Officer Accessions Flow Model

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July 2011

ORCEN Technical Report: DSE-TR-1103
DTIC: ADA546536

Executive Summary

Problem Definition

Each year, the Army accesses more than 7000 officers from across all the commissioning sources - West Point, the Reserve Officer Training Corps (ROTC), and Officer Candidate School (OCS). Of those officers, the U.S. Army Accessions Command (USAAC) is directly responsible for supplying more than half of these commissions - those from ROTC and College Option OCS. As the Army made the transition to the ARFORGEN readiness model, it became evident that a greater level of precision was necessary in placing newly commissioned officers in deploying units. The purpose of this modeling effort is to model the current "as is" process that an officer negotiates from pre-commissioning to the first unit of assignment to assist with synchronization of the officer accession and training with the Army Force Generation (ARFORGEN) process. In addition, it will facilitate "what if' analysis in which operational leaders can model potential changes to the system and the resulting consequences – both intended and unintended

Technical Approach

The methodology employed for this modeling and analysis effort began with a thorough stakeholder analysis to identify key questions of value to stakeholders and uncover the research questions to be addressed via modeling and analysis. Next, a conceptual model of officer flow was developed that started with entry to the sources of commission to the first unit of assignment. Attention then shifted to identification of data requirements necessary to support model development. Significant time was then focused on gathering, cleaning, and formatting the data in a series of spreadsheets to facilitate future data updates and input to the model. A discrete-event simulation model was then developed in ProModel© utilizing a phased programming approach. The simulation model tracks officers from source of commission to first unit of assignment recording relevant statistics and measures while allowing adjustment of key stakeholder variables to determine their impacts on metrics of interest and fundamental research questions. Verification and validation was then conducted to ensure the model was working as intended and in fact reflected reality. Lastly, numerous scenarios were run and analyzed to determine the impacts of stakeholder proposed changes on key enterprise metrics of interest.

Results

In this research effort we developed a discrete-event simulation to replicate the flow of officers from their commissioning source to their first unit of assignment. The model is comprised of a series of Excel macros, updateable Excel input files, and a Promodel© simulation. The model provides a tool for decision makers to conduct "what if" analysis – specifically, exploration of BOLC-B course capacity changes, BOLC-B allocation strategies, BOLC-B scheduling rules, and ROTC commissioning date profile adjustments. A series of output tables and graphics capture the effects of these parameter changes on key stakeholder metrics of interest including: ROTC hold population, BOLC-B wait times, time from commission to first unit, and timing of LT unit arrivals in relation to ARFORGEN cycles.

As we conduct "what if" analysis, we focus particular attention on ROTC officers and Armor (AR), Infantry (IN), and Military Police (MP) Lieutenants. ROTC officers have historically had the longest average BOLC-B wait times (123 days) and a large portion of these officers are placed in a "hold" status

(commissioned but not yet accessed) while they wait for their assigned BOLC-B course. Of the sixteen different BOLC-B courses in which Lieutenants attend, AR, IN, and MP are the branches with the longest BOLC-B wait times and will be the focus of portions of our analysis. Based upon stakeholder feedback, we focus attention on the following metrics as we explore different scenarios and vary specific scenario parameters:

- **Time from Commission to Unit:** The number of days from when a Lieutenant is commissioned until they arrive at their assigned first unit.
- **BOLC Wait Time:** Defined as the number of days from when a Lieutenant is commissioned until they start their BOLC-B course. This will be examined by branch and SOC.
- **ROTC Officer Hold Population:** Hold population is the number of ROTC officers that have been commissioned but not yet accessed. We will measure the total cumulative days that ROTC officers are in a hold status.
- **Lieutenant Arrival:** Defined as when in the ARFORGEN cycle Lieutenants arrive to the unit measured by total days (all officers) before the unit Latest Arrival Date (LAD) and the proportion of officers that arrive before the Mission Rehearsal Exercise (MRE).

Stakeholder Key Metrics of Interest	Scenarios				
	Baseline	Capacity (+15%)	Allocations (2 Mo)	Unit Priority	ROTC Comm (30%)
ROTC Avg BOLC-B Wait Time (Days)	123	90	94	108	78
USMA Avg BOLC-B Wait Time (Days)	97	97	118	106	97
ROTC Cumulative Hold (Days)	137294	88113	89225	93650	81870
ROTC time from Comm to Unit (Days)	310	281	282	293	270
USMA time from Comm to Unit (Days)	328	328	342	335	328
ROTC AR BOLC-B Wait (Days)	132	76	67	119	75
ROTC IN BOLC-B Wait (Days)	178	103	115	159	109
ROTC MP BOLC-B Wait (Days)	151	72	131	156	120
All officers total days before LAD (Days)	222116	230880	224525	252952	222084
All officers % arrive before MRE (%)	43.4	40.9	40.9	48.4	41.4

No Change from baseline
Better than baseline
Worse than baseline
Best result all scenarios

Figure A. Comparison of Scenario Results Highlighting Trade-offs between COA's and the best results for each scenario.

We explore the following specific scenarios with the results highlighted in Figure A.

Scenario 1 - Capacity: To counter the spike in BOLC-B demand in the summer months, we explore surging (increasing) BOLC-B capacity from April to November by 5%, 10% and 15% for AR, IN, and MP. Increasing AR, IN, and MP BOLC-B capacity by 5%, 10% and 15% significantly improves ROTC average BOLC-B wait time, ROTC cumulative hold days, and time from commission to unit for ROTC officers with minimal negative impacts on other metrics of interest.

Scenario 2 - Allocation: To address the concern of "USMA-centric" BOLC-B allocations in June and July, we shift the first major BOLC-B allocations from USMA to ROTC by one month (June) and two months (June and July). A two month shift improves most of the metrics of interest but negatively affects USMA BOLC-B wait time and time from commission to unit.

Scenario 3 - Unit Priority: A large portion of USMA officers select their own BOLC-B dates completely divorced of their unit assignment and that unit's ARFORGEN cycle. We reschedule all FY10 cohort LTs for BOLC-B based upon unit priority based upon number of days until LAD. Rescheduling all FY10 cohort LTs for BOLC-B based upon unit priority greatly improves total days before LAD and the proportion of officers that arrive before the MRE but has mixed results regarding some of the other metrics.

Scenario 4 - ROTC Commissioning Date Profile: Only 12% of ROTC officers are commissioned in December. As an additional means to counter the spike in BOLC-B demand in the summer months, we explore shifting a portion (10%,20%, and 30%) of FY10 May commissionees to December. Shifting 30% of ROTC commissionees from May to December greatly improves ROTC average BOLC-B wait time, ROTC cumulative hold days, and time from commission to unit for ROTC officers. However, total days before LAD and proportion of officers arriving before the MRE are negatively affected. This is primarily due to how the May commissionees are currently selected (randomly) to shift to December and could likely be improved with a refined selection process.

In general, scheduling officers to arrive at their first units without regard to the unit ARFORGEN cycle is counter-productive. A recommended future model refinement would be adjusting the model BOLC-B scheduling rules to incorporate this factor.

In summary, this modeling effort captures the "as is" process that an officer must negotiate from commissioning to first unit of assignment (FUA) – allowing "what if" analysis of stakeholder identified variables of interest. Scenario analysis reveals opportunities for increased efficiency in the officer accession process as well as highlighting strategic tradeoffs. This model provides an analytical tool to inform accession policy and a foundation to examine other variables of interest with minimal future refinements.

Acknowledgment

While their names do not explicitly appear on the cover page of this report, this study had many other critical supporters and analysts. Primary among these is the tireless, patient, and consummate professional Mr. Steve Courtney. A senior consultant with the ProModel© Corporation, Steve has been absolutely fundamental as the programmer of this simulation model, consistently performing well beyond any expectations. Mr. Ike Zeitler and CPT Dave Harnass of Human Resources Command provided their valuable time and advice throughout the project as SMEs in the officer management domain. MAJ Adam Albrich, DA G1, was invaluable in providing key personnel data as well as patiently explaining the extremely complex Army personnel processes. MAJ Ed Pitts, Cadet Command Analyst, graciously took the time to explain Cadet Command's scholarship forecasting model and provided valuable background on the ROTC accessions process. Mr. Lou Lafrenaye, TRADOC-TOMA, kindly explained the BOLC-B allocation process, shared critical data and insights, and allowed us the opportunity to participate in the annual BOLC-B Conference. Finally, there were numerous stakeholders who provided their time and insights regarding the officer accessions process: COL Schamburg, COL George, COL (Ret) Corley, COL Shultis, COL Lessig, and LTC Roederer.

Administratively, this study was funded by the Army Modeling and Simulation Office (AMSO) sponsored by US Army Accessions Command G2/9 as part of a year-long effort in support of the Statement of Work entitled, "ARFORGEN Officer Flow Model." The U.S. Government is authorized to reproduce and distribute reprints for governmental purposes notwithstanding any copyright annotation thereon. The views and conclusions contained herein are those of the authors and should not be interpreted as representing the official policies or endorsements, either expressed or implied, of Accessions Command, USMA or the U.S. Government.

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1.0 Introduction

Each year, the Army accesses more than 7000 officers from across all the commissioning sources - West Point, the Reserve Officer Training Corps (ROTC), and Officer Candidate School (OCS). Of those officers, the U.S. Army Accessions Command (USAAC) is directly responsible for supplying more than half of these commissions - those from ROTC and College Option OCS. As the Army made the transition to the ARFORGEN readiness model, it became evident that a greater level of precision was necessary in placing newly commissioned officers in deploying units. USAAC, being the largest supplier of commissioned Lieutenants, took some steps within the command to attempt a greater synchronization with ARFORGEN. However, it soon became clear that a larger, enterprise-level solution would be necessary to make noticeable gains. The different commissioning sources are "stove-piped" with no central authority to coordinate internally between the three, or externally with Human Resources Command (HRC) and the Training and Doctrine Command (TRADOC), so meaningful decisions were challenging. In order to aid in decision-making which would be more holistic in nature and to add analytical capability for leadership, USAAC acquired research funds to complete a simulation model of Officer Flow that would bridge the gap between all stakeholders in this process.

1.1 Background

Persistent conflict and limited resources were the primary factors that drove the Army toward transformational change in the way it manages the global commitment of forces. In 2006, the Army replaced the Cold War-era linear readiness and deployment model with Army Force Generation (ARFORGEN), a "supply-based model" that builds unit readiness over time. ARFORGEN is defined as " the structured progression of increased unit readiness over time, resulting in recurring periods of availability of trained , ready and cohesive units prepared for operational deployment in support of civil authorities and combatant commander requirements. " (Department of the Army [18]) General Charles Campbell noted that , although…. "the Army has a system for organizing, staffing, equipping, training, deploying, sustaining, modernizing and mobilizing - these systems are not, in themselves, self-synchronizing." (Campbell [2]). Senior Army leadership is now leveraging ARFORGEN as a common institutional model and process with which to synchronize these numerous complex components.

In 2009, Forces Command (FORSCOM) identified numerous internal and external disconnects with ARFORGEN execution. Some of these "disconnects" include: difficulty synchronizing NCO and officer education requirements, coordination of command tours at all echelons, and timely delivery of equipment training sets. (Campbell [3]) In addition to efforts to improve the functioning of ARFORGEN, there has been significant effort toward institutionalizing ARFORGEN by codifying policy, procedures, processes, definitions, roles and responsibilities in AR-525-9 and other key documents. A major challenge to synchronizing initial military training (IMT) and manning with unit cycles in ARFORGEN is the fact that the IMT and manning are linear processes which we are attempting to synchronize with the cyclical progression of units through the ARFORGEN process. Figure 1 graphically depicts this challenge. The Army Campaign Plan (ACP) 2009 directs CG USAAC and DCoS Army G1 to adapt recruiting and manning practices and processes to better support creating whole, cohesive units in ARFORGEN.

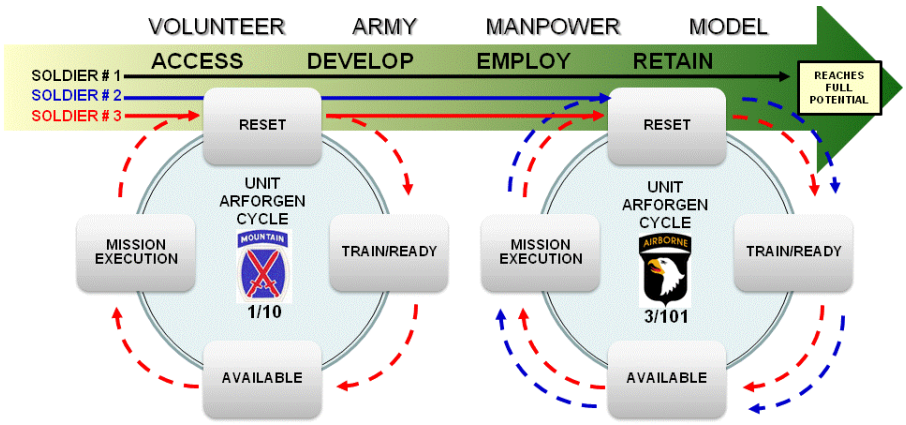


Figure 1. Synchronizing Individual and Unit Cycles.

1.2 Motivation

Current Generating Force processes, policies, and procedures do not enable the most efficient and effective implementation of ARFORGEN. Given current and projected demands on the force, The Human Capital enterprise (HCE) must be able to synchronize Officer flow through the accessions process to first unit of assignment, accurately analyze key metrics, and predict initial entry Officer shortfalls with respect to the ARFORGEN fill requirements of operating force units. Army Campaign Plan Decision Point 97 (ARFORGEN Knowledge Management) and Decision Point 98 (ARFORGEN Automation Integration), specifically direct action in these areas. The Accessions Officer ARFORGEN Flow Model simulation will be a key enabling tool for the HCE and will help synchronize accessions within the ARFORGEN construct.

1.3 Model Purpose

The purpose of this modeling effort is to model the current path that an officer negotiates from pre-commissioning to the first unit of assignment to assist with synchronization of the officer accession and training with the Army Force Generation (ARFORGEN) process. The model allows key stakeholder variables to be adjusted to facilitate "what-if" analysis. Figure 2 highlights the general flow from pre-commissioning to first unit of assignment. Officer candidates receive Basic Officer Leader Course (BOLC-A) training at their commissioning sources. Upon commissioning, officers attend BOLC-B, a course that provides technical training for their specific branch (i.e. Infantry, Armor, etc.). Following BOLC-B, based upon branch and unit skill requirements, officers may then attend additional functional training (i.e. Airborne, Stryker Leader, etc.)

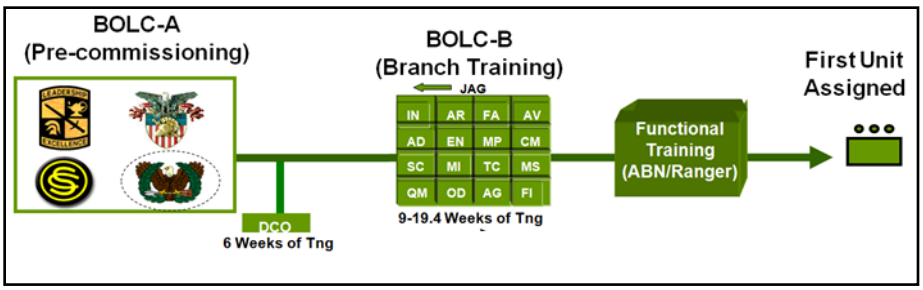


Figure 2. General Officer Flow from SOC to First unit.

1.4 Previous Related Research

CAA MARATHON Model. In 2005 the Center for Army Analysis (CAA) developed a discrete-event simulation as a means of replicating the cyclical unit readiness that would that will exist under ARFORGEN. MARATHON operated at the Standard Requirement Code (SRC) level of detail, implying that BCTs would be scheduled by their type (i.e., IBCT, HBCT, etc.) and not by their designation (e.g., 3rd Brigade, 101st Airborne Division (IBCT)).

Enlisted Flow Model. USAAC developed a discrete-event simulation model Enlisted Flow using ProModel©. The intent of this modeling effort is to determine if there are enough officer and enlisted Soldiers in the accessions pipeline, along with the right mix, to fill deploying units in support of ARFORGEN. Current model scope is limited to Regular Army enlisted skill level 10 Soldiers and deploying Brigade Combat Team (BCT) units. This model currently portrays the enlisted accessions process from appointment conduct through distribution to the BCTs. Key input data includes US Army recruiting Command (USAREC) contracting mission by month by Military Occupation Specialty (MOS), basic training & Advanced Individual training (AIT) class schedules, and the BCT ARFORGEN schedule provided by FORSCOM. Many adjustable model parameters are available within the AFM and these parameters provide a "what-if" analysis capability. In addition, attrition percentages can be adjusted throughout the accessions process. Training base parameters like type/quantity of classes by MOS and minimum/maximum class seat sizes can also be adjusted. Adjusting these levers will help to determine impacts and allow for follow-on trade off analyses.

BOG:Dwell Model. DA G1 and the Operations Research Center of Excellence (ORCEN) developed a discrete-event simulation model that replicated unit personnel turnover and operation tempo (OPTEMPO). The purpose of the model was to replicate the BOG:Dwell of enlisted personnel in key MOSs within BCTs. Features of commonality include: use of AST output as a demand signal, organizational manning authorization data from Force Management System Web Site (FMSWeb), unit inventory data from TAPDB, and fill of units in accordance with ARFORGEN manning guidance, and tracking of units at DMSL level.

Dynamic Accessions Resource Trade-off Simulation Model. In 2006, the Office of the Secretary of Defense (OSD) sponsored research that concluded "the key to continued [recruiting] success is the ability to provide the right level and mix of recruiting resources to meet recruiting market challenges promptly." The Army has begun to develop the Dynamic Accessions Resource Trade-off Simulation (DARTS), a

fully functional analytical tool designed with an System Dynamics (SD)-based analysis approach and capabilities. It provides the Army an integrated resource allocation tool to conduct the trade-off analysis necessary to provide informed, synchronized, and defendable resource allocation recommendations. The model also provides the capability to quantify the impact of reduced resources or changes in the recruiting environment on the Amy's ability to meet its current and future accessions missions.

Army Variable Enlistment Length Model. Current enlistment contract lengths are not synchronized with particular unit ARFORGEN cycles. The result is that approximately 10% of the first term skill level 1 Soldiers assigned to BCTs end up with non-distributable time after returning from deployment. To address this problem, USAAC is developed a simulation & tracking tool that studies the relationship between ARFORGEN planning cycles, the length of service/enlistment contracts, and the relationship with ARFORGEN requirements. This simulation will test the feasibility of writing precision contracts that align Soldier enlistments with BCT requirements along with looking at future BCT requirements and enumerating the needed contracts, by length and MOS, which will synchronize with the ARFORGEN demand. Additionally, the model can simulate the outcome of executing the proposed contracts taking into account all types of attrition along the way, latest arrival date (LAD) variability, and other factors that can influence the outcome of where a soldier is eventually assigned.

2.0 Methodology

The methodology employed for this modeling and analysis effort began with a thorough stakeholder analysis to identify key questions of value to stakeholders and uncover the research questions to be addressed via modeling and analysis. Next, a conceptual model of officer flow was developed that started with entry to the sources of commission to the first unit of assignment. Attention then shifted to identification of data requirements necessary to support model development. Significant time was then focused on gathering, cleaning, and formatting the data in a series of spreadsheets to facilitate future data updates and input to the model. A discrete-event simulation model was then developed in ProModel© utilizing a phased programming approach. The intent of the phased programming approach was to start with the portion of the model that answered key stakeholder questions and allow decision makers to judge the value of the modeling effort before proceeding with the next phases of programming. The simulation model tracks officers from source of commission to first unit of assignment recording relevant statistics and measures while allowing adjustment of key stakeholder variables to determine their impacts on metrics of interest and fundamental research questions. Verification and validation was then conducted to ensure the model was working as intended and in fact reflected reality. Lastly, numerous scenarios were run and analyzed to determine the impacts of stakeholder proposed changes on key enterprise metrics of interest.

3.0 Stakeholder Identification, Feedback, and Analysis A thorough stakeholder analysis was conducted to gain an understanding of the process, identify key metrics of interest, and identify fundamental research questions.

3.1 Stakeholder Identification The Army officer accessions process is a very complex system. As with all complex systems, there are numerous stakeholders that have an interest in or are impacted by the system. Figure 3 highlights the major stakeholders of the officer accessions flow process. The organizations highlighted in light green are those that we consulted and collaborated with throughout the modeling effort.

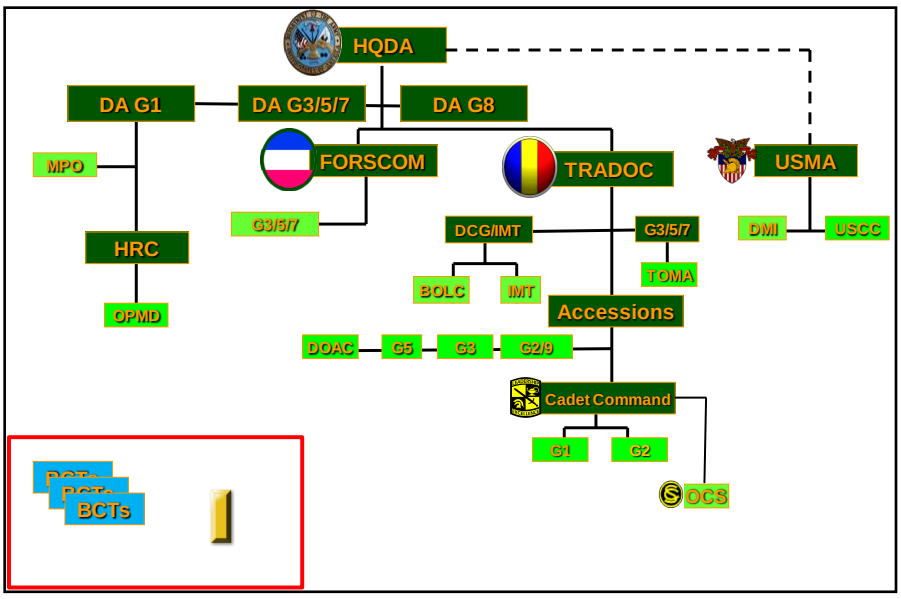


Figure 3. Major Officer Flow Model Stakeholders.

3.2 Stakeholder Feedback

Stakeholder interviews were conducted with the organizations highlighted in Figure 3 above. The feedback was analyzed to identify common themes and points of emphasis. The results are consolidated and organized into major findings, conclusions, and recommendations and are included in Appendix A. The major takeaways are highlighted below.

- **ARFORGEN Unit Fill and Timing:** ARFORGEN manning guidance highlights the specific manning levels for officer and enlisted personnel by unit type and phase within the ARFORGEN cycle. Stakeholders want to identify and track unit fill rates as well as when, in the ARFORGEN cycle, Lieutenants arrive (i.e. days before the MRE or early in the Train/Ready phase) to their first units of assignment.

- **BOLC –B Allocations and Scheduling:** BOLC-B training seats are allocated to the sources of commission at an annual conference co-hosted by Training and Doctrine Command (TRADOC) TOMA and Department of the Army G1. The allocations are USMA- centric in the June to October time period. Stakeholders are interested in varying the SOC BOLC-B allocations. Additionally, ROTC officers are assigned BOLC-B course dates according to the first to commission first to BOLC-B rule. Stakeholders would like the ability to explore alternative scheduling business rules.

- **BOLC Wait Time and LT idle time:** As of 4 Aug 2010, the average wait time for AC ROTC officers was 122 days, and was on a 4 year upward trend. The FORSCOM goal, as stated in 350-1, is a 90 day wait time for BOLC-B. The actual wait times vary by branch. Armor, Military Police, Infantry, and Aviation had average wait times exceeding 140 days. Stakeholders are

interested in adjusting course capacities and course allocations to reduce BOLC-B wait time and Lieutenant idle time.

- **Source of Commission (SOC) Mix:** Each SOC has a typical commissioning date distribution. OCS commissions an equal amount throughout the year while ROTC and USMA commission the vast majority in the May-July time frame and varying amounts at other points in the year. Feedback from units indicates that this sometimes results in SOC over representation or pooling in BCT-level units. Stakeholders are interested in both adjusting the commissioning date profile for ROTC and monitoring SOC mix in units.

- **LT Utilization during Wait Time:** While Lieutenants are waiting for BOLC-B they perform a wide variety of duties ranging from Gold Bar Recruiting to snowbird duty at their BOLC-B post. These duties vary in developmental value to the Lieutenant. Stakeholders are interested in identifying developmental opportunities for Lieutenants to perform during this idle time that provide value to Lieutenants and the Army. A separate Cadet Capstone project will research this topic.

3.3 Research Questions The fundamental research questions derived from stakeholder feedback are listed below.

- Can changes in training capacity improve key enterprise performance metrics?
- Can adjustments to course allocations and scheduling business rules improve key enterprise performance metrics?
- What impacts do adjustments in accessions commissioning date profile have on key enterprise performance metrics?

3.4 Key Enterprise Metrics Stakeholders identified several factors or model outputs that were of interest. They include the following.

- **Unit Fill:** Defined as percentage of ARFORGEN manning requirements versus actual assigned.

- **Lieutenant Arrival:** Defined as when in the ARFORGEN cycle Lieutenants arrive to the unit.

- **Time from Commission to Unit:** The number of days from when a Lieutenant is commissioned until they arrive at their assigned first unit.

- **BOLC Wait Time:** Defined as the number of days from when a Lieutenant is commissioned until they start their BOLC-B course. This will be examined by branch and SOC.

- **ROTC Officer Hold Population:** Defined as the number of ROTC officers that have been commissioned but not yet accessed.

- **SOC Mix in Units:** Defined as the SOC ratio in the BCTs.

4.0 Model Development

4.1 Model Scope

As mentioned previously, the Army Human Resourcing Enterprise is an extremely large and complex system. Ideally, we would attempt to create a model that replicates every possible detail across the Army throughout the entire process. However, this is not prudent or necessary for several reasons: 1) the added detail does not contribute to answering the key research questions, 2) valid, authoritative data does not exist to support this level of detail , and 3) it will be computationally prohibitive as the model is expanded in subsequent phases. In every modeling effort, proper scope of the modeling effort is important; the philosophy for this modeling effort is to start small and create a functioning model that focuses on key research questions. Figure 4 below highlights the range of scoping alternatives with those cells highlighted in yellow as the focus for this effort. A detailed discussion of model scope follows Figure 4.

Source	Component	Units	Branches	Start	Time Horizon
ROTC	Active	BCT/CAB/ Div HQs	ACC Branches	*Commissioning	Replicate current "as is"
USMA	Reserve	MTOE- Non BCT*	Non-ACC	2 Year Point	Model the future
OCS	NG	TDA*		SOC	
Direct					

Figure 4. Morphological Box of Model Characteristics.

4.1.1 Source Of Commission.

The Army accesses the officer corps from several sources: Reserve Officer Training Corps (ROTC), United States Military Academy (USMA), Officer Candidate School (OCS), and Direct Commissioning (DC). ROTC, USMA, and OCS are the SOCs of interest for this effort while DC accessions are excluded from this model for the following reasons.

- In FY10, DCs comprise approximately 13% of total officer accessions. DCs are primarily associated with specialty branches (doctors, lawyers, nurses, chaplains, etc) which have minimal representation in BCT-level units.
- DCs are not generally accessed as Lieutenants.

4.1.2 Reserve Component Level of Detail

Although it is acknowledged that the Reserve Component plays a vital role in the current operating environment and that we are "One Army", this modeling effort is limited to the Active Component for the following reasons. However, the framework is in place to expand the model in the future to include this level of detail.

- The Reserve component utilizes vastly different personnel management policies and systems.
- There are numerous factors (controllable and uncontrollable) that impact Reserve Component training allocation and attendance that make it extremely difficult to model in a generalized manner.
- The Military Personnel Management-Officer division of DA G1 does not track or forecast Reserve Component strength. The Office of the Chief, Army Reserves performs these functions.

4.1.3 Unit Level of Detail

In determining the scope of units to include in the model we first analyzed the concentration of Lieutenants in various unit types. Based upon the FY10 Personnel Manning Authorization Document (PMAD), 60% of Lieutenant Authorizations are in Brigade Combat Teams (BCTs), Combat Aviation Brigades (CABs), or Division Headquarters (DIV HQs). Given that there are several hundred other units that do not fall within these categories, the largest concentration of Lieutenants are in the BCTs, CABs, and DIV HQs. BCTs, CABs, and DIV HQs are tracked, scheduled, and closely managed by FORSCOM via the ARFORGEN Synchronization Tool (AST) which is not the case for all other unit types. Based upon the concentration of Lieutenants and ARFORGEN tracking we limit detailed modeling and analysis to BCTs, CABs, and DIV HQs. All remaining units are classified as either Non-BCT MTOE or TDA and tracked at a macro level.

4.1.4 Branch Level of Detail

Given that the units of primary focus of the model are BCTs, CABs, and DIV HQs, the overwhelming majority of branches represented within these units are those of the Army Competitive Category (ACC). Therefore, the sixteen branches that compromise the ACC are the focus of this modeling effort.

4.1.5 Starting Point

Based upon stakeholder feedback and the potential for future model expansion, it was determined that the officer flow modeling begin at post-commissioning. Additionally, 1 April 2010 was selected as the starting date for the model as April is before the commissioning surge in May and has the smallest BOLC-B queues.

4.1.6 Time Horizon

The desire of Accessions Command is to create a model of the "as is" process to facilitate what-if analysis. Additionally, FY09 was a transition year from the BOLC I,II,II paradigm to the current BOLC-

A:BOLC-B system. We therefore, focused modeling efforts on replicating the FY10 process and system. Because the commissioning cycle begins in May we chose to initialize the model on 1 April 2010. This provides the added benefit of starting the model at a point in which the BOLC-B queue is historically the smallest. The model will run for three years which allows the entire FY10 cohort to move completely through the process flow.

4.2 Conceptual Model Framework

In developing the conceptual model framework we identified four major subcomponents of officer flow from SOC to First unit of Assignment (FUA). These major subcomponents are formed into modules for model development and are shown in Figure 5, below. A functional decomposition of each module is presented in subsequent sections.

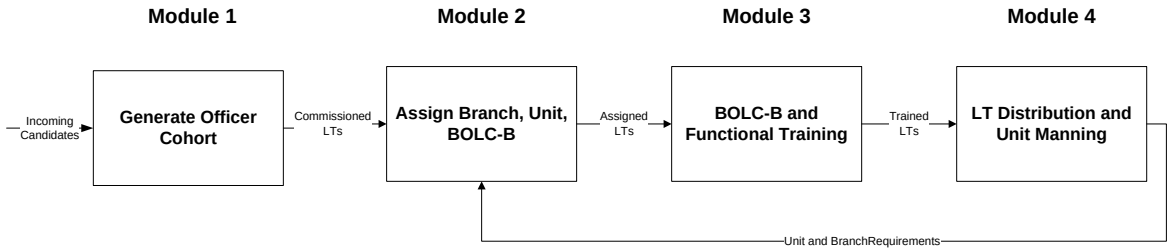


Figure 5. Conceptual Model Flow.

4.3 Functional Decomposition

Before constructing a model of officer flow, we functionally decomposed the process into its major inputs, controls, outputs, and mechanisms reflected in the series of Integrated Definition for Functional Modeling diagrams (IDEF0) in Figures 6 through 10 below. The mechanism for each module is a discrete-event simulation model. The model is separated into four modules for both conceptual clarity and with the intent of running the modules separately if so desired. The system IDEF0 model for the entire process is included in Appendix B.

4.3.1 Generate Officer Cohort

Module 1 begins with candidate arrival at the SOC and ends with commissioning. The module incorporates historical SOC progression and loss rates resulting in a commissioning cohort. Figure 6 below is the IDEF0 model for Module 1.

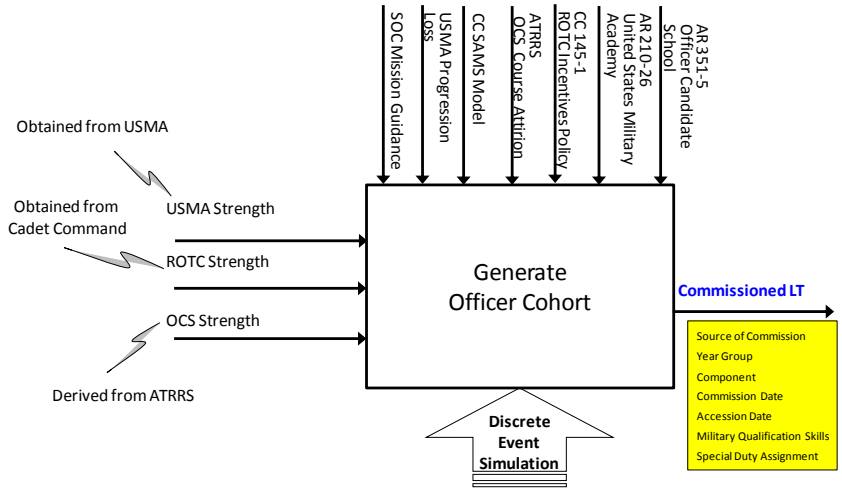


Figure 6. IDEF0 Model of Module 1.

4.3.1.1 Inputs – Module 1

SOC Current Strength. At model initialization (1 April 2010), the numbers of candidates at each SOC are populated within the model. Since this data is not tracked or recorded in a centralized Army database, it was necessary to gather the information from several sources. Cadet Command provided a 1 November 2009 annual record of ROTC cadets by MS-level; with the additional classification of scholarship status (scholarship or non-scholarship). USMA G5 provided the monthly strength, by class (Freshmen, Sophomore, etc.) from which April 2010 data was extracted. OCS strength was generated using ATRRS to determine the number of OCS students in training on 1 April 2010 in addition to their course start and finish dates.

4.3.1.2 Controls – Module 1

Progressions and Losses. As the simulation clock moves forward cadets or candidates will either progress or become a loss to the SOC. Historic SOC progression and loss rates are used to dictate what proportion of candidates or cadets progress to the next state and eventual graduation/commission. Cadet Command maintains a model that documents the three year average state transition rates from which the appropriate data was extracted. USMA G5 provided monthly progression and loss data by class. OCS progression and loss rates were generated using ATRRS historic course completion rates.

Arrivals. The Army Accessions mission is generated and published annually by the DA G1. This document provides detailed guidance regarding the five year projected requirements and missions by SOC, number, component, specialty branches, specialty skill requirements, etc. Cadet Command uses this guidance to update the model - combining historic attrition rates, mission guidance, and financial constraints to determine the number cadets to bring in by MS-level and scholarship type. This data is used as the ROTC arrival data. USMA arrivals are limited by the congressionally mandated size of the Corps and range from 1200 to 1350 incoming cadets each year. USMA arrivals occur in July of each year. OCS arrivals are simply a reflection of the ATTRS actual course enrollments on the course start date.

SOC Governing Regulations. Each SOC maintains appropriate policy and regulations that govern their education, training, and administrative requirements for their cadets or candidates. AR 210-26 is the governing document for USMA. Cadet Command maintains several policy documents with CC 145-1 outlining the ROTC scholarship and incentive programs. AR 351-5 documents the major policies and requirements of the Officer Candidate School.

Military Skill Qualifications. It is common for USMA and ROTC cadets to attend military training (airborne, air assault, etc.) while they are cadets. In fact, 34% of the FY10 ROTC cohort was airborne qualified upon graduation and commissioning. Additionally, OCS-IS candidates often possess military qualifications prior to entering OCS. These prior qualifications impact whether a new LT will attend unit/branch specific functional training following BOLC-B. The qualification data was derived by cross referencing the FY10 cohort roster with ATTRS.

Special Duty Assignments. A portion of ROTC graduates participate in a special duty assignment after graduation. Potential special duty assignments include Leader Development and Assessment Course (LDAC), Leadership Training Course (LTC), or Gold Bar (GB) recruiter duty. Cadet Command provided FY10 ROTC cohort special duty assignment data with beginning and end dates for each assignment. USMA is authorized to assign 20 graduates as athletic interns (10 Fall/10 Spring). Fall interns are assigned to an athletic team for duty following graduation and then attend their BOLC-B course in Dec/Jan at the completion of the season. Spring interns attend BOLC-B following graduation and return to USMA in Dec/Jan to begin duty with their assigned athletic team. In FY10, USMA tasked 50 graduates with supporting Cadet Summer Training (CST). Lastly, approximately 5 – 10 USMA graduates are awarded academic scholarships each year and pursue an advanced degree after graduation. The scholarships range in duration from 6 months to 2 years. USMA S1 provided special duty assignment data for the FY10 cohort.

4.3.1.3 Outputs - Module 1

Commissioned Lieutenants. The outputs of Module 1 are commissioned Lieutenants. These commissioned Lieutenants carry with them the following key attributes or information as they progress through the model: Source of Commission, Year Group, Component, Commission Date, Accession Date, Military Skill Qualifications, and Special Duty assignment (if appropriate).

4.3.2 Assign Branch, Unit, and BOLC-B This module takes the list of commissioned officers from all sources of commission and "stamps" each Lieutenant with a branch, unit of assignment, and a BOLC-B course. Figure 7 is the IDEF0 model for Module 2.

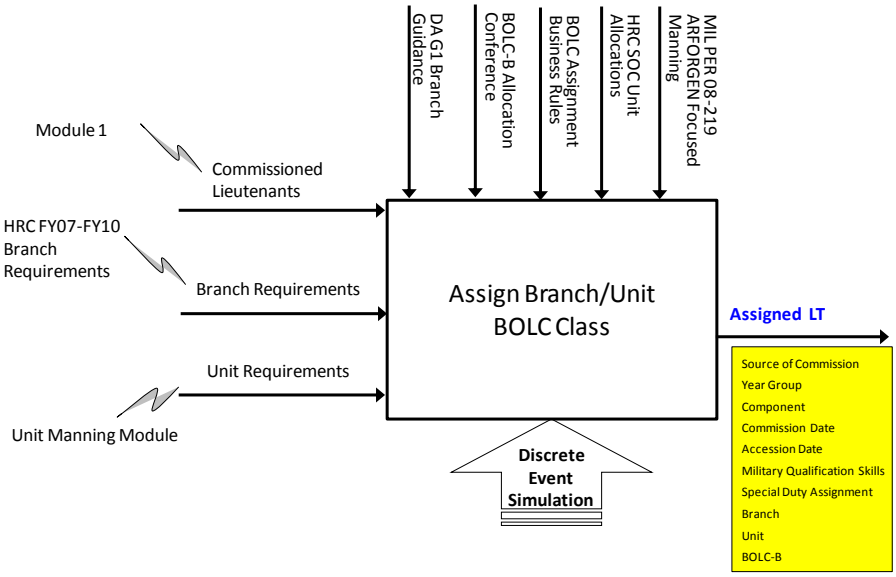


Figure 7. IDEF0 Model of Module 2.

4.3.2.1 Inputs – Module 2

Commissioned Lieutenants. The output of commissioned Lieutenants (Module 1) is an input to Module 2.

Branch Requirements. HRC determines the annual Active Duty (AD) branch requirements for the upcoming commissioning cohort by utilizing an in-house model to forecast requirements for AD Captains three years in the future. The model accounts for branch detail Lieutenants who serve their first 3 years in a control branch then revert to a basic branch. These branch requirements are then allocated to the three commissioning sources. HRC provided historical branch requirement data from FY07 to FY10 with Figure 8 below depicting the FY10 branch requirements.

FY10 LT ACCESSIONS PLAN								
BRANCH	CONTROL BRANCH				BASIC BRANCH			
	USMA	OCS	ROTC	ACC	USMA	OCS	ROTC	ACC
IN	197	310	511	1017	197	210	295	702
FA	143	199	316	658	143	152	214	509
AD	56	46	55	157	56	59	84	199
AV	111	30	151	292	111	30	151	292
AR	89	143	238	471	89	94	131	314
EN	129	115	177	421	129	115	177	421
SC	45	117	127	289	45	178	259	482
MP	26	69	103	198	26	69	103	198
MI	65	147	136	349	65	259	378	702
AG	27	75	87	189	27	106	154	287
FI	6	13	11	31	6	25	36	67
CM	11	76	133	220	11	44	63	118
TC	33	136	200	369	33	136	200	369
OD	32	126	183	341	32	126	183	341
QM	30	119	172	321	30	119	172	321
TOTAL	1000	1722	2600	5322	1000	1722	2600	5322

Figure 8. FY10 Branch Allocations.

Unit Requirements. HRC projects unit requirements three times a year targeting December graduates, spring graduates, and end-of-summer commissionees. The projections are made for a window of 8 to 12

months following the particular commissioning cycle since this is when those commissioned in that cycle could be expected to arrive at their units after completion of BOLC-B and functional training. The projection starts with a Total Officer personnel management Information System (TOPMIS) query of current unit inventory versus authorizations. Positions with the following criteria are considered vacant:

- An unfilled position with no Valid Open Requisition (VOU).
- Positions currently filled by Lieutenants that will be promoted before the target window.
- A position currently filled by a Lieutenant with an available to move date (YMAV) earlier than the target window.
- A position filled by a Lieutenant eligible to return from overseas (DEROS) earlier than the than the target window.

All of these vacant positions are rolled up by unit and by branch to determine unit "needs." Unit "requirements" are determined by finding the percentage of fill that is authorized by Army Manning Guidance with respect to ARFORGEN. HRC then proportionally allocates the unit requirements across the three commissioning sources. Module 4 of the model tracks current unit strength and unit ARFORGEN cycle. The model will apply the vacancy rules above to determine unit requirements.

4.3.2.2 Controls – Module 2

SOC Branch Allocations. HRC develops a recommended SOC branch allocation which is codified in a DA G1 Branch Guidance memorandum issued to the sources of commission. USMA has historic branch allocations in proportion to the USMA population that are largely driven by the 80/20 rule. The remaining branch allocations are proportionally split between ROTC and OCS. OCS aviation (AV) accessions are typically capped and the remaining allocations are proportionally split between ROTC and USMA. HRC provided FY07-FY10 historic SOC branch allocations. The historic allocations can be used to replicate SOC branch allocation within the model.

BOLC-C Allocation Conference. TRADOC (TOMA) and DA G1 co-host the annual BOLC-B conference where the training seats dictated by the SMDR are apportioned to the three sources of commission and other agencies. TOMA provided the historical Active Duty BOLC-B allocations for the 3 sources of commission. Additionally, these allocations and actual course attendance rates can be obtained from ATRRS. The FY10 allocations are used as the baseline from which allocation adjustments will be made.

BOLC-B Assignment Business Rules. Cadet Command assigns apportioned ROTC BOLC-B allocations utilizing a FIFO (First In First Out) rule. Within a given branch, those with the earliest commission dates are assigned to BOLC-B courses within allocation constraints. A small portion of USMA unit allocations come with a NLT BOLC-B date and cadets select their unit with an accompanying BOLC-B date. The remainders of the USMA BOLC-B slots are selected by cadets in accordance with the USMA branch OML. OCS typically sends an OCS graduate to the soonest available BOLC-B course date 45 days after graduation (within allocation constraints). HRC provided the FY10 cohort listing with SOC, commission date, accession date, and BOLC-B dates.

SOC Unit Allocations. HRC proportionally allocates the unit requirements across the SOCs. The allocations are passed to the SOCs for fill. Aviators are not assigned a unit until after they have completed BOLC-B and have been assigned a specific airframe. Consequently, aviators will be tracked at the macro level regarding unit assignment within the model. The FY10 cohort listing, discussed earlier, includes the unit of assignment for most of the commissioning cohort.

4.3.2.3 Outputs – Module 2 The outputs of Module 2 are assigned Lieutenants. These Lieutenants carry with them the following key attributes or information as they progress through the model: Source of Commission, Year Group, Component, Commission Date, Accession Date, Military Skill Qualifications, and Special Duty assignment, Branch, Unit (with the exception of Aviators), and BOLC-B Course assignment.

4.3.3 BOLC-B and Functional Training This module takes the list of commissioned officers with assigned branch, unit, and BOLC-B date and routes them through the appropriate BOLC-B course and required functional training enroute to their unit. Figure 9 below is the IDEF0 model for Module 3.

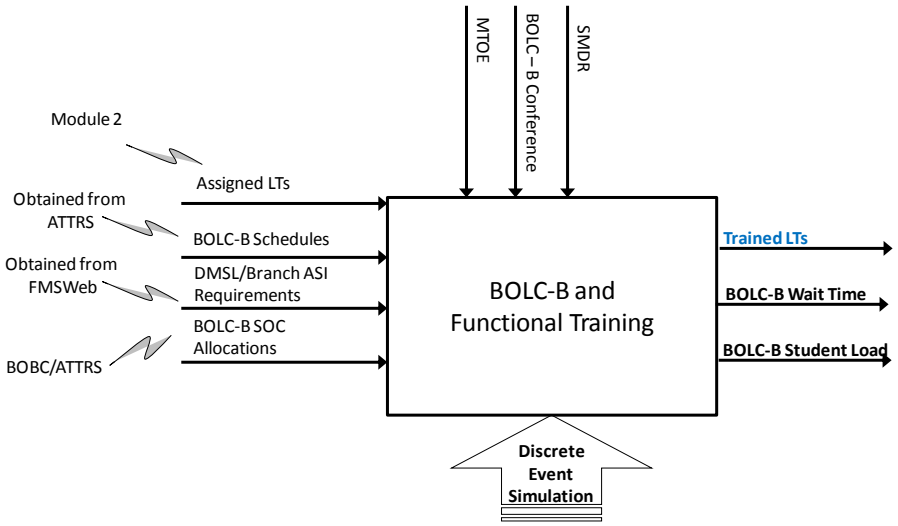


Figure 9. IDEF0 Model of Module 3.

4.3.3.1 Inputs – Module 3

Assigned Lieutenants. The output of assigned Lieutenants (Module 2) is an input to Module 3.

BOLC-B Schedules. A query of ATTRS provided the FY09 to FY11 course schedules (start date and end date) as well as the designed course capacities for the 16 BOLC-B courses.

Additional Skill Identifier Requirements. FMSWeb maintains all Army unit authorization data including skill requirements (ASI) and duty position titles. The FY10 FMSWeb data is used to create a special skill requirement matrix. The matrix captures the ASIs required by branch and DMSL. This matrix is the primary model reference for required functional training.

4.3.3.2 Controls – Module 3

Senior Management Decision Review (SMDR). The SMDR is the process that determines, validates, and directs the TRADOC training mission. TRADOC uses this information to schedule and resource courses for the upcoming and future FYs. The scheduling and resourcing is reflected in the ATRRS database of course offerings and capacities.

BOLC-B SOC Allocations. As discussed previously, TRADOC (TOMA) and DA G1 co-host the annual BOLC-B conference where the training seats dictated by the SMDR are apportioned to the three sources of commission and other agencies. TOMA provided the historical Active Duty BOLC-B allocations for the 3 sources of commission. Additionally, these allocations and actual course attendance rates can be obtained from ATRRS. The FY10 allocations are used as the baseline from which allocation adjustments will be made.

4.3.3.3 Outputs – Module 3 The outputs of Module 3 are trained Lieutenants. No additional attributes are assigned during this particular module. However, these Lieutenants carry with them the following key attributes or information as they progress through the model: Source of Commission, Year Group, Component, Commission Date, Accession Date, Military Skill Qualifications, and Special Duty assignment, Branch, Unit (with the exception of Aviators), and BOLC-B Course assignment.

4.3.4 Unit Manning and Lieutenant Distribution This module distributes trained Lieutenants to their assigned units. Module 4 also maintains current unit fill and unit ARFORGEN cycle as the model steps forward in time. Units are "matured" by processing arrivals and departures (promotions, losses, and reassignments). The unit status information is passed to module 2 to derive unit requirements. Figure 10 below is the IDEF0 model for Module 4.

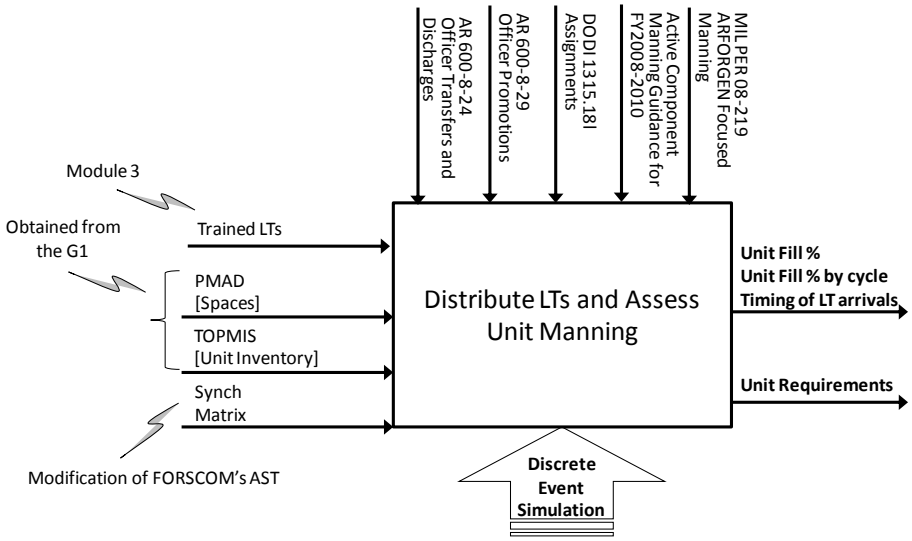


Figure 10. IDEF0 Model of Module 4.

4.3.4.1 Inputs – Module 4

Trained Lieutenants. The output of BOLC-B and Functional Training (Module 3) is an input to Module 4.

Personnel Management Authorization Document (PMAD). The PMAD provides the authorized positions for officers by MOS and grade. DA G1 provided the 31 March 2010 authorization data by Unit Identification Code (UIC), Distribution Management Level (DML) and Distribution Management Sub Level (DMSL).

Total Officer Personnel Management Information System (TOPMIS). TOPMIS maintains officer inventory by MOS and grade. DA G1 provided the 1 April 2010 inventory data by Unit Identification Code (UIC), Distribution Management Level (DML) and Distribution Management Sub Level (DMSL). The key additional elements of information included in the inventory file were: Time on Station (TOS), Date of Rank (PDOR), Date Expected to Return from Overseas (DEROS), branch, unit, and rank.

Unit ARFORGEN Schedules. We employed a modified version of the AST, utilized by HRC, to replicate unit ARFORGEN scheduling for FY09-FY11. This spreadsheet file maintains the following key dates for each unit included in our model: Redeploy date (R), Redeploy date +90 (R+90), Redeploy date +180 (R+180), Mission Rehearsal Exercise-45 (MRE-45), Mission Rehearsal Exercise, , and Deployment Date (LAD).

4.3.4.2 Controls – Module 4

Losses. The policy and guidelines for officer losses are dictated by AR 600-8-24, Officer Transfers and Discharges. DA G1 provided three years of monthly Lieutenant inventory and the corresponding monthly loss data. The loss data was for all loss codes, less reassignment and promotion. This data was translated into a monthly Lieutenant loss rate by branch.

Promotions. The policy and guidelines for officer promotions are dictated by AR 600-8-29, Officer Promotions. DA G1 provided the FY10 promotion timelines and promotion rates for Lieutenants and Captains.

Reassignments. DODI 1315.18I provides the policy and guidelines for officer assignments.

ARFORGEN Manning Guidance. ARFORGEN Focused Manning (AFM) directs that the Army "man and prioritize units based on deployment (LAD), major training exercises (MRE/MRX), and Redeployment (R) dates" (Department of the Army, 2008e, [15]). Specific manning goals are derived from this guidance and published in the HQDA Active Component Manning Guidance.

4.3.4.3 Outputs – Module 4 The outputs of module 4 are unit fill information as well as timing of Lieutenant arrival. The unit fill information is passed to module 2 to derive necessary unit requirement information.

4.4 High Level Simulation Structure (Phase I) As mentioned earlier, a phased approach to programming is implemented that begins with a scaled, workable model that answers the key research questions. The gray box in Figure 11 highlights the focus of Phase I. A phased approach allows decision makers the chance to decide whether the value added of Phase I merits pursuit of follow on

phases. The Phase I model starts with a spreadsheet that replicates the output of Module 2. The data was obtained from HRC and captures FY10 officer cohort information including: SOC, Year Group, Branch, Commission Date, Accession Date, Unit of Assignment, BOLC-B Date, Special Duty Assignment, and Military Skill Qualifications.

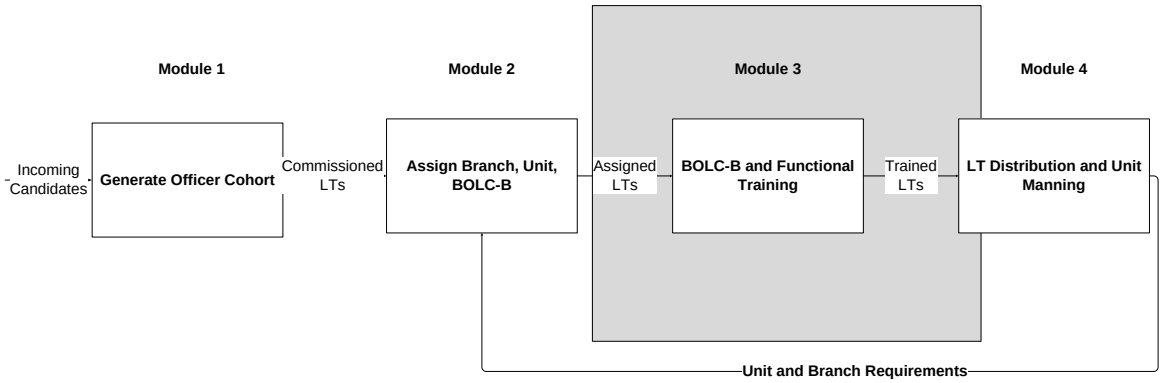


Figure 11. Focus of Phase I Programming Effort.

4.4.1 Phase I Flowchart The flowchart included in Appendix C outlines the flow of an officer from SOC, to appropriate BOLC-B training, through required follow-on functional training, to first unit of assignment (FUA).

4.4.2 Model Initialization The intent is to create a flexible model by utilizing a simple, spreadsheet front-end that allows the user to make adjustments to model parameters and inputs without editing the simulation logic. During model initialization, the model reads 12 arrays from an Excel file. The arrays vary in size and include: FY10 cohort data, BOLC-B course information, BOLC-B progression and loss rates, Aviation airframe specific training information, Unit ARFORGEN schedules, Unit: Branch: ASI matrix, Functional training course information, students in BOLC-B at start of model, officers in BOLC-B queue at start of model, students in airframe specific training at the start of model, and officers in the queue for airframe specific training at the start of the model. Once the simulation has loaded these inputs, the simulation clock is set to 1 April 2010 and the model will progress in one week time increments for 3 years.

4.4.2 Entities The entities for the Phase I model are commissioned officers. Entity arrivals are controlled via input arrays instead of the ProModel© built-in arrival editor.

4.4.3 Entity Attributes There are numerous attributes of interest that each entity will "carry" with them as they progress through the model. Table 1 below lists the entity attributes for Phase I.

Source of Commission	BOLC-B Start/End Dates
Component	BOLC-B Wait Time
Commission Date	Aviation Airframe Assigned
Accession Date	Aviation Airframe Start/End Date
Special Duty	Additional Military Training Required
Military Skill Qualification	Functional Training Start/End
Branch	Date of Arrival at Unit
Unit	

Table 1. Model Entity Attributes.

4.4.4 Model Assumptions and Clarifications Throughout the course of model development, assumptions were made to streamline the modeling process. Model assumptions and points of clarification are described below.

4.4.4.1 Assumptions

- Historic BOLC-B, Functional training, and Airframe specific training attrition and recycle rates are indicative of future rates.
- There will be no major changes in BCT, CAB, or DIV HQ structure (Officers, grade, skills, etc.).
- Although it is possible to participate in some functional training prior to BOLC-B, functional training is assumed to occur after BOLC-B.
- The proportion of aviators assigned to specific aviation platforms for each cohort is proportional to the historic proportion of active duty officers attending this training.
- No time lapse between MS BOLC-B Phase 1 and Phase 2; the courses are treated as one course with duration equal to the sum of the individual courses.
- If an officer recycles in his BOLC-B course or aviation specialty training more than once they are considered a loss. Recycles occur at the end of a course and the officer is slotted for the next course.

4.4.4.2 Clarifications

- There is no distinction made between OCS-In Service and OCS-College option candidates.
- Branch detail is not modeled as an attribute in the model as the intent of the model was to track LTs to their first unit of assignment.
- The model does not schedule individuals for functional training or airframe specific training therefore, specific course schedules, capacities and queues are not considered. However, an officer's time spent in either category of training is accounted for in the model.
- Airborne is the only ASI that an entity can leave their SOC with. As new data becomes available, additional ASIs can be added.
- Since aviators are not assigned a unit until completion of BOLC-B, the FY10 cohort data did not include units for the vast majority of aviators. Aviators without units are instead assigned to a "dummy" unit and their arrival date is recorded.

- As adjustments to course capacity and SOC course allocations are made, all changes will be made to the benefit of ROTC. Specifically, if a course capacity is increased by 10 seats, all 10 seats will be added to ROTC's current allocation for that course.

4.4.5 Model Operation

The model displays two graphical images that update during model operation. Figure 12 is the model Counter View which updates numerous counters, during the model run, for stakeholder variables of interest.

1. The first set of counters below Label 1 tracks the number of FY10 commissionees from each SOC as the simulation clock advances.
2. After commissioning, ROTC graduates are either accessed or placed in a hold status until their special duty begins or prior to their BOLC-B course. The set of counters below Label 2 display the number of ROTC cadets on hold or performing special duty and USMA graduates performing special duty.
3. ROTC commissionees spend differing amounts of time in hold status. The blue highlighted counter at Label 3 displays the cumulative hold time for ROTC commissionees.
4. The counters below Label 4 track the number of commissionees, by SOC, that are waiting for their assigned BOLC-B course.
5. The series of counters below Label 5 display the number of officers (all SOC) waiting for each particular BOLC-B course.
6. The series of counters below Label 6 display the average wait times (all SOC) for each BOLC-B course.
7. The series of counters below Label 7 display the number of officers (all SOC) that are training at their particular BOLC-B course.
8. The series of blue highlighted counters next to Label 8 track the average BOLC-B wait time, by SOC (all branches).
9. The counters above Label 9 track the number of officers (all SOC) that are waiting for and participating in basic rotary wing training (IERW).
10. Following BOLC-B, large numbers of officers participate in additional training that is specific to their branch and unit. The counter above label 10 tracks the number of officers that are participating in this additional "functional" training.
11. After completing basic rotary wing training, aviators are assigned a specific platform they will fly and then attend the specialty training for that specific aircraft.
12. The last set of counters below Label 12 track the average time for an officer, by SOC, to arrive at their assigned unit following commissioning.

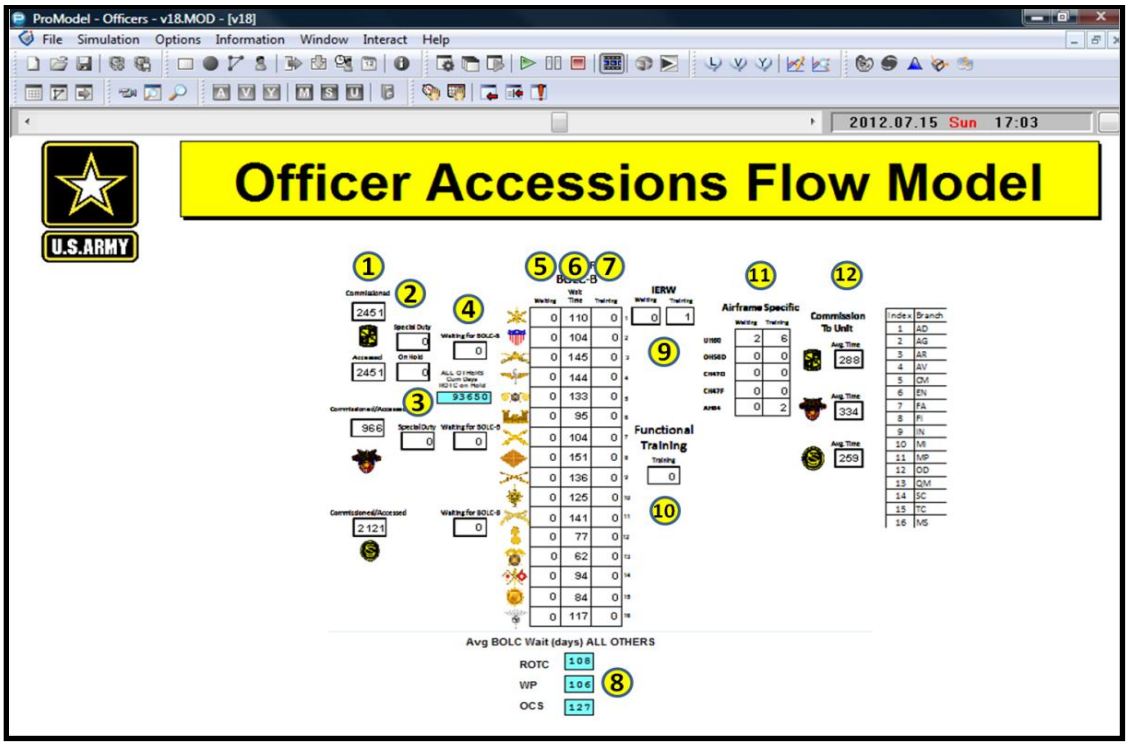


Figure 12. Model Counter View.

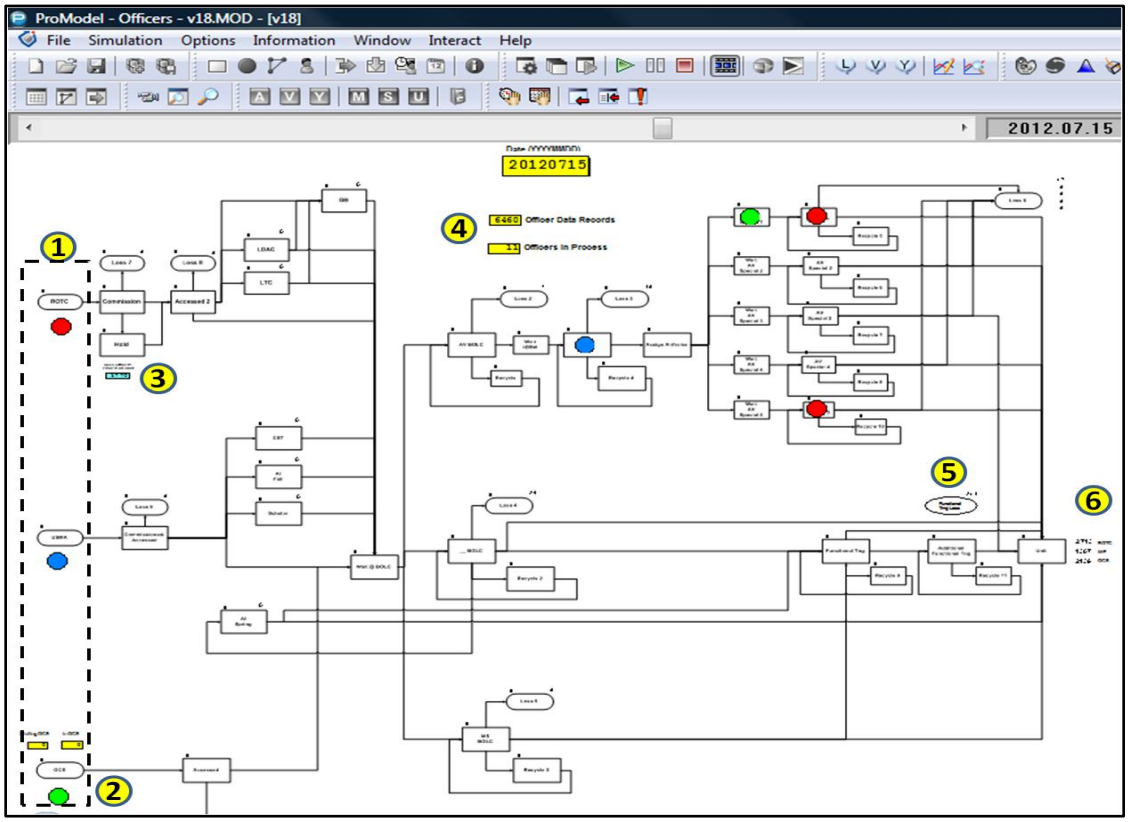


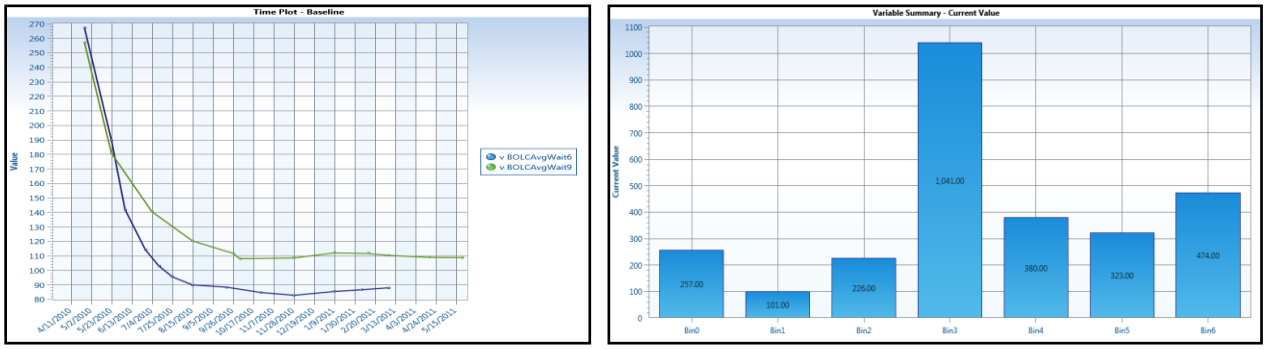
Figure 13. Model Flow View.

Figure 13 is the model Flow View which represents entities with colored dots that are color coded by SOC (ROTC=Red, USMA=Blue, and OCS=Green). This color coding facilitates SOC specific verification efforts.

1. Label 1 simply highlights the color coded dots for each SOC.
2. The yellow highlighted counters at Label 2 display the number of FY10 cohort OCS candidates awaiting OCS and in OCS training.
3. The blue highlighted counter next to Label 3 displays the cumulative number of ROTC officers that were placed in a hold status.
4. The counters next to Label 4 aid in model verification and track total number of officer records from the input file and the number of officers in the process flow.
5. There are several counters throughout the Flow View that capture losses at the various locations in the model. Losses are generally represented by ovals in the diagram. The counter below Label 5 is an example of one of these loss counters and depicts losses at functional training.
6. The counters below Label 6 display the numbers, of officers, by SOC, that have arrived at their units.

4.4.6 Model Outputs

The model tracks the statistics of 200+ variables of interest. Each of these variables can be graphed via several techniques utilizing the ProModel© output viewer. However, a smaller set of pre-programmed graphs were developed and are generated each time the model is run. An example of these pre-programmed output graphs are highlighted in Figure 14 below. A complete listing of the pre-programmed graphs is highlighted in Table 2 with examples of each included in Appendix E.



Average BOLC-B Wait Time by Branch LT Arrivals by ARFORGEN cycles

Figure 14. Sample Pre-programmed Output Graphs.

Graph Name	Type	Description
Number ROTC on Hold	Line Plot	The number of ROTC officers in a hold status plotted over time
Avg Wait for BOLC by Branch	Line Plot	The average wait time for BOLC-B by branch (All SOC) in days plotted over time
Number waiting for BOLC by Branch	Line Plot	The number of officers waiting for BOLC-B by branch (All SOC) in days plotted over time
ROTC Commission to Unit	Histogram	The average number of days for ROTC officers to arrive at unit after commissioning
WP Commission to Unit	Histogram	The average number of days for USMA officers to arrive at unit after commissioning
OCS Commission to Unit	Histogram	The average number of days for OCS officers to arrive at unit after commissioning
BOLC wait	Histogram	The average wait time for BOLC-B by branch (All SOC)
Unit Arrivals	Histogram	Arrivals of LTs to their unit in relation to ARFORGEN cycles
Variables Table	Table	Key statistics (min,max, avg,etc.) for all 200+ variables tracked in the model

Table 2. Model Pre-Programmed ProModel© Output Graphs

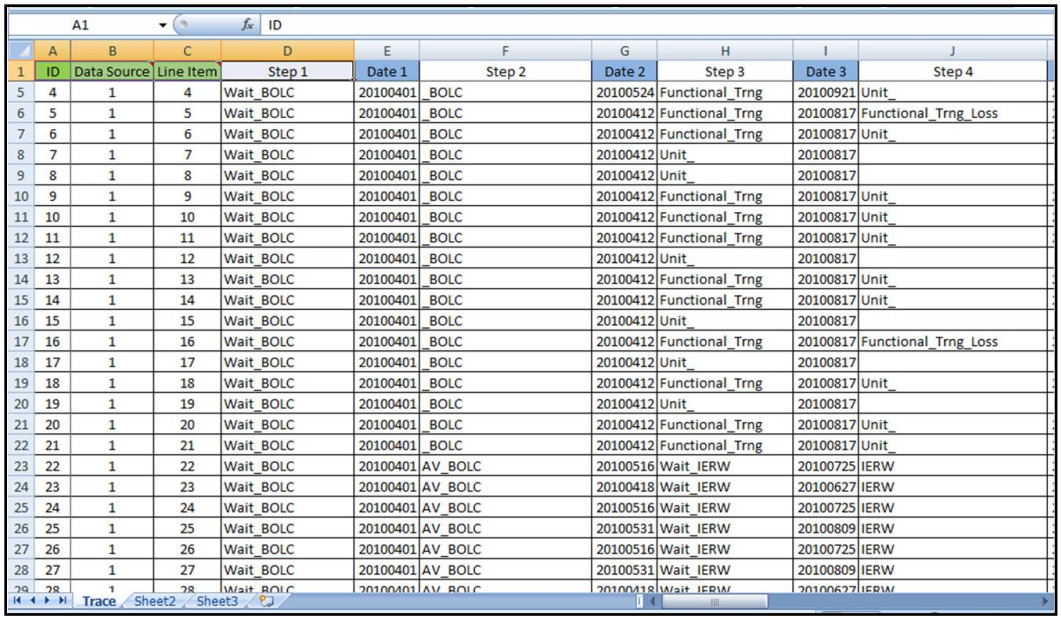
In addition to the outputs generated in ProModel©, the model also creates several useful Excel output files. The name and contents of each Excel file are highlighted in Table 3 below.

Output File Name	Tab	Description
Excel Reports.xlsm		
	Unit Gains	Counts Unit Arrivals (DMSL level) in Reference to ARFORGEN Cycles
	BOLC Wait	Model output of average BOLC-B wait by Branch and SOC
	BOLC Wait Detailed	The average number of days for ROTC officers to arrive at unit after commissioning
TraceFile.xlsx		
	Trace	Trace of every entity with DTG stamp each time the entity changes location
	Bin Trace	Trace of all entities, when they arrived to unit, and what ARFORGEN cycle
Starting Location.xlsx		
	Sheet 1	Trace of every entity and where they are at model start (1 Apr 2010)

Table 3. Model generated Excel Output Files.

4.4.7 Verification and Validation

4.4.7.1 Verification Model verification confirms whether the model operates as intended. We utilized three primary techniques to verify the Phase I model: animation, numerical observation, and entity trace. On the simulation main layout we dynamically update several counters and graphics. These items permit us to observe changes in the counter as the model runs. We check to see if these changes are logical. For example, we expect the number of ROTC commissioned officers in "hold" status to be no larger than the ROTC commissioning cohort and it should gradually decrease to zero as all ROTC officers have completed BOLC-B. ProModel© also provides an entity trace feature; allowing us to trace a particular entity from arrival all the way through the model to FUA. Finally, we created a trace output file (Figure 15) that recorded the DTG for each entity at each location throughout the model.



	A	B	C	D	E	F	G	H	I	J
1	ID	Data Source	Line Item	Step 1	Date 1	Step 2	Date 2	Step 3	Date 3	Step 4
5	4	1	4	Wait_BOLC	20100401	_BOLC	20100524	Functional_Trng	20100921	Unit_
6	5	1	5	Wait_BOLC	20100401	_BOLC	20100412	Functional_Trng	20100817	Functional_Trng_Loss
7	6	1	6	Wait_BOLC	20100401	_BOLC	20100412	Functional_Trng	20100817	Unit_
8	7	1	7	Wait_BOLC	20100401	_BOLC	20100412	Unit_	20100817	
9	8	1	8	Wait_BOLC	20100401	_BOLC	20100412	Unit_	20100817	
10	9	1	9	Wait_BOLC	20100401	_BOLC	20100412	Functional_Trng	20100817	Unit_
11	10	1	10	Wait_BOLC	20100401	_BOLC	20100412	Functional_Trng	20100817	Unit_
12	11	1	11	Wait_BOLC	20100401	_BOLC	20100412	Functional_Trng	20100817	Unit_
13	12	1	12	Wait_BOLC	20100401	_BOLC	20100412	Unit_	20100817	
14	13	1	13	Wait_BOLC	20100401	_BOLC	20100412	Functional_Trng	20100817	Unit_
15	14	1	14	Wait_BOLC	20100401	_BOLC	20100412	Functional_Trng	20100817	Unit_
16	15	1	15	Wait_BOLC	20100401	_BOLC	20100412	Unit_	20100817	
17	16	1	16	Wait_BOLC	20100401	_BOLC	20100412	Functional_Trng	20100817	Functional_Trng_Loss
18	17	1	17	Wait_BOLC	20100401	_BOLC	20100412	Unit_	20100817	
19	18	1	18	Wait_BOLC	20100401	_BOLC	20100412	Functional_Trng	20100817	Unit_
20	19	1	19	Wait_BOLC	20100401	_BOLC	20100412	Unit_	20100817	
21	20	1	20	Wait_BOLC	20100401	_BOLC	20100412	Functional_Trng	20100817	Unit_
22	21	1	21	Wait_BOLC	20100401	_BOLC	20100412	Functional_Trng	20100817	Unit_
23	22	1	22	Wait_BOLC	20100401	AV_BOLC	20100516	Wait_IERW	20100725	IERW
24	23	1	23	Wait_BOLC	20100401	AV_BOLC	20100418	Wait_IERW	20100627	IERW
25	24	1	24	Wait_BOLC	20100401	AV_BOLC	20100516	Wait_IERW	20100725	IERW
26	25	1	25	Wait_BOLC	20100401	AV_BOLC	20100531	Wait_IERW	20100809	IERW
27	26	1	26	Wait_BOLC	20100401	AV_BOLC	20100516	Wait_IERW	20100725	IERW
28	27	1	27	Wait_BOLC	20100401	AV_BOLC	20100531	Wait_IERW	20100809	IERW

Figure 15. Entity Trace File.

4.4.7.2 Validation Model validation confirms whether the model reflects reality. We utilized two primary techniques to validate the Phase I model: numerical observation and historical comparisons. On the simulation main layout we dynamically update several counters and graphics. These items permit us to observe changes in the counter as the model runs. We check to see if these changes reflect historical values. For example, we compare the BOLC-B wait times by branch with the historical (FY09 and FY10) wait times. Additionally, our time from commission to FUA roughly corresponds with the HRC estimate; 8 to 12 months from commission to FUA. Lastly, the commission to FUA averages across the sources of commission are logical in that OCS has the lowest average time compared to ROTC and USMA.

5.0 Analysis

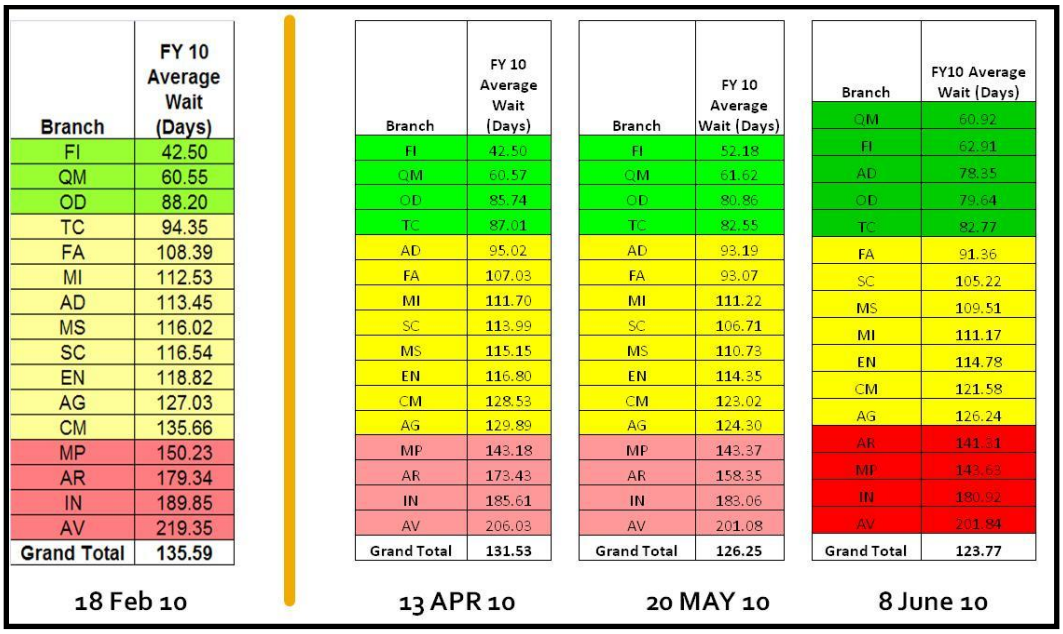
We derived the fundamental research questions and key model outputs from the stakeholder analysis described earlier. Stakeholders were interested in the following key model outputs:

- BOLC-B wait times by branch and SOC
- ROTC "commissioned but not accessed" population
- Time from commission to FUA
- Officer arrivals in relation to unit ARFORGEN cycles

Although there are numerous other outputs included within the model, these are the ones which we will focus primary attention as we make adjustments to key model variables or factors.

5.1 BOLC-B Wait Times

BOLC-B wait times are a function of course capacity, demand, and timing of demand. While AR 350-1 establishes a goal of 90 days BOLC-B wait time, in FY10, the average active duty ROTC BOLC-B wait time was 123 days. Figure 16 below highlights the active duty ROTC BOLC-B wait times by branch at several key points throughout the year. Note that Infantry (IN), Armor (AR), Military Police (MP), and Aviation (AV) are highlighted in red because of their deviation from the 90 day goal. Aviation wait times are driven largely by limited airframe availability and will not be explored here. **We will increase IN, AR, and MP capacities in the model by 5%, 10%, and 15% to determine the effect on the key model outputs highlighted above.**



Branch	FY 10 Average Wait (Days)
FI	42.50
QM	60.55
OD	88.20
TC	94.35
FA	108.39
MI	112.53
AD	113.45
MS	116.02
SC	116.54
EN	118.82
AG	127.03
CM	135.66
MP	150.23
AR	179.34
IN	189.85
AV	219.35
Grand Total	135.59

18 Feb 10

Branch	FY 10 Average Wait (Days)
FI	42.50
QM	60.57
OD	85.74
TC	87.01
AD	95.02
FA	107.03
MI	111.70
SC	113.99
MS	115.15
EN	116.80
CM	128.53
AG	129.89
MP	143.18
AR	173.43
IN	185.61
AV	206.03
Grand Total	131.53

13 APR 10

Branch	FY 10 Average Wait (Days)
FI	52.18
QM	61.62
OD	80.86
TC	82.55
AD	93.19
FA	93.07
MI	111.22
SC	106.71
MS	110.73
EN	114.35
CM	123.02
AG	124.30
MP	143.37
AR	158.35
IN	183.06
AV	201.08
Grand Total	126.25

20 MAY 10

Branch	FY10 Average Wait (Days)
QM	60.92
FI	62.91
AD	78.35
OD	79.64
TC	82.77
FA	91.36
SC	105.22
MS	109.51
MI	111.17
EN	114.78
CM	121.58
AG	126.24
AR	141.31
MP	143.63
IN	180.92
AV	201.84
Grand Total	123.77

8 June 10

Figure 16. FY10 ROTC Active Duty BOLC-B Wait Times.

5.2 BOLC Demand

Figure 17 below highlights the BOLC-B demand for the FY10 cohort as derived from cohort commissioning dates. Note that OCS BOLC-B demand is relatively constant throughout the year while ROTC and USMA have large spikes in May/June. **Although the model allows adjustments to any time period, we will focus any course capacity or SOC allocation adjustments on the April-October time period; corresponding to the greatest demand and backlog.**

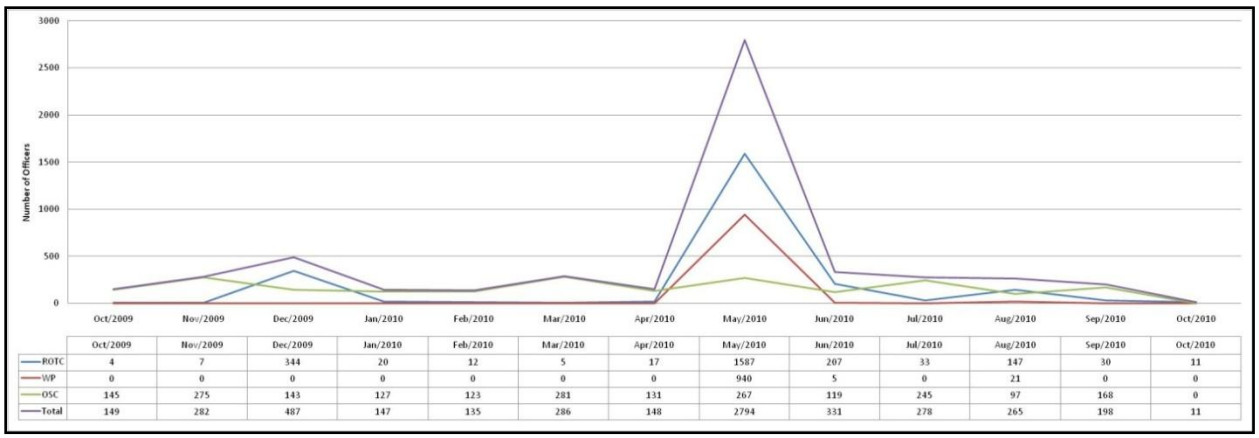


Figure 17. BOLC-B Aggregate Demand by SOC.

5.3 BOLC-B Capacity

We increase IN, AR, and MP BOLC-B course capacities in the model by 5%, 10%, and 15% during the April-October time period which corresponds to the greatest demand and backlog. As discussed in the model clarifications section, increased capacity is allocated exclusively to ROTC. We expect ROTC average BOLC-B wait time, ROTC BOLC-B (IN, AR, and MP) wait time, ROTC cumulative hold time, and ROTC average time from commission to unit to decrease as a result of increased capacity. Figures 18 through 20 highlight the impacts of 5%, 10%, and 15% increases to AR, IN, and MP BOLC-B capacity. A 5% increase in AR, IN, and MP BOLC-B capacity can reduce overall ROTC BOLC-B average wait time by 3 weeks and reduce ROTC cumulative hold days by 43,000 days which equates to approximately 20 days per ROTC officer.

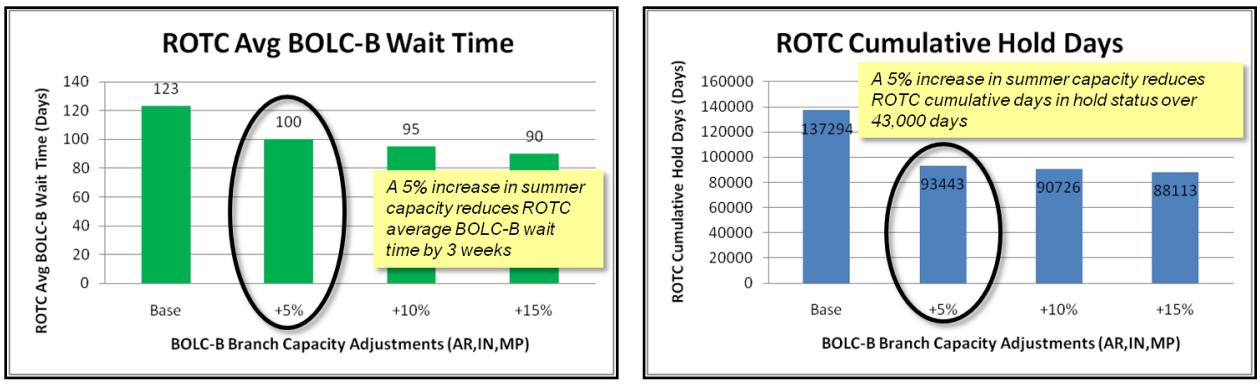


Figure 18. ROTC BOLC-B Wait Time and Hold Days.

Figure 19 highlights a 5% increase in AR, IN, and MP BOLC-B capacity for the courses conducted from April-October can get ROTC LTs to their units over 3 weeks earlier and reduce average ROTC Infantry BOLC-B wait time by over one month.

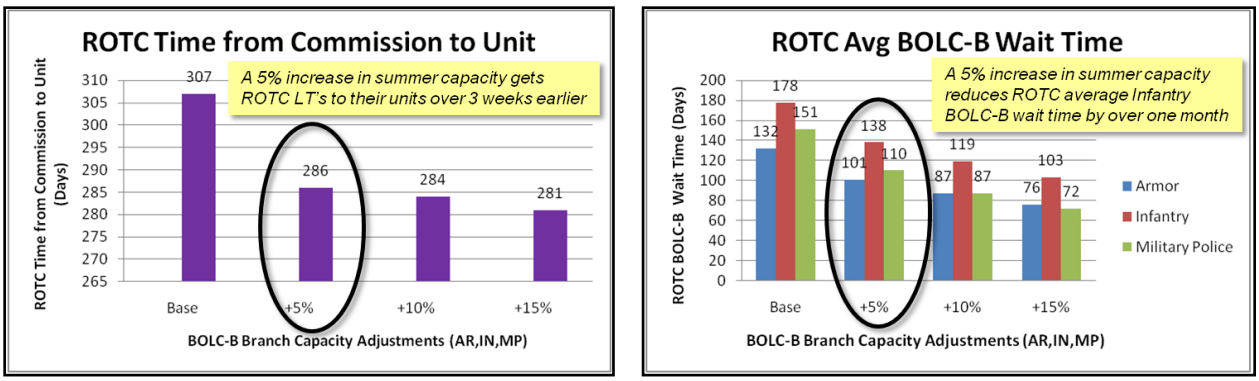


Figure 19. ROTC Time from Commission to Unit and BOLC-B Wait Time by Branch.

Figure 20 illustrates that increasing BOLC-B capacity for IN, AR, and MP by 5% in the summer months can have a positive effect on Lieutenant arrival to units. A 5% increase increases total number of of days between BOLC-B and unit LAD date for all officers by 5,000 days. However, when we look at proportion of LTs arriving before the MRE – getting LTs to their units earlier without regard to their unit cycle actually results in more LTs arriving between LAD and R+90.

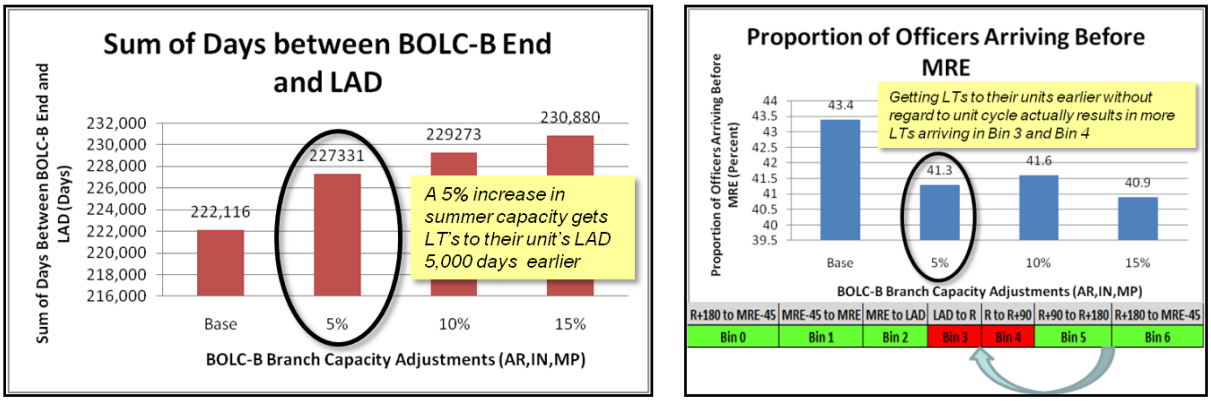


Figure 20. ROTC Time from Commission to Unit and BOLC-B Wait Time by Branch.

5.4 BOLC-B Seat Allocations

We will adjust IN, AR, and MP BOLC-B course allocations in the model during June and July. USMA receives its first post-graduation BOLC-B allocations in late June or early July. We will delay this first allocation by one and two months, shifting these allocations instead to ROTC. We expect ROTC average BOLC-B wait time, ROTC BOLC-B (IN, AR, and MP) wait time, ROTC cumulative hold time, and ROTC average time from commission to unit to decrease as a result of increased capacity. However, we expect these same USMA metrics to increase.

Figures 21 through 23 highlight the impacts of shifting these allocations away from USMA in June and July. A one month shift of USMA allocations for AR, IN, and MP BOLC-B seats levels USMA and ROTC average BOLC-B wait time and, while slightly increasing USMA BOLC-B wait time, can

decrease ROTC BOLC-B average wait time by 3 weeks. This same 1 month shift reduces ROTC cumulative hold days by 45,000 days which equates to approximately 18 days per ROTC officer.

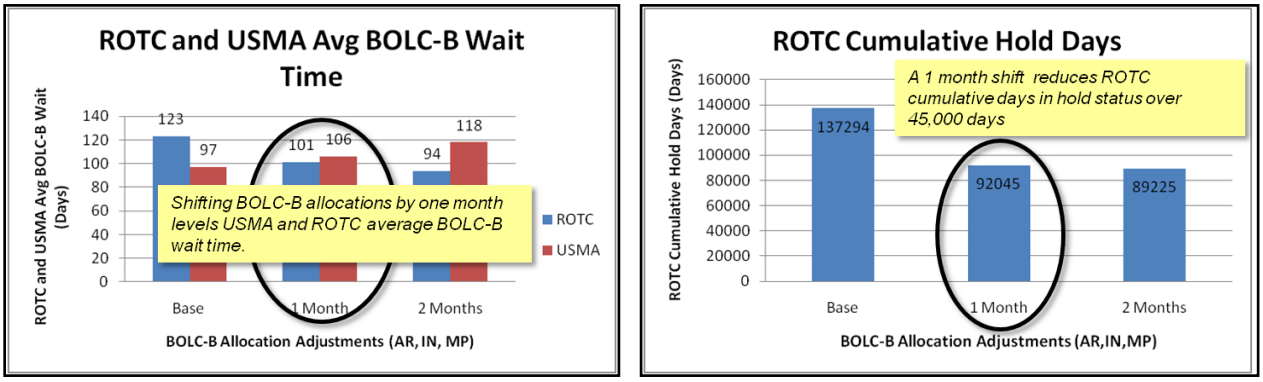


Figure 21. ROTC BOLC-B Wait Time and Hold Days.

Figure 22 illustrates that a one month shift of USMA allocations gets ROTC officers to their units 3 weeks earlier, while increasing USMA officer time to unit by 5 days. This same 1 month shift reduces ROTC average Infantry BOLC-B wait time by over one month.

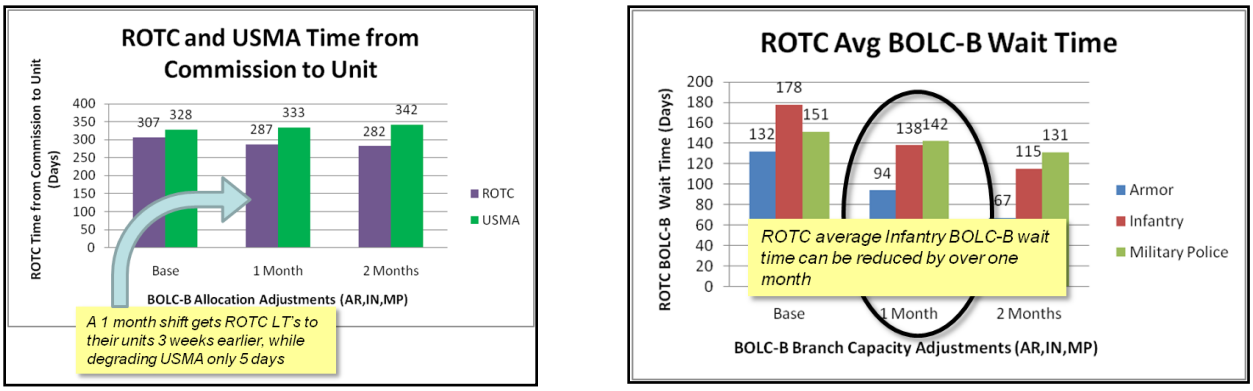


Figure 22. ROTC Time from Commission to Unit and BOLC-B Wait Time by Branch.

Figure 23 highlights that a one month shift of USMA allocations can increase the total number of days between BOLC-B and unit LAD date for all officers by 3,000 days. Similar to the capacity scenario, the proportion of LTs arriving before the MRE actually decreases compared to the baseline. Although we are getting LTs to their units sooner, without considering unit cycles when rescheduling, we are actually pulling more LTs from Bins 5 and 6 to the LAD to R+90 period.

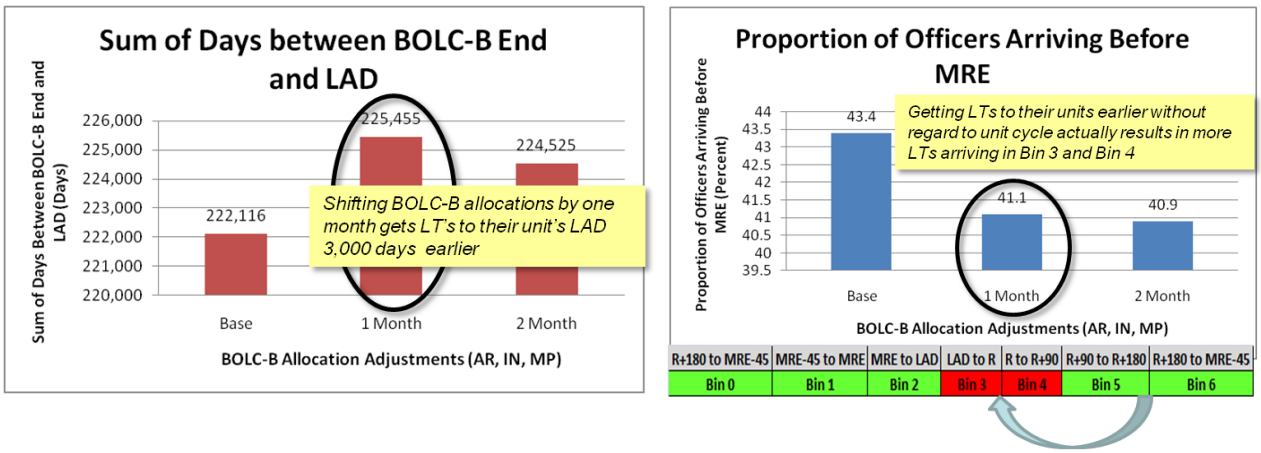


Figure 23. ROTC Time from Commission to Unit and BOLC-B Wait Time by Branch.

5.5 BOLC-B Scheduling By Unit Priority

The vast majority of USMA officers select their BOLC-B dates independent of the unit to which they will be assigned. Stakeholders were interested in examining the impact of scheduling BOLC-B attendance based upon unit priority; determined by days until LAD. The model allows rescheduling of the entire FY10 by unit priority. Figures 24 through 26 highlight the effects of this change.

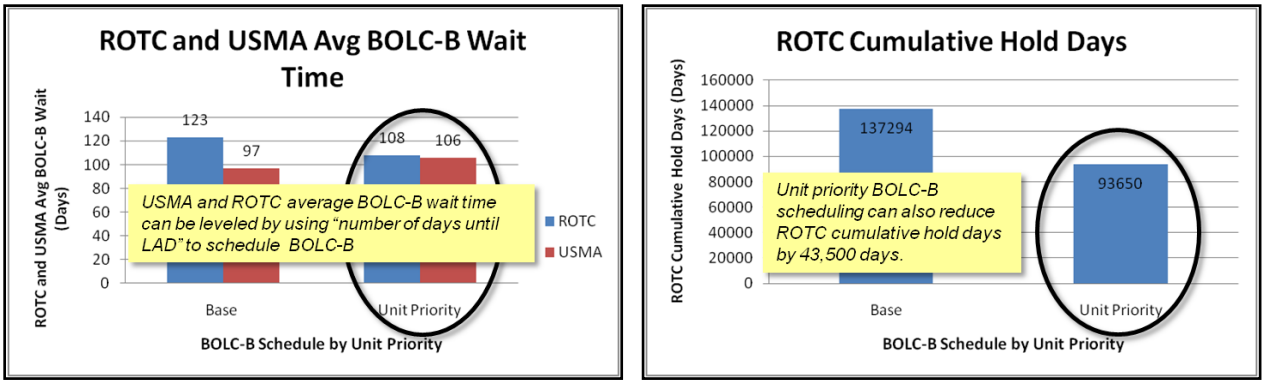


Figure 24. ROTC BOLC-B Wait Time and Hold Days.

Figure 24 illustrates that if we schedule officers for BOLC-B based upon unit priority we can level USMA and ROTC BOLC-B wait time and reduce ROTC cumulative hold days by 43,500 days.

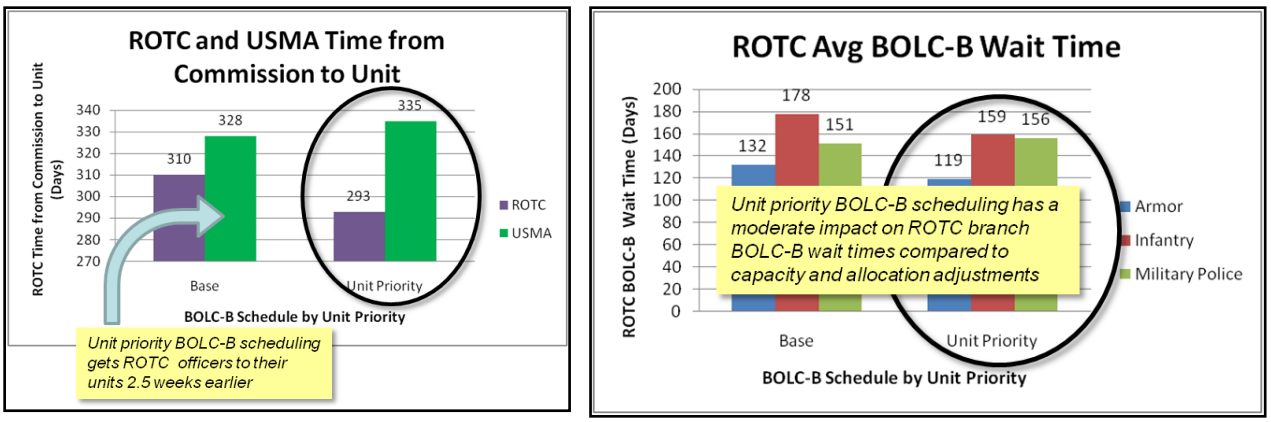


Figure 25. ROTC Time from Commission to Unit and BOLC-B Wait Time by Branch.

As highlighted in Figure 25, this BOLC-B scheduling methodology can get ROTC officers to their units 2.5 weeks earlier (with a slight increase for USMA times) and reduces ROTC AR, IN, and MP average BOLC-B wait times but not as drastically as capacity or course seat allocation adjustments.

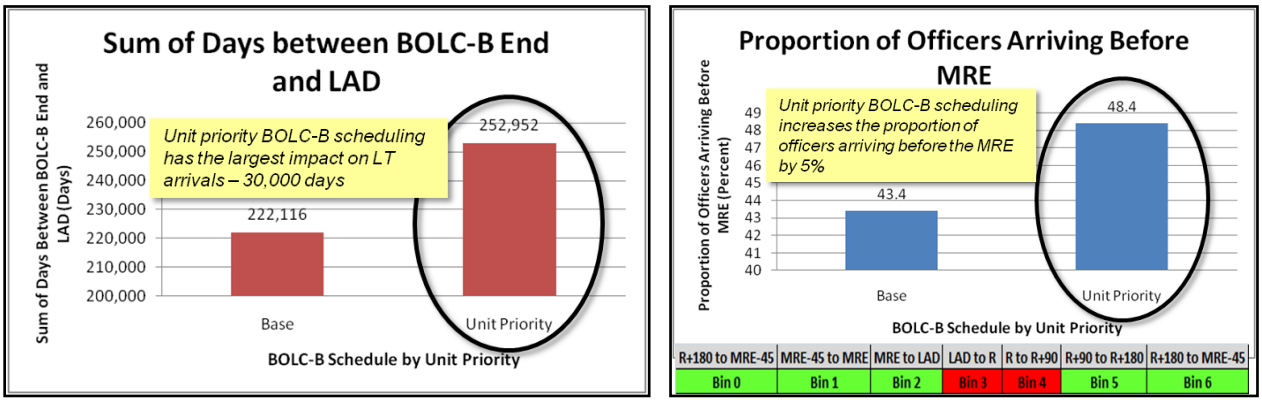
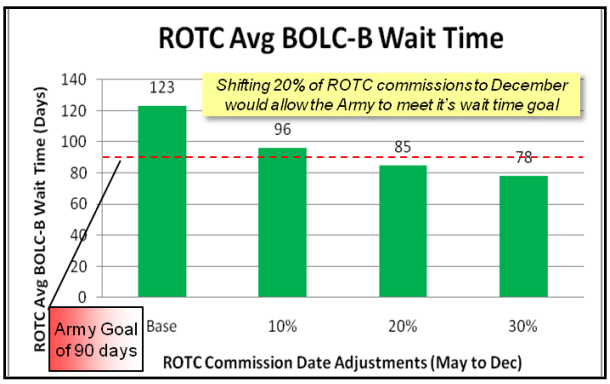


Figure 26. ROTC Time from Commission to Unit and BOLC-B Wait Time by Branch.

Of the scenarios considered, unit prioritized BOLC-B scheduling has the most dramatic impact on LT unit arrivals. This methodology can increase the total number of days between the end of BOLC-B and unit LAD by 30,000 days over the "as is" methodology. Even though this may still move officers into Bins 3 and 4, this adjustment can increase the proportion of officers that arrive prior to the MRE by 5%. These observations are highlighted in Figure 26.

5.6 ROTC Commissioning Date Profile

Approximately 12% of ROTC officers are commissioned in December. Stakeholders were interested examining the impacts of flattening the BOLC-B demand spike by increasing the proportion of ROTC officers commissioned in December by 10%, 20%, and 30% above the baseline values. The rationale was that the ROTC hold population could be decreased while simultaneously decreasing ROTC BOLC-B wait times. Figures 27 through 29 highlight the impacts of these changes.



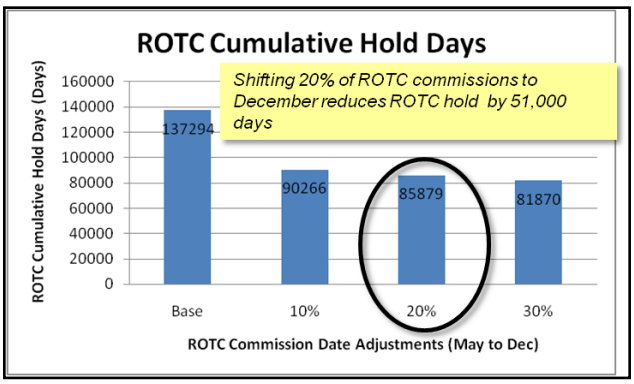
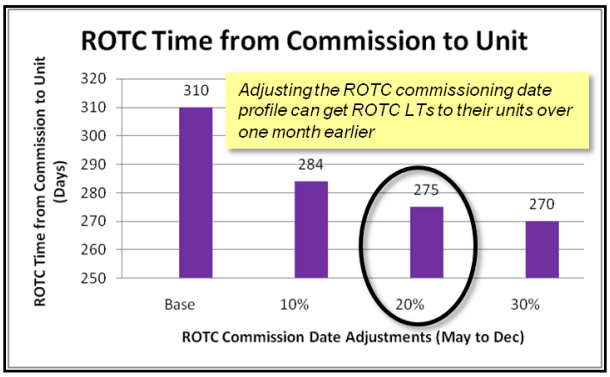


Figure 27. ROTC BOLC-B Wait Time and Hold Days.

Figure 27 indicates that moving 20% of ROTC commissionees from May to December reduces ROTC average BOLC-B wait time to 85 days (below the 90 day Army goal) and reduces cumulative hold days by 51000 days; approximately 21 days per ROTC officer.



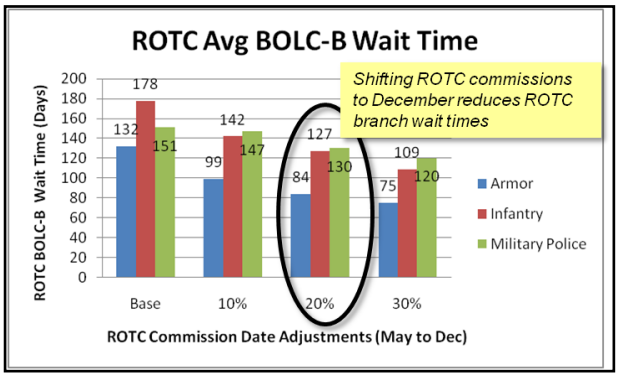


Figure 28. ROTC Time from Commission to Unit and BOLC-B Wait Time by Branch.

Adjusting the ROTC commissioning date profile reduces ROTC branch (AR, IN, and MP) BOLC-B wait times and gets ROTC LTs to their units over one month earlier.

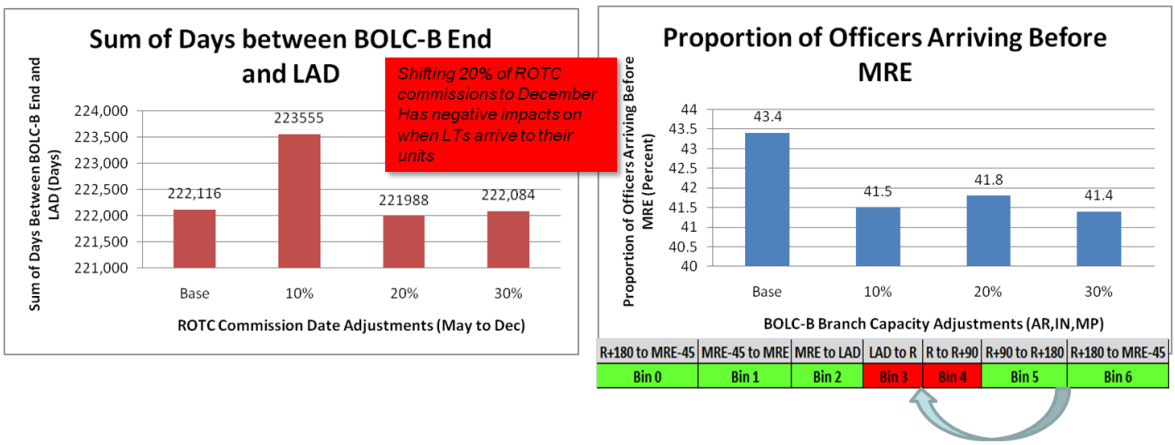


Figure 29. ROTC Time from Commission to Unit and BOLC-B Wait Time by Branch.

Figure 29 highlights that shifting 20% of ROTC commissionees from May to December has a negative effect on both the total number of days between BOLC-B completion and unit LAD for all officers as well as the proportion of officers that arrive before the MRE. This can likely be attributed to randomly selecting ROTC May commissionees to shift to December without regard to their current unit/BOLC-B course pairings. For example, we may randomly select a May ROTC commissionee with a July BOLC-B date scheduled to go to a unit with a June 2011 LAD date. By shifting this individual to a December commission date, the best case is that they would arrive in August which is well after unit LAD.

6.0 Potential Future Work. As mentioned previously, although a model construct and supporting data for Modules 1 through 4 was developed, the programming effort was limited to Module 3. Recommended future work includes both programming additional modules as well as refining the existing model. Current model refinements could include: a) an improved user interface for selecting and running scenarios, b) adding additional BOLC-B scheduling rules beyond FIFO and unit priority based upon days until LAD, c) adding possible variations in allocation methodologies amongst the three SOCs, d) develop a macro to optimize BOLC-B allocations for various objective functions, and e) refining metrics for LTs arrival to units. The recommended priority of effort for programming additional modules would be Modules 4 and 2 then Module 1. Major tasks required include reconciling the differences in unit inventory versus authorization accounting as well as codifying unit allocation business rules to facilitate coding within the model. The reserve component was not included in the scope of this effort but may be something that could be added to the existing model. However, capturing generalizable business rules for personnel assignments and scheduling of training for the reserve component may prove challenging. Units that were not BCTs, CABs, or Division HQs were also not in the scope of this effort but may be something that could be added to the existing model. This requires a validated, non-classified source of AST output that includes the ARFORGEN schedules for additional units of interest. Lastly, additional fidelity (i.e. course schedules and capacities, demand –based aviation platform assignments) regarding aviation specialty training could also be added to provide additional detail to the current model.

7.0 Conclusion

In this research effort we developed a discrete-event simulation to replicate the flow of officers from their commissioning source to their first unit of assignment. The model is comprised of a series of Excel macros, updateable Excel input files, and a Promodel© simulation. The model provides a tool for decision makers to conduct "what if" analysis – specifically, exploration of BOLC-B course capacity changes, BOLC-B allocation strategies, BOLC-B scheduling rules, and ROTC commissioning date profile adjustments. A series of output tables and graphics capture the effects of these parameter changes on key stakeholder metrics of interest including: ROTC hold population, BOLC-B wait times, time from commission to first unit, and timing of LT unit arrivals in relation to ARFORGEN cycles.

As we conduct "what if" analysis, we focus particular attention on ROTC officers and Armor (AR), Infantry (IN), and Military Police (MP) Lieutenants. ROTC officers have historically had the longest average BOLC-B wait times (123 days) and a large portion of these officers are placed in a "hold" status (commissioned but not yet accessed) while they wait for their assigned BOLC-B course. Of the sixteen different BOLC-B courses in which Lieutenants attend, AR, IN, and MP are the branches with the longest BOLC-B wait times and will be the focus of portions of our analysis. Based upon stakeholder feedback, we focus attention on the following metrics as we explore different scenarios and vary specific scenario parameters:

- **Time from Commission to Unit:** The number of days from when a Lieutenant is commissioned until they arrive at their assigned first unit.
- **BOLC Wait Time:** Defined as the number of days from when a Lieutenant is commissioned until they start their BOLC-B course. This will be examined by branch and SOC.
- **ROTC Officer Hold Population:** Hold population is the number of ROTC officers that have been commissioned but not yet accessed. We will measure the total cumulative days that ROTC officers are in a hold status.
- **Lieutenant Arrival:** Defined as when in the ARFORGEN cycle Lieutenants arrive to the unit measured by total days (all officers) before the unit Latest Arrival Date (LAD) and the proportion of officers that arrive before the Mission Rehearsal Exercise (MRE).

Stakeholder Key Metrics of Interest	Scenarios				
	Baseline	Capacity (+15%)	Allocations (2 Mo)	Unit Priority	ROTC Comm (30%)
ROTC Avg BOLC-B Wait Time (Days)	123	90	94	108	78
USMA Avg BOLC-B Wait Time (Days)	97	97	118	106	97
ROTC Cumulative Hold (Days)	137294	88113	89225	93650	81870
ROTC time from Comm to Unit (Days)	310	281	282	293	270
USMA time from Comm to Unit (Days)	328	328	342	335	328
ROTC AR BOLC-B Wait (Days)	132	76	67	119	75
ROTC IN BOLC-B Wait (Days)	178	103	115	159	109
ROTC MP BOLC-B Wait (Days)	151	72	131	156	120
All officers total days before LAD (Days)	222116	230880	224525	252952	222084
All officers % arrive before MRE (%)	43.4	40.9	40.9	48.4	41.4

No Change from baseline
Better than baseline
Worse than baseline
Best result all scenarios

Figure A. Comparison of Scenario Results Highlighting Trade-offs between COA's and the best results for each scenario.

We explore the following specific scenarios with the results highlighted in Figure A.

Scenario 1 - Capacity: To counter the spike in BOLC-B demand in the summer months, we explore surging (increasing) BOLC-B capacity from April to November by 5%, 10% and 15% for AR, IN, and MP. Increasing AR, IN, and MP BOLC-B capacity by 5%, 10% and 15% significantly improves ROTC average BOLC-B wait time, ROTC cumulative hold days, and time from commission to unit for ROTC officers with minimal negative impacts on other metrics of interest.

Scenario 2 - Allocation: To address the concern of "USMA-centric" BOLC-B allocations in June and July, we shift the first major BOLC-B allocations from USMA to ROTC by one month (June) and two months (June and July). A two month shift improves most of the metrics of interest but negatively affects USMA BOLC-B wait time and time from commission to unit.

Scenario 3 - Unit Priority: A large portion of USMA officers select their own BOLC-B dates completely divorced of their unit assignment and that unit's ARFORGEN cycle. We reschedule all FY10 cohort LTs for BOLC-B based upon unit priority based upon number of days until LAD. Rescheduling all FY10 cohort LTs for BOLC-B based upon unit priority greatly improves total days before LAD and the proportion of officers that arrive before the MRE but has mixed results regarding some of the other metrics.

Scenario 4 - ROTC Commissioning Date Profile: Only 12% of ROTC officers are commissioned in December. As an additional means to counter the spike in BOLC-B demand in the summer months, we explore shifting a portion (10%,20%, and 30%) of FY10 May commissionees to December. Shifting 30% of ROTC commissionees from May to December greatly improves ROTC average BOLC-B wait time, ROTC cumulative hold days, and time from commission to unit for ROTC officers. However, total days before LAD and proportion of officers arriving before the MRE are negatively affected. This is

primarily due to how the May commissionees are currently selected (randomly) to shift to December and could likely be improved with a refined selection process.

In general, scheduling officers to arrive at their first units without regard to the unit ARFORGEN cycle is counter-productive. A recommended future model refinement would be adjusting the model BOLC-B scheduling rules to incorporate this factor.

In summary, this modeling effort captures the "as is" process that an officer must negotiate from commissioning to first unit of assignment (FUA) – allowing "what if" analysis of stakeholder identified variables of interest. Scenario analysis reveals opportunities for increased efficiency in the officer accession process as well as highlighting strategic tradeoffs. This model provides an analytical tool to inform accession policy and a foundation to examine other variables of interest with minimal future refinements.

Appendix A. Stakeholder Feedback

Findings	Conclusions	Recommendations
Average AD ROTC BOLC Wait Time is 130 days. AR 350-1 goal is 90 days	BOLC wait time is of intense concern	Flow model should capture BOLC wait time as key metric
BOLC wait time equates to 959,000 of lost man days	Important aspect of the model should be to identify the backlog and potential causes	Flow model should identify bottleneck locations and potential causes
AD ROTC BOLC Wait Time increased after the transition from BOLC I,II,II to BOLC A,B		Flow model should allow modification of graduation dates in order to observe impact on BOLC wait time
Nearly all stakeholders expressed that BOLC wait time was a concern		
AD ROTC wait times have negative morale and financial implications		
If BOLC wait times were publicized before branch preferences, cadets may choose a branch where they can get on active duty sooner		
An increase in December graduates could shift BOLC demand to non-peak times		

Findings	Conclusions	Recommendations
BOLC has highest demand in the summer and fall with a large decline in the winter months	BOLC has a predictable cyclic demand with a surge in the summer	Flow model should allow adjustment of BOLC allocations by SOC
BOLC course allocations, at the macro level, are linked to ARFORGEN, and distributed during December BOLC conference	BOLC allocation is USMA centric from Jul-Oct	
OCS has a constant flow throughout the year and a commensurate BOLC demand		
Reserves receive equal allocation of BOLC slots throughout the year		
Validation of required BOLC allocations to support ARFORGEN is of concern		
USMA receives largest proportion of Jul-Oct BOLC allocations		

Appendix A. Stakeholder Feedback

Findings	Conclusions	Recommendations
Most branches have "must have" and "nice to have" functional training requirements	Functional training is a function of the branch and unit	Flow model should account for typical branch and unit specific functional training
Some units have "must have" and "nice to have" functional training requirements		
Functional training can add between 3 – 18 weeks to a LTs pre-FUA flow		
Repeated recycles during functional training (Ranger) can result in LTs arriving to unit outside of Reset phase or even after MRX		
Most functional training is conducted after BOLC		
Does not appear to be a mechanism at the enterprise level to "pull the cord" on functional training and expedite LT movement to unit		

Findings	Conclusions	Recommendations
BOLC assignment, at the micro level, may not be synched/linked with ARFORGEN	BOLC scheduling is specific to commissioning source therefore it is difficult to get an enterprise look	Capture the current business rules for individual BOLC scheduling in the flow model
ROTC BOLC scheduling is currently FIFO but is projected to change		Examine the effects of adjusting these business rules on key performance metrics
USMA BOLC scheduling is managed and coordinated by branch managers. ARFORGEN linkage to BOLC is made only for those slots mandated (300)		
OCS BOLC scheduling is done Just in Time (JIT) as branches are allocated each course		
HRC runs officer distribution model three times each year		
CSP selections have potential impacts on BOLC scheduling		

Appendix A. Stakeholder Feedback

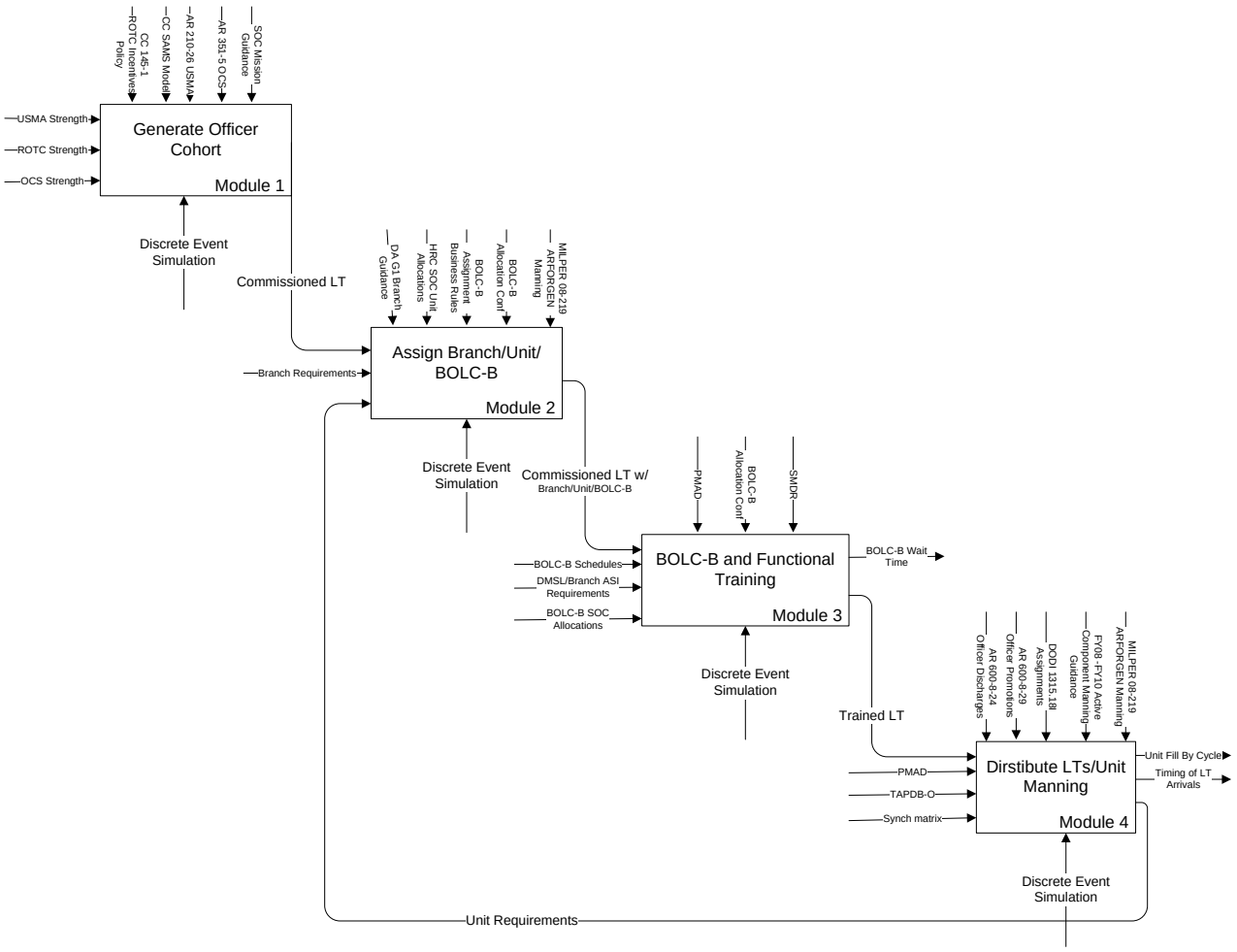
Findings	Conclusions	Recommendations
Distributing LT's to FUA is challenging due to grouping of commissioning times by SOC	Senior leaders and units are concerned about SOC "clustering" in units	Examine assignment rules that consider SOC
There appears to be "clustering" by SOC in the BCTs related to the current assignment and training allocation process		

Findings	Conclusions	Recommendations
There was recent data call asking each BOLC site for their ability to and implications of increasing capacity	BOLC capacity is constant yet demand fluctuates	Flow model should allow adjustments to capacity, training duration, and frequency to observe effects on key performance metrics
TRAPS are the current method for addressing short term increased training capacity	Generating force constraints and training requirements appear out of balance	
BOLC peak demand coincides with instructor summer PCS/rotation		
Officer accessions increased from 4600 to 5300 over the last several years-unsure if BOLC capacity increased comparably		
There are significant pressures to maintain a small generating force which appears at odds with increased training requirements		
"On the books" BOLC capacity does not necessarily match resourced strength so		
BOLC courses have fixed duration and roughly equal course sizes spread equally throughout the year		

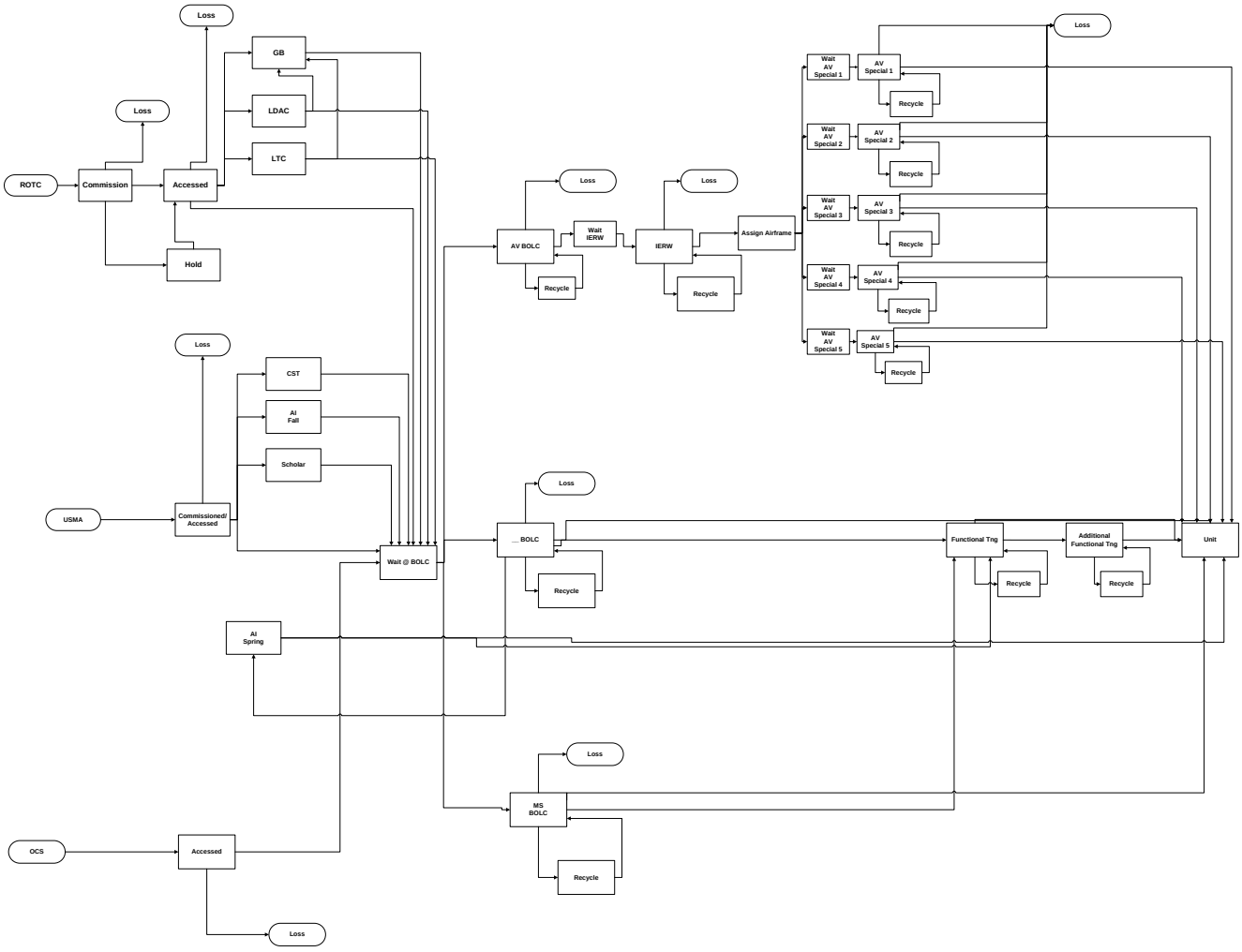
Appendix A. Stakeholder Feedback

Findings	Conclusions	Recommendations
ROTC utilizes AD LTs as Gold Bar recruiters, LDAC trainers, and LTC trainers	Desire is to provide meaningful, developmental opportunities for those waiting for BOLC	Identify meaningful developmental opportunities for those awaiting BOLC training
LDAC AD LTs trainers are predominantly not MFE branches		
Selection for Gold Bar recruiting correlates more with BOLC date vs. quality. Not all schools receive Gold Bar recruiters but all desire at least one.		
USMA utilizes approximately 100 AD LTs as CLDT trainers		
Cultural awareness training, CTCs, and Basic Training locations offer potential LT developmental experiences		
Certain Posts (i.e. BCT sites) have better and more developmental opportunities available		

Appendix B. IDEF0 System Model



Appendix C. Phase I Flowchart



Appendix D. Use of the Model

To Run "As is" baseline model:

- Open the data template.
- Enable Macros.
- Go to Tab Y, Cell AK:5520 and click "Run Program." This slots all FY10 cohort members in the appropriate BOLC-B courses in accordance with historical records.
- Save the workbook.
- Run ProModel. Ensure that the Excel Reports output file is closed before running the model or those specific model outputs will not be updated.

To Run BOLC-B capacity adjustments to the model:

- Open the data template.
- Enable Macros.
- Go to Tab W, Column M and enter new course capacities. This will adjust ROTC course allocations for each course with added capacity.
- Go to Tab BOLC Constrained Analysis, Cell A:1 and click "Run Program." This slots all FY10 cohort members in the appropriate BOLC-B courses utilizing First to Commission: First to BOLC scheduling rule and the adjusted capacities. At the first and second prompts enter 0.
- Save the workbook.
- Run ProModel. Ensure that the Excel Reports output file is closed before running the model or those specific model outputs will not be updated.

To Run BOLC-B specific course allocation adjustments to the model:

- Open the data template.
- Enable Macros.
- Go to Tab W, Column P and enter new ROTC course allocation. Any increase over the current ROTC allocation will be subtracted from USMA. You must remember to add this USMA allocation deduction to a subsequent class, then subtract that amount from ROTC allocation for the same course. Highlight these changes in red so you can return to the baseline data.
- Go to Tab BOLC Constrained Analysis, Cell A:1 and click "Run Program." This slots all FY10 cohort members in the appropriate BOLC-B courses utilizing First to Commission: First to BOLC scheduling rule and the new allocations. At the first and second prompts enter 0.
- Save the workbook.
- Run ProModel. Ensure that the Excel Reports output file is closed before running the model or those specific model outputs will not be updated.

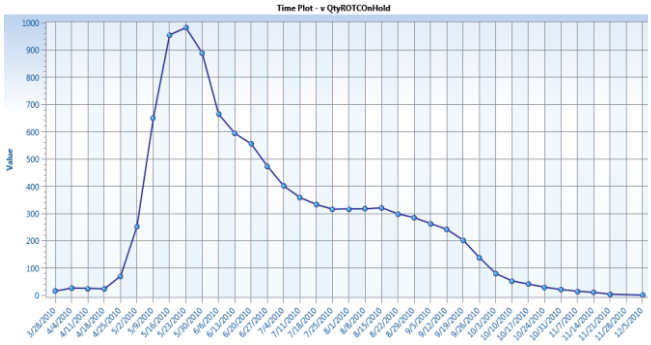
To Run Unit priority BOLC-B Scheduling:

- Open the data template.
- Enable Macros.
- Go to Tab BOLC Constrained Analysis, Cell A:1 and click "Run Program." At the first prompt enter "1" at the second prompt enter "0". This slots all FY10 cohort members utilizing the current allocations and unit priority based upon number of days until unit LAD.
- Save the workbook.
- Run ProModel. Ensure that the Excel Reports output file is closed before running the model or those specific model outputs will not be updated.

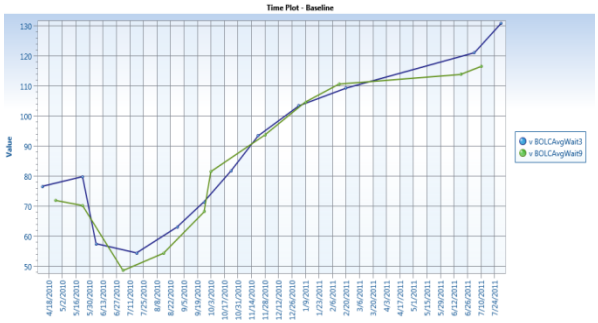
To Run Adjustment of ROTC Commission Profile:

- Open the data template.
- Enable Macros.
- Go to Tab BOLC Constrained Analysis, Cell A:1 and click "Run Program." At the first prompt enter "0" at the second prompt enter a whole number between 0 and 100 that represents the percentage of ROTC May graduates that you want to shift to December graduates. This slots all FY10 cohort members utilizing the current allocations and shift the designated percentage to December.
- Save the workbook.
- Run ProModel. Ensure that the Excel Reports output file is closed before running the model or those specific model outputs will not be updated.

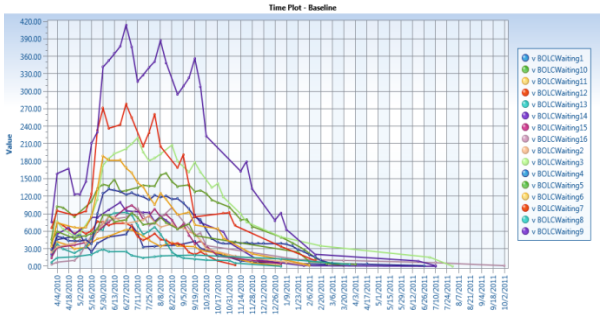
Appendix E. Model Outputs



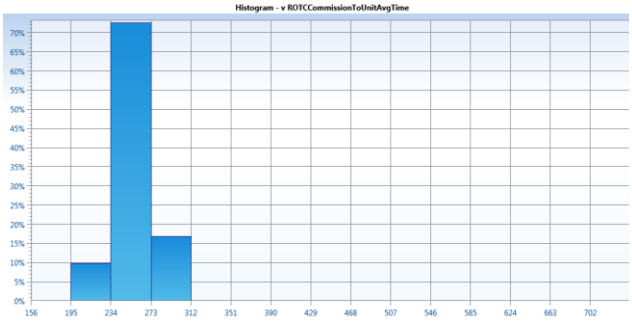
ROTC Hold Population



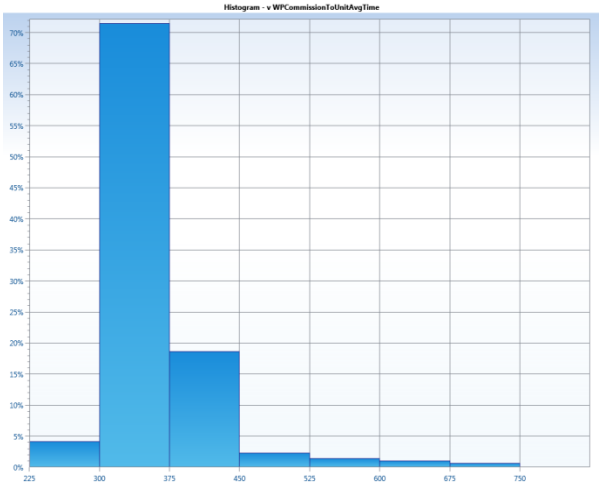
BOLC-B Wait Time by Branch (all officers)



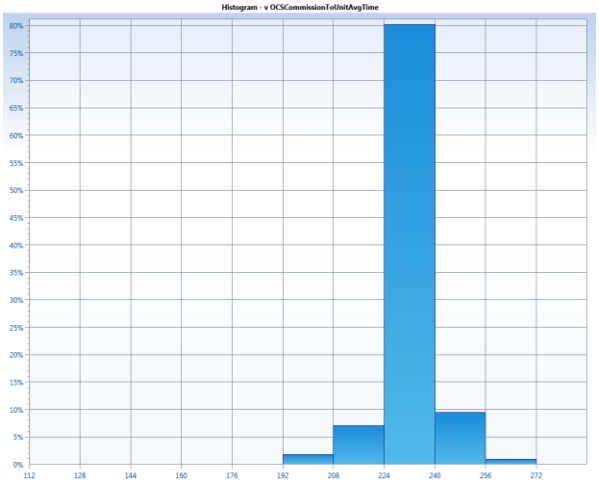
Officers Waiting for BOLC-B by branch



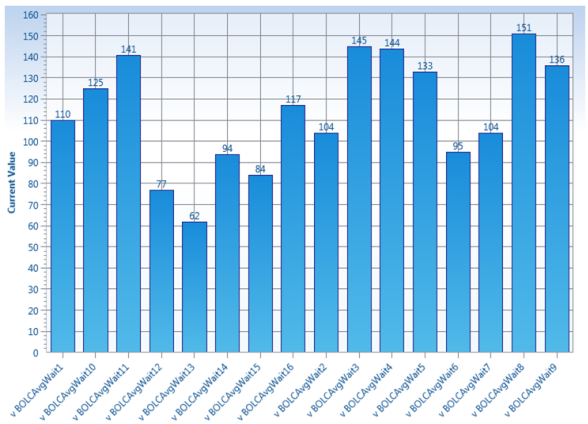
ROTC Time from Commission to Unit



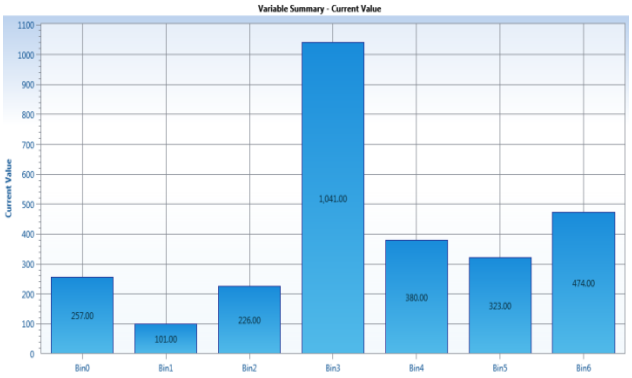
USMA Time from Commission to Unit



OCS Time from Commission to Unit



BOLC-B Wait by Branch (all officers)



Unit Arrivals by ARFORGEN Cycle

Variable Summary

Scenario	Name	Total Changes	Average Time Per Change (Min)	Minimum Value	Maximum Value	Current Value	Average
Baseline	Bin0	258.00	4,059.57	0.00	258.00	258.00	
Baseline	Bin1	108.00	6,509.72	1.00	108.00	108.00	
Baseline	Bin2	217.00	3,738.25	1.00	217.00	217.00	
Baseline	Bin3	1,070.00	997.36	1.00	1,070.00	1,070.00	
Baseline	Bin4	368.00	2,177.20	1.00	368.00	368.00	
Baseline	Bin5	314.00	2,990.29	1.00	314.00	314.00	
Baseline	Bin6	470.00	2,196.89	1.00	470.00	470.00	
Baseline	Not Scheduled	3,570.00	353.73	1.00	3,570.00	3,570.00	1
Baseline	OTHER VARIABLES	0.00	0.00	0.00	0.00	0.00	
Baseline	TDA MTOE	0.00	0.00	0.00	0.00	0.00	
Baseline	v AI Fall	24.00	15,240.00	0.00	12.00	0.00	
Baseline	v AI Spring	0.00	0.00	0.00	0.00	0.00	
Baseline	v AV BOLC	682.00	1,102.23	0.00	112.00	0.00	
Baseline	v AV BOLC Loss	2.00	234,900.00	1.00	2.00	2.00	
Baseline	v AV BOLC Recycle	5.00	73,796.00	1.00	5.00	5.00	
Baseline	v AV Special 1 Loss	16.00	63,636.50	1.00	16.00	16.00	
Baseline	v AV Special 1 Recycle	74.00	13,799.90	1.00	74.00	74.00	
Baseline	v AV Special 1 Training	1,202.00	1,050.59	0.00	134.00	0.00	
Baseline	v AV Special 1 Waiting	1,076.00	1,042.46	0.00	81.00	0.00	
Baseline	v AV Special 2 Loss	0.00	0.00	0.00	0.00	0.00	
Baseline	v AV Special 2 Recycle	0.00	0.00	0.00	0.00	0.00	
Baseline	v AV Special 2 Training	36.00	32,351.12	0.00	8.00	0.00	
Baseline	v AV Special 2 Waiting	36.00	28,150.84	0.00	3.00	0.00	
Baseline	v AV Special 3 Loss	0.00	0.00	0.00	0.00	0.00	
Baseline	v AV Special 3 Recycle	0.00	0.00	0.00	0.00	0.00	
Baseline	v AV Special 3 Training	20.00	57,572.60	0.00	4.00	0.00	
Baseline	v AV Special 3 Waiting	20.00	50,012.10	0.00	2.00	0.00	
Baseline	v AV Special 4 Loss	0.00	0.00	0.00	0.00	0.00	
Baseline	v AV Special 4 Recycle	0.00	0.00	0.00	0.00	0.00	
Baseline	v AV Special 4 Training	6.00	82,262.78	0.00	2.00	0.00	

Variable Summary Table (Includes Statistics on 200+ Model variables)

Nomenclature

AC	Active Component
ACC	Army Competitive Category
ACP	Army Campaign Plan
AD	Active Duty
ADSO	Active Duty Service Obligation
AFM	ARFORGEN Focused Manning
AHRC	Army Human Resources Command
AI	Athletic intern
ARFORGEN	Army Force Generation
ASI	Additional Skill Identifier
AST	ARFORGEN Synchronization Tool
ATRRS	Army Training Requirements and Resource System
AV	Aviation
BASD	Basic Active Service Date
BCT	Brigade Combat Team
BOG	Boots on the Ground
BOLC	Basic Officer Leader Course
BOLC-A	Basic Officer Leader Course (pre-commissioning training)
BOLC-B	Basic Officer Leader Course (branch specific training)
CAA	Center for Army Analysis
COMPO	Component
CONUS	Continental US
DA	Department of the Army
DCG-IMT	Deputy Commanding General, Initial Military Training
DEROS	Date Expected to Return from Overseas
DML	Distribution Manning Level
DMSL	Distribution Manning Sub-Level
DoD	Department of Defense
ETS	Expiration Term of Service
FMSWeb	Force Management System Web Site
FORSCOM	U.S. Forces Command
FSA	Force Structure Allowance
FUA	First unit of Assignment
FY	Fiscal Year
GB	Gold Bar Recruiter
GWOT	Global War on Terror
HBCT	Heavy Brigade Combat Team
HRC	Human Resources Command
IBCT	Infantry Brigade Combat Team
IDEF0	Integrated . . .
IERW	Initial Entry Rotary Wing
IET	Initial Entry Training
LAD	Latest Arrival Date
LDAC	Leader development and Assessment Course
LTC	Leader Training Course
MARATHON	Modeling the Army at Home or Not
MOS	Military Occupational Specialties
MRE	Mission Rehearsal Exercise
MRX	Mission Readiness Exercise
MSL	Military Science Level
MTOE	Modified Table of Organization and Equipment
NG	National Guard
OCONUS	Outside the Continental US

OCS	Officer Candidate School
OEMA	Office of Economic and Manpower Analysis
OPTEMPO	Operational Tempo
ORCEN	Operations Research Center of Excellence
OS	Operating Strength
PCS	Permanent Change of Station
PMAD	Personnel Management Authorization Document
R	Return Date
RC	Reserve Component
REFRAD	Release from Active Duty
ROTC	Reserve Officers Training Corps
SBCT	Stryker Brigade Combat Team
SECDEF	Secretary of Defense
SMDR	Senior Management Decision Review
SOC	Source of Commission
SRC	Standard Requirement Code
TAPDB	Total Army Personnel Database
TDA	Table of Distribution and Allowances
TIS	Time in Service
TOPMIS	Total Officer Personnel Management Information System
TOS	Time on Station
TRADOC	U.S. Army Training and Doctrine Command
UIC	Unit Identification Code
USANG	U.S. Army National Guard
USAR	U.S. Army Reserve
USMA	United States Military Academy
USAAC	U.S. Army Accessions Command
USACC	U.S. Army Cadet Command
V-and-V	Verification and Validation

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4. TITLE AND SUBTITLE

Officer Flow Model

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Mr. Gene Lesinski
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5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

USMA Operations Research Center of Excellence, West Point, NY
Accessions Research, US Army Accessions Command, FT Knox, KY

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

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14. ABSTRACT

In this research effort we developed a discrete-event simulation to replicate the flow of officers from their commissioning source to their first unit of assignment. The model is comprised of a series of Excel macros, update able Excel input files, and a Promodel© simulation. This model provides a tool for decision makers to conduct "what if" analysis – specifically, exploration of BOLC-B course capacity changes, BOLC-B allocation strategies, BOLC-B scheduling rules, and ROTC commissioning date profile adjustments. A series of output tables and graphics capture the effects of these parameter changes on key stakeholder metrics of interest including: ROTC hold population, BOLC-B wait times, time from commission to first unit, and timing of LT unit arrivals in relation to ARFORGEN cycles.

15. SUBJECT TERMS

BOLC, BOLC-B Wait Time, ARFORGEN, Training Capacity, Scheduling, Allocation, Unit Arrival, Officer Accessions, Sources of Commission

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