10,912.520	3.4
2804	Procurement and Production	10,780.102	1.6
2301	Intelligence, General	10,115.216	3.9
2704	Comptrollers and Fiscal	9,380.029	1.2
2504	Social Scientists	8,589.528	3.8

Table 4.3—Continued

Occupation Code	Occupation	Total Person-Months of Deployment	Relative Demand (%)
2414	Engineering and Maintenance Officers, Other	8,175.332	1.0
2511	Educators and Instructions	6,389.745	0.9
151	Administration	5,855.436	0.3
149	Technical Specialists, Not Elsewhere Classified	5,657.504	0.8
2410	Safety	5,645.670	3.7
2708	Police	5,516.658	2.3
119	Other Electronic Equipment	4,853.146	1.1
2402	Electric/Electronic	4,373.187	0.9
2703	Manpower and Personnel	4,299.689	0.7
2803	Transportation	3,132.466	2.7
170	Metalworking	2,697.021	0.8
2608	Biomedical Sciences and Allied Health Officers	2,172.506	0.5
2707	Information	1,872.203	1.0
2802	Supply	1,797.489	1.4
172	Utilities	1,753.441	0.4
183	Law Enforcement	1,677.093	0.6
182	Materiel Receipt, Storage and Issue	1,599.913	0.4
2501	Physical Scientists	1,534.501	0.6
2807	Supply, Procurement, and Allied Officers, Other	1,493.068	3.0
2506	Legal	1,291.025	0.9
2503	Biological Scientists	1,183.378	0.3
164	Armament and Munitions	1,069.469	0.5
122	Radar and Air Traffic Control	833.653	1.2

We predicted civilian deployments for the 76 occupations in which civilians deployed in the historical data. To do so, we used the same modeling framework previously described. Starting with these 76 dependent variables, we fit the same two-stage model for each, estimating the regression coefficients and significant variables each time.

Due to the extremely low predicted numbers of civilian deployments in our HA/DR scenarios, we did not make predictions for these scenarios by occupation. Instead, we restricted our focus to the four-remaining operation types (COIN, counterterrorism, MCOs, and stability/security). Table 4.4 shows the top 13 occupations (occupations with predicted demand greater than one person-month per quarter) based on the point estimates for civilian deployments to the notional future counternarcotics (stability/security) scenario. The table is sorted

Table 4.4
Civilian Deployment Forecasts, by Occupation, Counternarcotics Scenario

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
2301	Intelligence, General	25.47	(18.01, 28.14)
2801	Logistics, General	13.94	(6.23, 16.48)
2701	Administrators, General	12.09	(5.51, 14.12)
122	Radar and Air Traffic Control	10.76	(4.16, 12.40)
2804	Procurement and Production	8.39	(2.73, 11.02)
2704	Comptrollers and Fiscal	7.17	(3.99, 8.16)
155	Other Functional Support	6.30	(3.44, 6.99)
2708	Police	5.50	(2.65, 6.64)
169	Other Mechanical and Electrical Equipment	2.70	(0.85, 3.57)
151	Administration	2.33	(0.67, 3.48)
2402	Electrical/Electronic	2.18	(0.70, 2.77)
2410	Safety	1.98	(0.43, 2.59)
171	Construction	1.81	(0.25, 3.45)

in decreasing order of point-estimate value. That is, the occupation with the highest predicted point estimate for deployments is first in the table, and the occupation with the lowest predicted point estimate appears last.

The counternarcotics scenario had a predicted civilian deployment level of 107 person-months per quarter with a range of 53 to 128 person-months per quarter. The top ten occupations in Table 4.4 account for approximately 89 percent of civilian deployments, and the top three occupations account for nearly half (48 percent) of all deployments to the counternarcotics scenario.

Detailed predictions of civilian deployments, by occupation, for each of the eight non-HA/DR scenarios can be found in Appendix B. In Table 4.5, we present a summary of the most common occupations across all scenarios. Here, we consider "most common" to be those occupations that accounted for at least 5 percent of civilian deployments to at least one of the eight scenarios. That is, for each scenario, we identified all occupations for which deployment estimates represented at least 5 percent of total civilian deployments to that scenario. The cumulative list of such occupations across all eight future scenarios (not including HA/DR scenarios) is shown in the leftmost column. The eight future scenarios are shown in the header row. For occupations that accounted for at least 5 percent of civilian deployments to at least one of the future scenarios, we identify both the point-estimate and range on civilian deployments in that occupation. (Note that data are shown only for the scenarios in which the occupations accounted for at least 5 percent of demand.) The occupations are arranged in decreasing order of the number of scenarios in which the occupation accounted for at least 5 percent of demand. Occupations at the top of the table are in high demand in many scenarios, while those at the bottom of the table are in high demand in just one scenario.

For example, in the counternarcotics scenario, we see that six occupations each account for at least 5 percent of total civilian deployments: Administrators, General; Logistics, General; Other Functional Support; Comptrollers and Fiscal; Police; and Radar and Air Traffic Control. Additionally, the General Administration and General Logistics each accounted for at least 5 percent of civilian deployments

Table 4.5
Civilian Deployment Estimates, by Top Occupations

	Predicted Civilian Deployments, Point Estimate and Range Estimates (person-months per quarter)							
	COIN	Counterterrorism			MCO		Stability/Security	
Occupation	Operation Redline	Counter-ISIL	Counter-Taliban	OEF-HOA/ CJTF-HOA	Operation Indigo	Operation Neptune Knight	Counternarcotics	USPACOM Stability and Preparation
Administrators, General		161.87 (109.66, 279.40)	185.56 (82.45, 312.82)	3.10 (2.69, 4.10)	8,986.10 (6,503.75, 12,359.64)	4,556.57 (3,319.18, 6,228.10)	12.09 (5.51, 14.12)	454.32 (199.74, 517.8)
Logistics, General		111.57 (54.51, 290.94)	276.89 (81.87, 601.41)	1.96 (1.34, 3.28)	3,423.51 (1,809.88, 6,557.82)	1,934.05 (1,013.10, 3,732.71)	13.94 (6.23, 16.48)	269.22 (89.89, 323.73)
Other Functional Support		115.80 (75.75, 215.13)	85.28 (29.82, 166.36)		2,602.63 (1,725.28, 3,905.89	957.04 (626.90, 1,443.78)	6.3 (3.44, 6.99)	227.8 (113.22, 254.67)
Other Mechanical and Electrical Equipment	45.67 (24.28, 71.08)	76.87 (29.50, 197.26)		1.78 (0.50, 2.92)				141.68 (40.41, 169.78)
Construction and Utilities			68.24 (59.39, 75.33)	154.63 (91.47, 166.51)				
Data Processing			73.79 (53.46, 107.77)	332.85 (149.60, 379.05)				

Table 4.5—Continued

	Predicted Civilian Deployments, Point Estimate and Range Estimates (person-months per quarter)							
	COIN	Counterterrorism			MCO		Stability/Security	
Occupation	Operation Redline	Counter-ISIL	Counter-Taliban	OEF-HOA/ CJTF-HOA	Operation Indigo	Operation Neptune Knight	Counternarcotics	USPACOM Stability and Preparation
Educators and Instructors					2,167.04 (1,280, 3,677.92)	1,186.24 (700.28, 2,012.79)		
Electrical/Electronic	27.94 (28.21, 29.24)	2.66 (0.58, 3.22)						
Intelligence, General		5.44 (1.87, 6.83)						25.47 (18.01, 28.14)
Procurement and Production			80.32 (60.44, 108.59)					8.39 (2.73, 11.02)
Automotive	81.59 (61.52, 93.69)							
Comptrollers and Fiscal							7.17 (3.99, 8.16)	
Other Electrical Equipment	15.30 (6.86, 21.39)							

Table 4.5—Continued

	Predicted Civilian Deployments, Point Estimate and Range Estimates (person-months per quarter)							
	COIN	Counterterrorism			MCO		Stability/Security	
Occupation	**Operation Redline**	**Counter-ISIL**	**Counter-Taliban**	**OEF-HOA/ CJTF-HOA**	**Operation Indigo**	**Operation Neptune Knight**	**Counternarcotics**	**USPACOM Stability and Preparation**
Other Engineering and Maintenance Officers						1,233.42 (894.76, 1,689.60)		125.43 (66.03, 142.84)
Police							5.50 (2.65, 6.64)	
Radar and Air Traffic Control							10.76 (4.16, 12.40)	
Technical Specialists, Not Elsewhere Classified	33.76 (29.13, 35.97)							
Transportation		66.91 (48.90, 90.91)						

in seven scenarios (counter-ISIL, counternarcotics, counter-Taliban, OEF-HOA/CJTF-HOA, Operation Indigo, Operation Neptune Knight, and USPACOM stability and preparation).

Table 4.5 is sorted by occupation in decreasing order of the number of scenarios in which the occupation accounts for at least 5 percent of deployments. That is, occupations that account for at least 5 percent of deployments across many scenarios are on top of the table, and those that satisfy these criteria in only a few scenarios are on the bottom. The four occupations in italics at the top of the table (Administrators, General; Logistics, General; Other Functional Support; and Other Mechanical and Electrical Equipment) represent those occupations that account for at least 5 percent of civilian deployments in four or more (at least half) of the future scenarios. In other words, these are the most common occupations in which civilians will likely deploy. As noted earlier, the Administrators, General, and Logistics, General, occupations are the most common occupations in which civilians deploy overall.

Demand for Other Services

Although we did not build models to predict civilian deployments for services other than the Army, we offer some insight into what demand might be in the other services by comparing historical demand for Army civilians with demand for civilians from other services. In total, we observed 293,420 person-months of Army civilian deployment and 138,643 person-months of civilian deployments in the other services. Army civilian deployments accounted for approximately 68 percent of all civilian deployments to the historical operations that we considered. Total person-months of civilian deployments in other services reached only about 47 percent of the total person-months of civilian deployments in the Army.

The Army, more than the other services, accounted for the bulk of civilian deployments in all but three of the 12 scenarios in the historical data: OEF-P, OEF-HOA/CJTF-HOA, and Operation Tomodachi. Table 4.6 shows the average number of person-months of civilian deployments per quarter in each historical operation, broken out by Army and other services. Note that all large-scale COIN and stability/security operations relied on Army civilians to a greater degree than on civilians from other services. However, for small-scale COIN and counterterrorism operations and HA/DR operations, no service consistently dominated in terms of civilian deployments.

Table 4.6
Average Number of Deployed Civilian Person-Months per Quarter, by Scenario

Operation Type	Historical Operation	Deployed Civilian Person-Months per Quarter	
		Army	Other Services
COIN	OEF-A	563.54	151.46
COIN	OIF	695.05	227.37
Counterterrorism	Operation Freedom's Sentinel	208.58	110.34
Counterterrorism	OEF-Philippines	3.01	27.71
Counterterrorism	OEF-HOA/CJTF-HOA	4.28	14.34
Counterterrorism	Operation New Dawn/ Operation Inherent Resolve	246.41	234.21
HA/DR	Operation Tomodachi	44.81	236.66
HA/DR	Operation Unified Response	3.69	2.15
HA/DR	Operation United Assistance	1.94	1.48
Stability/security	Counternarcotics	41.28	14.00
Stability/security	Serbia/Kosovo peacekeeping	10.98	—
Stability/security	USPACOM stability and preparation	1,174.40	709.87

SOURCE: DMDC data.

CHAPTER FIVE

Conclusions and Recommendations

The primary objectives of this study were to develop a viable method for forecasting Army requirements for expeditionary civilians, to use this method to assess near-term demand in operational scenarios, and to identify policies or processes that would enable the more efficient and effective management of these personnel. RAND Arroyo Center was asked to create a demand model for expeditionary civilians that would take into account a comprehensive range of available historical data on civilian deployments. It is worth noting that this model was never intended to be the *only* suitable means of modeling expeditionary civilian demand; however, the research is aimed at making substantial strides in a field that has thus far been limited in terms of rigorous calculation of demand.

This chapter presents our conclusions and recommendations as they relate to these objectives.

Conclusions

In seeking to determine the most appropriate method for modeling Army expeditionary civilian demand, we reached several significant conclusions.

First, we found that data on civilian deployments is not collected in a standardized, systematic fashion, and demand for expeditionary civilians has not historically been modeled in a systematic way. Even the demand signal devised by the IES Office, which underlies the sourcing system for DoD-ECs outlined in DTM 17-004, is incomplete for two primary reasons:

- It relies on a subset of data on a limited set of historical contingencies, so it may not accurately predict demand for expeditionary civilians across a range of potential operational scenarios.
- The resulting force pool numbers, referenced in DTM 17-004, do not accurately reflect demand signal calculations, but, rather, may have been the result of a compromise among the various defense components.

These shortcomings speak to the need for a new, more-comprehensive and -accurate method of modeling demand for expeditionary civilian capabilities over time.

Second, this need to rigorously model future expeditionary civilian demand is particularly critical for the Army, which appears to have filled the bulk of DoD-wide civilian deployment requirements in the 2009–2016 time frame of our analysis. Indeed, we found that Army civilian deployments accounted for about 68 percent of all civilian deployments across operational scenarios during this period. As noted in Chapter Four, total person-months of civilian deployments in the other services were approximately 47 percent of the Army's total.

Third, after assessing the number and type of potential data inputs that were relevant to expeditionary civilian demand and the range of potential operational scenarios to which civilians may be called to deploy, we identified an appropriate method for modeling demand for Army expeditionary civilians: a multistage statistical/machine-learning model capable of pulling in numerous inputs specific to a particular deployment scenario.

Several specific findings emerged from the model development, as discussed in Chapters Three and Four and in greater detail in Appendix B.

Initially, we employed a fitted regression model to reveal the variables that were most important in predicting civilian deployments. In doing so, we reached our fourth overall finding: that both the type of operation and the distinction between countries classified as core versus ancillary to an operation have a large effect on numbers of civilian deployments. For instance, we observed high numbers of civilian deployments to countries classified as core in COIN operations.

Fifth, we found high levels of demand for expeditionary civilians in stability/security operations, particularly when military deployments in noncivilian occupations were high. Interestingly, we observed in our analysis a high degree of (positive) interaction between the stability/security classification and military deployments in noncivilian occupations. In fact, there was no interaction between any other operation type and any of the various military deployment variables. This means that, as military deployments in noncivilian occupations increase, the expected number of civilian deployments in stability/security operations increases more than in other operations. Not surprisingly, we observed that civilian deployments increased, in general, when military deployments increased.

Sixth, we found that civilian deployments were inversely related to a country's fragility and polity scores. That is, countries categorized as fragile and having transitional governments tended to see higher numbers of civilian deployments than locations with other fragility and polity classifications. Stable democracies had the fewest civilian deployments in the historical data, and the rate of increase in civilian deployments as military deployments increased was lower in democracies than in other regimes.

Seventh, specific occupations appeared to be in high demand for particular future scenarios: Administrators and logisticians were in high demand in almost all our notional future scenarios, intelligence occupations were in especially high demand in the counternarcotics and OEF-HOA/CJTF-HOA scenarios, and data processing was in high demand in the USPACOM stability and preparation scenario.

Finally, and more generally, we found that administrators, mechanical and electrical equipment personnel, and logisticians were the Army civilian occupations with the highest demand in 2009–2016. This speaks to a potentially high demand for these occupational specialties across future scenarios as well.

Recommendations

These findings and conclusions led us to two categories of policy and process recommendations to help the Army more effectively and efficiently manage its expeditionary civilian capability.

Improve Data Collection and Demand Signal Modeling to Better Understand Expeditionary Civilian Demand Moving Forward

We recommend that all Army components seek to more systematically collect and maintain data from across the Army and other DoD organizations on the location, duration, and operational and occupational characteristics of civilian deployments. Moreover, data on the numbers of expeditionary civilians *required* by various commands for particular billets should be systematically collected and reported in a manner distinct from data on the numbers of expeditionary civilian billets actually *filled*. These data can then be used as inputs into rigorous models of Army expeditionary civilian demand, such as the one described in this report. Demand for expeditionary civilians should be modeled on an annual or semiannual basis to help decisionmakers better understand and plan for the impact of such demands on the total force.

We also recommend that, once such modeling practices are in place, OSD and the defense components and services consider revising the DTM-17-004 force pool numbers to more accurately reflect demand based on such modeling. In the near term, OSD and the various defense components should consider revising force pool numbers based on the estimates presented in Chapter Four and Appendix B of this report, with the understanding that such numbers may represent a lower bound on required numbers of expeditionary civilians across potential future operational scenarios and occupational specialties.

Although doing so was not within the scope of this analysis, future modeling efforts may find it fruitful to further perform detailed historical case study analyses related to the various scenarios outlined here or to perform additional variable testing on the full range of hypothetical futures.

Implement a Strategic Plan to Fill Expeditionary Civilian Skill Sets That Are in High Demand

Particular civilian occupations tend to be in high demand for expeditionary roles, both in general and across specific types of operations. Civilian administrators, logisticians, intelligence personnel, and data processing specialists face particularly high demand. To ensure that such high-demand expeditionary positions do not drain overall Army civilian manpower in these occupations, Army manpower officials should proactively consider how and to what extent to substitute high-demand skill sets across different occupational codes. This should include deliberation across the Army and other defense components on the methods and process of backfilling high-demand expeditionary civilian positions. Officials should also consider incentivizing recruitment for these positions, such as with higher pay, recognition, awards, or options for career promotion.

Finally, to ensure that sufficient numbers of civilians with the requisite skill sets are deployable, the Army should work with OSD to standardize the definition and coding of E-E positions and to widely educate the force about this definition.

APPENDIX A

Interview Protocol

This appendix contains the interview protocol used to guide the semistructured interview process. Initially, two interview protocols were designed for the different stakeholder organizations: one for organizations that provided deployable civilians (force providers) and one for organizations that used deployable civilians to fill billets. As we refined the interview process for this study, the individual protocols were consolidated. The consolidated protocol then evolved over time as adjustments were made to reflect changes based on interview responses. Therefore, not all questions were asked in every interview session. The interview protocol included here is the final version.

Background

1. What is your current job, and how long have you been serving in this position? What were your most recent positions prior to this job?
2. What office, division, or G-code do you work in?
3. What is your occupational code? MOS?
4. What is your pay grade/rank?

Organizational Questions

1. Do you currently deploy civilians?
2. What types of contingencies do civilians from your organization deploy to support?

3. How large is your organization's potential deployable civilian force, and how much flexibility does it have to grow or shrink as requirements change?
    a. Are the same people asked to deploy repeatedly?
4. Is there a program office within your organization devoted entirely to the deployment and redeployment of civilians? If not, what entities within your organization are responsible for ensuring that civilian deployment proceeds smoothly?
5. When do civilians become relevant in a military operation?
    a. Immediately? Three months into a deployment? Six months in?
    b. What types of jobs can they perform to free up military capacity?
    c. Do the considerations for the use of civilians change across the phases of the operation? How so?
6. What is your organization's command philosophy on the use of civilians in contingency operations?
    a. How does policy vary from practice with regard to civilian deployment in your organization?
    b. How easy is it to use civilians in an expeditionary capacity? Is it difficult to find deployable civilians with the requisite skill sets? Does planning for the use of this capability mirror planning processes for the use of military personnel?
    c. Does the use of civilians affect morale in the unit?

Thinking About Using Civilians

1. What triggers would make you think about deploying civilians?
    a. Lack of military capacity?
    b. No appetite for military presence?
    c. Civilian expertise needed?
2. In force planning guidance, when can you use military personnel in lieu of civilians? What planning factors are considered for the use of civilians?

3. How do you determine whether there is a shortage of a military skill?
4. What kinds of situations could you send civilians to, in lieu of military?
5. What are the leading indicators that you will need to deploy civilians?
6. How many Army civilians are coded E-E? What is the denominator of Army civilians?
7. If you determine that you need civilians to fill a requirement, how do you go about filling those requirements? Where do you look for the required capability?

Planning and Demand

1. How many operational plans does your organization support?
2. What operational scenarios are you focused on now?
   a. Are you thinking about using civilians in these plans?
   b. Does your force planning consider the use of expeditionary civilians?
   c. If so, what occupational codes?
3. Are you instructed to think about using contractors or civilians?
4. How, if at all, does your organization track the demand signal for expeditionary civilian capabilities over time?

In Conclusion

1. What are the barriers that hinder or the facilitators that enable the successful request and use of civilians?
   a. What has worked well?
   b. What has not worked well?

APPENDIX B

Details of the Demand Model

The goal of the modeling effort for this study was to build a predictive model to forecast demand for Army expeditionary civilian deployments for a range of possible scenarios in the near term. As elaborated in the report, the model that we developed incorporated observable relationships between civilian deployments in historical operations and operation-related characteristics that were hypothesized to influence civilian deployments. In addition to providing total deployment estimates for individual scenarios, we predicted demand in specific occupational categories. Because deployment lengths can vary, it can be difficult to predict the number of civilian personnel required in future operations. Therefore, the model presents forecasts in person-months per quarter. Corresponding personnel estimates may be derived from assumptions of average deployment lengths.

Data

The data that we used to develop the model—the various operational characteristics and resultant civilian deployments—were derived from a variety of sources. In this section, we briefly discuss the data parameters in our two-step model.

Civilian Deployments to Historical Operations

In trying to identify historical civilian deployments, we found that civilian deployments are poorly tracked—or at least not tracked in a manner that allows for clear identification of deployments and deployed individuals. Thus, it was necessary to develop a procedure for identifying "likely" deployments using location and compensation data.

As discussed in Chapter Four, foreign post differential pay and danger pay are compensation incentives provided to individuals deployed to "hostile" overseas locations. Although permanently assigned civilians receive both foreign differential pay and danger pay for the entirety of their deployment, temporarily assigned individuals receive danger pay only (assuming they spend at least four hours in-country). Temporarily assigned civilians do not receive foreign post differential pay for the first 42 days of deployment. Therefore, to identify deployed civilians in the DMDC Civilian Pay File, we included all individuals who received foreign differential pay or danger pay at least one time and had an appropriately assigned location code. We matched individual-level data in the Civilian Pay File (distinguished by scrambled Social Security number) with the corresponding data in the DMDC Civilian Personnel Data File to obtain demographic data (e.g., occupation, pay grade) on the deployed individuals.

Because we estimated civilian deployments using data from the Civilian Pay File, only biweekly snapshots of deployment indicators (foreign differential pay, danger pay, and location variables) were available; we aggregated these snapshots to monthly data. For individuals identified as deployed, a naïve assumption would be that they were deployed for the entire two-week period that marked the beginning of their deployments, as well as the entire two-week period that marked the end of their deployments. It is possible that a deployment began on the last day of a pay period and ended on the first day of some subsequent pay period. Therefore, the assumption that deployments spanned the entire initial and final two-week pay periods could overestimate a deployment length by as much as 12 days. To obtain better estimates of deployment length, particularly during the initial and final pay periods (months) of deployment, we considered the amount of foreign or danger pay received in the first and second months and applied a ratio of the two to estimate what portion of the first month the individual was deployed.[1] We repeated this process for the last and second-to-last months of deployment.

Military Deployments to Historical Operations

As noted in Chapter Four, deployments of military personnel are well tracked in a variety of government databases and can fairly easily be determined. We considered active-duty military personnel deployments only and relied on three main files from the DMDC database: the CTS Deployment File, DEERS, and the Active Duty Master File. We used the CTS Deployment File to collect deployment data for operations associated with the Global War on Terrorism since September 2001. For other military deployments, we collected unit-level deployment data from DEERS. We assumed that all individuals assigned to a unit at the time of or during a deployment had deployed with that unit to the specified location. That is, the unit deployment location served as a proxy for individual deployment location for all personnel assigned to that unit during the deployment's time frame.

Although the CTS Deployment File and DEERS provided data on total deployments to the historical operations considered in Chapter Three, they did not provide data on the types (occupations) of deployed individuals. We used the Active Duty Master File to obtain demographic information—specifically, the DoD occupation codes—of service members during deployment. It was important to use DoD occupation codes rather than military specialty codes because civilians are assigned DoD occupation codes only.

With respect to occupation, the use of DoD occupation codes allowed us to classify military deployments across a variety of dimensions that could be related to civilian deployments. The first such classification categorized each military deployment according to civilian or

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[1] Because the individual was deployed for the entire second month, the ratio of danger/foreign differential pay in the first month to the amount of danger/foreign differential pay in the second month allowed us to estimate deployment length during the first month. For example, if the individual received $2,500 in danger/foreign differential pay in the first month and $4,500 in the second month, then the individual was deployed $2{,}500 / 4{,}500 = 55.5$ percent of time during the first month. If the month had 30 days, we estimated the individual was deployed $30 \times 0.555 = 17$ days.

noncivilian occupation. To differentiate between occupation types, we classified the set of all DoD occupation codes with at least one civilian deployment across the historical operations as civilian occupations (i.e., roles that could be filled by civilian or military personnel). We categorized occupations for which there were no civilian deployments in the historical operations as noncivilian occupations (i.e., roles filled strictly by military personnel). We then used the DoD occupation code for each military deployment to classify the deployment as either civilian (mil_{civ}) or noncivilian (mil_{nonciv}).

We also classified military deployments according to whether they were most closely associated with CA occupations (occupations that directly participate in combat), CS occupations (occupations that provide fire support and assistance to combat elements), or CSS occupations (occupations that provide logistical support to sustain the combat forces).[2] The team drew on its expertise to classify the DoD occupation codes of deployed military personnel as CA, CS, or CSS, which yielded values for the model variables mil_{CA}, mil_{CS}, and mil_{CSS}, respectively.

Operation-Related Parameters

We identified a set of broadly descriptive parameters associated with each historical operation and future scenario that we considered inour analysis and modeling. These parameters were operation type (HA/DR, COIN, counterterrorism, or stability/security), theater, and country or countries involved.[3] The location-related variables (theater and

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2 FM 3-90, *Tactics*, Washington, D.C.: Headquarters, U.S. Department of the Army, July 4, 2001. Note that FM 3-90 has since been replaced by FM 3-90-1 and FM 3-90-2, which state that "combat arms" and "combat support" are no longer doctrinal terms, though they do appear in Army regulations. See FM 3-90-1, *Offense and Defense, Volume 1*, Washington, D.C.: Headquarters, U.S. Department of the Army, March 2013, and FM 3-90-2, *Reconnaissance, Security, and Tactical Enabling Tasks, Volume 2*, Washington, D.C.: Headquarters, U.S. Department of the Army, March 2013.

3 We categorized historical operations as COIN, counterterrorism, HA/DR, or stability/security and future scenarios as COIN, counterterrorism, HA/DR, MCO, or stability/security. Although some future scenarios were technically categorized as MCOs, we coded them as COIN scenarios in the actual model. This was because there were no historical MCOs used in the model's development. Thus, all future scenarios must be categorized in the model according to historical operation types.

country) were immediately apparent for all historical operations and future scenarios. Categorization of the historical operations and future scenarios into the four identified types was done according to expertise of the study team.

Country-Specific Parameters

We theorized that various socioeconomic and political factors would influence civilian deployments to a particular operation or scenario. Therefore, we identified four such metrics—per capita GDP, a polity score, a fragility index, and a classification of core or ancillary country—to characterize each country involved in an operation or scenario. Although the model operates on the scale of quarters, in most cases, the level of granularity at which most data were available for these parameters was yearly. Thus, we considered yearly data to be consistent across all quarters of the corresponding calendar year.

The model represents the economic status of each country in the form of yearly per capita GDP, obtained from the World Bank.[4] This variable obviously takes on only positive values. We conjectured that per capita GDP and expeditionary civilian deployments were negatively correlated. That is, we suspected that the number of civilian deployments would decrease as per capita GDP increased, because countries with higher per capita GDPs would have the resources to provide their own military and civilian power.

We derived the yearly polity scores assigned to countries in the model from the Polity Project. The scoring is based on "six component measures that record key qualities of executive recruitment, constraints on executive authority and political competition. It also records changes in the institutionalized qualities of governing authority."[5] Combined polity scores assigned by the Polity Project range from –10 (hereditary monarchy) to +10 (consolidated democracy), where countries with scores between –10 and –6 are considered autocracies, countries with scores between –5 and 5 are considered anocracies, and countries with scores between 6 and 10 are considered democracies.

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[4] World Bank, "GDP Per Capita," webpage, undated.

[5] Center for Systemic Peace, undated.

For the purposes of this study, we adjusted the ranges a bit and used the terms autocracy, transitional, and democracy. We identified any country with a score between –10 and –4 as an autocracy, between –3 and 3 as transitional, and between 4 and 10 as a democracy.

To determine fragility, we used the Fragile States Index, produced by the Fund for Peace, which assesses vulnerability to conflict or collapse.[6] The index takes into account a variety of social, economic, and political indicators. Each of the 12 indicators is scored on a scale of 0–10, with higher numbers indicating a higher level of fragility or instability. The overall (numerical) fragility index is determined by the sum of the 12 indicator scores, so a country may be assigned a fragility index between 0 and 120. Four categories of fragility—alert, warning, stable, and sustainable—correspond to the numerical rankings, with further subdivision within each category (e.g., "alert" has the subdivisions "very high," "high," and "alert").[7] Our model did not require such a granular description of fragility. Instead, we used three categories: fragile (equivalent to "alert"), warning (covering two of the three subdivisions of "warning"), and stable (from low warning to very sustainable).[8]

Finally, we classified each country as either core or ancillary, depending on its role and importance in the corresponding operation or scenario. Core countries are those that tend to be the focus of an operation or scenario and are often identified as the central location of combat or services provided (e.g., disaster relief in HA/DR situations). Ancillary countries, on the other hand, are those that play a supporting role in an operation or scenario, often serving as staging grounds for combat. Because of their nature, HA/DR and stability/security operations typically have only core countries, whereas COIN, counterter-

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6 Fund for Peace, Fragile States Index, homepage, undated.

7 Fund for Peace, undated.

8 The three fragility classifications in this study were based on the distribution of countries across the range of numerical indexes, from 0 to 120. In a histogram of the Fragile States Index for the countries of interest, cutoffs of 70 and 90 appeared to naturally divide the data. Furthermore, there were few countries with an index score above 100 ("stable"), so including the subcategory "low warning" in our "stable" category provided additional observations and more evenly divided the data.

rorism, and MCO scenarios have both core and ancillary countries. Unlike the data on other country characteristics, which are available yearly, it may be possible to designate a country as core or ancillary at the quarterly level for historical operations based on observed shifts in focus and the phase of combat operations.

Note that because we modeled historical operations at the country level, we identified military and civilian deployments at the country level as well. Likewise, in this report, we present estimates of military deployments to future scenarios and predictions of civilian deployments at the country level. Results for predicted civilian deployments are presented at the scenario level as a sum of deployments to all involved countries.

Preliminary Data Analysis

Correlation Analysis: Civilian and Military Deployment Parameters

Each of the two subdivisions of military deployments (mil_{civ}/mil_{nonciv} and $mil_{CA}/mil_{CS}/mil_{CSS}$) completely defined total military deployments in our analysis. That is,

$$mil_{civ} + mil_{nonciv} = total\ military\ deployments$$

and

$$mil_{CA} + mil_{CS} + mil_{CSS} = total\ military\ deployments.$$

Therefore, it was not necessary to include all five of these variables in the model; one of the variables may be omitted because its value can be determined with simple arithmetic, if necessary. For example, if both mil_{civ} and mil_{nonciv} are included, then the total number of military deployments is known to the model. Similarly, if all three military deployment parameter variables (mil_{CA}, mil_{CS}, and mil_{CSS}) are included, then the total number of military deployments is known, again implying that only mil_{civ} or mil_{nonciv} are necessary. Because the mil_{civ}/mil_{nonciv} breakdown represents the simpler and more “intuitive” breakdown of military deployments, we opted to include these two variables in the model and determine which of mil_{CA}, mil_{CS}, or mil_{CSS} should be omitted. We made this determination using correlation analysis.

Table B.1 shows a variety of pairwise correlations between total civilian deployments (represented by *civ* in the table) and the military deployment parameters, as well as between the three military deployment parameters (mil_{CA}, mil_{CS}, or mil_{CSS}). It is evident that an extremely strong correlation (0.997) exists between mil_{CS} and mil_{CSS}, and this correlation is stronger than either of the other two pairwise correlations between the military deployment parameters (both are 0.96). This suggests that either mil_{CS} or mil_{CSS} should be omitted. Examining the correlations of these two variables with total civilian deployments (*civ*) reveals that there is a weaker correlation between mil_{CSS} and *civ* than between mil_{CS} and *civ* (0.49 versus 0.52). Hence, we omitted mil_{CSS} and included in the model the military deployment variables mil_{civ}, mil_{nonciv}, mil_{CA}, and mil_{CS}.

Additionally, among the military deployment parameters, Table B.1 shows that civilian deployments were most strongly correlated with military deployments in CS positions (mil_{CS}) and least correlated with military deployments in CSS positions (mil_{CSS}). This suggests that civilian deployments are more strongly correlated with military deployments in positions that civilians do not generally fill than positions that they do fill.

We also considered correlations between military personnel in civilian positions (mil_{civ}) and military personnel in noncivilian positions (mil_{nonciv}), as well as between total deployments in civilian occupations ($civ + mil_{civ}$) and military deployments in noncivilian occupations. Table B.2 shows the results of these analyses. We found a strong correlation in both cases, and although the correlation between $civ + mil_{civ}$ and mil_{nonciv} (0.985) and the correlation between mil_{civ} and mil_{nonciv} (0.984) were nearly identical, the former was slightly larger. This suggests a strong correlation between total deployments in support roles and total deployments in combat-centric roles.

Table B.1
Correlation Analysis Between Civilian and Military Deployments

Variable 1	Variable 2	Correlation
mil_{CA}	mil_{CS}	0.960
mil_{CA}	mil_{CSS}	0.960
mil_{CS}	mil_{CSS}	0.997
civ	mil_{CA}	0.500
civ	mil_{CS}	0.520
civ	mil_{CSS}	0.490

Table B.2
Additional Correlation Analyses Between Military Deployments

Variable 1	Variable 2	Correlation
mil_{civ}	mil_{nonciv}	0.984
$civ + mil_{civ}$	$milnon_{civ}$	0.985

Comparative Analysis: Civilian Deployment and Operation Characteristics Parameters

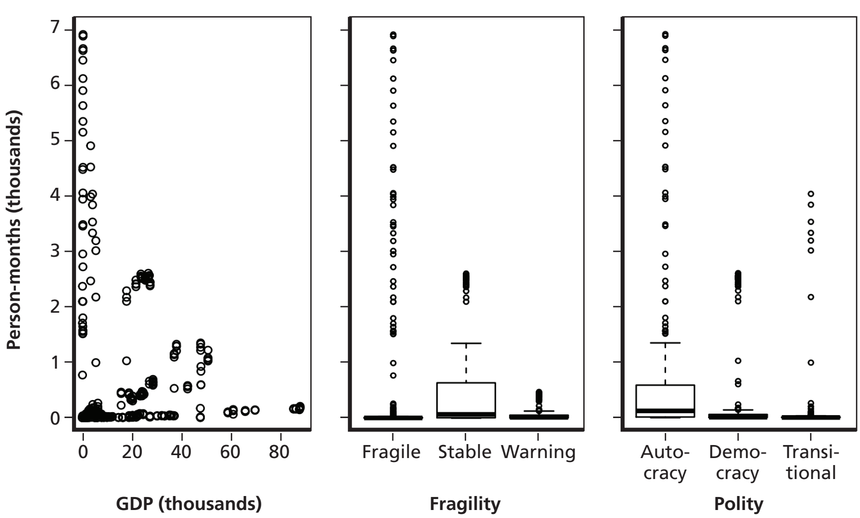
In the historical operations, the data suggest that civilian deployments tended to be greatest for COIN operations (averaging 596 person-months per quarter), followed by stability/security operations (431 person-months per quarter), counterterrorism operations (139 person-months per quarter), and HA/DR operations (five person-months per quarter).

With respect to theater-level requirements, USPACOM required the largest number of civilian deployments, at 786 person-months per quarter, followed by USCENTCOM (474 person-months per quarter). Demand for deployed civilians in other theaters was often much smaller. The historical data showed an average demand of 32 person-months per quarter in USSOUTHCOM, 18 person-months per quarter in USEUCOM, and four person-months per quarter in USAFRICOM. (Note that the manner in which civilian deployments are estimated includes civilians permanently stationed in the operational locations. Thus, for example, we identified civilians stationed in South Korea as "deployed" to the USPACOM stability and preparation operation in our analysis.)

We also analyzed country-specific parameters (per capita GDP, polity score, and fragility index) with respect to civilian deployments to identify trends. In the leftmost panel of Figure B.1, the general decreasing trend in civilian deployments as GDP increases suggests that per capita GDP has a not insignificant relationship to total civilian deployments. Correlation analysis yielded a correlation of 0.06 between these two variables, which indicates the lack of a linear relationship between GDP and civilian deployments. However, Figure B.1 reveals that a relationship does exist, and the shape of the leftmost graph suggests that this relationship may be quadratic. Thus, we included a quadratic term in the model in an attempt to describe this relationship.

Figure B.1 also reveals that countries identified as fragile and stable have the highest average civilian deployments, and warning countries have the lowest. We caution that the large average deployments for fragile countries are skewed by some extremely large

Figure B.1
Effect of Country-Specific Parameters on Civilian Deployments



deployments (evident in the center panel of Figure B.1); more often than not, fragile and warning countries exhibit similar deployment patterns.

With respect to political climate, autocracies had the highest average civilian deployments (676 person-months per quarter), followed by democracies (189 person-months per quarter). Countries in transition saw the fewest average civilian deployments (182 person-months per quarter).

Modeling Total Civilian Deployments

This study forecasted both total Army civilian demand and demand by occupation in a set of notional future scenarios. The goal of the forecast modeling was to explain and predict future expeditionary deployments as a function of the military deployment and operation-related variables discussed in the previous section. However, there were some complicating factors that made it difficult to describe the relationships between civilian deployments and these predictor variables.

For example, the exploratory data analysis in the previous section makes clear that there are relationships between civilian deployments and the various military deployment variables, but there were many situations in which we observed large numbers of military deployments but very few civilian deployments. (Recall that we presented military deployment values and operation-related characteristics on a quarterly basis for each historical operation, illustrating the numerous sample points considered.) Approximately 20 percent of the sample points had a response variable (civilian deployment) value of zero, which can hinder development of an appropriate predictive model.

To avoid issues caused by the large number of zeroes in the response variable, we applied two models to explain civilian deployments as a function of the input variables. The first model determined the probability of civilian deployments to an operation (i.e., the probability that the number of civilian person-months per quarter is nonzero). Given a nonzero probability of civilian deployments, we used the second model to predict the magnitude of deployments in person-months per quarter.

Mathematically, the first model is a logistic regression model for the probability that there are zero civilian deployments, *Y*, given a set of covariates (predictor variables), *X*:

$$logit\left(P\left(Y=0\,|\,X\right)\right)=X^T\beta,$$

where β is the vector of coefficient variables to be determined. The response variable here can be thought of as binary: Either there are civilian deployments ($Y \neq 0$) or there are not ($Y = 0$). A predicted probability greater than 0.5 yields a prediction of civilian deployments ($Y \neq 0$), and a predicted probability less than 0.5 yields a prediction of no civilian deployments ($Y = 0$).

Given a prediction of civilian deployments (i.e., $Y \neq 0$), we applied the second model, a normal linear regression model, in person-months per quarter:

$$Y = X^T\zeta + \varepsilon, \text{ for } Y > 0.$$

The series of models yielded a predicted distribution of civilian deployments (i.e., magnitude of civilian deployments in person-months per quarter) for a given historical operation or notional future scenario, defined by

$$\widehat{Y} = \frac{\left(X^T\hat{\zeta}\right)\exp\left(X^T\widehat{\beta}\right)}{1+\exp\left(X^T\widehat{\beta}\right)}.$$

The set of predictors (covariates, *X*) presented here (the military deployment parameters and operation-related characteristics) contain some variables that are highly correlated. For example, recall that military deployments in civilian occupations were correlated with military deployments in noncivilian occupations. Because of these correlations, it is not clear whether all of the predictor variables are necessary to explain civilian deployments. If it is the case that not all predictors are necessary, it is not obvious which subset of predictors will yield the best predictions. Furthermore, it is preferable to allow and account for the possibility of interaction terms between variables. (An *interaction* occurs when two or more predictor variables simultaneously affect the response variable, civilian deployments, in a nonadditive manner.)[9] For example, the relationship between military deployments in civilian occupations and civilian deployments may differ based on the type of operation or scenario, implying that there is an interaction between mil_{civ} and operation or scenario type. The inclusion of pairwise interaction terms between military deployment predictors and location characteristic predictors further increases the number of predictor variables considered by the model (again, not all of which may be necessary).[10]

When using standard regression techniques, the modeler must explicitly identify the set of predictor variables to be included in the model. This requires some prior knowledge or intuition of how the predictor variables interact with the response variable, as well as with one another, to avoid overfitting the data (i.e., fitting the model so well to the given data that applying the model to new data yields poor predictions) or selecting variables that do not yield the strongest predictions.

Given the large number of possibly correlated (and thus redundant) predictors considered in this analysis (we considered 75 predictors), we opted to implement a semiautomatic approach to modeling to simultaneously identify the subset of predictors that yielded the best predictions and estimate the effects of these predictors on civilian deployments. To do so, we used a technique called LASSO (least absolute shrinkage and selection operator). LASSO avoids overfitting the data by restricting the magnitudes of the regression coefficients and effectively forcing some coefficients to be zero. The result is a simpler

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9 Norman R. Draper and Harry Smith, *Applied Regression Analysis*, 3rd ed., New York: John Wiley and Sons, 1998.

10 To prevent the model from becoming overly complex, we discussed pairwise interactions and included only those that we believed to be most promising. We considered most interactions between the military deployment, fragility, polity, operation type, and core/ancillary country parameters, with the exception of interactions between the polity and core/ancillary parameters and the fragility and core/ancillary parameters.

model (i.e., a model with as few predictor variables as possible) with maximum predictive power.

We used a method known as *k-fold cross-validation* to identify the model with the best predictive power.[11] The process involves dividing the data into k equal-sized subsets, with one of the subsets forming the *testing sample* and the remaining k–1 subsets collectively forming the *training sample*. We used the training sample to fit the model and determine corresponding regression coefficients. We then applied the resulting fully defined model to the test sample to assess its predictive power. This approach, in essence, fits k different models to the data and identifies the one with the strongest predictive power (i.e., the model with the smallest average prediction error). For this study, we used a value of $k = 10$.

We used the same set of predictor variables each of our two models (the model to predict the likelihood of nonzero civilian deployments and the model to determine the distribution of civilian deployments, when necessary). We included all the main effects terms (the five military deployment parameters and the five operation- and location-related parameters), as well as quadratic terms for the five military deployment parameters, the austerity metric, and per capita GDP. We additionally included the pairwise interaction variables, yielding a total of 75 predictor variables in the model.

Because the response variable, civilian deployments, must be positive, the model works on the log scale. Additionally, positive-valued data are more "normally distributed" when transformed by a logarithm, thereby better satisfying the distributional assumptions of the model. This implies that values for civilian deployments are transformed by taking the natural logarithm of each value. The various military deployment predictors used as inputs during model development were also log-transformed. (Note that all zero values were replaced with 0.01 prior to taking the logarithm.)

It was necessary to identify a set of "baseline" values for the categorical variables during deployment, against which outputs of the

[11] Trevor Hastie, Robert Tibshirani, and Jerome Friedman, *The Elements of Statistical Learning: Data Mining, Inference, and Prediction*, 2nd ed., New York: Springer, 2009.

model would be interpreted. In this study, the baseline was arbitrarily chosen to have the following characteristics: a counterterrorism scenario set in a country within the USAFRICOM theater that was classified as a fragile autocracy and that was ancillary to the scenario. We then interpreted the resulting coefficients of the categorical predictor variables for the stage 1 model, as shown in Table B.3, along with coefficients for all predictor variables, with respect to changes in these baseline values. (Note that Table B.3 presents only nonzero coefficients to emphasize variables the model that we identified as predictive of civilian deployments.)

It is important to note that because a logistic regression was implemented and the response variable (the probability of zero versus nonzero civilian deployments) is the logit of a probability these coefficients do not convey linear effects of the predictor variables. In fact, the interpretation of the coefficients (other than their sign, positive or negative) does not make sense without proper conversion.

As expected, a positive coefficient indicates an increase in likelihood of having zero civilian deployments and a negative coefficient indicates a decrease in that likelihood. For noncategorical predictor variables, the change is with respect to a one-unit increase in the predictor variable. For categorical predictor variables (e.g., operation type), however, the change occurs when the predictor variable takes on the indicated value relative to the baseline, *with everything else held constant*. For instance, Table B.3 shows a positive coefficient (0.87) for the (operation type) predictor variable COIN, which indicates that the likelihood of zero civilian deployments is greater for COIN operations that the baseline counterterrorism operations. That is, it is less likely that civilians would deploy to COIN operations than counterterrorism operations, which is consistent with the historical data in which 25 percent of quarters saw zero civilian deployments to COIN operations and 17 percent of quarters saw zero civilian deployments to counterterrorism operations.

With respect to interpretation of the magnitude of the coefficients, it is necessary to convert from (out of) the log scale. To do so, the given coefficients become exponents of the natural exponential function. Using the coefficient of the predictor (operation type)

Table B.3
Nonzero Coefficients of Predictor Variables for the Stage 1 Model

Predictor Type/Category	Predictor	Coefficient
Theater	USCENTCOM	0.88
Theater	USPACOM	–1.07
Theater	USSOUTHCOM	–1.17
Operation type	COIN	0.87
Fragility	Warning	0.16
Polity	Democracy	–0.77
Polity	Transitional	1.02
Austerity (GDP)	Austerity	–1.20
Core/ancillary country	Core	0.47
Military deployments	$\log(mil_{civ})$	–0.13
Military deployments	$\log(mil_{CA})$	–0.14
Military deployments (quadratic)	$\log(mil_{civ})^2$	–0.05
Military deployments (quadratic)	$\log(mil_{CA})^2$	0.01
Military deployments (quadratic)	$\log(_{milCS})^2$	0.01
Interaction (fragility:military deployments)	Warning:$\log(mil_{civ})$	0.17
Interaction (polity:military deployments)	Transitional:$\log(mil_{civ})$	–0.35
Interaction (operation type:military deployments)	HA/DR:$\log(mil_{civ})$	0.15
Interaction (operation type:polity)	HA/DR:democracy	0.68
Interaction (operation type:polity)	COIN:democracy	0.32
Interaction (operation type:polity)	HA/DR:transitional	–0.72
Interaction (operation type:polity)	COIN:transitional	–0.64
Interaction (operation type:core/ancillary country)	HA/DR:core	1.24

Table B.3—Continued

Predictor Type/Category	Predictor	Coefficient
Interaction (operation type:fragility)	HA/DR:stable	3.74
Interaction (operation type: fragility)	HA/DR:warning	3.13
Interaction (operation type:fragility)	COIN:warning	0.48
Interaction (polity:military deployments)	Democracy:log(mil_{total})	0.17
Interaction (operation type:military deployments)	HA/DR:log(mil_{total})	–0.04
Interaction (fragility:military deployments)	Stable:log(mil_{CS})	5.08
Interaction (fragility:military deployments)	Warning:log(mil_{CS})	–0.09
Interaction (polity:military deployments)	Transitional:log(mil_{CS})	0.01
Interaction (operation type:military deployments)	HA/DR:log(mil_{CS})	–0.10
Interaction (operation type:military deployments)	COIN:log(mil_{CS})	–0.09
Interaction (operation type:military deployments)	Stability/security:log(mil_{CS})	–0.21
Interaction (operation type:military deployments)	HA/DR:log(mil_{CA})	0.31
Interaction (operation type:military deployments)	Stability/security:log(mil_{CA})	–0.10
Interaction (fragility:polity)	Stable:democracy	1.34
Interaction (fragility:polity)	Warning:democracy	0.16
Interaction (fragility:polity)	Stable:transitional	–5.15
Interaction (fragility:polity)	Warning:transitional	–0.53

COIN, the effects of this predictor on civilian deployments can be determined by calculating $e^{0.87} = 2.39$, implying that it is 2.39 times more likely that there are zero civilian deployments to a COIN operation than to a counterterrorism operation (when all other baseline predictor variables are held constant).

Table B.3 further reveals that the interaction between variables is quite important because so many of the pairwise interaction variables have nonzero coefficients, implying that the effects of many of the main effects variables are influenced by other predictors. For example, consider the interaction terms COIN:democracy and COIN:transitional. The COIN:democracy interaction variable has a positive coefficient (0.32), which implies that zero civilian deployments are more likely if the baseline scenario changes from a counterterrorism operation in an autocracy to a COIN scenario in a democracy. The COIN:transitional interaction variable, on the other hand, has a negative coefficient (–0.64), which suggests that zero civilian deployments would be *less* likely if the setting was changed to a COIN scenario in a *transitional* country.

The stage 2 model utilized data in which there were nonzero deployments to an operation (at the quarterly level) to predict civilian deployments to an operation (where the scale is the logarithm of person-months per quarter). The resulting nonzero coefficients for this model are shown in Table B.4. As with the stage 1 model, the signs of the coefficients can easily be interpreted, but the interpretation of magnitude cannot be done until after conversion from the log scale. In this case, the effect is related to the actual change in the number of civilian deployments. For example, the baseline case corresponds to a COIN operation. In Table B.4, if the operation type were instead stability/security (and all other characteristics of the baseline remained the same), one would expect civilian deployments to increase by a factor of $e^{1.75} = 5.75$. That is, there would be approximately 5.75 times more civilian deployments (in person-months per quarter).

What is interesting in this case is that the main effect predictor for the COIN operation type does not appear in this table, which implies it has a coefficient of zero. On average, however, COIN operations tend to have more civilian deployments than the baseline counterterrorism operation, so one would assume that the COIN predic-

Table B.4
Nonzero Coefficients of Predictor Variables for the Stage 2 Model

Predictor Type/Category	Predictor	Coefficient
Theater	USCENTCOM	0.54
Theater	USEUCOM	0.01
Theater	USSOUTHCOM	–1.14
Operation type	HA/DR	0.08
Operation type	Stability/security	1.75
Fragility	Stable	–0.56
Fragility	Warning	0.54
Polity	Democracy	–0.19
Austerity (GDP)	Austerity	9.20
Core/ancillary country	Core	0.74
Military deployments	$\log(mil_{civ})$	0.13
Military deployments	$\log(mil_{total})$	0.03
Military deployments	$\log(mil_{CA})$	0.01
Military deployments	$\log(mil_{CS})$	0.08
Military deployments (quadratic)	$\log(mil_{civ})^2$	0.02
Interaction (fragility:military deployments)	Stable:$\log(mil_{civ})$	–0.07
Interaction (polity:military deployments)	Democracy:$\log(mil_{civ})$	–0.13
Interaction (polity:military deployments)	Transitional:$\log(mil_{civ})$	0.04
Interaction (operation type: military deployments)	HA/DR:$\log(mil_{civ})$	0.03
Interaction (operation type:polity)	COIN:democracy	–0.53
Interaction (operation type:polity)	Stability/security:democracy	0.02
Interaction (operation type:polity)	HA/DR:transitional	0.38

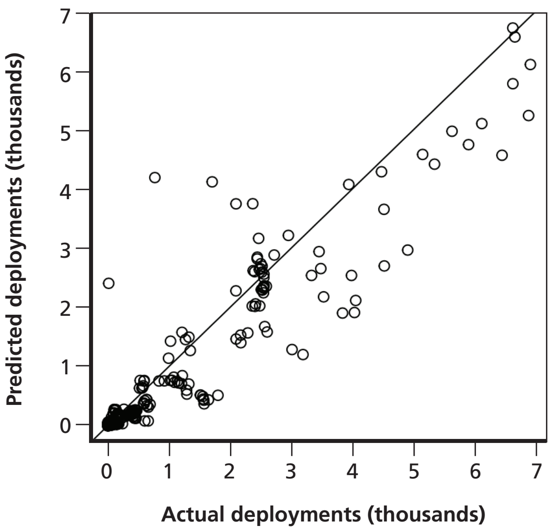
Table B.4—Continued

Predictor Type/Category	Predictor	Coefficient
Interaction (operation type:polity)	COIN:transitional	–0.81
Interaction (operation type:core/ancillary country)	COIN:core	2.58
Interaction (operation type:core/ancillary country)	Stability/security:core	3.51
Interaction (operation type:fragility)	COIN:stable	–0.04
Interaction (operation type:fragility)	COIN:warning	0.51
Interaction (fragility:military deployments)	Stable:log(mil_{total})	–0.03
Interaction type (polity:military deployments)	Democracy:log(mil_{total})	–0.09
Interaction (fragility:military deployments)	Warning:log(mil_{CS})	–0.07
Interaction (polity:military deployments)	Democracy:log(mil_{CS})	–0.04
Interaction (fragility:military deployments)	Stable:log(mil_{CA})	–0.01
Interaction (operation type:military deployments)	HA/DR:log(mil_{CS})	3.12
Interaction (operation type:military deployments)	HA/DR:log(mil_{CA})	–0.02
Interaction (operation type:military deployments)	COIN:log(mil_{CA})	–0.08
Interaction (operation type:military deployments)	Stability/security:log(mil_{CA})	0.25
Interaction (fragility:polity)	Warning:democracy	–0.52
Interaction (fragility:polity)	Warning:transitional	–1.22

tor would have a positive coefficient. However, COIN operations do not always have a higher number of civilian deployments than counterterrorism operations. The nonzero coefficients of interaction terms between COIN operations and other location-related parameters suggest that the effect (and magnitude of the effect) of being a COIN operation is codependent on location-related parameters. For example, Table B.4 shows that civilian deployments decrease when the baseline operation changes to a COIN operation in a stable country (coefficient of –0.56) but increase when the baseline operation changes to a COIN operation in a warning country (coefficient of 0.54).

Using the stage 1 and 2 models, civilian deployments for the historical operations can be predicted and compared with actual deployments. Figure B.2 shows predicted deployments against actual observed deployments and can be used to visually assess the accuracy of the model in predicting civilian deployments. In general, we see that the data points exhibit a nearly linear trend, which suggests that the predicted civilian deployments align closely with the actual deployments.

Figure B.2
Predicted Civilian Deployments Versus Observed Deployments



We further examine the goodness of fit of the stage 1 model used to predict the probability of zero civilian deployments. A resulting probability greater that 0.5 yields a prediction of "zero civilian deployments" and resulting probability less than 0.5 yields a prediction of nonzero civilian deployments. We found that the stage 1 model correctly classified 92 percent of observations. Such an accuracy statistic can be misleading in the context of rare events, however, so we also calculated two additional metrics: precision and recall.[12] *Precision* calculates the proportion of predicted "zeroes" that were truly associated with zero civilian deployments, and *recall* calculates the proportion of true "zeroes" that were correctly identified by the model. The precision of our model is 0.87, which implies that 87 percent of the predicted "zero deployments" are true zero deployments, and 13 percent of the predicted "zero deployments" actually correspond to nonzero deployment observations. The recall has a value of 0.69, implying that 69 percent of predicted nonzero deployments correspond to observations that truly had nonzero deployments. Thus, in 31 percent of nonzero deployment predictions, there were actually zero civilian deployments.

For the stage 2 model, we inspected the predicted deployments versus actual deployments, shown on the log-scale used in the model (left panel) and on the original scale (right panel) in Figure B.3.[13] We can see that the points follow the line of left slope reasonably well, but there is still some variation around the line, which indicates errors in the predictions. If the model predicted actual deployments perfectly, then all points would fall exactly on this line.

Deviance is a goodness-of-fit statistic that measures the discrepancy between a model's predictions and actual values. We used this

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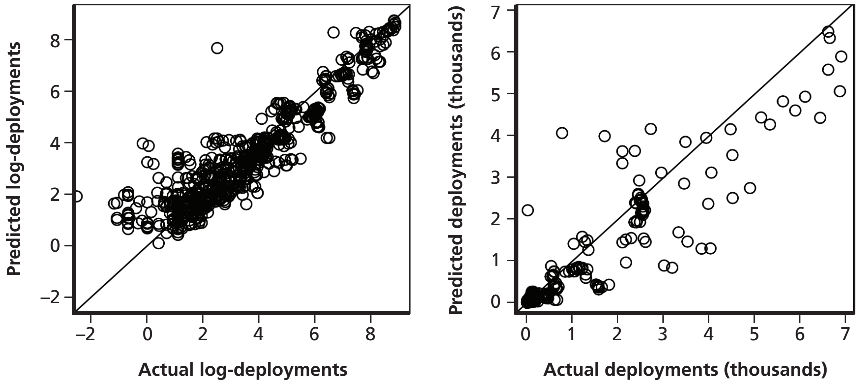
[12] For example, suppose that, out of a collection of 100 observations, civilians deployed in only eight instances. If the model predicted that civilians never deployed (i.e., predicted zero deployments for all observations), then the model would have a 92-percent accuracy rate. However, the model does not provide information on situations in which civilians *do* deploy.

[13] Note that the figure shows deployment predictions only for instances in which the stage 1 model predicted nonzero deployments. This differs from Figure B.2, which showed predictions for all instances, regardless of whether the stage 1 model predicted zero or nonzero deployments.

Figure B.3
Predicted Civilian Deployments Versus Observed Deployments (Restricted to Nonzero Predictions Only)



method to assess the accuracy of the stage 2 model. Deviance, in general, is defined such that

$$d\left(y, y\right) = 0$$
$$d\left(y, \hat{y}\right) > 0, \text{ for all } y \neq \hat{y},$$

where y is the actual observed value, and $\hat{y}$ is the predicted value. (A general definition for *deviance* is provided here because the mathematical definition for the deviance function, d, is dependent on the distribution of the input parameters.) In the case of regression modeling, this definition is often referred to as *unit deviance* because it calculates the deviance for a single prediction-observation pair. The total deviance of a model is the sum of all unit deviances. The *null deviance* is the deviance under an intercept-only model (i.e., a model that utilizes the average value of the response variable as the constant predicted value). This value is typically quite high because an intercept-only model often yields poor predictions. We denoted deviance under the stage 2 model with predictors as

$$D_1 = \sum_{i=1}^{n} d_1\left(y_i, \widehat{y_i}\right)$$

and the null deviance as

$$D_0 = \sum_{i=1}^{n} d_0\left(y_i, \widehat{y_i}\right).$$

The total deviance of the stage 2 model, D_1, is only 14 percent of D_0 (i.e., $D_1 / D_0 = 0.14$), which implies that the stage 2 model explains 86 percent of the null deviance. This suggests that the model provides reliable predictions for civilian deployment demands, that it provides insight into the effects of different operation- and location-related characteristics on civilian deployments, and that the chosen predictor variables help explain much of the variation in civilian deployments. However, the model does not perfectly predict civilian deployments, as supported by the discussion of Figures B.2 and B.3, and some unexplained variation remains.

Predicting Civilian Deployment Demand for the Notional Future Scenarios

As discussed in the previous section, we developed a two-stage model for predicting civilian deployments and applied statistical goodness-of-fit techniques to determine the accuracy of the model and the validity of its application to future scenarios. Because the future scenarios were notional, the values of the predictor variables were not explicitly known. In this section, we discuss our methodology for developing these values for each of the future scenarios.

Military Deployment Estimates

Of the predictor variables, military deployment estimates can be the most difficult to accurately estimate, particularly for the purely notional COIN and MCO scenarios.

Counterterrorism and Stability/Security Scenarios

The future counterterrorism and stability/security scenarios are assumed to be extensions of current ongoing operations, so estimates of military deployments to these scenarios can be readily derived from historical data on the ongoing operations. For each of these five scenarios, we derived estimates for military deployments from the average number of military deployments and the fifth and 95th percentiles of military deployments to the corresponding historical operation. The data were reported at the country-level, so we showed military deployment estimates at the country level for the future scenarios.

For example, the USPACOM stability and preparation operation is assumed to continue into the near future. Historically, this operation was ongoing during the entire period of study (2009–2016), so we obtained 32 quarterly data points for this operation. Over the 32 quarters of observation, total military deployments ranged from zero person-months per quarter to 65,338 person-months per quarter, with an average deployment level of 25,965 person-months per quarter. The fifth- and 95th-percentile deployment values were three person-months per quarter and 61,979 person-months per quarter, respectively. (The fifth-percentile value represents a deployment level greater than or equal to 5 percent of data points, or two quarters. That is, there were only two quarters in which deployment levels fell below three person-months. Similarly, at the 95th percentile, there were only two quarters in which civilian deployments exceeded 61,979 person-months.) Similar determinations can be made for military deployments in civilian and noncivilian occupations, as well as for CA and CS occupations. We assumed similar deployment trends in the future USPACOM stability and preparation scenario, so we used the average, fifth percentile, and 95th percentile as inputs in this scenario to develop a range of plausible civilian deployment needs. Table B.5 shows the assumed military deployment estimates for future counterterrorism, HA/DR, and stability/security scenarios by country.

HA/DR Scenarios

Because of the nature of HA/DR operations (e.g., natural disasters), they are nearly impossible to predict even in the near term. However, they are also almost certain to occur and require civilian deployments, so we opted to include hypothetical HA/DR scenarios. These hypothetical scenarios were not based on any scientific evidence suggesting their occurrence (e.g., the study team had no scientific evidence

Table B.5
Distribution of Estimated Military Deployments to Future Counterterrorism, HA/DR, and Stability/Security Scenarios

Operation and Countries (core countries in italics)	Civilian			Noncivilian			CA			CS		
		Percentile			Percentile			Percentile			Percentile	
	Average	5th	95th	Average	5th	95th	Average	5th	95th	Average	5th	95th
Counterterrorism												
Counter-ISIL												
Iraq	3,522	51	12,961	5,451	110	18,628	3,278	19	11,108	1,914	20	6,701
Bahrain	234	50	472	326	13	701	277	5	590	62	4	139
Israel	13	2	20	5	0	9	2	0	6	1	0	3
Jordan	308	35	677	465	27	963	319	20	638	166	7	412
Kuwait	28,339	9,973	95,471	26,376	9,539	93,587	14,895	5,000	54,810	10,897	3,458	38,951
Qatar	1,509	867	2,193	1,621	541	2,615	1,097	339	1,944	735	242	1,335
Saudi Arabia	285	215	373	290	171	412	249	146	350	61	43	92
Turkey	155	33	290	79	15	134	46	5	97	53	9	105
Counter-Taliban												
Afghanistan	20,146	4,790	44,844	27,002	9,277	52,860	17,311	6,055	33,402	9,111	2,518	19,451
Egypt	564	453	740	566	182	1,255	441	93	1086	58	20	100
Kyrgyzstan	28	15	69	22	9	76	6	0	32	8	0	40
Oman	6	2	10	3	0	6	3	0	6	0	0	2

Table B.5—Continued

Operation and Countries (core countries in italics)	Civilian			Noncivilian			CA			CS		
		Percentile			Percentile			Percentile			Percentile	
	Average	5th	95th	Average	5th	95th	Average	5th	95th	Average	5th	95th
Counter-Taliban (cont.)												
Pakistan	32	19	47	20	10	27	18	9	24	2	0	5
Tajikistan	4	0	7	2	0	5	1	0	3	1	0	3
Uzbekistan	5	1	9	1	0	3	0	0	1	0	0	0
Yemen	13	4	25	10	0	38	8	0	33	3	0	9
OEF-HOA/CJTF-HOA												
Somalia	9	0	30	12	2	32	6	0	26	6	1	14
Djibouti	329	56	732	723	62	1,915	547	23	1,574	166	33	367
Ethiopia	11	5	18	2	0	7	1	0	4	1	0	4
Kenya	41	4	58	9	0	38	3	0	18	6	0	22
Uganda	8	2	12	3	0	8	1	0	4	3	0	6
HA/DR												
Operation Castle (swine flu in Southeast Asia)												
Cambodia (Liberia)	16	3	52	6	0	31	1	0	5	2	0	10
Thailand (Nigeria)	5	0	7	3	0	6	2	0	3	1	0	3

Table B.5—Continued

Operation and Countries (core countries in italics)	Civilian			Noncivilian			CA			CS		
		Percentile			Percentile			Percentile			Percentile	
	Average	5th	95th	Average	5th	95th	Average	5th	95th	Average	5th	95th
Operation Elemental (large earthquake in El Salvador)												
El Salvador (Haiti)	12	3	17	8	0	34	5	0	30	1	0	4
Operation Interval (large tsunami in India)												
India (Japan)	4,083	3,993	4,148	3,390	3,360	3,420	1,797	1,745	1,841	1,948	1,915	1,965
Stability/security												
Counternarcotics												
Colombia	56	19	78	40	10	82	26	4	57	16	1	35
Honduras	375	91	455	224	51	288	157	33	209	54	15	70
Mexico	18	5	28	8	2	14	3	0	8	4	2	7
USPACOM stability and preparation												
Marshall Islands	22	3	30	20	5	30	17	3	27	8	0	12
South Korea	30,424	7,956	37,153	21,465	4,249	26,542	9,436	1,771	11,770	12,066	2,715	14,501

NOTE: Countries in parentheses were used as a source of proxy data to inform the civilian deployment estimates for the future HA/DR scenarios.

to suggest a tsunami in India in the near future). Rather, they were rooted in HA/DR scenarios with similar circumstances in the historical data. Recall that the historical HA/DR operations included Operation Tomodachi, the U.S. response to a tsunami in Japan; Operation United Assistance, the response to the Ebola outbreak in Africa; and Operation Unified Response, the response and aid following an earthquake in Haiti. The future HA/DR scenarios included two natural disasters and a disease outbreak: a large earthquake in El Salvador (Operation Elemental), a tsunami in India (Operation Interval), and a swine flu outbreak in Southeast Asia centered in Cambodia and Thailand (Operation Castle).

We envisioned similar levels of military response to each of these scenarios as we observed for their historical counterparts. Thus, we used proxy data from the historical operations to estimate military deployments. Specifically, we used military deployments to Operation Tomodachi (tsunami in Japan) to estimate military deployments to Operation Interval (tsunami in India); deployments to Operation Unified Response (earthquake in Haiti) were the source of deployment estimates for Operation Elemental (earthquake in El Salvador); and deployments to Operation United Assistance (Ebola outbreak in African countries) were the source of deployment estimates for Operation Castle (swine flu outbreak in Southeast Asia).[14]

COIN and MCO Scenarios

Estimating military deployments for the notional COIN and MCO scenarios proved most difficult. There have not been any large-scale MCO-like operations in recent history, so there was little historical data on which to base our estimates. Furthermore, these notional scenarios involve adversaries against which the United States has not fought before on a large scale, so it is difficult to know for sure what

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[14] Note that only two of the countries involved in Operation Unified Assistance—Liberia and Nigeria—were selected as proxy countries for Operation Castle because Liberia and Nigeria showed the most significant number of deployments (and involvement in operations) in Operation United Assistance. In the Operation Castle scenario, we anticipated that both Cambodia and Thailand would be heavily involved in terms of operations and hosting the U.S. military footprint.

the scale of the conflict may be or how much military power may put forth by the United States.

Unlike Operation Indigo (war with Iran) and Operation Neptune Knight (war with North Korea), both of which represent "standard" MCO-like conflicts requiring vast numbers of military ground forces, Operation Redline (war with Russia) was envisioned to be more COIN-like, with irregular warfare playing a role. For this reason, we derived military deployments to Operation Redline from observed military deployments during OEF-A. The seven countries involved in OEF-A during this period served as proxies for the nine countries assumed to be involved in Operation Redline.

We assumed that military deployments to the core countries (Estonia, Latvia, and Lithuania) would be similar to military deployments to the core country in OEF-A (Afghanistan). Therefore, we evenly split observed military deployments to Afghanistan across the three core countries in Operation Redline to develop our deployment estimates. We assumed that Germany, Italy and Belgium (all ancillary countries in Operation Redline) would be the main staging grounds, just as Kuwait and Qatar were in OEF-A. Kuwait serves as a proxy for Germany, and Qatar serves as a proxy for both Italy and Belgium. The remaining ancillary countries of OEF-A—Egypt, Oman, and Pakistan—serve as proxy ancillary countries for Poland, Finland, and Denmark in Operation Redline.[15] The estimated military deployments to countries involved in Operation Redline are shown in Table B.6. The three core countries are listed first in italics, and the ancillary countries appear in alphabetical order below the core countries.

Estimates of military deployments to Operation Indigo and Operation Neptune Knight, on the other hand, were not based on proxy data from historical scenarios. For these scenarios, we determined a "most likely" estimate of total military deployments to each country. We identified the lower and upper bounds on this estimate by halv-

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[15] We matched countries from OEF-A to countries in Operation Redline based on (1) matching U.S. footprint in OEF-A countries with predicted U.S. presence in Operation Redline countries and (2) a rough match in the relative land mass and population size of the countries in OEF-A and Operation Redline. We used these two factors to provide a rough, subjective heuristic for country matches between the historical campaign and the future scenario.

Table B.6
Estimated Military Deployments to Operation Redline

Countries (core countries in italics)	Civilian			Noncivilian			CA			CS		
	Point Estimate	Lower Bound	Upper Bound	Point Estimate	Lower Bound	Upper Bound	Point Estimate	Lower Bound	Upper Bound	Point Estimate	Lower Bound	Upper Bound
Estonia	20,095	4,847	47,186	26,316	9,312	55,476	16,824	6,232	34,983	8,977	2,636	20,542
Latvia	20,095	4,847	47,186	26,316	9,312	55,476	16,824	6,232	34,983	8,977	2,636	20,542
Lithuania	20,095	4,847	47,186	26,316	9,312	55,476	16,824	6,232	34,983	8,977	2,636	20,542
Belgium	1,455	898	2,216	1,551	648	2,681	1,041	383	1,972	706	276	1,388
Denmark	41	20	92	71	13	201	53	12	142	18	0	58
Finland	8	3	19	8	1	27	7	0	23	1	0	5
Germany	40,439	10,232	128,990	38,092	9,601	124,314	21,890	5,062	73,507	15,521	3,501	48,315
Italy	1,455	898	2,216	1,551	648	2,681	1,041	383	1,972	706	276	1,388
Poland	470	381	703	282	154	1,209	185	78	1,070	32	14	95

ing and doubling the point estimate, respectively. The point estimates for Operation Indigo and Operation Neptune Knight are shown in Table B.7. The core country in each scenario is listed first in italics, and the ancillary countries appear in alphabetical order below the core country.

It was still necessary to determine the distribution of these deployments across civilian and noncivilian positions, as well as CA and CS positions. To do so, we examined the distributions of military deployments across these categories in OIF.[16] In that operation, 55 percent of

Table B.7
Estimated Military Deployments to Operation Indigo and Operation Neptune Knight

Countries (core countries in italics)	Point Estimate	Lower Bound	Upper Bound
Operation Indigo			
Iran	200,000	100,000	400,000
Iraq	50,000	25,000	100,000
Kuwait	50,000	25,000	100,000
Oman	30,000	15,000	60,000
UAE	30,000	15,000	60,000
Operation Neptune Knight			
North Korea	300,000	150,000	600,000
Japan	50,000	25,000	100,000
Marshall Islands	50,000	25,000	100,000
South Korea	200,000	100,000	400,000

[16] We examined distributions of military deployments among civilian and noncivilian positions, as well as CA, CS, and CSS positions in World War II, Korea, Vietnam, the Gulf War, OEF-A, and OIF for their applicability to future scenarios. Upon review, the study team agreed that the distribution of military personnel among these categories during operations prior to 2000 was too drastically different from that observed in recent operations to be included in the analysis. We also concluded that future distribution would likely resemble the distributions observed in the most recent conflicts, regardless of the setting or enemy.

military deployments were in civilian occupations, and 45 percent were in noncivilian occupations. Similarly, 28 percent of military deployments were in CA occupations, and 36 percent were in CS occupations. The resulting estimates of military deployments for Operation Indigo and Operation Neptune Knight are shown in Table B.8.

Country-Specific Parameters

All country-specific predictions relied on the most recent data available at the time of model implementation. That is, all 2016 values for fragility indexes, per capita GDP, and polity scores were used as proxy data for the future scenarios. These values were assumed to remain constant in the near future. We did not attempt to model or predict changes to these parameters. The model also did not account for time-phased variations in data and demand.

Modeling Civilian Deployments by Occupation

In the 2009–2016 time frame, there were Army civilian deployments in 76 different occupational groups. To predict future deployment demands for these occupations, we used a similar two-stage process for modeling. All input variables—scenario type, location-related parameters, and military deployment parameters—remained the same, but we now associated the response variables with civilian deployments in specific occupations rather than total civilian deployments. As was the case when modeling total civilian deployments, the stage 1 model predicted the probability of zero civilian deployments in a given occupation, and we used the stage 2 model to estimate the demand for civilians in the given occupation for each scenario. We repeated this process for each occupation-scenario combination, giving us 152 iterations of this two-step process to forecast civilian deployment demand across all occupations. Tables B.9–B.16 show point and range estimates corresponding to the three military deployment values for the demand for

Therefore, we decided that the distributions observed during OIF would be applied to future scenarios.

Table B.8
Distribution of Estimated Military Deployments to Operation Indigo and Operation Neptune Knight

Countries (core countries in italics)	Civilian			Noncivilian			CA			CS		
	Point Estimate	Lower Bound	Upper Bound	Point Estimate	Lower Bound	Upper Bound	Point Estimate	Lower Bound	Upper Bound	Point Estimate	Lower Bound	Upper Bound
Operation Indigo												
Iran	110,000	55,000	22,000	90,000	45,000	180,000	56,000	28,000	112,000	72,000	36,000	144,000
Iraq	27,500	13,750	55,000	22,500	11,250	45,000	14,000	7,000	28,000	18,000	9,000	36,000
Kuwait	27,500	13,750	55,000	22,500	11,250	45,000	14,000	7,000	28,000	18,000	9,000	36,000
Oman	16,500	8,250	33,000	13,500	6,750	27,000	8,400	4,200	16,800	10,800	5,400	21,600
UAE	16,500	8,250	33,000	13,500	6,750	27,000	8,400	4,200	16,800	10,800	5,400	21,600
Operation Neptune Knight												
North Korea	165,000	82,500	330,000	135,000	67,500	270,000	84,000	42,000	168,000	108,000	54,000	216,000
Japan	27,500	13,750	55,000	22,500	11,250	45,000	14,000	7,000	28,000	18,000	9,000	36,000
Marshall Islands	27,500	13,750	55000	22,500	11,350	45,000	14,000	7,000	28,000	18,000	9,000	36,000
South Korea	110,000	55,000	220,000	90,000	45,000	180,000	56,000	28,000	112,000	72,000	36,000	144,000

civilian deployments by occupation.[17] Due to the degree of error in the model and the model's difficulty predicting values close to zero (working on the log scale makes for questionable predictions of values near zero), the tables show only those occupations with more than one person-month per quarter of demand.[18] The results are sorted in decreasing order of point estimates.

COIN Scenario

Table B.9
Operation Redline: Forecasted Civilian Deployments, by Occupation

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
161	Automotive	81.59	(61.52, 93.69)
169	Other Mechanical and Electrical Equipment	45.67	(24.28, 71.08)
149	Technical Specialists, Not Elsewhere Classified	33.76	(29.13, 35.97)
2402	Electrical/Electronic	27.94	(28.21, 29.24)
119	Other Electronic Equipment	15.3	(6.86, 21.39)
2803	Transportation	12.06	(11.57, 12.10)
2707	Information	7.35	(6.21, 8.77)
2705	Data Processing	7.25	(5.27, 8.79)
155	Other Functional Support	7.21	(5.02, 8.67)
2401	Construction and Utilities	5.30	(4.80, 5.89)
2501	Physical Scientists	4.72	(4.46, 4.91)

[17] As in Chapter Four, the range estimates here do not necessarily yield lower and upper bounds on the point estimates due to the possible nonlinear relationship between military and civilian deployments.

[18] Even occupations that have predictions on the order of two or three person-months per quarter may be questionable. Additionally, predictions of three or fewer person-months per quarter are equivalent to a requirement for one individual per quarter. Such requirements can likely be filled on an as-needed basis and without maintaining a "cadre" of deployable Army personnel.

Table B.9—Continued

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
172	Utilities	4.32	(2.22, 5.37)
2805	Food Service	2.78	(2.35, 3.32)
2701	Administrators, General	2.58	(1.85, 3.12)
170	Metalworking	2.29	(0.91, 3.96)
2511	Educators and Instructors	1.81	(0.95, 2.92)
2413	Surveying and Mapping	1.77	(1.18, 2.24)
164	Armament and Munitions	1.62	(1.17, 1.78)
2703	Manpower and Personnel	1.56	(0.55, 3.22)
2608	Biomedical Sciences and Allied Health Officers	1.29	(1.10, 1.52)
2503	Biological Scientists	1.26	(1.00, 1.67)
171	Construction	1.22	(0.94, 1.71)
2714	Morale and Welfare	1.21	(1.10, 1.17)
141	Mapping, Surveying, Drafting, and Illustrating	1.19	(0.98, 1.44)
2404	Aviation Maintenance and Allied	1.1.7	(0.98, 1.33)
2407	Ship Construction and Maintenance	1.17	(0.93, 1.11)
2301	Intelligence, General	1.13	(0.82, 1.40)
115	Automated Data Processing Computers	1.03	(0.71, 1.08)

Counterterrorism Scenarios

Table B.10
Counter-ISIL: Forecasted Civilian Deployments, by Occupation

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
2701	Administrators, General	161.87	(109.66, 279.40)
155	Other Functional Support	115.80	(75.75, 215.13)
2801	Logistics, General	111.57	(54.51, 290.94)
2804	Procurement and Production	80.32	(60.44, 108.59)
169	Other Mechanical and Electrical Equipment	76.87	(29.5, 197.26)
2705	Data Processing	73.79	(53.46, 107.77)
2401	Construction and Utilities	68.24	(59.39, 75.33)
2803	Transportation	66.91	(48.90, 90.91)
2704	Comptrollers and Fiscal	55.25	(43.16, 69.62)
151	Administration	36.19	(28.07, 46.52)
171	Construction	36.14	(32.49, 34.62)
2703	Manpower and Personnel	31.25	(20.71, 47.32)
2708	Police	30.29	(17.34, 57.65)
2301	Intelligence, General	28.32	(15.61, 43.98)
161	Automotive	28.18	(17.76, 42.69)
2511	Educators and Instructors	24.91	(12.73, 41.84)
2414	Other Engineering and Maintenance Officers	22.02	(15.55, 32.55)
119	Other Electronic Equipment	21.68	(12.62, 37.43)
2410	Safety	18.28	(8.34, 26.92)
2402	Electrical/Electronic	14.38	(8.45, 23.70)
2807	Supply, Procurement, and Allied Officers, Other	10.48	(8.10, 12.66)
2506	Legal	10.37	(8.98, 11.74)
2714	Morale and Welfare	10.20	(7.91, 11.43)
149	Technical Specialists, Not Elsewhere Classified	8.51	(5.01, 14.13)

Table B.10—Continued

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
154	Accounting, Finance, and Disbursing	7.19	(6.48, 9.22)
126	Communications Center Operations	7.77	(4.75, 6.87)
170	Metalworking	7.30	(3.79, 12.90)
182	Materiel Receipt, Storage, and Issue	6.41	(3.75, 8.30)
156	Recreation and Welfare	5.54	(6.01, 5.19)
2407	Ship Construction and Maintenance	5.24	(4.16, 5.70)
2503	Biological Scientists	5.16	(3.22, 5.44)
2504	Social Scientists	4.91	(3.02, 6.78)
2501	Physical Scientists	4.88	(2.72, 6.85)
2802	Supply	4.87	(3.58, 5.69)
2510	Mathematicians and Statisticians	4.37	(2.35, 5.82)
2403	Communications and Radar	4.28	(3.06, 5.29)
164	Armament and Munitions	4.14	(2.66, 5.20)
2207	Operations Staff	2.90	(0.87, 4.37)
150	Personnel	2.85	(1.94, 3.39)
172	Utilities	2.85	(0.66, 7.45)
2605	Nurses	2.49	(2.06, 2.67)
2707	Information	2.40	(1.66, 3.20)
124	Language Interrogation/ Interpretation	1.96	(1.78, 2.14)
115	Automated Data Processing Computers	1.69	(0.79, 2.57)
157	Information and Education	1.54	(0.84, 2.08)
183	Law Enforcement	1.53	(0.58, 3.10)
132	Veterinary Medicine, Environmental Health Services	1.22	(0.49, 2.01)

Table B.11
Counter-Taliban: Forecasted Civilian Deployments, by Occupation

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
2801	Logistics, General	276.89	(81.87, 601.41)
2701	Administrators, General	185.56	(82.45, 312.82)
155	Other Functional Support	85.28	(29.82, 166.36)
169	Other Mechanical and Electrical Equipment	55.61	(20.33, 110.04)
2301	Intelligence, General	53.56	(24.29, 89.27)
2804	Procurement and Production	50.64	(27.81, 72.56)
2704	Comptrollers and Fiscal	49.81	(22.05, 78.21)
2401	Construction and Utilities	47.30	(31.65, 59.42)
2708	Police	28.48	(12.19, 47.47)
2705	Data Processing	27.28	(13.51, 41.72)
2414	Other Engineering and Maintenance Officers	24.69	(12.30, 37.12)
119	Other Electronic Equipment	24.50	(13.07, 34.27)
2511	Educators and Instructors	24.28	(11.14, 40.06)
2402	Electrical/Electronic	22.43	(8.74, 38.83)
171	Construction	18.77	(13.12, 22.81)
2703	Manpower and Personnel	18.38	(10.17, 26.22)
2410	Safety	17.44	(10.18, 24.15)
151	Administration	16.26	(9.77, 22.42)
170	Metalworking	8.98	(2.62, 14.21)
149	Technical Specialists, Not Elsewhere Classified	8.34	(4.75, 11.31)
2803	Transportation	8.33	(3.73, 12.36)
183	Law Enforcement	7.50	(4.78, 9.60)
161	Automotive	7.33	(3.25, 12.35)
2504	Social Scientists	6.39	(3.80, 8.34)
182	Materiel Receipt, Storage, and Issue	4.42	(3.12, 5.30)

Table B.11—Continued

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
2807	Supply, Procurement, and Allied Officers, Other	4.34	(1.33, 6.79)
2506	Legal	4.27	(2.58, 5.39)
154	Accounting, Finance, and Disbursing	3.77	(1.73, 5.04)
2802	Supply	3.55	(2.49, 4.03)
2510	Mathematicians and Statisticians	3.37	(2.75, 3.76)
2501	Physical Scientists	3.35	(2.26, 4.30)
122	Radar and Air Traffic Control	3.27	(0.14, 5.35)
164	Armament and Munitions	2.94	(1.65, 3.88)
2707	Information	2.75	(1.87, 3.29)
2503	Biological Scientists	2.61	(2.05, 2.94)
2714	Morale and Welfare	2.59	(1.29, 3.61)
150	Personnel	2.44	(1.67, 2.86)
2403	Communications and Radar	2.30	(1.32, 2.82)
181	Motor Transport	2.18	(0.35, 5.58)
172	Utilities	1.85	(0.64, 2.82)
2207	Operations Staff	1.75	(1.05, 2.28)
107	Installation Security	1.31	(0.81, 1.56)
2605	Nurses	1.07	(0.48, 1.40)

Table B.12
OEF-HOA/CJTF-HOA: Forecasted Civilian Deployments, by Occupation

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
2301	Intelligence, General	5.44	(1.87, 6.83)
2701	Administrators, General	3.10	(2.69, 4.10)
2402	Electrical/Electronic	2.66	(0.58, 3.22)
2801	Logistics, General	1.96	(1.34, 3.28)
169	Other Mechanical and Electrical Equipment	1.78	(0.50, 2.92)
2401	Construction and Utilities	1.51	(0.48, 1.91)
164	Armament and Munitions	1.39	(0.34, 1.79)
171	Construction	1.16	(0.66, 1.19)
2705	Data Processing	1.16	(0.09, 2.12)
2501	Physical Scientists	1.04	(0.41, 1.39)
2511	Educators and Instructors	1.00	(0.15, 2.09)

MCO Scenarios

Table B.13
Operation Indigo: Forecasted Civilian Deployments, by Occupation

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
2701	Administrators, General	8,986.10	(6,503.75, 12,359.64)
2801	Logistics, General	3,423.51	(1,809.88, 6,557.82)
155	Other Functional Support	2,602.63	(1,725.28, 3,905.89)
2511	Educators and Instructors	2,167.04	(1,280, 3,677.92)
2401	Construction and Utilities	852.13	(729.11, 979.01)
161	Automotive	706.19	(512.10, 955.80)
151	Administration	679.74	(534.75, 853.01)
2804	Procurement and Production	639.53	(506.95, 790.74)
2705	Data Processing	510.46	(356.36, 728.99)
171	Construction	426.45	(407.60, 436.60)
2414	Other Engineering and Maintenance Officers	307.71	(222.47, 423.28)
2704	Comptrollers and Fiscal	284.08	(240.65, 326.89)
172	Utilities	207.37	(171.61, 235.34)
2708	Police	176.86	(122.79, 253.14)
2703	Manpower and Personnel	158.38	(119.98, 206.28)
169	Other Mechanical and Electrical Equipment	136.34	(77.58, 240.96)
149	Technical Specialists, Not Elsewhere Classified	107.16	(86.01, 130.76)
2504	Social Scientists	92.73	(84.60, 99.88)
2410	Safety	83.21	(65.05, 104.27)
119	Other Electronic Equipment	70.45	(48.62, 94.80)
2803	Transportation	51.37	(46.59, 55.93)
170	Metalworking	44.54	(25.14, 65.83)
2807	Supply, Procurement, and Allied Officers, Other	40.78	(33.05, 49.72)

Table B.13—Continued

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
181	Motor Transport	34.48	(21.99, 52.10)
2301	Intelligence, General	34.48	(24.00, 49.04)
2506	Legal	29.37	(26.50, 31.56)
182	Materiel Receipt, Storage, and Issue	28.60	(23.93, 31.00)
154	Accounting, Finance, and Disbursing	25.24	(23.01, 26.38)
2501	Physical Scientists	24.12	(20.25, 28.12)
2714	Morale and Welfare	22.29	(21.09, 22.64)
2707	Information	20.92	(19.84, 21.53)
2402	Electrical/Electronic	19.28	(15.02, 24.63)
2510	Mathematicians and Statisticians	12.69	(10.87, 14.16)
2802	Supply	12.28	(11.49, 12.53)
164	Armament and Munitions	10.84	(9.76, 11.75)
2403	Communications and Radar	10.81	(8.18, 12.88)
2407	Ship Construction and Maintenance	10.63	(8.98, 11.36)
183	Law Enforcement	10.23	(7.03, 14.10)
2413	Surveying and Mapping	9.6	(6.81, 13.30)
115	Automated Data Processing Computers	6.29	(4.72, 7.64)
156	Recreation and Welfare	5.66	(6.03, 5.18)
150	Personnel	4.79	(5.06, 4.44)
2805	Food Service	4.53	(4.20, 4.72)
157	Information and Education	3.96	(3.64, 4.20)
2404	Aviation Maintenance and Allied Officers	3.16	(2.97, 3.42)
176	Fabric, Leather, and Rubber	3.04	(2.92, 3.10)
141	Mapping, Surveying, Drafting, and Illustrating	2.80	(2.77, 2.78)

Table B.13—Continued

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
106	Seamanship	2.63	(2.52, 2.63)
132	Veterinary Medicine, Environmental Health Services	2.59	(1.52, 3.61)
2605	Nurses	2.52	(2.35, 2.65)
126	Communications Center Operations	2.50	(1.86, 3.29)
107	Security Guards	2.26	(2.06, 2.34)
122	Radar and Air Traffic Control	2.22	(0.37, 6.15)
2608	Biomedical Sciences and Allied Health Officers	1.93	(1.56, 2.30)
153	Operators/Analysts	1.78	(1.64, 1.89)
2806	Exchange and Commissary	1.68	(1.54, 1.79)
185	Auxiliary Labor	1.27	(1.16, 1.35)
2601	Physicians	1.01	(0.80, 1.23)

Table B.14
Operation Neptune Knight: Forecasted Civilian Deployments, by Occupation

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
2701	Administrators, General	4,556.57	(3,319.18, 6,228.10)
2801	Logistics, General	1,934.05	(1,031.10, 3,732.71)
2414	Other Engineering and Maintenance Officers	1,233.42	(894.76, 1,689.60)
2511	Educators and Instructors	1,186.24	(700.28, 2,012.79)
155	Other Functional Support	957.04	(626.90, 1,443.78)
2705	Data Processing	352.88	(245.39, 505.11)
2401	Construction and Utilities	303.62	(261.91, 345.35)
151	Administration	285.98	(229.15, 352.77)
2804	Procurement and Production	241.77	(194.65, 294.53)

Table B.14—Continued

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
2504	Social Scientists	94.39	(87.10, 100.37)
172	Utilities	90.28	(78.04, 99.06)
2704	Comptrollers and Fiscal	86.71	(75.38, 97.83)
161	Automotive	82.07	(48.25, 133.10)
2708	Police	78.45	(54.91, 111.62)
2703	Manpower and Personnel	66.26	(49.86, 88.33)
169	Other Mechanical and Electrical Equipment	63.37	(34.78, 114.82)
149	Technical Specialists, Not Elsewhere Classified	62.62	(51.94, 74.45)
2410	Safety	31.73	(26.63, 37.45)
171	Construction	26.19	(21.27, 31.62)
2402	Electrical/Electronic	21.84	(17.80, 26.62)
119	Other Electronic Equipment	19.02	(13.11, 27.78)
2807	Supply, Procurement, and Allied Officers, Other	15.23	(11.21, 20.53)
181	Motor Transport	10.91	(6.87, 15.89)
183	Law Enforcement	9.99	(8.09, 12.18)
2707	Information	9.59	(9.37, 9.57)
154	Accounting, Finance, and Disbursing	8.11	(7.72, 8.33)
2506	Legal	7.68	(6.89, 8.48)
2501	Physical Scientists	7.5	(6.37, 8.61)
2714	Morale and Welfare	6.90	(6.46, 7.24)
2803	Transportation	6.59	(5.38, 7.97)
122	Radar and Air Traffic Control	5.47	(4.26, 7.30)
2413	Surveying and Mapping	4.89	(3.47, 6.83)
2301	Intelligence, General	4.14	(3.12, 5.44)
2805	Food Service	3.40	(3.10, 3.55)
2802	Supply	3.15	(2.91, 3.37)

Table B.14—Continued

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
164	Armament and Munitions	2.99	(2.62, 3.26)
2403	Communications and Radar	2.89	(2.55, 3.24)
2510	Mathematicians and Statisticians	2.84	(2.38, 3.07)
2609	Health Services Administration Officers	2.58	(2.49, 2.56)
182	Materiel Receipt, Storage, and Issue	2.54	(2.47, 2.58)
156	Religious, Morale, and Welfare	2.20	(1.98, 2.38)
2608	Biomedical Sciences and Allied Health Officers	2.06	(1.90, 2.15)
115	Automated Data Processing Computers	1.93	(1.62, 2.13)
150	Personnel	1.93	(1.75, 2.07)
170	Metalworking	1.88	(0.80, 4.02)
2407	Ship Construction and Maintenance	1.40	(1.32, 1.38)
157	Information and Education	1.23	(1.18, 1.25)
2404	Aviation Maintenance and Allied	1.17	(1.15, 1.20)
176	Fabric, Leather, and Rubber	1.13	(1.07, 1.14)
141	Mapping, Surveying, Drafting, and Illustrating	1.10	(1.06, 1.11)
2605	Nurses	1.07	(1.07, 1.09)

Stability/Security Scenarios

Table B.15
Counternarcotics: Forecasted Civilian Deployments, by Occupation

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
2301	Intelligence, General	25.47	(18.01, 28.14)
2801	Logistics, General	13.94	(6.23, 16.48)
2701	Administrators, General	12.09	(5.51, 14.12)
122	Radar and Air Traffic Control	10.76	(4.16, 12.40)
2804	Procurement and Production	8.39	(2.73, 11.02)
2704	Comptrollers and Fiscal	7.17	(3.99, 8.16)
155	Other Functional Support	6.30	(3.44, 6.99)
2708	Police	5.50	(2.65, 6.64)
169	Other Mechanical and Electrical Equipment	2.70	(0.85, 3.57)
151	Administration	2.33	(0.67, 3.48)
2402	Electrical/Electronic	2.18	(0.70, 2.77)
2410	Safety	1.98	(0.43, 2.59)
171	Construction	1.81	(0.25, 3.45)

Table B.16
USPACOM Stability and Preparation: Forecasted Civilian Deployments, by Occupation

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
2701	Administrators, General	454.32	(199.74, 517.80)
2705	Data Processing	332.85	149.60, 379.05)
2801	Logistics, General	269.22	(89.89, 323.73)
155	Other Functional Support	227.80	(113.22, 254.67)
2401	Construction and Utilities	154.63	(91.47, 166.51)
169	Other Mechanical and Electrical Equipment	141.68	(40.41, 169.78)
2414	Other Engineering and Maintenance Officers	125.43	(66.03, 142.84)
171	Construction	82.84	(46.59, 89.62)
2704	Comptrollers and Fiscal	63.61	(39.04, 67.20)
2703	Manpower and Personnel	61.00	(21.95, 69.07)
149	Technical Specialists, Not Elsewhere Classified	60.83	(33.29, 66.93)
2410	Safety	55.95	(28.96, 61.32)
2504	Social Scientists	50.23	(29.60, 53.98)
2608	Biomedical Sciences and Allied Health Officers	48.96	(34.54, 51.22)
2708	Police	45.68	(19.44, 51.80)
2402	Electrical/Electronic	43.78	(21.14, 49.56)
2511	Educators and Instructors	40.52	(16.57, 46.33)
2802	Supply	34.31	(20.82, 36.32)
2301	Intelligence, General	34.04	(15.30, 38.47)
2807	Supply, Procurement, and Allied Officers, Other	32.59	(15.48, 35.84)
2804	Procurement and Production	29.80	(16.23, 31.57)
2803	Transportation	29.08	(15.56, 31.99)
183	Law Enforcement	25.02	(8.77, 27.73)
119	Other Electronic Equipment	19.97	(6.30, 22.99)

Table B.16—Continued

Occupation Code	Occupation	Point Estimate (person-months per quarter)	Range Estimate (person-months per quarter)
161	Automotive	19.44	(9.21, 21.50)
2707	Information	15.95	(10.76, 16.81)
151	Administration	3.89	(6.66, 15.63)
2605	Nurses	12.61	(9.21, 13.12)
2403	Communications and Radar	12.42	(7.78, 13.30)
122	Radar and Air Traffic Control	12.15	(8.17, 12.56)
2609	Health Services Administration Officers	9.22	(6.51, 9.75)
2506	Legal	8.17	(5.13, 8.75)
2805	Food Service	6.30	(4.32, 6.56)
2706	Pictorial	5.84	(3.04, 6.35)
172	Utilities	5.20	(1.12, 6.04)
2714	Morale and Welfare	4.70	(3.49, 4.86)
124	Language Interrogation/ Interpretation	4.05	(3.32, 4.16)
170	Metalworking	3.60	(1.20, 4.08)
164	Armament and Munitions	3.49	(2.20, 3.71)
2404	Aviation Maintenance and Allied	3.43	(2.13, 3.58)
2208	Civilian Pilots	3.10	(1.29, 3.29)
2601	Physicians	2.86	(1.93, 2.98)
157	Information and Education	2.46	(1.53, 2.62)
2207	Operations Staff	2.07	(0.58, 2.41)
2501	Physical Scientists	1.96	(0.79, 2.22)
130	Medical Care	1.49	(1.18, 1.54)
156	Recreation and Welfare	1.23	(0.90, 1.78)
115	Automated Data Processing Computers	1.09	(0.23, 1.32)
167	Precision Equipment	1.03	(0.53, 1.13)

In these tables, it is clear that administrative and logistics occupations tend to be required most often. (These occupations are in the top five in terms of demand in most scenarios.) For stability/security scenarios, intelligence requirements are also a main driver of occupational demand. Curiously, Operation Redline's demand signal tended to differ from those of the other scenarios, especially the MCO-like scenarios, with mechanical- and electrical-related occupations being the top drivers of demand.

As is evident in Tables B.9–B.16, many of the 76 occupations experienced very few deployments in the future scenarios. This was also the case in the historical data. Therefore, it may be beneficial to focus efforts on occupations that have deployed (and are likely to deploy) a not insignificant number of civilians. Of particular interest would be occupations with *high absolute demand* or *high relative demand*.[19]

High absolute demand occupations are occupations with a least 1,000 person-months of deployment across the historical operations that we considered. High-relative-demand occupations are those that deployed at least 1 percent of their available workforce.[20] Forty-four of the 76 occupations were high-absolute-demand or high-relative-demand occupations. Table B.17 shows these occupations sorted from high to low in terms of total deployments (in person-months). The 44 occupations in Table B.17 are *all* those that accounted for at least 1 percent of civilian deployments in the 12 historical operations. That is, each of the remaining 32 occupations accounted for no more that 1 percent of total civilian deployments in any of the historical operations. These 44 "high-interest" occupations should be given special attention in future modeling and supply-and-demand analyses. From the perspective of workforce planning, these occupations may merit special attention when deciding on an appropriate mix of specialties from the deployable civilian workforce.

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[19] This is similar to the concept of *low-density, high-demand* occupations (i.e., occupations filled by very few personnel across the workforce that also require a large number of deployments). However, the standard interpretation of low-density alone is not sufficient to this analysis. Of interest are those occupations that place a significant amount of stress on the workforce to deploy, which is why we the concept of high relative demand is considered in place of low density.

[20] A review of the deployment data suggested a 1-percent cutoff to distinguish occupations that require a "significant" portion of their workforce to deploy.

Table B.17
Low-Density, High-Demand Occupations

Occupation Code	Occupation	Total Person-Months of Deployment	Relative Demand (%)
2701	Administrators, General	41,541.12	1.4
2801	Logistics, General	26,531.39	3.4
169	Other Mechanical and Electrical Equipment	21,677.48	4.5
155	Other Functional Support	20,552.96	1.6
2401	Construction and Utilities	19,307.92	2.2
2705	Data Processing	15,851.93	1.3
161	Automotive	14,501.96	1.1
171	Construction	10,912.52	3.4
2804	Procurement and Production	10,780.10	1.6
2301	Intelligence, General	10,115.22	3.9
2704	Comptrollers and Fiscal	9,380.03	1.2
2504	Social Scientists	8,589.53	3.8
2414	Other Engineering and Maintenance	8,175.33	1.0
2511	Educators and Instructors	6,389.75	0.9
151	Administration	5,855.44	0.3
149	Technical Specialists, Not Elsewhere Classified	5,657.50	0.8
2410	Safety	5,645.67	3.7
2708	Police	5,516.66	2.3
119	Other Electronic Equipment	4,853.19	1.1
2402	Electrical/Electronic	4,373.19	0.9
2703	Manpower and Personnel	4,299.69	0.7
2803	Transportation	3,132.47	2.7
170	Metalworking	2,697.03	0.8
2608	Biomedical Sciences and Allied Health Officers	2,172.51	0.5
2707	Information	1,872.20	1.0
2802	Supply	1,797.49	1.4

Table B.17—Continued

Occupation Code	Occupation	Total Person-Months of Deployment	Relative Demand (%)
172	Utilities	1,753.44	0.4
183	Law Enforcement	1,677.09	0.6
182	Materiel Receipt, Storage and Issue	1,599.91	0.4
2501	Physical Scientists	1,534.50	0.6
2807	Supply, Procurement, and Allied Officers, Other	1,493.07	3.0
2506	Legal	1,291.03	0.9
2503	Biological Scientists	1,183.38	0.3
164	Armament and Munitions	1,069.47	0.5
122	Radar and Traffic Control	833.65	1.2

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The U.S. Department of Defense (DoD) has long turned to its civilian employees to support overseas operations and emergencies. Yet, there is no standardized, systematic process in place for collecting data on past civilian deployments or for identifying a pool of civilians who are available to deploy to future contingencies. The requirements for these expeditionary civilians are often the result of a compromise among defense components rather than based on actual historical or modeled demand.

As the largest provider of civilians for DoD operations, the U.S. Army stands to benefit to a great extent from a more robust process for forecasting future demand for its civilian workforce. Although it has established organizations and processes to fulfill its staffing mix obligations, there is some question of whether the processes are efficient and effective and whether the Army's current approach to providing civilian personnel will be appropriate for future conflicts. To address potential gaps, it is important to examine DoD's targets for civilian staffing, how these needs may change, and what policies and procedures should be in place to ensure that the Army can continue to meet these demands.

The modeling process described in this report supports the Army and—by extension—other DoD civilian force providers in aligning their available expeditionary civilian workforces with the future demand for these capabilities, with the goal of helping them forecast demand and better prepare to deploy civilians to a range of future scenarios.

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