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Aviation Logistics in U.S. Pacific Command: A Cost-Based Analysis and Comparative Advantage to Commercial Shipment

20 November 2012

by

Capt Tod B. Diffey, USMC, and

Capt Matthew J. Beck, USMC

Advisors: Dr. Edward H. Powley, Assistant Professor

Simona L. Tick, Lecturer

Graduate School of Business & Public Policy

Naval Postgraduate School

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ABSTRACT

The purpose of this study is to examine and compare the cost and time-to-reliably-replenish (TRR) constraints of commercial and military modes of shipment to the main three (of 13) annual joint USPACOM exercises conducted in three distinct allied countries. In this study, we estimate potential cost savings if commercial shipment becomes the primary means. Using a business case analysis (BCA), we compare the estimated costs of current methods for providing logistical support in USPACOM and provide recommendations to improve the system as a whole.

The utilization of commercial companies as the primary means of shipment of aircraft parts in U.S. Pacific Command (USPACOM) is a national and military strategic imperative. Specifically, the current costs of operating KC-130J aircraft as the primary means of shipment far exceed costs if the primary mode of shipment became employment of commercial agencies. Equally important is improving upon joint multinational relationships and joint logistics best business practices that would facilitate optimal asset throughput in the customs departments of our allied nations.

In considering and analyzing these dynamics, this study provides a cost-based analysis and qualitative evaluation regarding the use of commercial agencies (i.e., FedEx and DHL) and/or the United States Marine Corps (USMC) KC-130J heavy-lift aircraft in the shipment of F/A-18 aircraft parts within the USPACOM area of responsibility (AOR) of Southeast Asia, to include Australia.

Based on our analysis, commercial shipment of aircraft parts is the most attractive option to current alternatives in USPACOM. These findings led to our conclusion of the ever-present necessity of an operational shift in mindset where more planning and negotiation resources attempt to influence increased commercial shipment throughput in the customs departments of USPACOM allied countries.

Keywords: U.S. Pacific Command (USPACOM), area of responsibility (AOR), time to reliably replenish (TRR), business case analysis (BCA)

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ABOUT THE AUTHORS

Tod Diffey is a captain in the U.S. Marine Corps and a student in the Graduate School of Business and Public Policy at the Naval Postgraduate School. Capt Diffey earned a BA in 2004 from the University of San Diego. He is an aircraft maintenance officer and aviation logistician and has served in a wide range of operational assignments in 18 years of active service. Upon graduation from the Material Logistics Program at the Naval Postgraduate School in December 2012, Capt Diffey will report to Marine Corps Logistics Command, Albany, GA.

Photo of Captain Diffey (front left) with his detachment of Marines in support of Joint Exercise Cobra Gold 2010 on the Royal Thai Air Force (RTAF) Base, Khorat, Thailand

Matthew Beck is a captain in the U.S. Marine Corps and a student in the Graduate School of Business and Public Policy at the Naval Postgraduate School. Capt Beck earned a Bachelor of Architecture (BArch) in 2003 from the University of Notre Dame. He is an EA-6B Prowler Electronic Counter-Measures Officer (ECMO) and has served multiple operational tours in nine years of active service. Upon graduation from the Material Logistics Program at the Naval Postgraduate School in March 2013, Capt Beck will report to Marine Corps Systems Command, Quantico, VA.

Photo of Captain Beck (right) before a flight departing from Al Asad Airbase, Iraq, in support of Operation Iraqi Freedom

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Disclaimer: The views represented in this report are those of the authors and do not reflect the official policy position of the navy, the department of defense, or the federal government.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACB	Australian Customs Bureau
ACE	Aviation Combat Element
AO	Area of Operations
AQIS	Australian Quarantine Inspection Service
BCA	Business Case Analysis
COA	Courses of Action
CONOPS	Concept of Operations
DAU	Defense Acquisition University
DLA	Defense Logistics Agency
DoS	Department of State
DO	Distributed Operations
DoD	Department of Defense
FOB	Forward Operating Base
FY	Fiscal Year
GPS	Global Positioning System
GSO	General Services Office
IRR	Internal Rate of Return
JUONS	Joint Urgent Operational Need Statement
JUSMAG	Joint U.S. Military Advisory Group
JIT	Just In Time
JITD	Just In Time Distribution
JLU	Joint Logistics Unit

LCC	Life-Cycle Cost
M-SHARP	Marine-Sierra Hotel Aviation Readiness Program
MAG	Marine Aircraft Group
MALS	Marine Aviation Logistics Squadron
MAW	Marine Aircraft Wing
MC	Mission Capable
MCAS	Marine Corps Air Station
MilAir	Military Air
MOS	Military Occupation Specialty
NAVAIR	Naval Air Systems Command
NMC	Non-Mission Capable
OAD	Operations Analysis Division
O&M	Operations and Maintenance
OCO	Overseas Contingency Operations
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
R&D	Research and Development
RDT&E	Research Development Test and Evaluation
RTAF	Royal Thai Air Force
SOP	Standard Operating Procedure
TAD	Temporary Assigned Duty
TRR	Time To Reliably Replenish
UDP	Unit Deployment Program
USMC	United States Marine Corps
USPACOM	United States Pacific Command

VAMOSC	Visibility and Management of Operating and Support Costs
VMGR	Marine Aerial Refueler Transport Squadron
VMI	Vendor Managed Inventory

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I. INTRODUCTION

A. PURPOSE OF THE STUDY

This study provides a cost-based analysis and qualitative evaluation regarding the use of commercial agencies (i.e., FedEx and DHL) or the U.S. Marine Corps (USMC) KC-130J heavy-lift transport aircraft in the shipment of F/A-18 aircraft parts within the USPACOM Area of Responsibility (AOR) of Southeast Asia, to include Australia. As stated in the 2011 National Military Strategy of the U.S., “as our presence and alliance commitments remain the key to preserving stability in Northeast Asia, we must also invest new attention and resources in Southeast and South Asia” (Mullen, 2011, p. 1). The U.S. national military strategy is not only focused on building upon a strong presence in the USPACOM AOR but also on considering the current global economic recession. The U.S. military leadership is focused on sustaining a strong presence in the most efficient manner possible while concurrently increasing effectiveness. Increased effectiveness would result in increased mission capable (MC) readiness of F/A-18 aircraft in the region, and, hence, lower time-to-reliably-replenish (TRR) rates; increased efficiency implies decreases in cost to ship aircraft parts to joint exercise locations in foreign countries, both complementing each other and satisfying U.S. strategic objectives. The research provided the opportunity to travel to a few key joint U.S. military advisory groups (JUSMAGs) and supporting general services offices (GSO), where we observed the current standard operating procedures (SOP), spoke with the host-country and U.S. military leadership, and gained perspective that significantly contributed to the validity of this project.

The purpose of this study is to examine and compare the cost and TRR constraints of commercial and military modes of shipment to three (of 13) annual joint USPACOM exercises conducted in three distinct allied countries, as well as estimate potential cost savings if commercial shipment were to become the primary or sole mode of shipment of aircraft parts. Furthermore, in this study, we conduct a business case analysis (BCA) comparing the estimated costs of current methods that provide logistical support in the USPACOM and provide recommendations to improve the logistics system as a whole. We identify and describe the costs associated with shipping by either method, referencing the international commercial carrier cost, and the cost to operate, man, and maintain military aircraft. We additionally identify and describe the TRR constraints of each method through push-pull methodologies that elaborate on the complexities of the USPACOM hybrid supply chain system, the time to deliver an item from Japan to another country in Southeast Asia if shipped via commercial carrier, and the planning of the lead-time for how long it takes to deliver an item from Japan to another country in Southeast Asia if shipped via military air.

The balance of our report is a historical analysis using data available for the previous three years spanning 2008–2011. We explore USMC demand trends for each Unit Deployment Program (UDP) flying squadron for each joint USPACOM exercise from 2008–2011. We also analyze delivery trends of commercial carriers and USMC KC-130J military heavy-lift transport aircraft for each USPACOM exercise from 2008–2011. At the same time, we examine diplomatic influence strategies employed by the U.S. specific to the U.S. military joint leadership at each respective JUSMAG and host-country customs department. Finally, we conduct a quantitative and qualitative analysis to simulate, forecast, and develop a cost estimate for employing either commercial carriers or military air transport in the near/distant future. Based on the results of the simulation and forecast, we recommend the most efficient and effective means to optimize logistical support for U.S. UDP flying squadrons during joint PACOM exercises in the most optimal manner.

B. PROBLEM STATEMENT

There is continuing pressure for the Department of Defense (DoD) to cut costs and contribute to reducing the national debt. The fiscal year (FY) 2012 president’s budget requests $670.9 billion for the DoD, including $553.1 billion in base funds and $117.8 billion in overseas contingency operation (OCO) funds. This is a decrease of $37.3 billion from FY2011 and will require further scrutiny and management of program acquisitions to ensure that only the best programs are funded (DoD, 2011). How do you efficiently and effectively implement cut-backs or change in an organization like the DoD that, unlike the whole of the U.S. government, does not currently answer to a system of “checks and balances” and is, therefore, not auditable? Answering this question becomes a very difficult task in which the answer may be unpopular and not in the best interest of a nation striving to remain free and secure in the onset of a fiscally constrained global environment in the near and distant future.

The DoD's audit policy has a trickle-down effect on the subcomponents of the DoD and/or the Department of State (DoS). Since there are not official checks and balances in place at the highest level, why would there be at lower levels (i.e., JUSMAGs)? For example, JUSMAGs, and Marine Aviation Logistics Squadron 12 (MALS-12) specifically, are operational and tactical agencies, respectively, whose effectiveness/efficiency have strategic implications in times of peace and war. How do DoD operational entities become more efficient and effective if they are untouchable from outside business practice scrutiny or audits? MALS-12 is subject to external scrutiny and must meet the highest of aviation safety standards in order to help ensure that all F/A-18 aircraft in the Marine Aircraft Group 12 (MAG-12) are safe for flight (SFF) at all times. MALS-12 functionality is, therefore, highly transparent to all higher headquarters and falls under the direction of the Commander, Naval Air Forces (CNAF) umbrella for proper and efficient maintenance and optimal readiness practices. However, overseas DoD organizations like the JUSMAGs do not. The DoD as a whole is coming under more and more fire for its "unauditability," and for good reason, for if there were a full-scale conflict involving the U.S. (with USPACOM allies engaged as well) mounted against a USPACOM foe, the logistics ineffectiveness within the JUSMAG organizations and host-country customs departments would surely become the most significant allied constraint. It is, again, a national and strategic imperative that joint effectiveness and relationships improve in Southeast Asian countries in order to support logistics throughput in a time of a conflict with China or other adversaries in the region.

Rapid allied forward force projection is, fortunately, still a reality today, even considering the current logistical and diplomatic hurdles that evade optimal efficiency and effectiveness. The U.S. diplomatic and global economic influence scale still greatly favors the U.S. and its allies in the region, but the U.S. may be slowly moving out of favor in some of those countries that we intend to continue to protect and support. This paradigm is best summarized by the commanding officer of the U.S. Defense Logistics Agency (DLA) in Guam, Marianas (P. M. Tucker, personal communication, June 4, 2012):

> The policy makers in the State Department are rattled by DoD strong arming for military execution. These [USPACOM-allied countries] are relationships where we want them to need us instead of resorting to Chinese influence, so it's tenuous. Because our other elements of [U.S.] national power are so

weakened, it’s like being a guest that feels that he’s worn out his welcome as he arrives.

So how does the U.S. sustain regional security that is vital to U.S. national interests while helping those nations that may not want help but are forced to tolerate the U.S. presence because of the imminent threat of another Asian country (i.e., choosing the better of two “evils”)? What is the better of two evils, China or the U.S.? According to current posturing in the region, most Asian countries still, to a great degree, trust and favor the known U.S. presence over the unknown—and rapidly expanding—Chinese prevalence in Asia. Specifically, amid tensions in the region and consistent with U.S. national and strategic objectives projected for the next 10 years, the U.S. Secretary of Defense, Leon Panetta, flew to Vietnam (see Figure 1) on June 4, 2012, to discuss strategy and the threats of bordering countries, specifically China. The bottom line is that Vietnam wants protection from Chinese aggression; so do other allies.

Figure 1. Secretary of Defense Leon Panetta greets Vietnam military leadership (04 June 2012)

Enter the extreme and imminent challenge of planning for, and implementing, efficient and effective logistics operations in order to sustain a potential military conflict against China and/or other enemies in the region. A strategic imperative is, yet again, to continue to diligently attempt to influence new commercial contracts in cohort with host-country allies in order to best prepare for conflict.

Since it has been widely publicized that the U.S. national and strategic focus is currently shifting to the USPACOM AOR, then joint operational training and expectations must increase significantly in order to achieve national strategic objectives. The military tactical units are not capable of organically sustaining the movement of their own gear/parts in an efficient and fast enough timeframe in a time of conflict. Specifically, using Marine Aerial Refueler Transport Squadron 152 (VMGR-152)—the sole USMC KC-130J troop/gear transport squadron in the USPACOM—as an example, the squadron's mission to support the movement and sustainment of USMC units would be inadequate, overburdened, and cumbersome if joint action were taken against China or other adversaries.

It is, ultimately, unrealistic to expect that one KC-130J squadron consisting of 12 aircraft could sustain the movement and posturing of thousands of Marines in the region in a time of conflict, but even more daunting is the expectation of this squadron providing parts replenishment operations for non-mission capable (NMC) F/A-18 aircraft wherever the aircraft may be NMC for example, the small, isolated country of Brunei, where aircraft have been known to divert in times of an in-flight maintenance emergency.

Considering the current military and national strategic shift to the USPACOM, emphasis must quickly shift to focus on joint commercial or government contracts (i.e., status of forces agreements) that better facilitate optimal and seamless movement of commercial parts through the customs departments of all allied Southeast and Southern Asian countries. This not only could become the most effective means of parts replenishment—as we will cover later—but more important, and considering the current global recession and fiscal constraints, is the more efficient alternative to providing logistical support. The U.S. needs to save money, and very closely examining DoD business practices is a good place to start. As we will discuss in the following sections, options are available, and due diligence from contract writers and negotiators could achieve the economic and strategic ends necessary to meet U.S. national and military strategic objectives while saving the U.S. a large sum of money.

Life-cycle costs are one of the most important measures in determining whether to pursue implementation of new logistics processes or international contracts in order to justify discontinuing current methods. If performance of current sustainment priorities cannot justify costs—as is the case for KC-130J in the movement of aircraft parts—then emphasis on military modes of shipment should be significantly decreased. Whereas the increased emphasis on the use of agencies, such as FedEx and DHL, will not completely replace the total mission and necessity of military airlift, these agencies can serve as an extremely viable cost "force multiplier" that significantly contributes to the potential for an exponential amount of cost savings for the DoD in the short and long run.

Concurrently, increased aircraft readiness will be realized as well, for the parts will arrive days sooner if the customs obstacle is permanently understood and overcome. The best alternative to become more efficient and achieve cost savings and increased effectiveness is for the DoD, and hence U.S. operational- and tactical-level units, to be provided greater opportunity to ship by commercial means. In turn, this alternative will result in less emphasis on MilAir transport (avoiding extreme operations and maintenance [O&M] costs of KC-130J aircraft) and rely more heavily on the capability of commercial carriers through the DoS and the DoD to remain vigilant under pressure and to apply attention to the fluidity and business practices of their own host-country customs departments. The degree of joint fluidity of all allied customs departments determines a large portion of the life-cycle costs (costs incurred through awaiting parts) as well as the potential level of heightened aircraft readiness essential to satisfy the United States' new national strategic objectives in the volatile USPACOM region.

1. The High Cost of Current Asset Replenishment in USPACOM

Current F/A-18 aircraft part replenishment costs to allied countries within the USPACOM AOR is dependent upon the number of aircraft forward deployed at an exercise site in an allied country; how far away that country is from the supply warehouse on Marine Corps Air Station (MCAS), Iwakuni, Japan; the demand frequency of parts for NMC aircraft; the level of local support typically experienced at a host-country embark location; and finally and most importantly, VMGR-152 mission priorities planned to be accomplished before, or concurrent to, F/A-18 parts replenishment requirements in other USPACOM countries. Many different missions are planned for the following day, and those missions may shift or arise on a daily basis for VMGR-152. Parts replenishment is just one cog in the squadron's large wheel, representing their many mission sets and operational and tactical capabilities. Keeping this in mind, as well as the extremely high O&M costs of these aircraft and the U.S. national and military strategic objectives recently re-focusing on Southeast Asia, it is imperative to keep the relatively small number of F/A-18 aircraft in the region at optimal readiness levels and to apply other alternatives and means to do so. It is a U.S. national and strategic imperative that the U.S. joint forces employ more use of commercial private carriers and at the same time learn how to significantly lessen the time commercially shipped items spend in each allied country's customs department. The many mission challenges and priorities alluded to previously are oftentimes shifted for the highest priority, which is to re-route KC-130Js—with replenishment part(s)—to the Southeast Asian country where an NMCS F/A-18 is in need. The aforementioned priority shift is oftentimes justified for reasons of effectiveness and not for the cost efficiencies that could be realized if aircraft parts were sent commercially and customs were a smooth, quick process.

VMGR-152 is the sole USMC KC-130 squadron supporting Marine forces in the Pacific. These 12 large and unique heavy-lift transport aircraft are charged with "supporting the Marine Air-Ground Task Force (MAGTF) Commander by providing aerial refueling and assault support, day or night under all weather conditions during expeditionary, joint, or combined operations" (USMC, 2012). Flight data for each leg of flight is recorded and tracked via the Marine-Sierra Hotel Aviation Readiness Program (M-SHARP). Each leg of each flight is documented, and the contents and purpose of each flight are captured within the system. Table 4 is a snapshot of the total poundage and frequency of cargo moved from 2008–2011. VMGR-152's troop/gear transport is critical to FFP and stability in the USPACOM region. Its mission is overburdened by the insurmountable number of tasks the unit is charged with achieving on any given day. This is where commercial shipping agencies can serve as a huge complement to this tactical unit, specifically, and significantly decrease their workload by taking the lead on the shipment of all F/A-18 aircraft parts that need to reach a foreign destination quickly and efficiently.

The majority of all F/A-18 parts are currently sent from the MALS-12 warehouse via a VMGR-152 KC-130J aircraft. Too few are sent via commercial carriers if the availability of the Super Hercules aircraft is limited. Each of these variables alone plays a major role in the cost of replenishment processes. It goes without saying that USMC KC-130J aircraft are very expensive to operate and maintain. Specifically, on average, the cost to the U.S. taxpayer is about 10 times more to ship an aircraft part via KC-130J roundtrip to Khorat, Thailand, (the location of Joint Exercise Cobra Gold) than the cost to ship the same part via commercial means. As we display in a later chapter, the cost to employ a commercial agency is far less than the O&M costs of military aircraft.

C. LOGISTICS

As is the case in any major conflict, operational needs drive all facets of support. Logistics and an effective supply chain are major enablers in the USPACOM region. Simply stated, the only way to render proper support to forward locations is to have a supply chain that is constantly evolving in response to changing conditions and threats. Conditions and threats are changing in Asia. With the withdrawal of forces from Operation Enduring Freedom (OEF), and according to the National Security Strategy of 2011, "we [the U.S.] have taken substantial steps to deepen our engagement in the region, through regional organizations, new dialogues, and high-level diplomacy … [to] expand our military security cooperation, exchanges, and exercises with the Philippines, Thailand, Vietnam, Malaysia … and Australia" (Mullen, 2011). The renewed strategic emphasis on the aforementioned countries and Asia as a whole implies a strategic imperative to improve all processes and relationships to obtain optimal levels in order to counter known threats in the region.

D. LOGISTICAL DELIVERY METHODS

Organic to the 1st Marine Aircraft Wing (1MAW) headquartered in Okinawa, Japan, three main cargo delivery capabilities currently support units on MCAS Iwakuni, Japan, and each arranges and delivers parts to Southeast and South Asian countries for annual joint exercises:

- USMC KC-130J heavy-lift troop transport aircraft,
- U.S. Navy or Air Force C-40A heavy-lift transport aircraft, and
- commercial carrier shipment via FedEx or DHL.

These capabilities can be combined to resupply detached F/A-18 units but do not typically complement each other very well. In this study, we focused on the USMC VMGR-152 (KC-130Js) and commercial modes to investigate the best alternative as a means of replenishment.

E. SCENARIO DEVELOPMENT

In this study, we investigated the joint, regional, and operational conditions needed/required for effective and efficient employment of commercial logistics agencies. In our analysis, we dissected the distance between each logistical leg of the journey for commercial and MilAir shipment, total replenishment costs, the platform/agency providing support, and the TRR for each method. We describe the scenario in detail in Chapter III.

F. MBA PROJECT SCOPE AND ORGANIZATION

Our primary purpose is to analyze the cost and capability of commercial shipment against the cost and capability of MilAir transport. Our analysis indicates if and where shipping parts commercially can be of greater benefit to the end user (F/A-18 flying squadron) and the DoD's checkbook. Furthermore, in this project, we discuss how the development and/or redressing of current logistics joint contracts in USPACOM can impact and likely significantly benefit the Marines and other tactical units serving in unique conditions in all of Asia. Ultimately, achieving U.S. national and military strategic objectives in USPACOM comes through realizing increased readiness by using the most efficient (commercial) and effective (overcoming customs hurdles) means. U.S. joint logistics means must become significantly cheaper; however, effectiveness should not be sacrificed in the process. In subsequent chapters, we look at the history, current trends, and potential for logistical efficiency and effectiveness never realized but critical to satisfying U.S. objectives in the near future.

This project is organized into eight chapters: Chapter I—Introduction, Chapter II—Background, Chapter III—Business Case Analysis (BCA), Chapter IV—BCA Methodology, Chapter V—Operational and Strategic Scenarios, Chapter VI—Supply Chain in USPACOM, Chapter VII—Data Analysis, and Chapter VIII—Conclusions and Recommendations.

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II. BACKGROUND

In this chapter, we outline the history and context of the exercises in the USPACOM that currently rely on the logistic support methods discussed in Chapter IV. Understanding historical relevance of logistics in the modern era is important in reference to understanding the design and structure of current logistics policies and procedures that hinder and/or facilitate logistics efficiency and effectiveness today.

A. OVERVIEW/HISTORY

Since the inception of forward flight, and its subsequent integration in the execution of a war, logistics efficiency has habitually been sacrificed for effectiveness. All that has ever mattered to the U.S. when planning for and engaged in World War II, the Korean War, Desert Storm, and, in more recent years, the Global War on Terrorism was how quickly and effectively bombs could be dropped on a target to ensure quick and decisive victory to win a battle and/or war. Pennies were seldom counted for the logistical costs of war because the security of our nation was perceived to be in jeopardy and, therefore, securing freedom outweighed fiscal consequences. Fortunately, times have changed, more resources are available, and the U.S. and its allies are ever more willing to work together in the USPACOM, specifically, to work toward continuous process improvement in logistics best practices in order to achieve optimal joint forward force projection. Joint negotiations at the tactical level can now achieve maximum logistical efficiency and effectiveness without either principle being sacrificed, primarily through the increased employment of private commercial carriers (i.e., FedEx and/or DHL).

The USMC and allied forces within the USPACOM share a partnership of providing regional security to a vast area of approximately 30,000 square miles of land and sea—about 51% of Earth's mass. With the ongoing withdrawal of U.S. forces from Iraq and Afghanistan, "renewed emphasis has been focused on the implications and potential ramifications of rebalancing and realigning U.S. military forces toward the Asian Pacific region" (Wise, 2012, p. 3). How will reemphasizing our existing alliance and logistical capabilities in this region impact USPACOM strategy? And, how do the strategic intentions of China and North Korea fit in the United States' declared "pivotal shift" following OEF and Operation Iraqi Freedom (OIF)? These questions address strategic uncertainty in a region where at least one thing is certain: there are highly capable and efficient "game-changing" commercial logistics agencies firmly established and now available that can move aircraft parts faster and cheaper than any military organization or private company.

B. CONCEPT OF EXERCISES IN THE USPACOM

The USPACOM protects and defends the territory of the United States, its people, and its interests, in concert with other U.S. government agencies. With allies and partners, USPACOM leadership is charged with enhancing stability in the Asia-Pacific region by promoting security cooperation, encouraging peaceful development, responding to contingencies, deterring aggression, and, when necessary, fighting to win. This approach is based on U.S. partnership, presence, and military readiness in the region. Stability enhancement and engaged and trusted partnerships are facilitated through the execution of annual joint exercises in the USPACOM AOR, as portrayed in Figure 2.

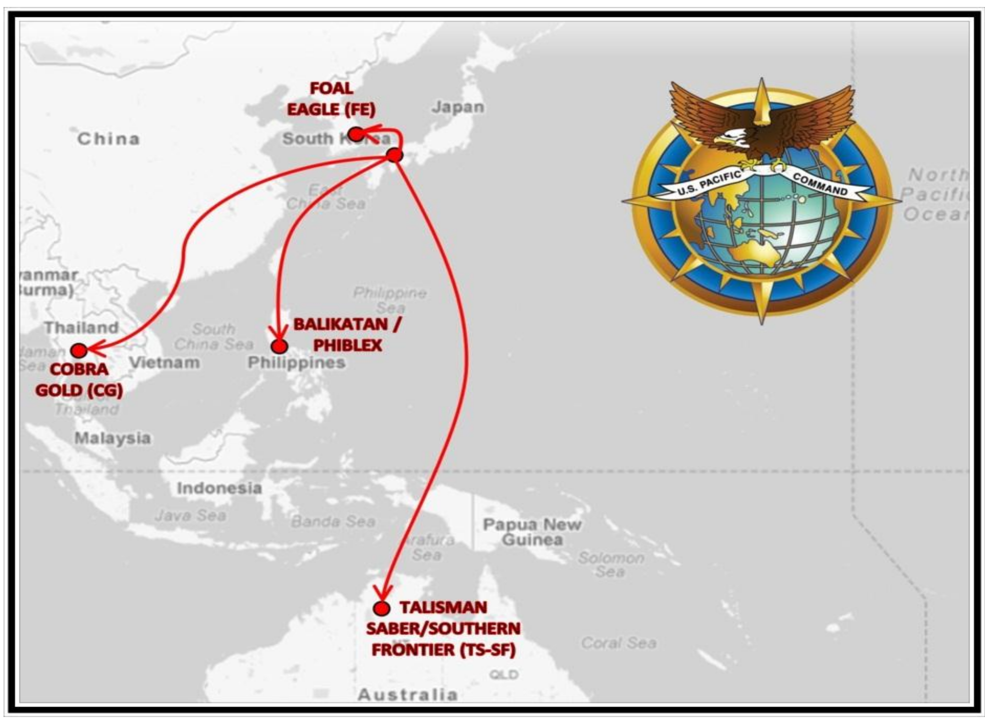

Figure 2. USPACOM Regional Map
(USPACOM, 2012)

C. DESCRIPTION AND PURPOSE OF EXERCISES

The USPACOM participates in many exercises and other engagement activities with foreign military forces. Four of the major exercises and countries include the following:

1. TALISMAN SABER/SOUTHERN FRONTIER (TS-SF). A biennial Australia/United States bilateral exercise(s) merging the following exercises: TANDEM THRUST, KINGFISHER, and CROCODILE. TS-SF is the primary training venue for Commander Seventh Fleet as a Combined Task Force (CTF) in a short-warning, power-projection, forcible-entry scenario. The exercise is a key opportunity to train Australian and U.S. combined forces in mid- to high-intensity combat operations using training areas in Australia.
2. COBRA GOLD (CG). A joint/combined exercise with Thailand, CG is designed to improve U.S./Thai combat readiness and joint/combined interoperability.
3. BALIKATAN/PHIBLEX. A joint exercise with the Republic of the Philippines and the U.S. The purpose of this exercise is to conduct bilateral training between the two military forces to maintain readiness, improve interoperability, and sustain the long-term security cooperation relationship shared between the Republic of the Philippines and the United States.
4. FOAL EAGLE (FE). An annual combined field training exercise (FTX) conducted between the armed forces of the Republic of Korea (ROK) and the United States under the auspices of Combined Forces Command (CFC) within the Korean Theater of Operations (KTO). It is one of the largest military exercises conducted annually in the world. The primary purpose of Foal Eagle is to demonstrate ROK-U.S. military resolve to deter war on the Korean peninsula and to improve the combined and joint operational posture of those forces.

D. FUTURE OF USPACOM JOINT EXERCISES

The aforementioned joint exercises will remain in effect for years to come. The alliances are firm and necessary to ensure stability in the near and long term. Since change of the political and economic global climate is constant, the U.S. and its allies must continue to foster relationships facilitating advances in the understanding of their different cultures and values, as well as collectively remain vigilant and fiscally responsible in the way they operate together, both remaining militarily effective and finding ways to operate in the most cost-efficient manner.

The following chapter introduces a BCA model and structure in order to provide one means by which to examine and display/capture data to help forecast fiscally responsible logistics solutions that could be applied in a joint operating environment. After all, the United States' constant FFP presence is necessary not only to support and complement each host country's military in a volatile region but also to grow together with their allies, employ each other's resources in the best manner possible, and achieve collective joint strategic objectives in the USPACOM.

III. BUSINESS CASE ANALYSIS

A BCA is a tool used by managers to assess how a new technology compares to an existing technology that performs the same function. The goal of a BCA is to help management decide whether to invest in the new technology and whether that new technology will bring sufficient additional value to the table to justify its costs. The BCA provides a justification for proceeding with a given project. In our case, the BCA is a decision tool providing structure to the display and representing complex data pulls relevant to establishing better business practices. A BCA is best presented in a well-structured, written document and typically describes the background of the project, the expected business benefits, the options considered, the expected costs of the project, the impact to stakeholders, and the expected risks (Defense Acquisition University [DAU], 2011). A BCA typically determines the following:

- the relative cost versus benefits of different support strategies,
- the methods and rationale used to quantify benefits and costs,
- the impact and value of performance/cost/schedule/sustainment trade-offs,
- the data required to support and justify a performance-based logistics strategy,
- the sensitivity of the data to change,
- the analysis and classification of risks, and
- a recommendation and summary of the implementation plan for proceeding with the best value alternative (DAU, 2011).

BCAs typically continue throughout the life-cycle process of the project and are updated as necessary to reevaluate the project because life-cycle costs and other improvements may change. Due to this, there are no two BCAs that are exactly the same, and they are formatted and customized to each specific project. As illustrated in Figure 3, the four steps of a BCA are definition, data collection, evaluation analysis, and results presentation.

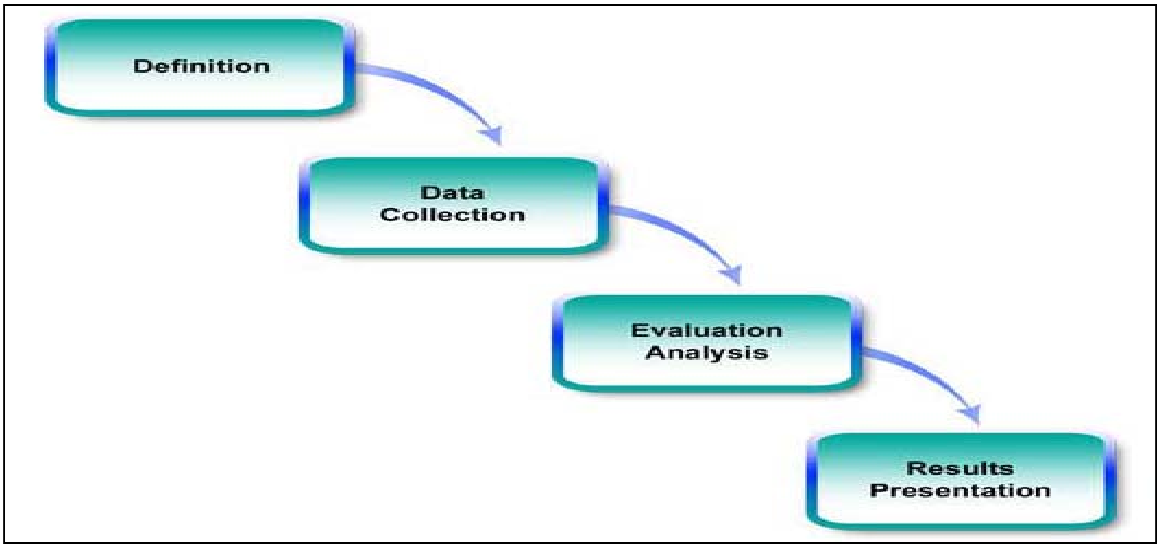

Figure 3. Steps in the BCA Process
(DAU, 2011)

A. DEFINITION

In the definition stage (Chapter V) of the BCA, managers describe the scope of the analysis and set assumptions, constraints, and scenarios that will direct the analysis. During this stage, the managers identify the groundwork for the BCA and communicate to decision-makers the reasons why the analysis is needed. All alternatives identified are considered and compared to the status quo (DAU, 2011).

B. DATA COLLECTION

In the data collection stage (Chapter VI), managers identify the types of data that will be necessary to complete the analysis and classify that data into categories. They identify data sources and all relevant data, including cost data and performance data. Managers estimate any data that is not available and describe the approach to that estimation. They normalize all data and scrutinize them for accuracy. Data normalization ensures that "apples are being compared to apples" (DAU, 2011).

C. EVALUATION ANALYSIS

In the evaluation analysis (Chapter VII), managers use the data collected in the second stage of the BCA and begin the applicable calculations using both quantitative and qualitative data. They compare each scenario against the other to determine which alternative has the lowest cost and the best performance. Managers then identify an optimal combination of low cost and high performance to find the best value alternative. They also conduct a risk and sensitivity analysis, identify potential risks, and determine ways of mitigating those risks. Sensitivity analysis determines the effect that changes in particular inputs and constraints will have on the analysis (for example, changes in fuel costs or lower costs of the new alternative may change the solution; DAU, 2011).

D. RESULTS PRESENTATION

The results presentation is the final stage (Chapter VIII). In this step, managers communicate the results of the analysis to the decision-makers. Managers construct their conclusions around the objectives of the analysis that they stated earlier in the case. They use charts and graphs to communicate the results of all quantitative data along with a narrative description to ensure that the results are easily interpreted. They also discuss any unexpected results, outliers, or easily misinterpreted results. Finally, they identify a recommended course of action and state support for that recommendation to bring closure to the analysis (DAU, 2011).

E. BCA AND JUSMAG SUSTAINMENT

We apply a BCA to the current sustainment methods being employed, on different levels, by the U.S. across the globe. In the next chapter, we introduce push-pull methodology following the logic of the preceding concepts. By conducting an in-depth BCA of the current global logistics supply chains, the U.S. and its allies can best determine solutions to joint strategic imperatives in the USPACOM. It is no secret that the U.S. and its allies in Southeast Asia currently operate in a fiscally constrained environment and therefore must apply due diligence to create more efficient means of resupply to and from all foreign countries. The BCA tool helps to determine which logistics approach would be most cost effective and efficient given the environmental constraints.

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IV. SUPPLY CHAIN STRATEGIES

Given the current global economic and security environment in the USPACOM and the U.S. national and strategic shift in focus towards the USPACOM in the coming years, a concurrent shift in the mindset of logistics policies and system-wide education and improved communication must follow in order to secure prosperity and security and to ensure consistency with changing U.S. and allied strategic objectives for the very near future. The mindset shift must place more emphasis on a total pull system and, subsequently, apply equal reliance on the potential capability of host-country customs departments through increased pressure on the joint leadership of the U.S., which is co-located within the customs department of each host country in which the U.S. exercises regularly for continued FFP.

In the following two sections, we discuss how supply chain strategies are categorized as either a push, pull, or hybrid methodology. Each strategy is unique, with individual characteristics, advantages, and disadvantages. We explain in detail each one of these strategies in the context of BCA structure. It's important to understand these two systems in relation to which system is primarily employed—or could possibly be employed—globally by the U.S. military. Specifically, without an in-depth understanding of supply chains that are currently employed, it becomes difficult to justify a need for change to more efficient and effective DoD business practices. The purpose of this chapter is, therefore, to provide an elaborate definition and application of each methodology in order to build an argument for employment of a more efficient and effective global supply chain than can be feasibly employed by the DoD agencies across the board overseas.

A. PUSH METHODOLOGY

The push-based system of distribution has been in existence and documented as being used in production and manufacturing since the beginning of the 20th century (although it was not always called *push*), coinciding with the manufacturing revolution that occurred during this same time period. In this system, manufacturers produce and distribute their products based on historical retailer order data. With this historical data, a manufacturer/supplier is able to create a demand forecast, allowing it to make production quantity decisions (Skjott-Larsen, Schary, & Mikkola, 2007, p. 89). Under the push system, "production is dominated by large consumer goods manufacturers. The manufacturers have long production runs in order to gain efficiencies of scale and minimize unit costs" (Bonacich & Wilson, 2008, p. 4). Under this system, manufacturers often entice retailers with promotions and discounts in order to attain large advanced purchases, pushing products out to the retailers' warehouses.

As with any type of supply chain strategy, there are always advantages and disadvantages of this production and distribution system. One advantage of using a push-based system is the idea of *product certainty*. Manufacturers know with little doubt that the demand for their product will be consistent, so they can continue to have long production runs. Certain commonly used and mass-production items (see Figure 4) such as diapers, office supplies, basic construction materials, soap or detergent, pasta, and so forth will yield success within a push system because they will always have a constant demand. Figure 4 illustrates this point by showing that these products "are characterized by predictable demand and slow product introduction frequency" that are served best by utilizing a push-based strategy, yielding supply chain efficiency and high inventory turns (Simchi-Levi, Kaminsky, & Simchi-Levi, 2008, p. 107).

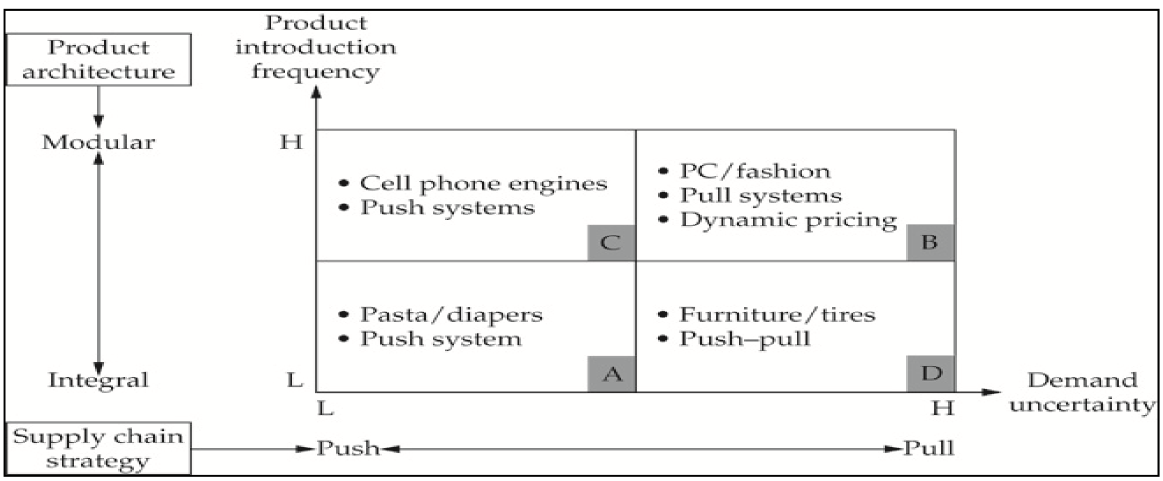

Figure 4. Supply Chain Strategies

Note. The information in this figure is based on Simchi-Levi et al., 2008.

To summarize, a push-based strategy is good for manufacturers if they are able to produce large amounts of a single product, spreading the setup costs against a large number of units. This will ultimately lower the individual costs to manufacture that item. This strategy is also good for items that have a predictable demand because the manufacturer can continue to produce this item knowing that the demand will not falter. The disadvantage of a push-based system is its reliance on forecasts used to determine production levels. There is no guarantee that the forecast will always be accurate, thereby creating the risk that there will not be enough of the product to meet demand or that there will be too much product, raising inventory holding costs. The push-based system is one option for replenishing stores, but specific to the DoD, the pull system is more applicable and more commonly used in U.S. military logistics.

B. PULL METHODOLOGY

The *pull* inventory management system, sometimes called *just-in-time* (JIT) management, began as one facet of Toyota's *lean* production methodology. This is more well known in U.S. military logistics. The background idea of lean manufacturing was to create the desired product with as little waste as possible, with the definition of *waste* being anything that the customer did not want. If done properly, lean manufacturing can provide immense gains "by eliminating non-value-adding activities, reducing lead times and faster flow through the factory by driving manufacturing through customer demand [pull] and continuous improvements" (Patni Computer Systems Limited, 2005, p. 9). This pull management system has now been incorporated into many manufacturing processes by a number of suppliers due to its direct impact on total costs through the reduction of operational expenses.

The pull inventory management system performs as follows. When any item is sold by a retailer, that retailer places an order to replace that single item only. That single item, which would be the finished product handled by the supplier, is shipped to the retailer. The supplier now has a gap in its finished product inventory, so that supplier will now "pull" another finished product from upstream to replace what was shipped. If no finished product exists, an upstream workstation may have to complete the manufacturing process. Regardless of the number of workstations involved in this total process, only one order moves at a time, with each station pulling from the next upstream workstation. Eventually, the "last" upstream station is reached—that of bringing raw materials into the factory to begin the work-in-process labor. In practice, the pull system may involve larger orders (instead of a single unit) constituting what is called a *Kanban*: the standard lot size calculated for that particular item managed by the pull system.

Boundaries, or clear separation points, can be created between push and pull methodologies where one method might be more profitable than the other. Performance measures such as customer wait time and service goals will allow the manufacturer to choose the correct support and distribution method. When determining this boundary between push and pull (see Figure 5), "the decoupling point separating the part of the supply chain operating in a make-to-order environment [pull] from the part of the supply chain based on planning [push]" must be ascertained (Croxton, Garcia-Dastugue, Lambert, & Rogers, 2001, p. 15).

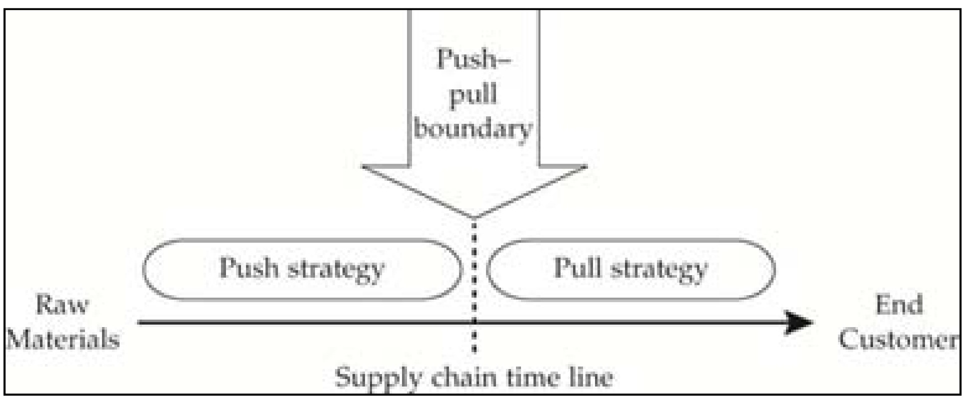

Figure 5. Push-Pull Boundaries
(Simchi-Levi et al., 2008)

The Kanban system (see Figure 6) is an example of the pull methodology in action. Also developed by Toyota, the Kanban system incorporates a visual trigger to signal demand. While the word *kanban* means "sign" or "instruction card," there are also other paperless methods for controlling product movement. One example is the use of containers or bins—if the bin is empty, it means that the worker at that station has used up all available resources and must be resupplied in order to continue working. This empty bin is then filled by the next upstream worker from his own bin of ready-for-transfer parts. Other production lines might use colored golf balls to signify a requirement of a certain type of part needed in the manufacturing process. The key difference between the pull and push systems of inventory management can be seen with this example: while a worker may have material that is ready to be used by the next person downstream in the manufacturing process, that material is not sent "down the line" until it is requested. Thus, the downstream worker pulls material from upstream rather than having it pushed to him (Jacobs, Chase, & Aquilano, 2009, p. 113). Stated a different way, "the ordering quantity for each process is determined on the basis of the consumed quantity at the inventory station where the items processed are stocked" (Takahashi & Nakamura, 2004, p. 128).

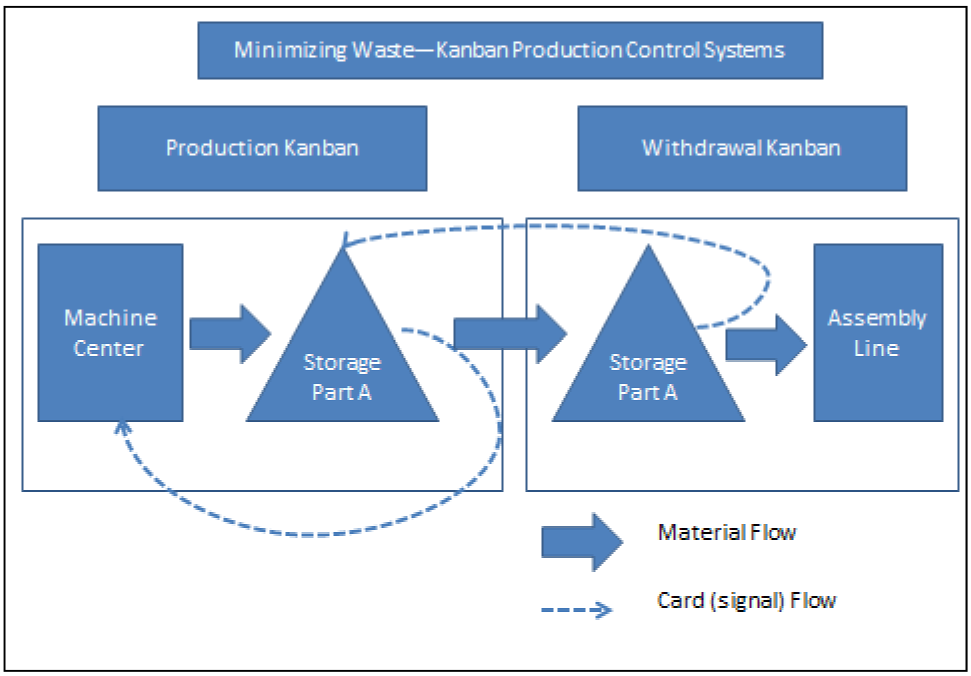

Figure 6. Kanban System
(Jacobs et al., 2009)

The greatest benefit of the pull methodology is the reduction in operational expenses because of the elimination of waste. Since orders are placed only upon a sale, another benefit is a reduction of working capital required for operations because work-in-process inventory only needs to be as large as the next order (no stockpiling is required). Capital requirements are also reduced due to the fact that large amounts of cash are not typically tied up in held inventory—the retailer has an initial start-up cost to fill his or her shelves but, after that, only orders what is actually selling. The pull method also allows for a retailer to take action only if demand changes, preventing the retailer from suffering from the bullwhip effect (Arts, 2004).

Some of the risks of shifting to a pull method for inventory management include higher ordering and transportation costs, and strains on the supplier-retailer relationship because of more frequent orders. Due to the reduced order size when using the pull method (as opposed to the push methodology, which orders up to a desired on-hand inventory number), and assuming that there is a fixed cost of placing an order, the ordering costs will rise in correlation to the increased number of orders. This ordering cost should be fairly stable after full conversion to the pull system, which will then make holding costs an overriding factor for implementation decisions. Since pulling inventory reduces the on-hand inventory requirement, the holding costs should also be reduced and the pull system should become "more cost-effective at a wider range as the demand level increases" (Abuhilal, Rabadi, & Sousa-Pouza, 2006, p. 54).

Similar to ordering costs, the transportation costs that a business incurs when shifting to a pull inventory management system are likely to increase. These cost increases are due to the more frequent but smaller-sized deliveries required to ensure that a factory can remain a JIT producer. The increase in transportation costs may, however, be offset by the reduction in on-hand inventory requirements, so the total operating costs may actually fall (Aron, 1998, p. 59). Additionally, if a retailer is able to receive split vendor shipments, where merchandise originating from many companies is loaded onto the same truck for delivery, costs may be reduced by receipt of a single truck rather than numerous partially filled ones.

Finally, the relationship between a supplier and a retailer can become strained when implementing a pull management system. "With a pull contract the manufacturer/supplier bears the inventory risk because only the supplier holds inventory while the retailer replenishes as needed during the season" (Pearson, 2008, p. 497). Many of these retailers are risk averse and carry only the inventory that is found on the shelves of their stores, so they have to be willing to directly communicate with their suppliers and often even share real-time data. Retailers that have incorporated the pull inventory management system often have some of the best information and technology infrastructure as well as supply chain management concepts in order to achieve this symbiotic working relationship with their suppliers (Wong, Arlbjorn, & Johansen, 2005, p. 367).

As can be seen from the previous discussion, there are varying opinions on which method is best for production and distribution. While most academics and practitioners tend to favor the pull methodology, this is not always the correct option for every circumstance. The pull system is excellent in many environments, but it can also be disastrous in other operations. The main issue is that the pull system cannot react quickly to sudden increases in demand while the push system protects against these surges in demand by ensuring an increased on-hand inventory at all times. This balance between on-hand inventory and protection level is critical when considering the strategic implications overseas.

C. PUSH-PULL HYBRID METHODOLOGY

One of the main reasons that supply chain management currently receives so much attention is that information technology enables the shifting of a production and sales business model from push type to pull type. There is an obvious benefit and legitimacy to the application of push and pull methodology, either together or separately, on a local and/or global market scene. Each niche market has distinct demands and resources that drive which method they subscribe to primarily in order to satisfy customers' wants/needs and sustain sufficient revenues. Some execute their push or pull business processes more efficiently and effectively than others. As was alluded to in the previous sections of this chapter, most commercial and/or private businesses have the luxury of only losing money and customer loyalty if their business is run poorly by either method.

The consequences in the DoD, however, and more specifically, in the military, are much more severe and require continuous public scrutiny to ensure that the most efficient and effective system is employed, is adaptable to the ever-changing global security and economic environment, and, ultimately—because of the logistical tyranny of distance—is deployed using a push-pull system capable of responding to all U.S. warfighters' needs and capable of sustaining equipment/asset readiness at optimal levels in order to thwart all enemy threats or aggression towards the U.S. or its allies.

The current logistics system supported from the continental U.S. (CONUS) and deployed in the USPACOM is a push-pull hybrid system of many depositories and channels. Put simply, there are six aviation supply depots located in the U.S. stockpiled with parts that regularly "push" items to hundreds of warehouses located on many U.S. installations overseas in order to resupply inventory. Those overseas warehouses are then "pulled" from by squadrons exercising FFP spread across the vast region of Southeast Asia. As an example, using the F/A-18 aircraft-specific parts warehouse located on MCAS Iwakuni, Japan, a squadron places a requisition from a forward deployed joint aviation exercise site in Thailand, for example—and the warehouse ships the requisitioned item(s) via commercial carrier or military lift to the location. As is captured in Figure 2, the USPACOM is a vast area encompassing over 50% of the planet's land and water mass. From Thailand to Japan alone, it is nearly 2,700 miles—a flight nearly equivalent to a coast-to-coast flight across the U.S.

Due to the dynamic operating environment and the extremely large footprint of U.S. forces in the region, the "complexities of our system have exceed[ed] our grasp" (McFarland, 2012). Either through the use of a commercial carrier or MilAir transport, the military has become very effective in expediting requisitions from a foreign country's warehouse (i.e., MCAS Iwakuni, Japan) to the customs department in another country (i.e., Bangkok, Thailand) in a matter of one to two days, but immediately upon arrival of parts in a host country, all efficiency and effectiveness are lost due to varying processing speeds, practices, and policies of the host country's customs department. In many cases, these hinderances result in prolonged delays before parts reach their final destination.

We discuss the complexities of each foreign customs department's system in greater detail in the next section (Operational and Strategic Scenarios), but it bears mentioning when considering the push-pull system in its entirety currently deployed by the U.S. military. The customs departments' bottlenecks of the USPACOM region do not complement the efficiencies and extreme effectiveness of the U.S. military's ability to move its own gear, but, conversely, the actions of the host country's customs department actually reside at the other end of the spectrum and are a near-future strategic concern of the U.S., with the increased focus on allied FFP and stability in Southern and Southeast Asia.

V. OPERATIONAL AND STRATEGIC SCENARIOS

As was introduced in Chapter III (Business Case Analysis), we describe in this chapter the scope of the analysis and set assumptions, constraints, and scenarios that will guide further analysis. During this stage, we identify the groundwork for the BCA and communicate to decision-makers the reasons why the analysis is needed. All alternatives we identify are considered and compared to the status quo (DAU, 2011).

A. MILITARY POSTURE IN THE USPACOM

"So many communists, so little time" was the attitude of many western leaders during the Cold War era, according to the Under Secretary of Defense for Acquisition, Technology & Logistics, Frank Kendall, back in the 1970s when he was a United States Army captain. Fortunately, anti-communist sentiment has dissipated some since the end of the Cold War era, but threats still do persist today, albeit within the framework of a much more modern and economically in-tune nation—China. Although current relationships are far less tattered and fragile than they were 50 years ago, democracy still combats communist ideology, and the U.S. and China remain cognizant of each other's actions or inactions politically, economically, or militarily. With what the near future may hold in the USPACOM region politically, one can only hope that diplomacy succeeds, conflict is avoided, and the democratic disposition of all allied countries in the region remains firm. The U.S. and its allies must plan for potential conflict in Asia, and logistics capability (or a lack thereof) should be at the forefront of joint planning in order to satisfy U.S. national and allied security and stability objectives. Without a sound joint logistics plan, as well as sound SOFAs intact for commercial shipments, the U.S. and its allies may not be able to respond to personnel and equipment readiness support issues in a timely manner.

Each U.S. military Service currently has personnel and equipment prepositioned throughout the USPACOM in order to sustain FFP and collectively contribute to regional stability. There are currently over 300,000 U.S. military personnel stationed in the region, as well as billions of dollars in assets and facilities that must be maintained. In addition to ensuring the safety and security of U.S. military personnel in the region while executing their individual daily missions, fixed-wing aircraft and squadrons that are either permanently stationed in the region or a UDP flying squadron that rotates in and out of the region from the CONUS every six to seven months are a critical asset for the United States on many levels. There are, at any given time, approximately 40 USMC fixed-wing aircraft disproportionately spread about the airspace or on the deck in an allied country in the USPACOM, most of which are capable on a moment's notice of delivering bombs to the doorstep of our adversaries and ensuring what could otherwise evolve into a conventional war over 50 years ago into a short "battle" of seconds. Elevated readiness to achieve these ends comes at an extremely high cost, however, and is not easily achieved. In the next chapter (Supply Chain in the USPACOM), we analyze logistics and other sustainment costs. A high level of political and fiscal nurturing is inevitably required, but necessary, to secure increased aircraft readiness and, as a result, added stability in the USPACOM AOR.

The readiness of U.S. F/A-18 and U.S. Air Force F/A-16 aircraft is essential to sustaining and evolving FFP measures in the USPACOM. The higher the readiness of U.S. fixed-wing aircraft in the USPACOM, the higher the capability of the U.S. and its allies to counteract any threat or aggression in the region at a moment's notice. How does the U.S. sustain and forecast elevated readiness levels in the future for an unstable region encompassing over 30,000 square miles? Better yet, how does the U.S. remain at the tip of the spear and implement evolving technologies to build an established logistics distribution network to increase its efficiencies and effectiveness? We argue that to accomplish this goal, we must improve processes that are organic to the U.S. military and commercial sectors to compensate for poor host-country customs logistics throughput. The United States must diplomatically engage allied host countries in an attempt to achieve decreased entry barriers for our assets/parts/gear in order to achieve increased logistics throughput within these countries' customs departments.

Imagine the most dense, tangled, disproportionate, three-dimensional spiderweb cloaking the USPACOM AOR. Imagine the ends of each thread halting in the capital city of each allied country with the center of the spiderweb located in MCAS Iwakuni, Japan. The end of each thread in each capital city would further represent the location of the host-country customs department. A spider moves much more quickly along each thread to capture its prey than operating outside the confines of its web. Operating outside the confines of the web for the spider is foreign, unfamiliar, constrained, and uncertain. Similar to the external environment of the web for a spider is the United States' understanding of how to increase its sphere of influence, change policy, and, ultimately, realize improved joint logistics throughput in host-country customs departments for commercially shipped national assets (i.e., aircraft parts). It's a theater-wide challenge that continues to evade understanding from policy-makers at the national level and to garner emphasis from leadership at the strategic level, persuasion from contract/SOFA negotiators at the operational level, and efficiency and effectiveness of logisticians at the tactical level.

In the following subsections, we introduce and display the different customs SOPs of a few of the allied countries that the U.S. exercises in annually. One of the authors of this project made visits to each country discussed in order to gather data relevant to the research. In this fashion, the on-site research facilitated an in-depth understanding of the complex challenge at-hand for the DoD and DoS in continually attempting to influence dramatic change to international business practices, most of which consists of foreign agencies that do not have a deep vested interest in the end result of improving their processes (i.e., increased logistics throughput for U.S. piece-parts for U.S. assets and aircraft). The purpose of breaking down the following customs departments is to elaborate on the many different cultures and business climates that play a crucial role in expediting U.S. assets from beginning to end through the customs process.

B. THE KINGDOM OF THAILAND

The Kingdom of Thailand presents its own unique requirement for commercial shipments via FedEx and DHL. The Royal Thai Air Force (RTAF) and other customs personnel work limited hours and are oftentimes reported to be in and out of the office throughout normal business hours—most of these factors are out of U.S. control to change. However, the purpose of the U.S. Marine log cell position is to effect change and influence and expedite aircraft parts/paperwork as quickly as possible by being persistent, albeit tactful, in how the RTAF is approached and how quickly it processes U.S. items.

Table 1. Summary of Distance and TRR to Exercise Cobra Gold

Joint Exercise	Joint Exercise Location	Customs Department Location	Customs Department Distance from Exercise Location	Avg. time to arrive from Iwakuni to Host-Country Customs (days)	Avg. time parts spent in Customs Department (days)	TRR Commercial (days)	TRR MilAir (days)	Avg. # parts shipped commercially past 3 years	Avg. # parts shipped MilAir past 3 years
Cobra Gold	Khorat/Utapao, Thailand	Bangkok	4-hour drive	1	3 - 6	4 - 7	2 - 4	23	39
Southern Frontier/Talisman Sabre/Pitch Black	Tindal/Rock Hampton, Australia	Cairns/Darwin	3-hour flight	1.5	3 - 6	4 - 8	3 - 5	99	31
Balikatan/PHIBLEX	Taguig City, Philippines	Manila, Philippines	1/2 hour drive	1	2 - 4	3 - 5	2 - 3	9	29
Foal Eagle	Yongsan	Seoul/Inchon	4-hour drive	1	< 1	1 - 2	2 - 3	0	8

Note. Data courtesy of the MAG-12 Distribution Management Office (DMO).

As shown in Table 1, most parts over the past three years for Joint Exercise Cobra Gold arrived from MCAS Iwakuni, Japan, to Bangkok within one day and then remained in the customs pipeline for 2–7 days because of the approximately 18 different RTAF members, RTAF airport customs personnel, or U.S. embassy GSO (operated by Foreign Service Nationals) who must approve and route the paperwork and parts. They move at their own speed. Because a large amount of work is completed behind the scenes by U.S. log cell officers, the customs process currently employed may possibly be as streamlined as it can get, but it's far from perfect. Two U.S. military members manage the customs requirements for the entire joint task force and receive shipments from across Asia and the U.S. There is no interaction between this U.S. log cell, the Thai Customs Department, and the RTAF except through the carrier—DHL or FedEx. However, the responsibilities of the U.S. log cell officer(s) are described as follows:

1. serve as a conduit between the commercial carriers and JUSMAGTHAI,
2. pre-clear shipments via e-mail in order to expedite shipments,
3. 3) work closely with Thai military and Thai Customs officials for cargo clearance, and
4. be familiar with aircraft material and be able to speak intelligently when describing the function of inbound material.

The U.S. log cell never physically sees or touches any parts/gear; the parts/gear remain in a bonded warehouse at the freeport area of the airport until all paperwork is signed. The gear/parts are not released from the airport until the 18 customs agents located at the Bangkok airport, GSO, or JUSMAGTHAI have processed the paperwork.

The accuracy of shipping documentation is an important factor in expediting the customs process. A Thai military official and a U.S. military official will certify all shipments arriving in support of the exercise. Thai Customs requires a detailed packing list of all shipments, including the items' composition, intended use, and users. Additionally, sustainment shipments must be coordinated with the Thai Customs log cell to alleviate the documentation process. A brief breakdown of the shipping and customs process and time line is provided here:

1. The shipper arranges with their respective shipping agency for shipment of items using the Cobra Gold Commercial Carrier (Day 1).
2. The shipping agency then notifies the Thai Customs log cell of the shipment and must fax or e-mail the documentation to the customs log cell. Thai Customs authorities require original documents for all shipments. The customs log cell will complete this requirement (Day 1).
3. Once the Thai Customs log cell receives the documents from the shipper, an exemption letter is generated and signed by the customs log cell and a Thai military counterpart. This letter may be delivered to the Thai military counterpart via the courier (Days 2–4).
4. The exemption letter is then given to the commercial carrier to clear customs. The commercial carrier provides the exemption letter, airway bill, and packing list, in English, to the Thai Customs authority to clear customs (Days 2–4). This process can take place while the shipment is in transit.
5. If the process is completed correctly, the customs authority immediately releases the shipment once it arrives and the carrier forwards it to its final destination (Days 2–7). Shipments of high-value items are assessed a fee. The carriers add this fee to the overall shipping cost.
6. Shipments with a value of less than U.S.$1,200 are processed for tax exempt status and incur the customs tax fee. These fees are extremely small (pennies on the dollar) and result in immediate delivery of those shipments.

As is captured in Figure 7, the process is lengthy, with many steps to completion. Thailand and the U.S. seem to be postured for a long allied partnership in the region, but logistics-specific negotiations must continue to press the degree of ineffectiveness and inefficiency of the current inbound system. Joint force readiness is ultimately at the mercy of how the customs system honors the United States' need for increased speed and overall throughput of all assets. Currently, there is much to be desired in the working relationship, diplomacy, and logistics throughput for joint exercises in the Kingdom of Thailand.

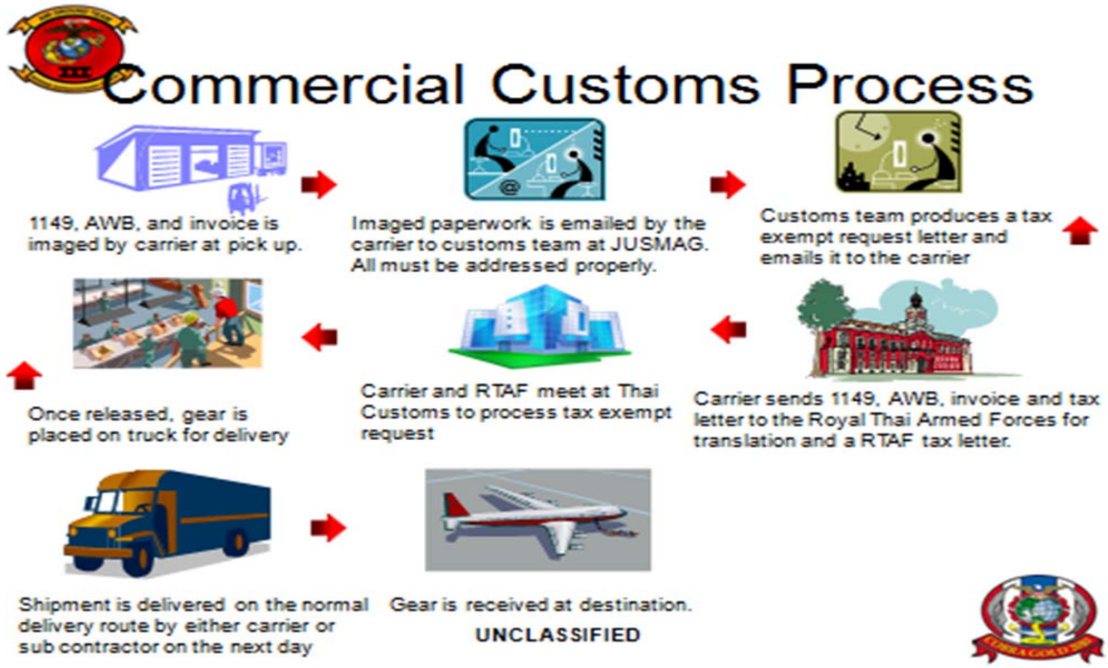

Figure 7. Customs Process of GSO & JUSMAGTHAI, Bangkok
(Courtesy of JUSMAGTHAI staff)

C. AUSTRALIA

Although Australian customs requirements are the most stringent of all USPACOM-allied countries, they are reasonably effective in processing U.S. assets through their checkpoints, as well as dealing with the tyranny of distance between MALS-12 in Japan, and the distance between the port of entry (Darwin, Townsville, or Rockhampton) and the actual joint exercise site.

As is displayed in Table 2, three to six days for Exercises Southern Frontier, Talisman Saber, and Pitch Black is still unacceptable for a commercially shipped item from Japan, but when considering that all items shipped from Japan to joint exercises in Australia travel on average a total distance of over 6,000 miles and are processed through several different hubs on a long journey of trucks and planes, it is perhaps a reasonable time frame. However, the planes, trucks, and commercial carrier are not the issue. The lengthy customs process still could be improved upon.

Table 2. Summary of Distance and TRR to Exercise Southern Frontier/Talisman Saber

Joint Exercise	Joint Exercise Location	Customs Department Location	Customs Department Distance from Exercise Location	Avg. time to arrive from Iwakuni to Host-Country Customs (days)	Avg. time parts spent in Customs Department (days)	TRR Commercial (days)	TRR MilAir (days)	Avg. # parts shipped commercially past 3 years	Avg. # parts shipped MilAir past 3 years
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Foal Eagle	Yongsan	Seoul/Inchon	4-hour drive	1	< 1	1 - 2	2 - 3	0	8

Note. Data courtesy of the MAG-12 DMO.

Each customs department has its own process and number of host-nation personnel involved in the often-cumbersome clearance process. For starters, an Australian broker/shipping agent is required to lodge a quarantine entry for goods processing of equipment and inbound U.S. assets. A manifest of cargo must be supplied to the Australian Quarantine Inspection Service (AQIS) and the shipper's Australian broker/shipping agent prior to cargo arriving in Australia. To avoid delays, the lists need to be complete, legible, and accurate and contain a full description of the goods with estimated costs of the goods; NATO or defense stock numbers by themselves are not sufficient. Accurate and detailed manifests ensure the efficient clearance of cargo. Accuracy and legibility of paperwork is the key to ensuring the quickest throughput of items through Australian customs.

The earlier the cargo manifest is reported, the quicker clearance can be obtained. If the U.S. military employs the services of a customs broker, bureau, or cargo reporter to report their cargo, goods are reported in the Integrated Cargo System (ICS). U.S. Customs and Border Protection legislation requires that goods be formally entered unless specifically exempted. There is no provision in the legislation that allows for goods owned by the U.S. military to be exempt from the legislative requirements. The Australian Customs Tariff Act of 1995, under Item 4, Schedule 4, allows for the duty- and tax-free entry of goods that are

1. owned by the government of another country,
2. for the official use of that government and not to be used for the purposes of trade, and
3. required in accordance with an arrangement or agreement between the Australian government and the government of that other country.

These goods to be imported will be entered on an import declaration. The goods should be described as "Military equipment for the use of U.S. armed forces." Unless arrangements are in place to report military cargo electronically, the Australian Customs Bureau (ACB) will continue to allow military cargo to be reported on paper manifests. A legible cargo manifest, containing a full description of goods (not part numbers or inventory numbers), will be submitted to the ACB prior to arrival at the first port of entry, and, at a minimum, a copy should be on board at the first port of entry. Lastly, cargo manifests need to be detailed, not just generalized, and are subject to risk assessment and examination at any time.

Goods arriving into Australia on a temporary basis may also be imported under Section 162 of the Act, which allows for a duty- and tax-free entry of goods. Where a temporary importation under Section 162 is utilized, an import declaration that lists every cargo item is required. A cash security and a bank guarantee are also required to cover the duty.

The Australian military is one of the staunchest advocates and strong players alongside the U.S. in FFP in the USPACOM region. Although they employ stringent customs practices that do not facilitate optimal joint military readiness for their exercises, they continue to be willing to adapt to change and maintain a strong rapport with the U.S. government and military.

D. THE PHILIPPINES

The Filipino customs system is very similar to the system in Thailand. All of the same organically capable agencies are present and functional; however, the customs processes encompass only 11 total personnel (as opposed to 18 in Thailand) and three buildings located closely together in the same area of Manila. Transit time and other business practices are streamlined because of the proximity between offices (because most documents are routed as hard copies and not via e-mail) and continued effective communication. All of this contributes to a shorter logistics throughput lag-time than currently present in Bangkok, Thailand. Table 3 provides a breakdown of the logistics life-cycle dynamic for Joint Exercise PHIBLEX or Balikatan (Philippines) for 2008–2011.

Table 3. **Summary of Distance and TRR to Exercise Balikatan/PHIBLEX**

Joint Exercise	Joint Exercise Location	Customs Department Location	Customs Department Distance from Exercise Location	Avg. time to arrive from Iwakuni to Host-Country Customs (days)	Avg. time parts spent in Customs Department (days)	TRR Commercial (days)	TRR MilAir (days)	Avg. # parts shipped commercially past 3 years	Avg. # parts shipped MilAir past 3 years
Cobra Gold	Khorat/Utapao, Thailand	Bangkok	4-hour drive	1	3 - 6	4 - 7	2 - 4	23	39
Southern Frontier/Talisman Sabre/Pitch Black	Tindal/Rock Hampton, Australia	Cairns/Darwin	3-hour flight	1.5	3 - 6	4 - 8	3 - 5	99	31
Balikatan/PHIBLEX	Taguig City, Philippines	Manila, Philippines	1/2 hour drive	1	2 - 4	3 - 5	2 - 3	9	29
Foal Eagle	Yongsan	Seoul/Inchon	4-hour drive	1	< 1	1 - 2	2 - 3	0	8

Note. Data courtesy of the MAG-12 DMO.

All equipment that arrives from another country via commercial air or sea to the Philippines requires clearance from the customs department of the Filipino government. The breakdown of delays and TRR is displayed in Table 3. Military cargo coming on military sea or air components does not require customs clearance. Customs clearance packages are generated, processed, and sent to the Department of Foreign Affairs for clearance by the staff at the U.S. transportation unit on the U.S. embassy compound working in conjunction with host-country officials.

For customs packages, the minimum amount of paperwork required for each shipment includes the following:

1. certificate of tax exemption form (CTE),
2. packing/inventory list,
3. bill of lading (or airway bill),
4. broker authorization form, and
5. certificate of guarantee (for air shipment only).

From the time the U.S. officials receive both the shipment inventory and the bill of lading, it takes on average two to four work days to generate a complete package for routing to the Defense Finance Agency and, subsequently, deliver to the U.S. unit in-country. The paperwork flow within the Filipino government can be very rigid and slow at times, but it is well organized and all communication lines are open. Specifically, many of the local customs representatives and GSO foreign-service nationals have been working together for years, and obvious continuity and strong working relationships exist. However, challenges persist that could be improved upon to increase the overall timeliness of the arrival of assets that are shipped from Japan to the Philippines.

It is absolutely essential that required paperwork arrives to the U.S. embassy GSO as soon as a requirement is realized for a joint exercise in order to ensure the process (shown in Figure 8) is as expeditious as possible.

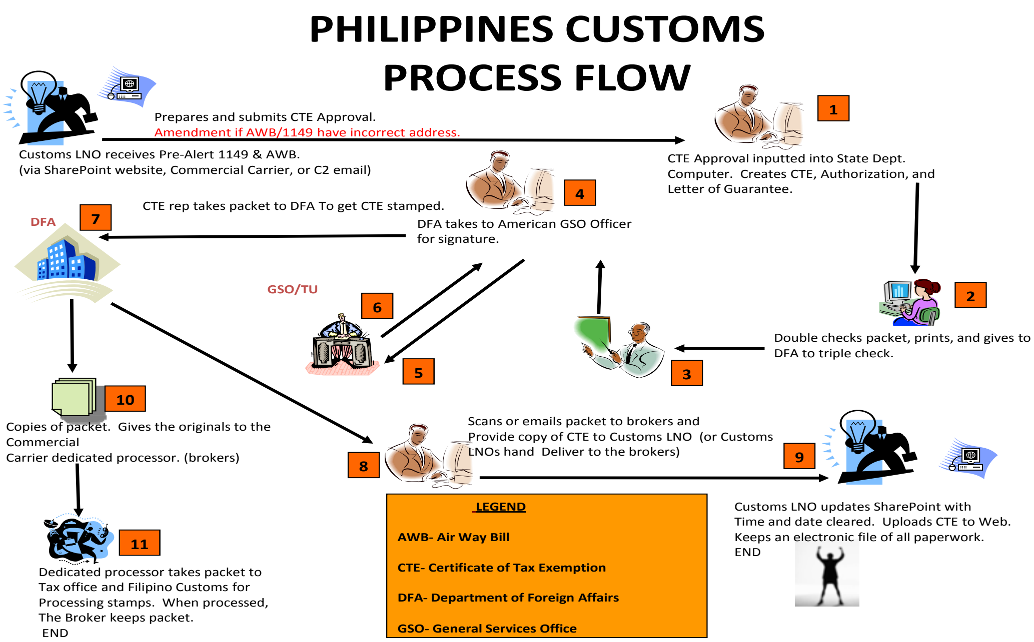

Figure 8. Customs Process at JUSMAGPHIL, Manila
(Courtesy of JUSMAGPHIL staff via personal communication)

The most common problem that Filipino customs officials witness on a daily basis is the wrong address, which occurs 50% of the time. The second most common problem realized is the lack of advanced documentation, which occurs about 40% of the time. The third most common problem is the wrong or incomplete description of the item, which occurs about 10% of the time. If the GSO is provided advanced notice of an incorrect bill of lading address, it can fix the problem before the shipment arrives. Once the shipment arrives, if the address is incorrect, the GSO is required to submit a change of address request to customs, via the Department of Foreign Affairs, which could add another 3–5 days to the processing time.

E. COMBINED CUSTOMS ANALYSIS OF THAILAND, AUSTRALIA, AND THE PHILIPPINES

To understand these dynamics, it is essential to understand how long items typically would take to arrive in Thailand, Australia, or the Philippines if SOFAs were non-existent and U.S. personnel were not stationed in-country to expedite the process. The total process would take nearly 20 days for a part to arrive to the Philippines, for example, if there were not already SOFAs in place requiring U.S. and host-country cooperation to meet the requirements and prerequisites from both countries. The customs departments of these countries process nearly 10,000 items annually. That is an average of 27 items a day—a lot of paper shuffling to ensure that many hundreds of different boxes and forms are completely filled in, and most importantly, filled in correctly. The system is better off with SOFAs having now been in place for several years. However, there is always room for improvement. This invites all the more reason to research viable alternatives to repair the current host-country customs departments' in-processing time of U.S. assets.

F. STRATEGIC CONSIDERATIONS SPECIFIC TO CUSTOMS CHALLENGES

When U.S. Marines go to the rifle range annually, they train to improve so that if in combat, they are best prepared to react and employ their rifle in a timely and effective manner. They typically realize their deficiencies on the first day of familiarization firing and work expeditiously to fine-tune their muscle memory, improve their effectiveness, and gain greater competency with their weapon over the course of the one- to two-week training period. They are attempting to improve over that period—not just get by and survive the training. That is the purpose of training at the micro level at a USMC rifle range, just as it is at the macro level. For instance, during each joint exercise conducted in any U.S.-allied country in the USPACOM, the staffs within the customs departments should work and train to improve their processes, and not view the increased logistics footprint during an exercise as solely an increase in workload. The customs staff should view these exercises as an opportunity to train and increase the speed at which items are processed.

Each foreign customs department has its policies in place to govern how it processes inbound or outbound items. Each local JUSMAG has policies that govern their customs-specific function. Each GSO also has its standard operating procedures to follow to in-process foreign items. None of these systems, however, has a set maximum time frame to process items, and therefore, there is little accountability or incentive to improve. This mindset must change if increased throughput will ever occur. Because of the strategic implications of poor logistics throughput, each allied country should work to improve all joint logistics processes in order to support conflict within their respective borders.

If China is rapidly gaining ground economically and militarily in the USPACOM region, and if allied countries wish to continue to rely heavily on the U.S. for FFP as a deterrent for China and other smaller threats, then the host-country customs barriers should be minimal for inbound and outbound critical U.S. assets affecting joint military readiness—not only for the short durations necessary for annual joint exercises but also for every day throughout the year, if needed, in preparation for a larger conflict. Host-country customs policies should, however, obviously remain firm with regard to all other routine and ordinary commercial items (i.e., civilian non-DoD commercial shipments), personnel, or gear that arrive in-country, but hard-line SOFA policy negotiations must change and loosen the bottleneck realized whenever a U.S. asset is shipped commercially to an allied country. The U.S. is simply too effective and efficient (through employment of commercial carriers) otherwise to be penalized and experience days-on-end delays waiting for an asset to clear each host country's customs pipeline, especially when the asset most likely arrived at the allied country in less than one day. Time is money, and the U.S. is spending funding inefficiently and decreasing readiness each day an asset goes through the respective customs pipeline. All allied host countries must, in other words, take a more diligent "help us help you" approach to support the efforts of the U.S. to conduct FFP measures and experience increased joint force readiness through fully optimal increased logistics throughput.

If hard-line negotiations fail to achieve abolishment of customs processing at the point of entry in a host country, then a separate approach would still be an improvement from each country's current system. For example, a process similar to what occurs during an AQIS inspection could be implemented. For this inspection, which occurs aboard MCAS Iwakuni, Japan, annually about a month before the first fly day of Exercise Southern Frontier, Pitch Black, or Talisman Sabre, a team of Australian customs agents are flown to the point of debarkation/origin (MCAS Iwakuni) to pre-inspect larger bulk items that will be shipped via commercial black-bottom boat or commercial air. The main purpose of the AQIS customs inspection of large gear and ammo before arrival in Australia is to pre-clear all U.S. assets and, therefore, facilitate a quick and eventless offload of all items upon arrival to any of the three ports for these three exercises. If, for instance, the Thai, Filipino, and Australian governments could approach the shipment of individual assets in the same manner, money, time, and, therefore, military readiness would be spared on the back-end because each item would be cleared for immediate delivery upon arrival in a host country. Specifically, consideration should be given to the cost of sending an RTAF member and Thai GSO representative temporarily assigned on duty to MCAS Iwakuni, Japan, for the two- to three-week duration of annual Joint Exercise Cobra Gold to perform pre-clear functions that would otherwise have to be performed in Thailand. The cost of sending these representatives is probably not as high as the cost to have a U.S. F/A-18 aircraft NMC on the deck in Khorat or U'Tapao, Thailand, for days if the part were shipped per the current commercial and host-country customs system.

To show this, in the next chapter (Chapter VI, Supply Chain in the USPACOM), we dissect the fiscal viability of each of these options to show the added efficiency and effectiveness if host-country systems were to implement policy amendments and change their organizational behavior.

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VI. SUPPLY CHAIN IN THE USPACOM

Representing the data collection stage of the BCA relevant primarily to the pull-type methodology, in this chapter, we identify the range of data that will be necessary to complete the analysis and classify that data into categories (cost and performance) for analysis in follow-on chapters. We estimate any data that is not available and describe the approach to that estimation. For clarity, we further normalize all data and scrutinize it for accuracy. Data normalization ensures that "apples are being compared to apples" (DAU, 2011).

During the Internet boom, retailers and manufacturers of consumer-packaged goods began talking about a new kind of demand-driven supply chain. Rather than build product based on historical forecasts, load up a warehouse, and then push product out to the marketplace, savvy supply chain managers would capture real-time demand from point-of-sale systems and cash registers and use the emerging supply chain planning and management tools to make products according to demand: sell one, make one. If a company could really capture what its customers were buying, less excess inventory would pile up in warehouses. Maintaining and operating an aircraft—especially one as complicated as a military fighter jet—is obviously more complicated than packaging common food items or manufacturing military combat boots. So much of what is repaired is unplanned, and so much of what is shipped is unanticipated, and that makes it hard to plan and achieve a directed mission capable readiness goal. What is more, there is no check-out counter next to a maintenance hangar to capture demand. Worse yet, the consequences of having an aircraft on the ground because of a stock-out are greater than Wal-Mart running short on food on a Friday night or a military warehouse running short on spare boots in garrison.

As mentioned previously in the Strategic and Operational Scenarios chapter, aside from ensuring that the United States' number one asset—Service members—is secure and safe, fighter jets prepositioned abroad in the USPACOM represent an extremely critical asset with respect to FFP. Aside from, and excusing, the extreme fiscal obligations, these jets must be maintained in peak condition for flight safety purposes and to satisfy the United States' national strategic objective of FFP in the USPACOM region. How are these elite aircraft sustained and flying squadrons supported at peak levels? The primary method is currently parts transport via the KC-130J "Super Hercules" of VMGR-152 across the vast area of the Pacific region.

As mentioned earlier in the problem statement of this project, VMGR-152 is the sole USMC KC-130 squadron supporting Marine forces in the Pacific. These 12 large and unique heavy-lift transport aircraft are charged with "supporting the Marine Air-Ground Task Force (MAGTF) Commander by providing aerial refueling and assault support, day or night under all weather conditions, during expeditionary, joint, or combined operations" (USMC, 2012). Flight data for each leg of flight are recorded and tracked via the M-SHARP. Each leg of each flight is documented, and the contents/purpose of each flight is captured within the system. Table 4 provides a snapshot of the total poundage and frequency of cargo moved from 2008–2011.

Table 4. Summary of Cargo Moved via MilAir

Joint Exercise	Joint Exercise Location	Number of Flights Past 3 Years	Total Cargo Moved Past 3 Years (lbs)
Cobra Gold	Khorat/Utapao, Thailand	13	315262
Southern Frontier/Talisman Sabre/Pitch Black	Tindal/Rock Hampton, Australia	3	49030
Balikatan/PHIBLEX	Taguig City, Philippines	7	68800
Foal Eagle	Yongsan	8	105763

Note. Data obtained from the M-SHARP.

VII. DATA ANALYSIS

In reference to the evaluation analysis stage of the BCA, in this chapter we use the data collected in the second stage (Data Collection) of the BCA and begin the applicable calculations using both quantitative and qualitative data. We compare each scenario against the other to determine which alternative has the lowest cost and the best performance. We then identify an optimal combination of low cost and high performance to find the best value alternative. Additionally, we conduct a risk and sensitivity analysis, identify potential risks, and determine ways of mitigating those risks. Specifically, the sensitivity analysis section determines the effect that changes in particular inputs and constraints will have on the analysis (for example, changes in fuel costs or lower costs of the new alternative may change the solution; DAU, 2011).

A. UTILIZATION OF MONTE CARLO SIMULATION

In an attempt to more fully capture the costs incurred by both commercial and MilAir shipping methods, we considered the delays in both of these shipping methods in this study. However, some values for variables in this study were not available. Therefore, we used a simulation technique (Monte Carlo) to determine costs associated with both host-country customs and overall TRR delays in shipping. We utilized Crystal Ball (a Microsoft Excel application) to run 10,000 trials of the relevant scenarios.

Table 5. Summary of Customs and TRR Delays

Joint Exercise	Joint Exercise Location	Avg. time parts spent in Customs Department (days)	TRR Commercial (days)	TRR MilAir (days)	Annual Avg. # parts shipped commercially past 3 years	Annual Avg. # parts shipped MilAir past 3 years	Cost of parts shipped commercially past 3 years
Cobra Gold	Khorat/Utapao, Thailand	3 - 6	4 - 7	2 - 4	23	39	$ 16,940.25
Southern Frontier/Talisman Sabre/Pitch Black	Tindal/Rock Hampton, Australia	3 - 6	4 - 8	3 - 5	99	31	$ 831,612.96
Balikatan/PHIBLEX	Taguig City, Philippines	2 - 4	3 - 5	2 - 3	9	29	$ 1,552.35
Foal Eagle	Yongsan	< 1	1 - 2	2 - 3	0	8	$ -

Note. Data courtesy of the MAG-12 DMO.

The highlighted cells in Table 5 represent the three variables that held significant variance from the data provided by the DMO. The DMO was unable to provide data down to "single part" specificity; therefore, in this study, we used a triangular distribution for

- average time parts spent in the customs department,
- TRR commercial, and
- TRR MilAir.

We used a triangular distribution as a result of multiple discussions with the DMO, which established the shortest, average, and longest delays for each country. As an example, and in reference to historical data presented in previous chapters, it is known that the TRR window for a commercially delivered part from Iwakuni, Japan, to Khorat, Thailand, is 4-7 days.

The next variable we derived is the annual costs of shipping parts commercially and via MilAir. The DMO was unable to provide single part data but was able to provide the average number of parts shipped per year, as shown in Table 5. Important to note is that the number of parts shipped is an annual number and can simply be multiplied by 3 to derive the total number of parts shipped for the previous three years. We then multiplied the number of parts shipped by the average cost of shipping those parts commercially for each year. The MilAir shipping costs are slightly more involved to derive.

Using the average number of parts shipped via MilAir is only part of the necessary equation. The weight of the parts is also needed. We made an assumed distribution with respect to the frequency in which various F/A-18 parts of various weights are shipped. The DMO was able to provide weight and dimensions of the heaviest F/A-18 part that is shipped. This part is the horizontal stabilizer, which weighs approximately 1,200 lbs and is transportable by the KC-130J. It is important to note that an F/A-18's engine is heavier, but unique shipping requirements and regulations preclude it from being included in this study. As a result of discussions with the DMO, we used the following weights (with their respective probabilities) to establish the assumed distribution: 1 lb (20%), 5 lbs (20%), 20 lbs (50%), 500 lbs (5%), and 1,200 lbs (5%).

Using the M-SHARP, we pulled all VMGR-152 KC-130J flight records for the periods covering each of the four exercises. From this data, we found the total number of flights and cargo loads for each exercise. In this study, we looked only at the flights taking cargo to the exercise destinations and did not factor the costs of return flights. We used straight-line distances and a cruising speed of 350 knots to calculate total flight hours to each exercise's location. We then used a per-flight hour rate of $5,000 in calculating the KC-130J costs. This rate accounts for fuel costs only and does not necessarily capture the full cost of operating/maintaining the KC-130J. We viewed the additional operating costs (e.g., salaries of aircrew, maintenance hours/flight hours) as sunk costs.

Table 6 shows the breakdown of the flights and cargo to each exercise. We used a further breakdown of the total cargo and total costs to derive the per-pound costs. By multiplying this per-pound cost by the expected weight of an F/A-18 part (distributed as discussed in the previous paragraph), we achieved the annual cost of moving said parts via KC-130J. These costs reflect the per-pound rate that is being incurred to ship parts via MilAir. An interesting observation, however, is that nearly all the flights observed carried significantly less than their full capacity of 55,000 lbs. We discuss this aspect further in Chapter VIII.

Table 6. Summary of MilAir Cargo/Costs

Joint Exercise	Joint Exercise Location	Number of Flgihts Past 3 Years	Cost of Flights Past 3 Years	Total Cargo Moved Past 3 Years (lbs)	Per Pound Costs of Cargo Moved
Cobra Gold	Khorat/Utapao, Thailand	13	$371,428.57	315262	$1.18
Southern Frontier/Talisman Sabre/Pitch Black	Tindal/Rock Hampton, Australia	3	$124,285.71	49030	$2.53
Balikatan/PHIBLEX	Taguig City, Philippines	7	$130,000.00	68800	$1.89
Foal Eagle	Yongsan	8	$34,285.71	105763	$0.32

Note. Data courtesy of the MAG-12 DMO.

The third area of costs involves the TAD costs of personnel at the four exercise locations. The TAD cost calculations assume the full per diem rate and that the average size of an F/A-18 maintenance department is around 170 Marines (these are the Marines whose primary job is to perform maintenance on aircraft). TAD pay is at a flat rate, regardless of rank, which makes it easy to apply to the 170 Marines. Using the TAD rates, we established a daily cost of TAD by exercise location and year for the 170 Marines (see Table 7).

Table 7. Summary of TAD Costs
(Defense Travel Management Office, n.d.)

Joint Exercise	Joint Exercise Location	Daily TAD Costs of 170 Marines (2009)	Daily TAD Costs of 170 Marines (2010)	Daily TAD Costs of 170 Marines (2011)
Cobra Gold	Khorat/Utapao, Thailand	$18,893.71	$18,588.81	$18,020.00
Southern Frontier/Talisman Sabre/Pitch Black	Tindal/Rock Hampton, Australia	$37,430.94	$52,960.56	$62,900.00
Balikatan/PHIBLEX	Taguig City, Philippines	$33,509.61	$32,968.83	$31,960.00
Foal Eagle	Yongsan	$19,428.44	$22,096.13	$22,440.00

Using these daily TAD amounts, the next step calculated how much TAD is paid per available maintenance hour by dividing the 170 Marines into two 8-hour shifts, for a total of 1,360 hours per day. Using this number of maintenance hours per day, we established a per-hour-of-maintenance TAD rate. These rates represent 170 Marines who are "gainfully employed," meaning that they were able to perform maintenance hours for their entire 8-hour shift.

However, what if the 170 Marines cannot perform maintenance because they are awaiting parts? This question is at the crux of the TAD costs. To account for hours "lost" to customs and TRR delays, a 75% reduction of daily maintenance hours is applied for every day of delays. This means that for every day an aircraft part is delayed in shipping, the 170 Marines can only accomplish 25% of their daily tasks. Appling this reduction, the number of useful man hours becomes 340 among the 170 Marines.

While TAD is paid regardless of what Marines are doing in the location they are at, efforts should be made to maximize the efficiency of these dollars. By applying the reduction discussed previously, a sort of efficiency rating emerges that shows how much the daily TAD dollars are buying. Table 8 shows a side-by-side comparison of the daily costs of maintenance hours with and without the reduction (i.e., when parts are available versus when the Marines are awaiting parts). It is important to note that during the early stages of the exercises, these costs are more of a TAD efficiency measure rather than actual costs. However, if the delays occur at the end of an exercise and force maintainers to stay longer than planned at the exercise locations (in order to fix a downed aircraft), these costs may quickly become actual costs that can be directly attributed to customs and TRR delays.

Table 8. Summary of TAD Rates (Defense Travel Management Office, n.d.)

Joint Exercise	Joint Exercise Location	Daily TAD Costs/Hr of Maintenance w/o Delays (2009)	Daily TAD Costs/Hr of Maintenance w/ Delays (2009)	Daily TAD Costs/Hr of Maintenance w/o Delays (2010)	Daily TAD Costs/Hr of Maintenance w/ Delays (2010)	Daily TAD Costs/Hr of Maintenance w/o Delays (2011)	Daily TAD Costs/Hr of Maintenance w/ Delays (2011)
Cobra Gold	Khorat/Utapao, Thailand	$13.89	$55.57	$13.67	$54.67	$13.25	$53.00
Southern Frontier/Talisman Sabre/Pitch Black	Tindal/Rock Hampton, Australia	$27.52	$110.09	$38.94	$155.77	$46.25	$185.00
Balikatan/PHIBLEX	Taguig City, Philippines	$24.64	$98.56	$24.24	$96.97	$23.50	$94.00
Foal Eagle	Yongsan	$14.29	$57.14	$16.25	$64.99	$16.50	$66.00

B. BASELINE COSTS/ASSUMPTIONS

Using the costs and assumptions we discussed in the previous section, the Monte Carlo simulation provides total costs for each location over the three-year period. We discuss each location's results, which served as a baseline for our analysis, in the next section.

1. Cobra Gold/Cope Tiger—Thailand

Figures 9–13 and Tables 9–13 show the results of the Monte Carlo simulation for both commercial shipping costs and MilAir shipping costs. They include a breakdown of TAD costs as attributed to both customs delays and overall TRR delays. An average cost and a 90% certainty range are also provided for all forecasts. It should be noted that Crystal Ball is licensed for educational use by The Naval Postgraduate School and, therefore, all charts in this section contain the statement "Not for Commercial Use."

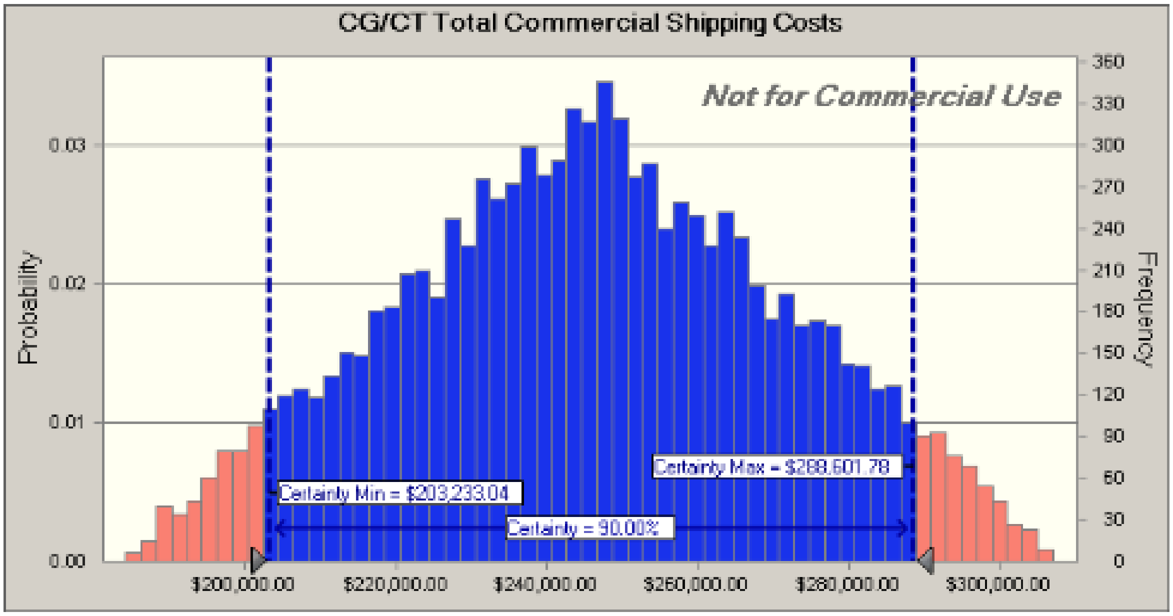

Figure 9. Cobra Gold/Cope Tiger Total Commercial Shipping Costs

Table 9. Cobra Gold/Cope Tiger Total Commercial Shipping Costs

Summary:

Certainty level is 90.00%	
Certainty range is $203,233.04 to $288,601.78	

Statistics:	Forecast values
Trials	10,000
Mean	$245,933.70
Standard Deviation	$25,353.13
Minimum	$184,282.22
Maximum	$306,942.64
Range Width	$122,660.42
Mean Std. Error	$253.53

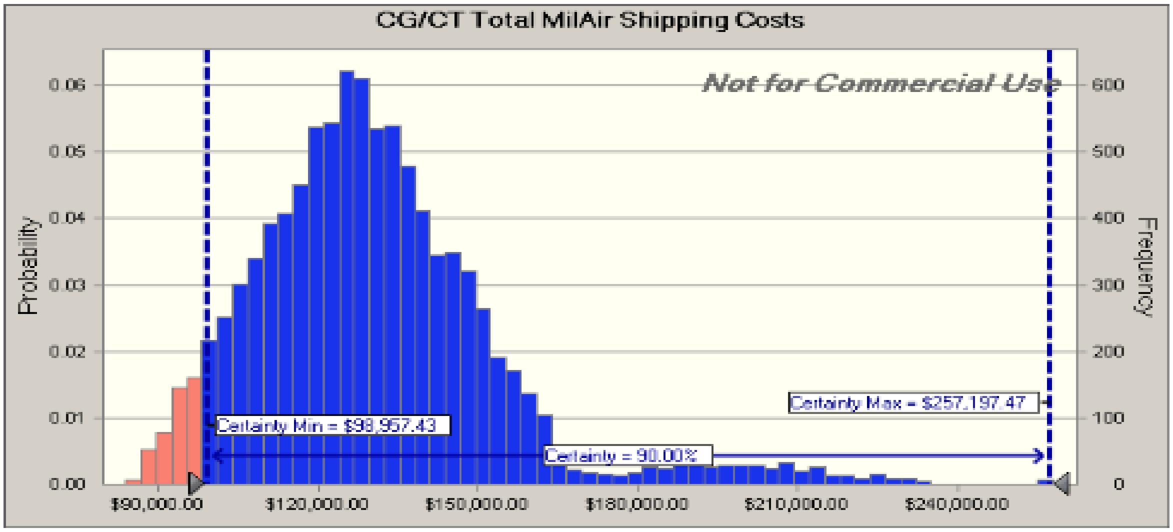

Figure 10. Cobra Gold/Cope Tiger Total MilAir Shipping Costs

Table 10. Cobra Gold/Cope Tiger Total MilAir Shipping Costs

Summary:

Certainty level is 90.00%
Certainty range is $98,957.43 to $257,197.47

Statistics:	Forecast values
Trials	10,000
Mean	$138,612.72
Standard Deviation	$42,541.77
Minimum	$83,940.03
Maximum	$332,855.77
Range Width	$248,915.75
Mean Std. Error	$425.42

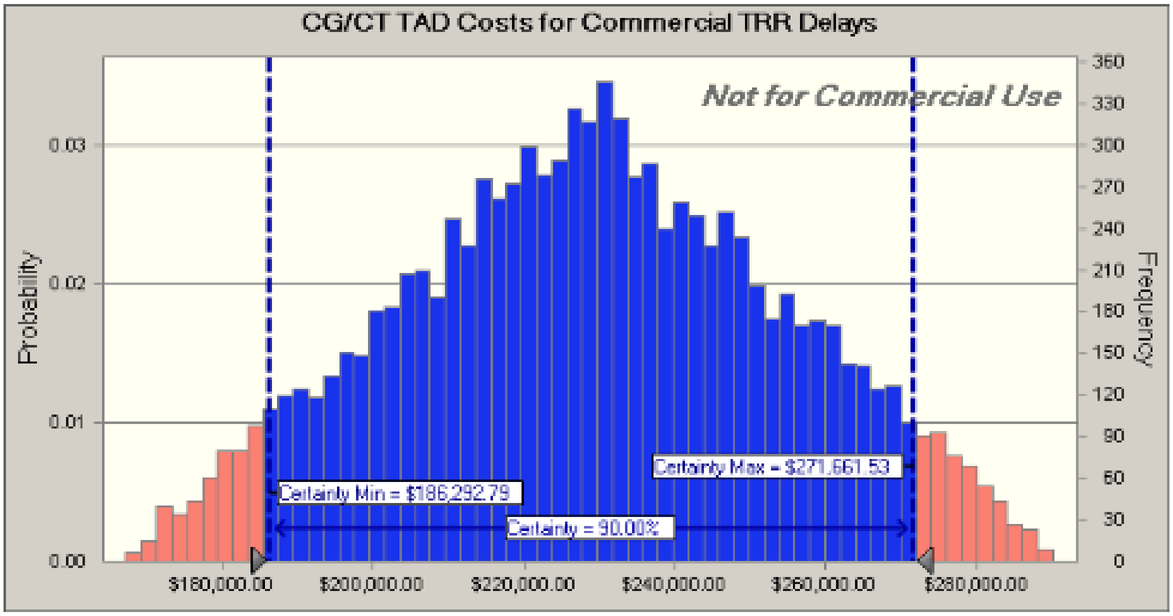

Figure 11. Cobra Gold/Cope Tiger TAD Costs for Commercial TRR Delays

Table 11. Cobra Gold/Cope Tiger TAD Costs for Commercial TRR Delays

Summary:

Certainty level is 90.00%	
Certainty range is $186,292.79 to $271,661.53	

Statistics:	Forecast values
Trials	10,000
Mean	$228,993.45
Standard Deviation	$25,353.13
Minimum	$167,341.97
Maximum	$290,002.39
Range Width	$122,660.42
Mean Std. Error	$253.53

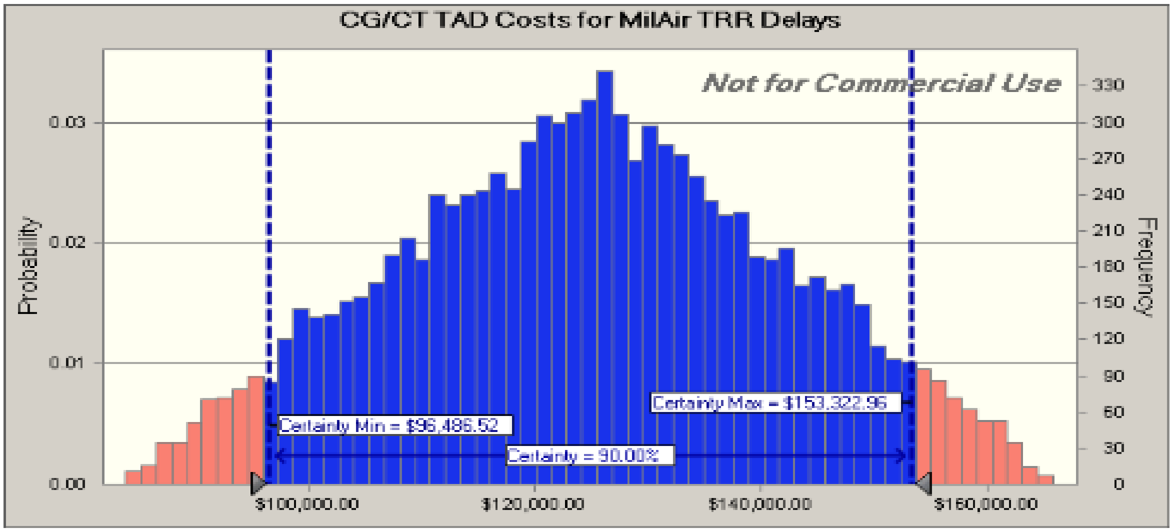

Figure 12. Cobra Gold/Cope Tiger TAD Costs for MilAir TRR Delays

Table 12. Cobra Gold/Cope Tiger TAD Costs for MilAir TRR Delays

Summary:

Certainty level is 90.00%
Certainty range is $96,486.52 to $153,322.96

Statistics:	Forecast values
Trials	10,000
Mean	$124,915.13
Standard Deviation	$16,959.12
Minimum	$83,798.50
Maximum	$165,782.13
Range Width	$81,983.62
Mean Std. Error	$169.59

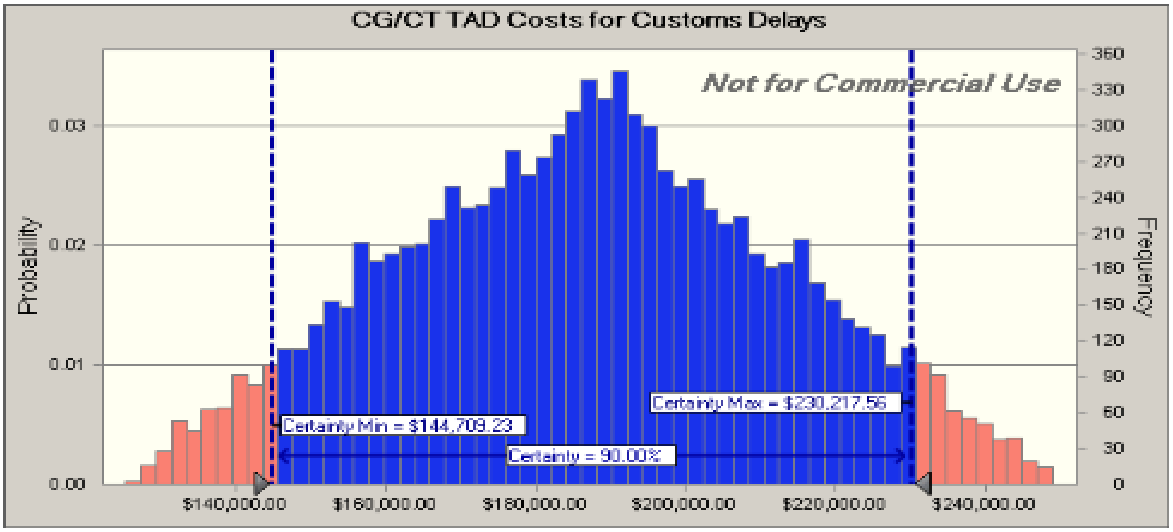

Figure 13. Cobra Gold/Cope Tiger TAD Costs for Customs Delays (Applies to Commercial Shipping Only)

Table 13. Cobra Gold/Cope Tiger TAD Costs for Customs Delays

Summary:

Certainty level is 90.00%
Certainty range is $144,709.23 to $230,217.56

Statistics:	Forecast values
Trials	10,000
Mean	$187,169.87
Standard Deviation	$25,488.62
Minimum	$125,309.94
Maximum	$248,948.46
Range Width	$123,638.52
Mean Std. Error	$254.89

2. Talisman Saber/Southern Frontier—Australia

Figures 14–18 and Tables 14–18 show the results of the Monte Carlo simulation for both commercial shipping costs and MilAir shipping costs. They include a breakdown of TAD costs as attributed to both customs delays and overall TRR delays. An average cost and a 90% certainty range is also provided for all forecasts.

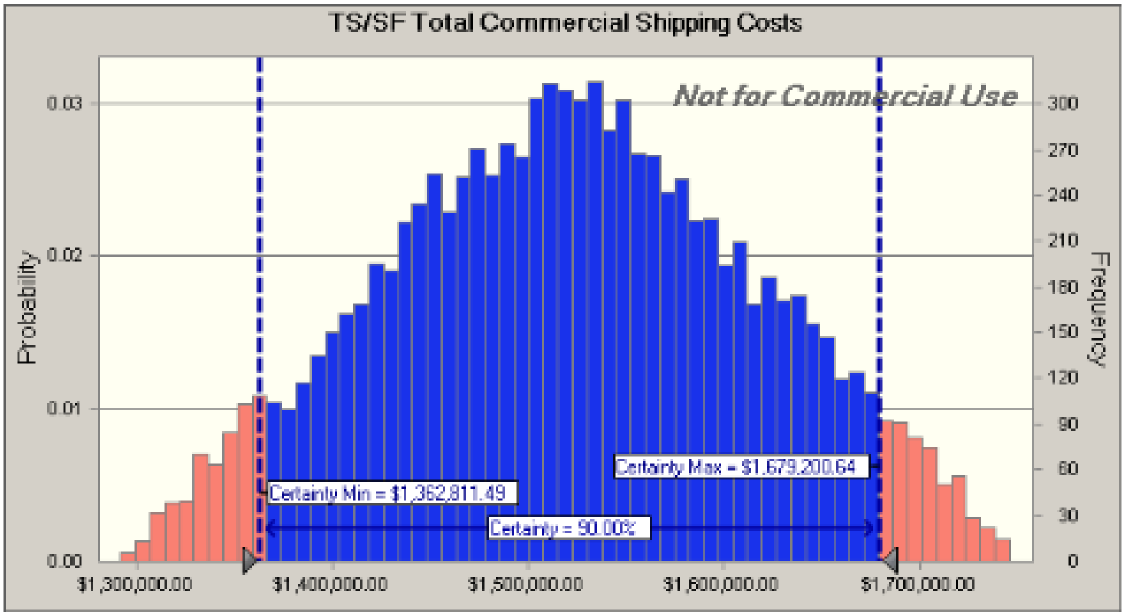

Figure 14. Talisman Saber/Southern Frontier Total Commercial Shipping Costs

Table 14. Talisman Saber/Southern Frontier Total Commercial Shipping Costs

Summary:
Certainty level is 90.00%
Certainty range is from $1,362,811.49 to $1,679,200.64

Statistics:	Forecast values
Trials	10,000
Mean	$1,521,514.60
Standard Deviation	$94,171.80
Minimum	$1,292,003.27
Maximum	$1,745,697.68
Range Width	$453,694.40
Mean Std. Error	$941.72

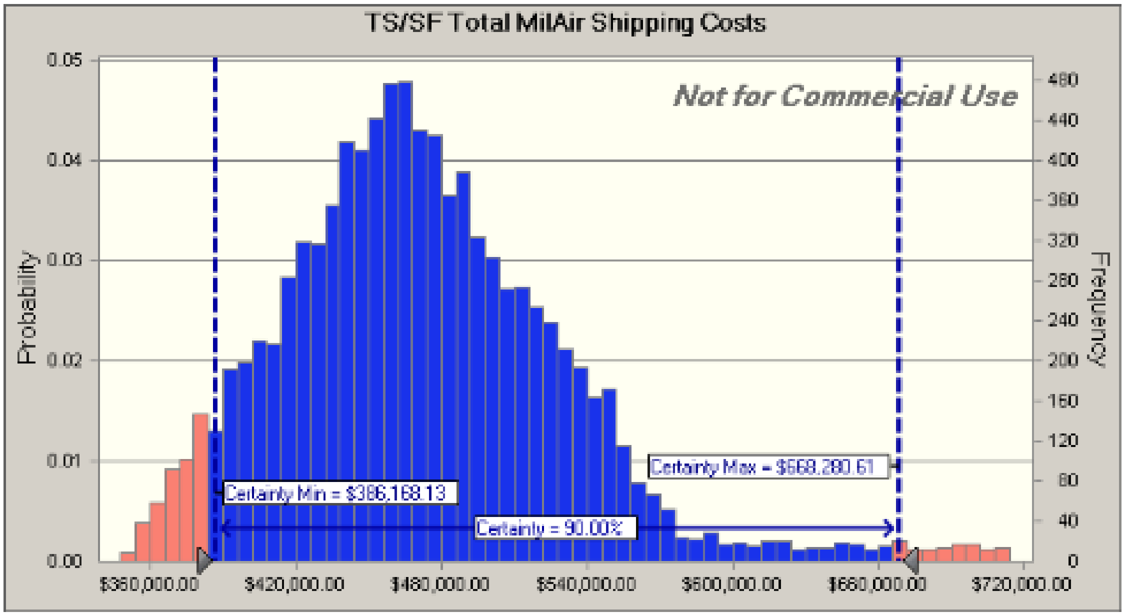

Figure 15. Talisman Saber/Southern Frontier Total MilAir Shipping Costs

Table 15. Talisman Saber/Southern Frontier Total MilAir Shipping Costs

Summary:
Certainty level is 90.00%
Certainty range is from $386,168.13 to $668,280.61

Statistics:	Forecast values
Trials	10,000
Mean	$484,037.12
Standard Deviation	$82,121.41
Minimum	$347,794.00
Maximum	$853,982.48
Range Width	$506,188.48
Mean Std. Error	$821.21

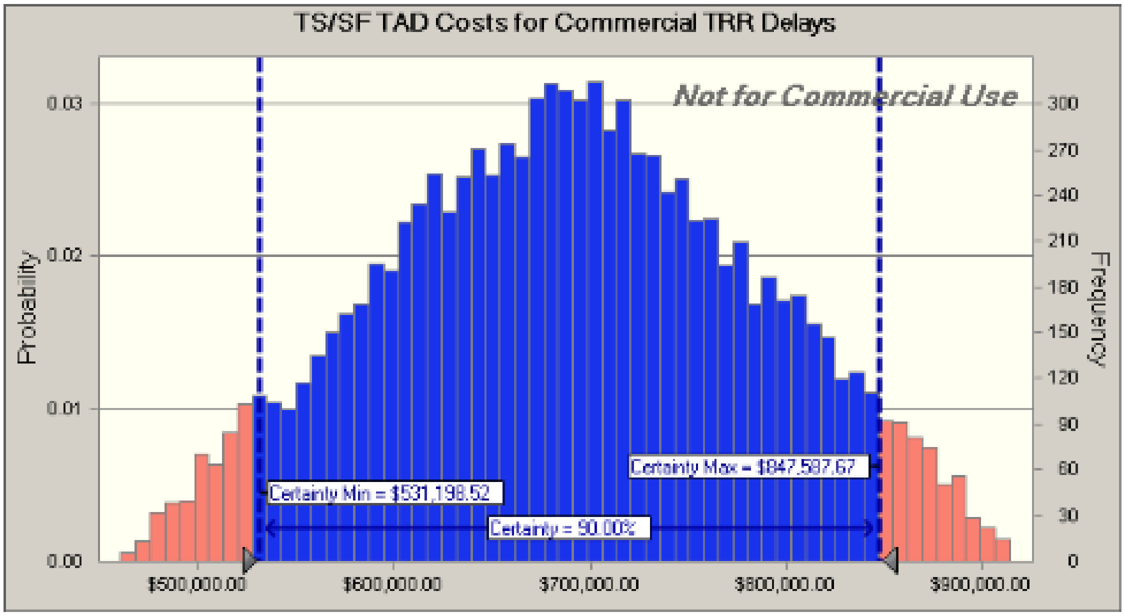

Figure 16. Talisman Saber/Southern Frontier TAD Costs for Commercial TRR Delays

Table 16. Talisman Saber/Southern Frontier TAD Costs for Commercial TRR Delays

Summary:	
Certainty level is 90.00%	
Certainty range is from $531,198.52 to $847,587.67	
Statistics:	Forecast values
Trials	10,000
Mean	$689,901.64
Standard Deviation	$94,171.80
Minimum	$460,390.31
Maximum	$914,084.71
Range Width	$453,694.40
Mean Std. Error	$941.72

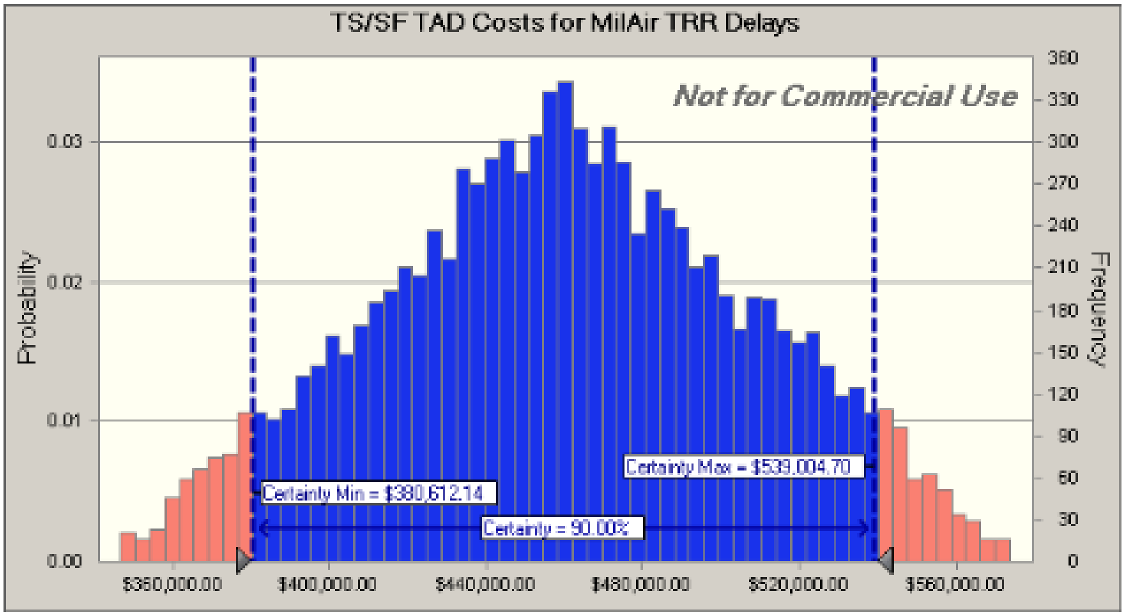

Figure 17. Talisman Saber/Southern Frontier TAD Costs for MilAir TRR Delays

Table 17. Talisman Saber/Southern Frontier TAD Costs for MilAir TRR Delays

Summary:
Certainty level is 90.00%
Certainty range is from $380,612.14 to $539,004.70

Statistics:	Forecast values
Trials	10,000
Mean	$460,213.63
Standard Deviation	$46,948.93
Minimum	$346,786.55
Maximum	$573,498.53
Range Width	$226,711.98
Mean Std. Error	$469.49

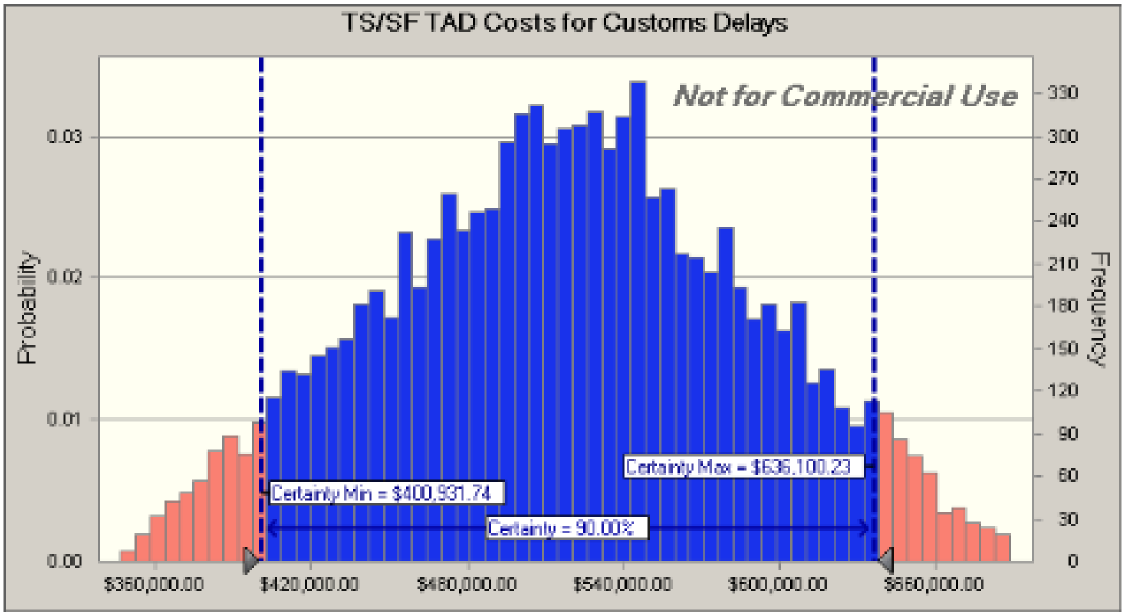

Figure 18. Talisman Saber/Southern Frontier TAD Costs for Customs Delays (Applies to Commercial Shipping Only)

Table 18. Talisman Saber/Southern Frontier TAD Costs for Customs Delays

Summary:
Certainty level is 90.00%
Certainty range is from $400,931.74 to $636,100.23

Statistics:	Forecast values
Trials	10,000
Mean	$517,896.27
Standard Deviation	$70,127.57
Minimum	$346,897.82
Maximum	$688,100.39
Range Width	$341,202.57
Mean Std. Error	$701.28

3. Balikatan/PHIBLEX—Philippines

Figures 19–23 and Tables 19–23 show the results of the Monte Carlo simulation for both commercial shipping costs and MilAir shipping costs. They include a breakdown of TAD costs as attributed to both customs delays and overall TRR delays. An average cost and a 90% certainty range are also provided for all forecasts.

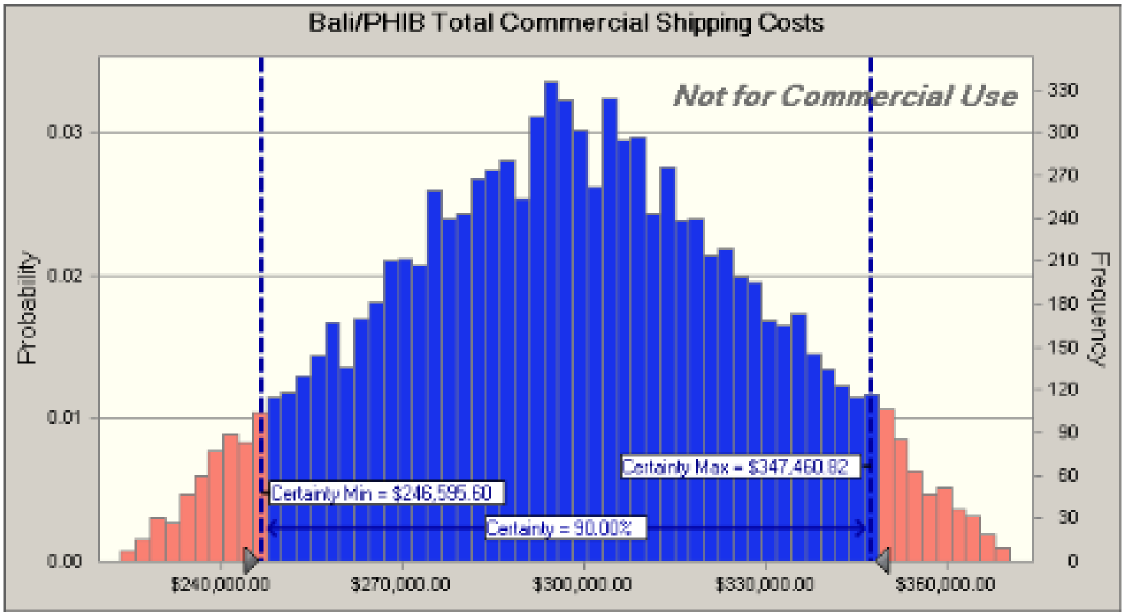

Figure 19. Balikatan/PHIBLEX Total Commercial Shipping Costs

Table 19. Balikatan/PHIBLEX Total Commercial Shipping Costs

Summary:
Certainty level is 90.00%
Certainty range is from $246,595.60 to $347,460.82

Statistics:	Forecast values
Trials	10,000
Mean	$297,281.17
Standard Deviation	$30,080.63
Minimum	$223,514.86
Maximum	$370,246.49
Range Width	$146,731.63
Mean Std. Error	$300.81

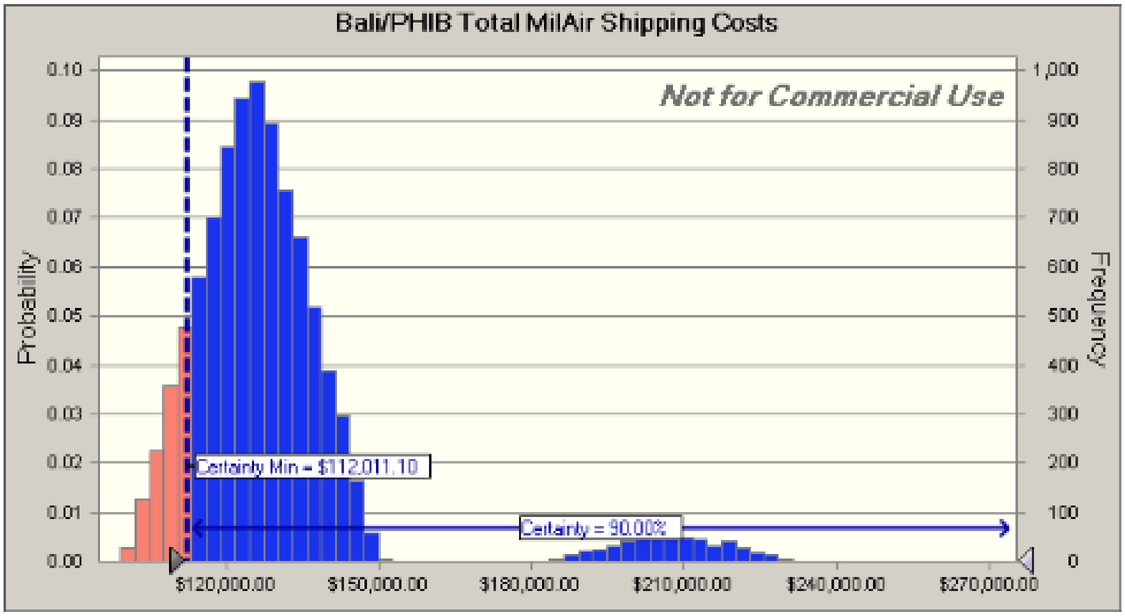

Figure 20. Balikatan/PHIBLEX Total MilAir Shipping Costs

Table 20. Balikatan/PHIBLEX Total MilAir Shipping Costs

Summary:
Certainty level is 90.00%
Certainty range is from $112,011.10 to Infinity

Statistics:	Forecast values
Trials	10,000
Mean	$139,086.76
Standard Deviation	$47,024.19
Minimum	$99,050.49
Maximum	$348,159.91
Range Width	$249,109.42
Mean Std. Error	$470.24

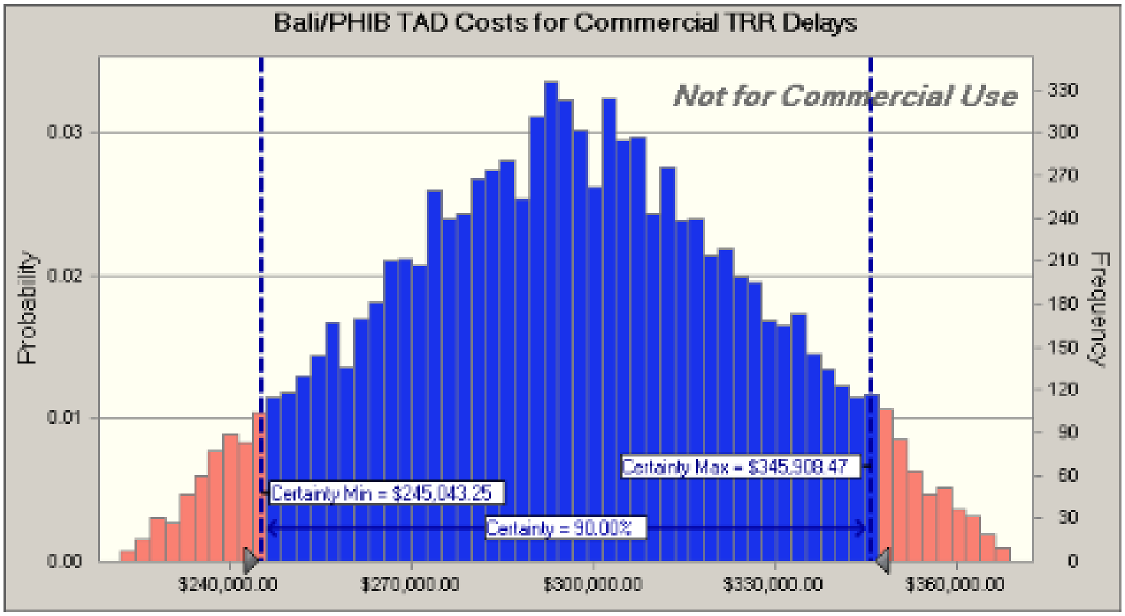

Figure 21. Balikatan/PHIBLEX TAD Costs for Commercial TRR Delays

Table 21. Balikatan/PHIBLEX TAD Costs for Commercial TRR Delays

Summary:
Certainty level is 90.00%
Certainty range is from $245,043.25 to $345,908.47

Statistics:	Forecast values
Trials	10,000
Mean	$295,728.82
Standard Deviation	$30,080.63
Minimum	$221,962.52
Maximum	$368,694.15
Range Width	$146,731.63
Mean Std. Error	$300.81

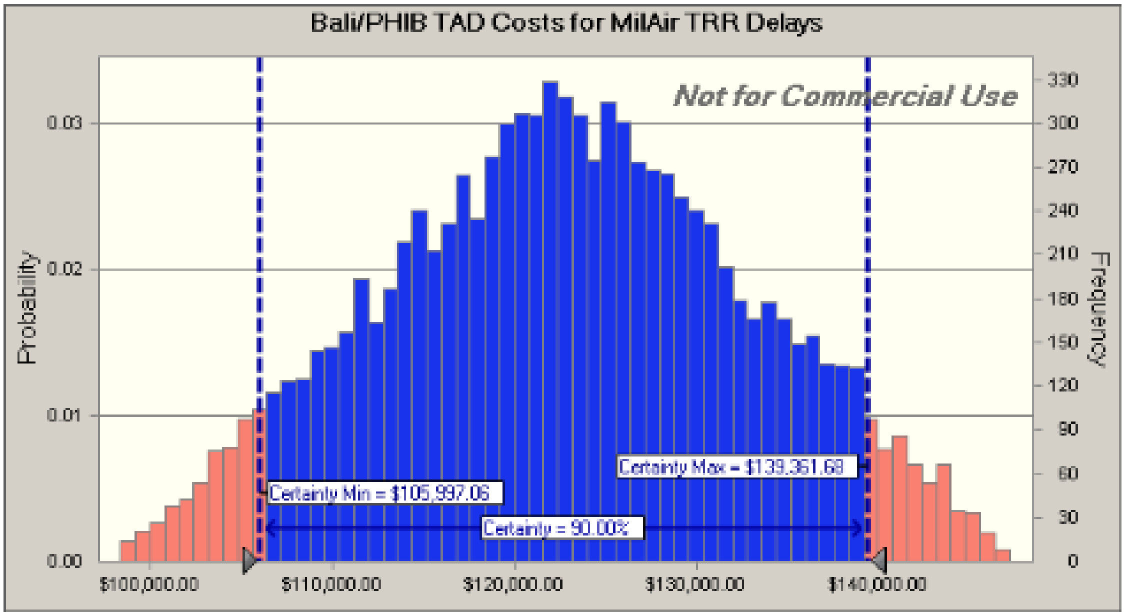

Figure 22. Balikatan/PHIBLEX TAD Costs for MilAir TRR Delays

Table 22. Balikatan/PHIBLEX TAD Costs for MilAir TRR Delays

Summary:
Certainty level is 90.00%
Certainty range is from $105,997.06 to $139,361.68

Statistics:	Forecast values
Trials	10,000
Mean	$122,822.91
Standard Deviation	$9,988.84
Minimum	$98,406.19
Maximum	$147,103.32
Range Width	$48,697.14
Mean Std. Error	$99.89

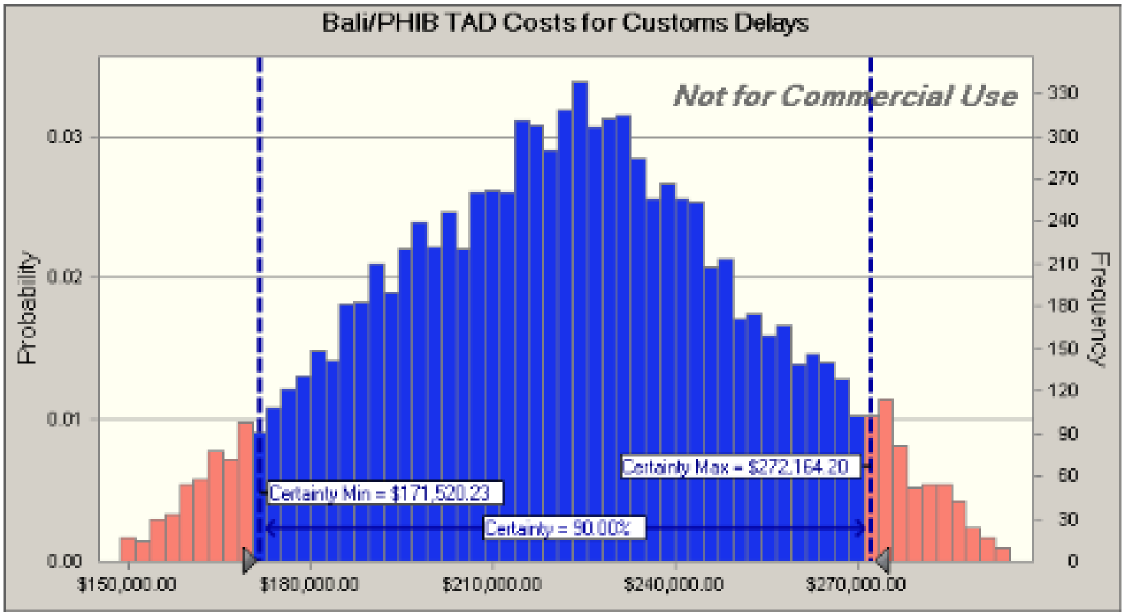

Figure 23. Balikatan/PHIBLEX TAD Costs for Customs Delays (Applies to Commercial Shipping Only)

Table 23. Balikatan/PHIBLEX TAD Costs for Customs Delays

Summary:
Certainty level is 90.00%
Certainty range is from $171,520.23 to $272,164.20

Statistics:	Forecast values
Trials	10,000
Mean	$221,767.61
Standard Deviation	$29,893.12
Minimum	$148,712.99
Maximum	$295,056.32
Range Width	$146,343.33
Mean Std. Error	$298.93

4. Osan Turn Det/Key Resolve/Foal Eagle—South Korea

Figures 24–28 and Tables 24–28 show the results of the Monte Carlo simulation for both commercial shipping costs and MilAir shipping costs. They include a breakdown of TAD costs as attributed to both customs delays and overall TRR delays. An average cost and a 90% certainty range are also provided for all forecasts.

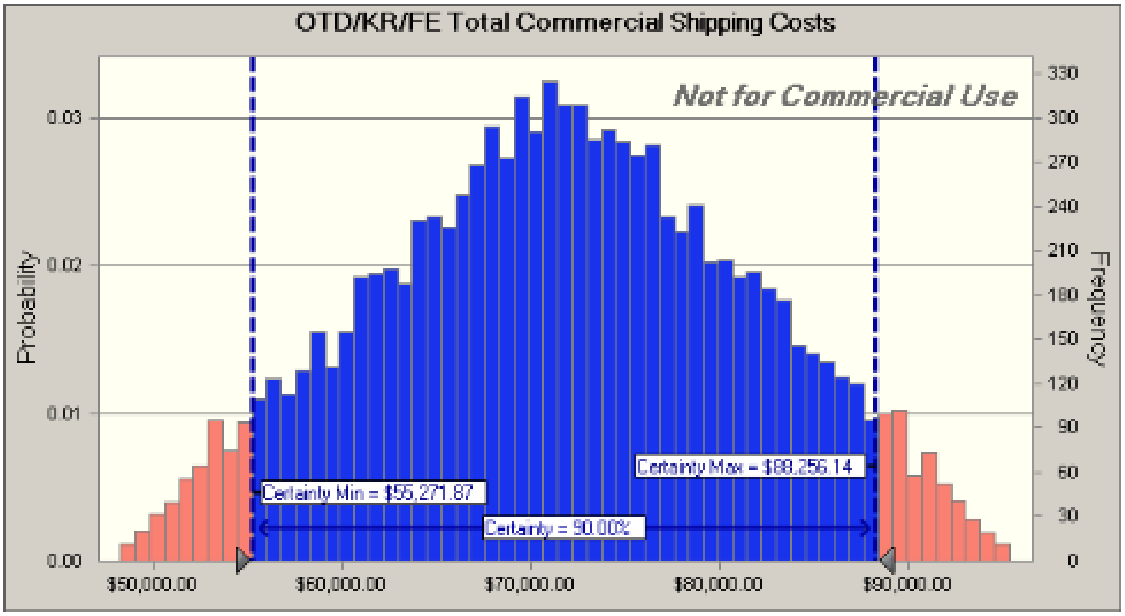

Figure 24. Osan Turn Det/Key Resolve/Foal Eagle Total Commercial Shipping Costs

Table 24. Osan Turn Det/Key Resolve/Foal Eagle Total Commercial Shipping Costs

Summary:
Certainty level is 90.00%
Certainty range is from $55,271.87 to $88,256.14

Statistics:	Forecast values
Trials	10,000
Mean	$71,784.59
Standard Deviation	$9,803.05
Minimum	$48,238.87
Maximum	$95,370.08
Range Width	$47,131.22
Mean Std. Error	$98.03

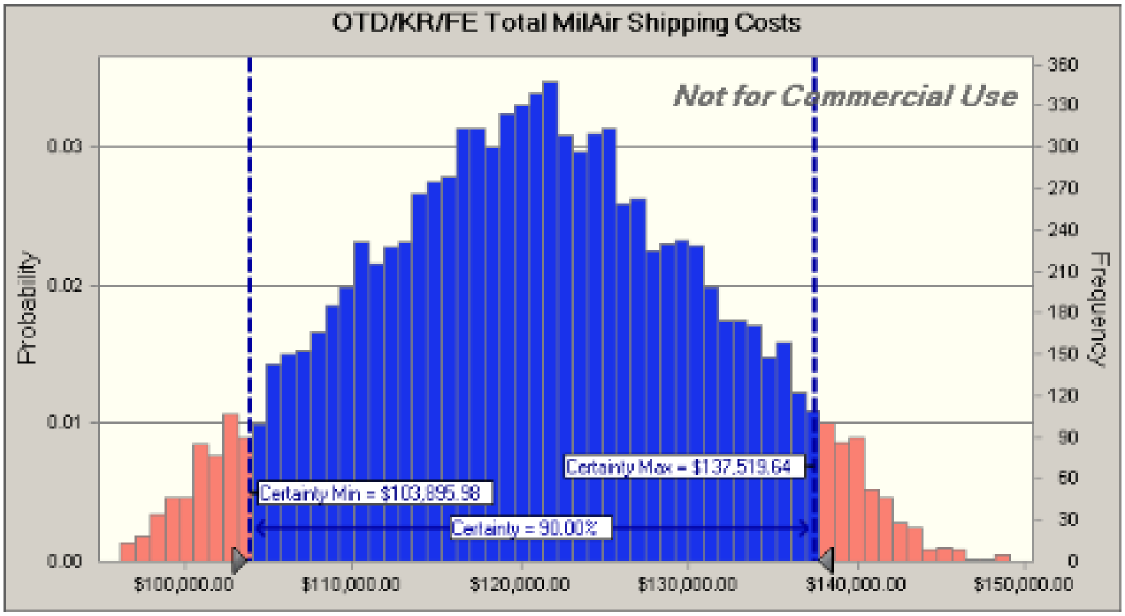

Figure 25. Osan Turn Det/Key Resolve/Foal Eagle Total MilAir Shipping Costs

Table 25. Osan Turn Det/Key Resolve/Foal Eagle Total MilAir Shipping Costs

Summary:	
Certainty level is 90.00%	
Certainty range is from $103,895.98 to $137,519.64	
Statistics:	Forecast values
Trials	10,000
Mean	$120,734.91
Standard Deviation	$10,116.23
Minimum	$96,243.41
Maximum	$152,773.63
Range Width	$56,530.22
Mean Std. Error	$101.16

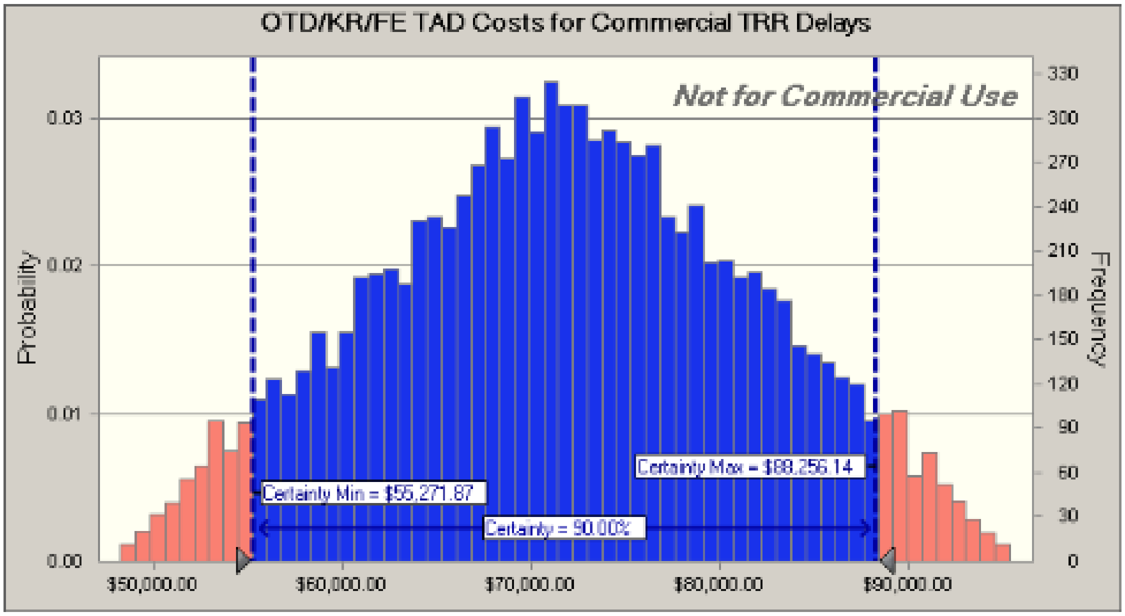

Figure 26. Osan Turn Det/Key Resolve/Foal Eagle TAD Costs for Commercial TRR Delays

Table 26. Osan Turn Det/Key Resolve/Foal Eagle TAD Costs for Commercial TRR Delays

Summary:
Certainty level is 90.00%
Certainty range is from $55,271.87 to $88,256.14

Statistics:	Forecast values
Trials	10,000
Mean	$71,784.59
Standard Deviation	$9,803.05
Minimum	$48,238.87
Maximum	$95,370.08
Range Width	$47,131.22
Mean Std. Error	$98.03

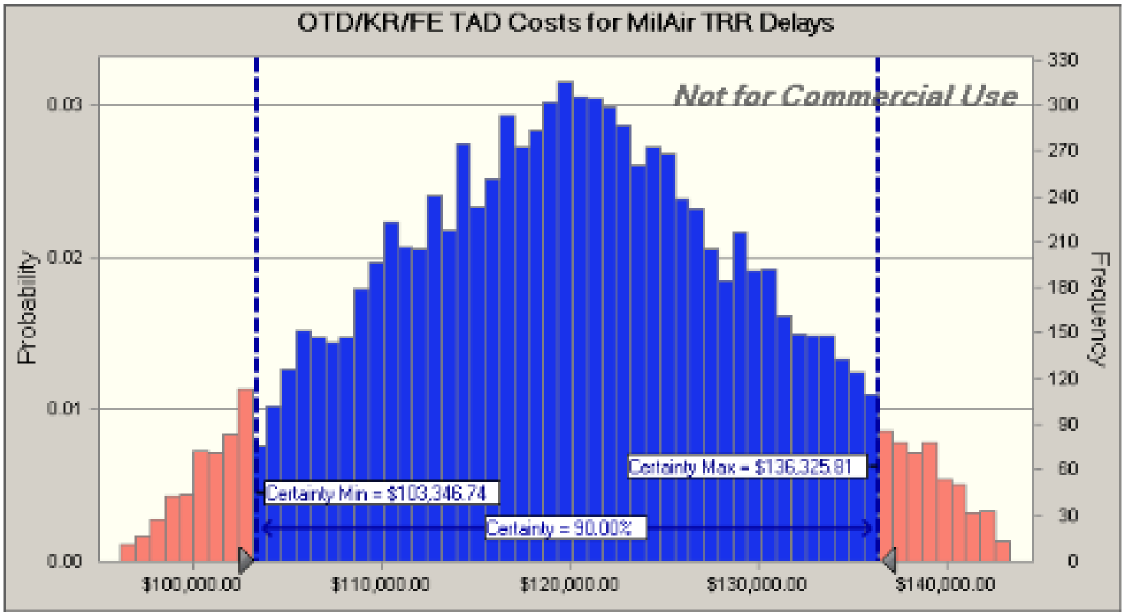

Figure 27. Osan Turn Det/Key Resolve/Foal Eagle TAD Costs for MilAir TRR Delays

Table 27. Osan Turn Det/Key Resolve/Foal Eagle TAD Costs for MilAir TRR Delays

Summary:
Certainty level is 90.00%
Certainty range is from $103,346.74 to $136,325.81

Statistics:	Forecast values
Trials	10,000
Mean	$119,908.77
Standard Deviation	$9,847.79
Minimum	$96,173.13
Maximum	$143,290.36
Range Width	$47,117.23
Mean Std. Error	$98.48

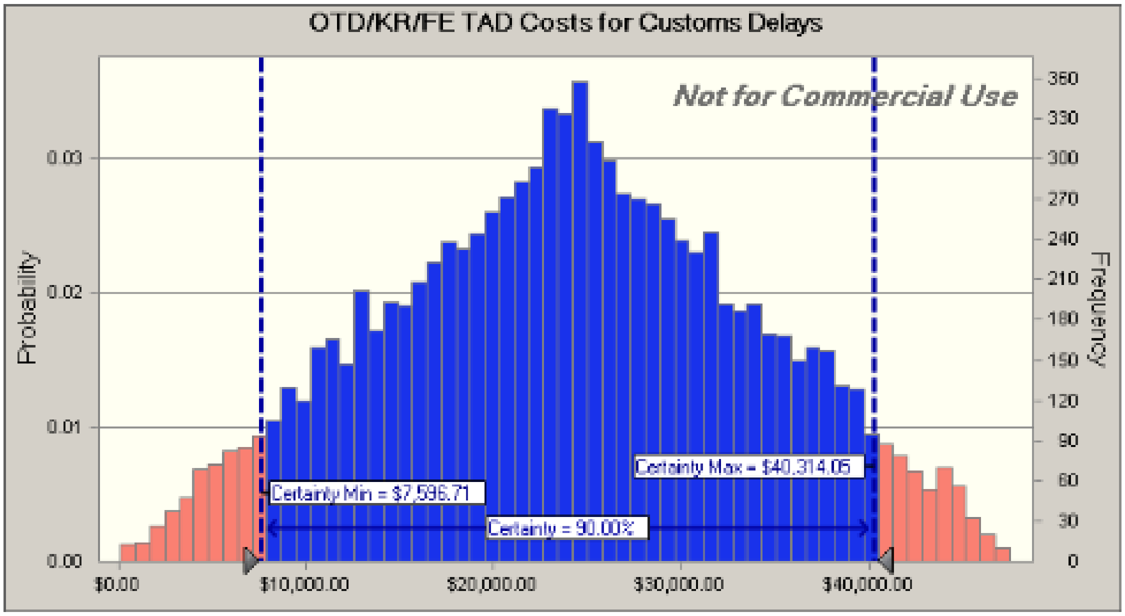

Figure 28. Osan Turn Det/Key Resolve/Foal Eagle TAD Costs for Customs Delays (Applies to Commercial Shipping Only)

Table 28. Osan Turn Det/Key Resolve/Foal Eagle TAD Costs for Customs Delays

Summary:
Certainty level is 90.00%
Certainty range is from $7,596.71 to $40,314.05

Statistics:	Forecast values
Trials	10,000
Mean	$24,037.31
Standard Deviation	$9,784.85
Minimum	$149.29
Maximum	$47,494.22
Range Width	$47,344.93
Mean Std. Error	$97.85

C. COST DRIVERS

From the results of the preceding Monte Carlo simulations, and remaining in-line with the evaluation analyses stage, flow, and process of the BCA, it can quickly be seen in this section that significant costs arise due to customs delays for commercially shipped parts. On average, these costs are $187,169, $517,896, $221,767, and $24,037 for Cobra Gold/Cope Tiger, Talisman Saber/Southern Frontier, Balikatan/PHIBLEX, and Osan Turn Det/Key Resolve/Foal Eagle, respectively, from 2008–2011. Again, these costs reflect wasted TAD funds being spent for Marines who can't perform their daily duties because they are awaiting parts, but they do not include the other possible costs that may result from a broken aircraft that is sitting and unable to fly.

A squadron commanding officer will employ as many aircraft on the flight schedule as the maintenance department can provide in a MC status the following day. If the aircraft maintenance officer of an F/A-18 squadron anticipates that he or she will have eight of 12 aircraft in an MC status the following day, then in most training environments, the commanding officer will maximize aircrew training and schedule all eight aircraft for use on the flight schedule on a given day. If 10 aircraft are MC, 10 aircraft will most likely be flown, and so forth. The more aircraft that are available, the higher the readiness will obviously be. In addition, an increase in aircrew training will be realized, and, in turn, the aircrew will accomplish their training requirements within the required time frame or sooner. If readiness is optimal and all training requirements are met before a scheduled deployment, mission, or exercise, then the squadron commanding officer has an added opportunity to refine aircrew flight skills/knowledge through additional flights/training.

This concept becomes even more important when a squadron is participating in an exercise away from their home station. In these cases, the DoD is paying extra monies (in the form of TAD funds) to allow the squadron to carry out daily training. During an exercise, the value of TAD funds are represented by the extent of training that the squadron can accomplish. This metric is, of course, directly affected by the waiting times that we have discussed in this research.

This scenario occurs year in and year out during exercises in the USPACOM AOR because C-130s are the most effective means of moving parts (i.e., the fastest means of moving parts due to lack of customs delays) and because current customs lag-time is too large an issue to tackle. When time is of the essence and the 1MAW, MAG, and squadron commanders collectively want—ignoring cost—parts, a situation develops in which increased readiness is being achieved at too high of a cost.

D. SENSITIVITY ANALYSIS

Given the effect that customs delays have on the overall cost of shipping parts commercially, in this section, we conduct a sensitivity analysis of the impact that decreased customs delays have on overall shipping costs. Figures 29–36 and Tables 29–36 show how a one-day reduction in custom delays would affect commercial shipping cost for each of the four exercises involved. Further, projections are made for a scenario without customs delays altogether.

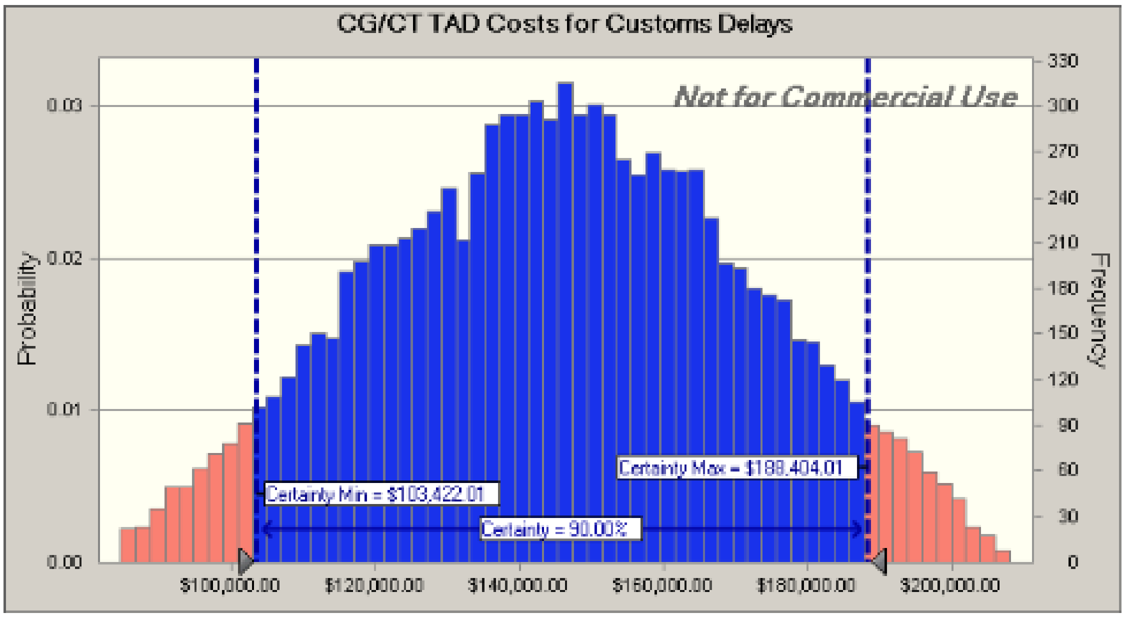

Figure 29. Cobra Gold/Cope Tiger TAD Costs With Decreased Customs Delays

Table 29. Cobra Gold/Cope Tiger TAD Costs With Decreased Customs Delays

Summary:
Certainty level is 90.00%
Certainty range is from $103,422.01 to $188,404.01

Statistics:	Forecast values
Trials	10,000
Mean	$145,784.55
Standard Deviation	$25,512.25
Minimum	$84,616.17
Maximum	$207,992.78
Range Width	$123,376.61
Mean Std. Error	$255.12

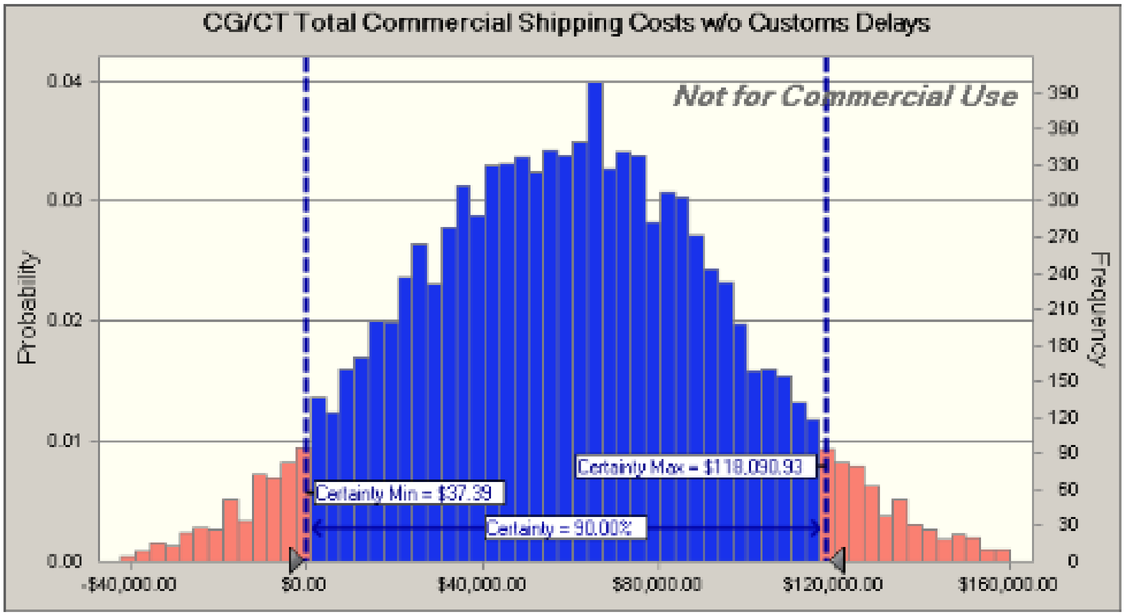

Figure 30. Cobra Gold/Cope Tiger Commercial Shipping Costs Without Customs Delays

Table 30. Cobra Gold/Cope Tiger Commercial Shipping Costs Without Customs Delays

Summary:
Certainty level is 90.00%
Certainty range is from $37.39 to $118,090.93

Statistics:	Forecast values
Trials	10,000
Mean	$58,763.83
Standard Deviation	$36,044.15
Minimum	-$53,194.63
Maximum	$169,962.59
Range Width	$223,157.23
Mean Std. Error	$360.44

With the one-day reduction in customs delays, the three-year average TAD costs for shipping commercially to the Thailand exercises is decreased from $245,933 to $145,784, which is a 40% reduction. Furthermore, the average total cost to ship commercially without any customs delays is $58,763, which demonstrates that the preponderance of costs can be attributed to TAD costs caused by customs delays.

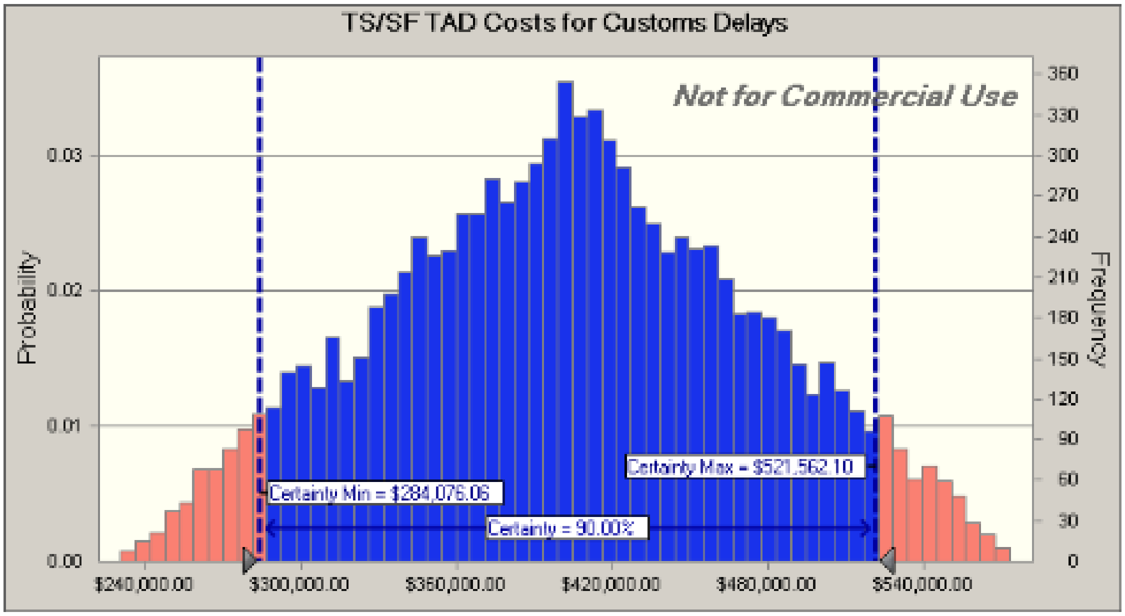

Figure 31. Talisman Saber/Southern Frontier TAD Costs With Decreased Customs Delays

Table 31. Talisman Saber/Southern Frontier TAD Costs With Decreased Customs Delays

Summary:	
Certainty level is 90.00%	
Certainty range is from $284,076.06 to $521,562.10	
Statistics:	Forecast values
Trials	10,000
Mean	$402,278.36
Standard Deviation	$70,462.31
Minimum	$230,561.57
Maximum	$572,829.23
Range Width	$342,267.66
Mean Std. Error	$704.62

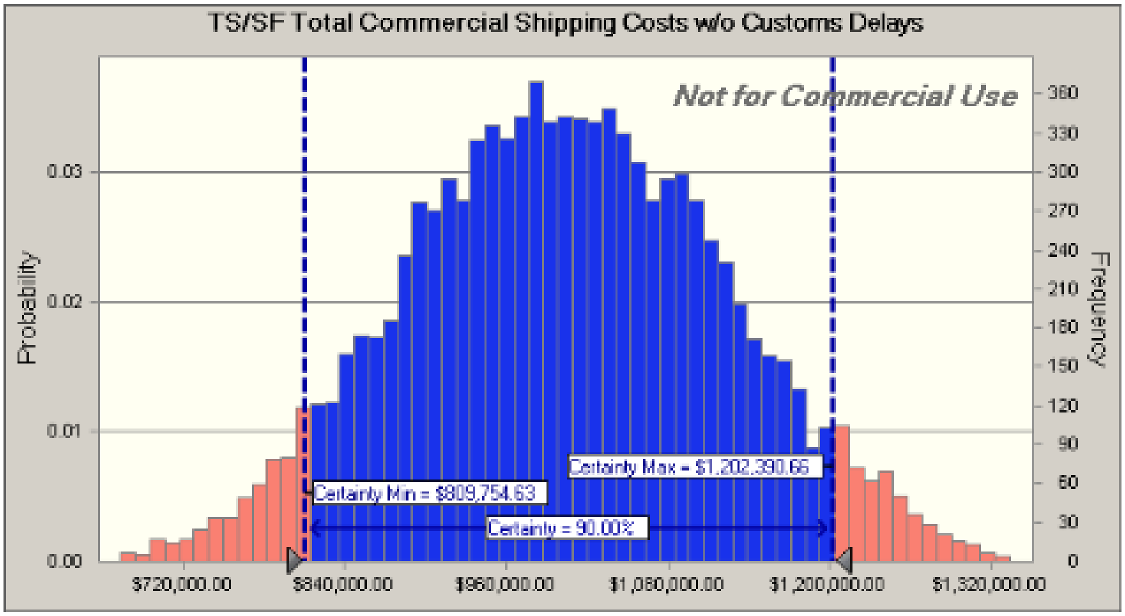

Figure 32. Talisman Saber/Southern Frontier Commercial Shipping Costs Without Customs Delays

Table 32. Talisman Saber/Southern Frontier Commercial Shipping Costs Without Customs Delays

Summary:
Certainty level is 90.00%
Certainty range is from $809,754.63 to $1,202,390.66

Statistics:	Forecast values
Trials	10,000
Mean	$1,003,618.33
Standard Deviation	$117,693.46
Minimum	$640,130.45
Maximum	$1,369,896.50
Range Width	$729,766.05
Mean Std. Error	$1,176.93

The Australian exercises prove to have similar reductions as those of the Thai exercises. By reducing customs delays by one day, average commercial TAD shipping costs decrease from $1,521,514 to $402,278, which is a 74% reduction. Eliminating customs delays entirely leads to average total commercial shipping costs of $1,003,618, which again demonstrates the high proportion of total costs attributed to TAD costs.

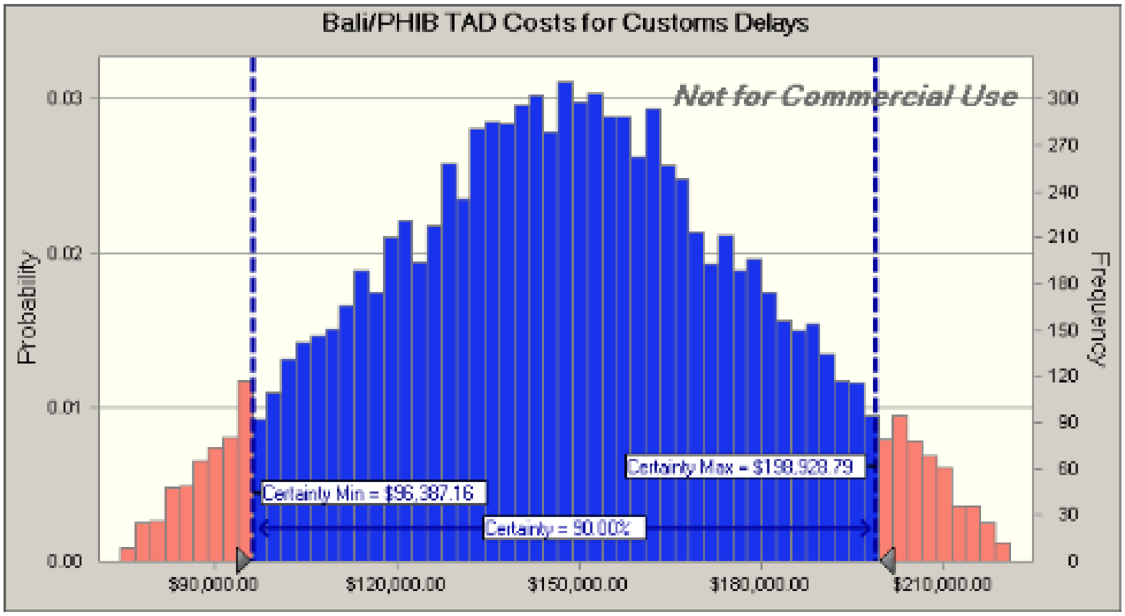

Figure 33. Balikatan/PHIBLEX TAD Costs With Decreased Customs Delays

Table 33. Balikatan/PHIBLEX TAD Costs With Decreased Customs Delays

Summary:
Certainty level is 90.00%
Certainty range is from $96,387.16 to $198,928.79

Statistics:	Forecast values
Trials	10,000
Mean	$147,631.80
Standard Deviation	$30,459.73
Minimum	$74,659.58
Maximum	$220,864.44
Range Width	$146,204.86
Mean Std. Error	$304.60

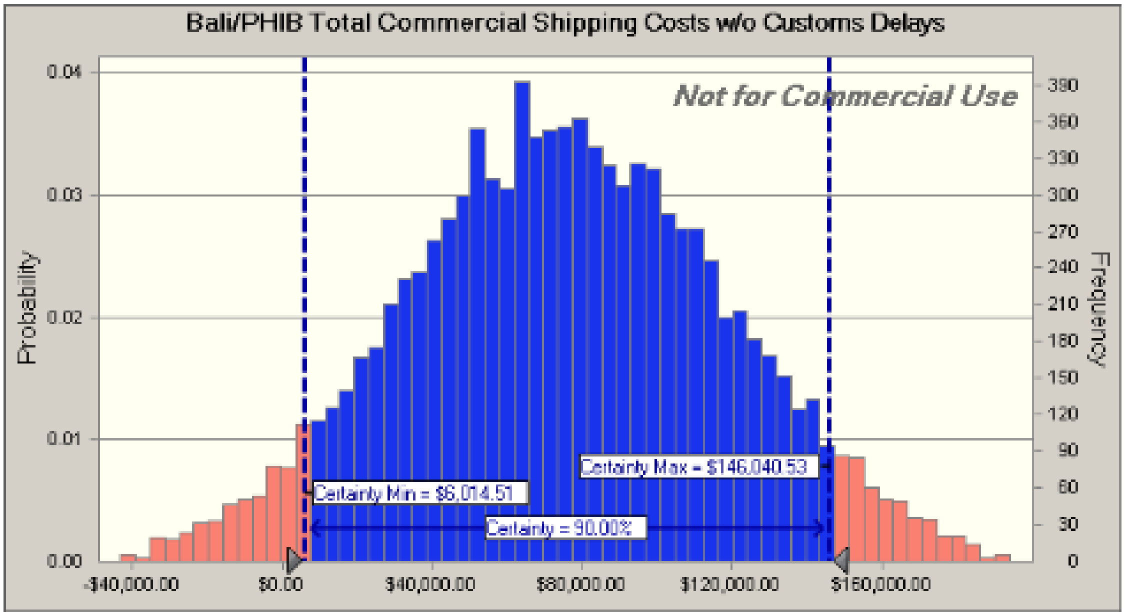

Figure 34. Balikatan/PHIBLEX Commercial Shipping Costs Without Customs Delays

Table 34. Balikatan/PHIBLEX Commercial Shipping Costs Without Customs Delays

Summary:	
Certainty level is 90.00%	
Certainty range is from $6,014.51 to $146,040.53	
Statistics:	Forecast values
Trials	10,000
Mean	$75,513.55
Standard Deviation	$42,313.94
Minimum	-$66,121.06
Maximum	$205,698.72
Range Width	$271,819.78
Mean Std. Error	$423.14

The Filipino exercises prove to be no different again, with similar reductions in costs. The three-year average TAD costs for commercially shipped parts falls from $221,767 to $147,631, which is a 33% reduction. Total average commercial shipping costs of $75,513 are seen without customs delays.

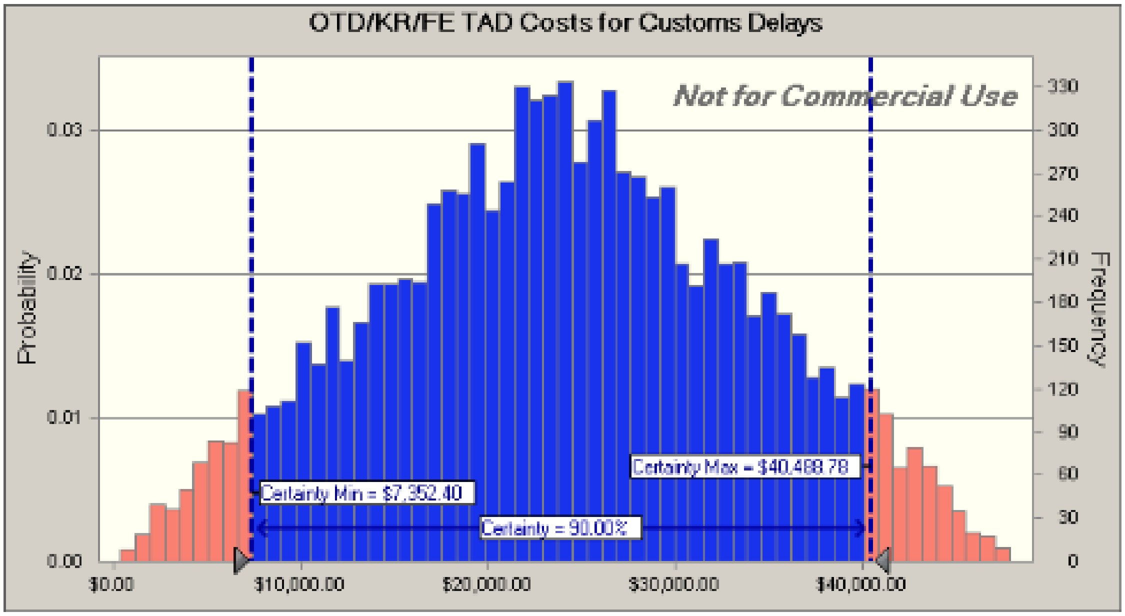

Figure 35. Osan Turn Det/Key Resolve/Foal Eagle TAD Costs With Decreased Customs Delays

Table 35. Osan Turn Det/Key Resolve/Foal Eagle TAD Costs With Decreased Customs Delays

Summary:
Certainty level is 90.00%
Certainty range is from $7,352.40 to $40,488.78

Statistics:	Forecast values
Trials	10,000
Mean	$24,003.70
Standard Deviation	$9,828.81
Minimum	$379.81
Maximum	$47,877.44
Range Width	$47,497.63
Mean Std. Error	$98.29

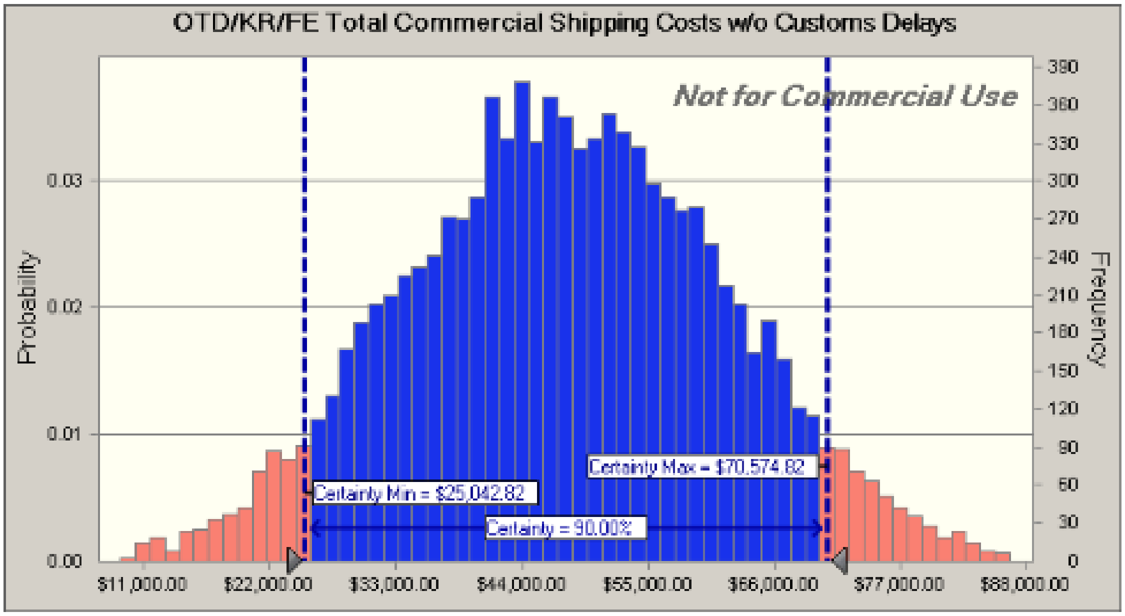

Figure 36. Osan Turn Det/Key Resolve/Foal Eagle Commercial Shipping Costs Without Customs Delays

Table 36. Osan Turn Det/Key Resolve/Foal Eagle Commercial Shipping Costs Without Customs Delays

Summary:
Certainty level is 90.00%
Certainty range is from $25,042.82 to $70,574.82

Statistics:	Forecast values
Trials	10,000
Mean	$47,747.28
Standard Deviation	$13,827.79
Minimum	$6,131.21
Maximum	$90,994.27
Range Width	$84,863.06
Mean Std. Error	$138.28

Finally, the South Korean exercises follow suit with the other exercises but show less significant reductions by reducing customs delays. With the one-day reduction in customs delays, TAD costs for commercially shipped parts fall from an average of $24,037 to an average of $24,003, which is less than a 1% reduction. Total average shipping costs without customs delays are $47,747.

E. RISK ANALYSIS

The risks of commercial shipping costs mainly lie in two areas: variance in customs delays and the potential variation in the size of operations within the PACOM AOR. We show the former through the analysis of the data we presented thus far in this research, while the latter is less tangible but still important to mention.

The effects of customs delays are readily apparent from the sensitivity analysis we presented in the previous section. Furthermore, the variance in customs delays also leads to the majority of variance in the overall costs of shipping parts commercially. As such, the true risk in the commercial shipping costs lies in the variance of the customs delays. Controlling this variance would lead to more controlled commercial shipping costs as well as reduce the overall costs entirely.

It is worth noting that the breadth of the data we presented in this research is relatively small compared to potential large-scale combat operations in the PACOM AOR. While we looked at only one type of aircraft and only short exercises (7–14 days in duration) in this research, it is easy to imagine how the costs due to customs delays could quickly grow given the full spectrum of DoD aircraft during sustained combat operations. It is also not fully understood how the various countries' customs departments might respond to large increases in workload and throughput.

There are several other factors that could impact the costs of both commercial and MilAir shipping costs. Variables such as fuel prices, TAD rates, and O&M costs of KC-130 operations could also affect overall shipping costs. However, the intent of this research was to focus on the effects of customs delays, and the other factors, as we mentioned previously, fall outside the scope of this study.

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VIII. CONCLUSIONS AND RECOMMENDATIONS

The results presentation is the final stage of the BCA and the topic of this final chapter. In this step, we communicate the results of the analysis. We construct conclusions around the objectives of the analysis that we stated throughout Chapters V–VII. In previous chapters of this study, we used figures and tables to communicate the results of all quantitative data along with a narrative description to ensure that the results are easily interpreted. In this chapter, we discuss any unexpected results, outliers, or easily misinterpreted results. Finally, we identify a recommended course of action and state support for that recommendation to bring closure to the analysis (DAU, 2011).

A. RESULTS OF ANALYSIS

Using a BCA methodology in this study, we confirmed the assumption that commercial shipment in the USPACOM AOR has the potential to be a more economical means of shipment, if not for customs delays. Although we also further confirmed that MilAir can be the more effective means of shipment (from a TRR standpoint), we identified limitations and extreme fiscal consequences to this form of shipping. Due to the current global recession and the extremely high O&M costs of refueling/providing tactical support for MilAir aircraft, it has become a strategic imperative that the U.S. DoS and DoD create initiatives that apply appropriate incentives on foreign customs departments in a more diligent attempt to ease the bottleneck realized each time a U.S. asset is inducted for processing by host-nation personnel.

B. COMPARATIVE ADVANTAGES OF COMMERCIAL SHIPMENT

In this study, we showed that commercial shipping options are the most cost-efficient method to ship aircraft parts to any allied country in the USPACOM. These efficiencies can only be realized, however, if the customs delays are held to a minimum. The logistics businesses such as DHL and FedEx operate with such high efficiencies, making it reasonable to conclude that utilizing these agencies would contribute to significant cost savings for the military. These advantages would prove to be even more important given any large-scale operations in the USPACOM AOR. However, the speed and price will continue to be compromised and negated and remain a secondary option, until customs turnaround time is improved upon in all host nations.

C. SOURCE OF SECOND THOUGHTS: VULNERABILITIES OF COMMERCIAL SHIPMENT

There are serious problems overseas in the DoD's overall management structure and foreign joint relationships, including the seemingly endless quest for auditability of all agencies from the top down. The logistics support organizations, doctrine, and procedures for MALS-12 in the Marine Corps, and other USPACOM units, presuppose a challenging degree of complexity and the almost inevitable conflicting objectives associated with supporting operational units in a deployed joint and combined environment. The subtleties of cooperation within the different Thai government organizations—from the RTAF to GSO to customs—are at the forefront of the challenge. Host-nation customs arrangements are the most common complaint among U.S. forces and are a result of outdated or unenforced SOFAs, or ambivalence from senior levels in the DoD/DoS toward seriously approaching the host nation about the necessity for improvement, and a collective vested interest to increase readiness for optimal security in the region. Some recent progress has been made in this area, but as aircraft parts transportation or supply has become increasingly outsourced, the problem has worsened, and long clearance delays in peacetime make one wonder about how any real increase in the level of operations could be meaningfully sustained.

While the use of local nationals in our embassies is not in itself objectionable, this common cost-saving measure means that DoS personnel must exercise much closer supervision than they would over U.S. staff. It is questionable how often this would actually happen in an embassy like Bangkok or Manila, where customs clearance does not have a priority among hundreds of other matters. In that context, the log cell staff becomes the main facilitator, and an all-too-small organization must be a very frustrating and stressful place to work. Additionally, U.S. embassy GSO operations need to meet a minimum standard coordinated with other U.S. agencies, even if there are inevitable variations due to host-nation practices. As an example, Australia is a very close ally and is one in particular that could potentially loosen customs practices as it regularly hosts large rotations of U.S. forces as well as a small permanent footprint of facilities, equipment, and supplies. Australia is also an advanced, sophisticated western nation that has a major stake in world trade. Hopefully, an adaptability characteristic will soon reach the ACB. Perhaps a blanket exemption from customs procedures is required for every country in which the U.S. has a significant presence. Implementing these reforms in national law would require more sophistication on the DoD side in terms of advance shipping notices to the host nation but could be accomplished through diligent, persistent, and effective negotiation by the DoS, with the DoD in a close, supporting technical role.

It is difficult to grasp the significance of the pivot to Asia in the face of—as we allude to—the most dense, tangled, disproportionate spiderweb cloaking the USPACOM AOR. As in so many other major decisions, logistics considerations need to be fully integrated into the deployment of forces and into changes in military strategy in the very near future.

D. RECOMMENDATIONS FOR FOLLOW-ON RESEARCH

We recommend several follow-on studies that would be relevant in understanding and influencing change of the current commercial and military logistics processes, as well as host-nation customs policies. First, research could be conducted on the labor force in each host country specific to the number of people that work and influence item processing in a customs department and/or JUSMAG. Coming to a deeper understanding of the internal processes and personnel numbers within each joint or host-country agency may be immense in assisting in the "leaning out" of traditional or culture-specific antiquated and very cumbersome foreign business practices. Ultimately, if 10 people in the near future could more effectively do the job of the 20 that are currently operating at status quo, then there must be a business culture mindset shift in order for total TAT to occur. The U.S. might focus on influence strategies that achieve this end—assisting by all means in the development of a foreign business model for organizations such as JUSMAGs, GSOs, and other customs offices in order to garner vested interest in U.S. force readiness and, in the end, to resolve the current customs bottleneck that exists in each host country.

We noted in our analysis of flight records that almost none of KC-130 flights that supported the various exercises carried their full capacity of cargo. This fact led to a higher per-pound cost of the cargo transported and is an area that may warrant further research.

Perhaps some sort of optimization that balances total cargo loads to TRR delays caused by waiting for full or nearly full cargo loads could be beneficial for achieving more economical MilAir shipping.

Another potentially beneficial study would be to look back at how U.S. forces operated logistically in the region to support and sustain the Vietnam War. Although much has changed over the past 40 years since the end of the war, there may be concepts and agreements applied back then that may still be applicable and beneficial today in negotiating new contracts with other Asian countries.

E. CONCLUSION

Complex challenges will always persist in the world of logistics, especially on the international scene. The U.S., either independently or in concert with its closest allies, may not be able to continue supporting annual exercises or a conflict in the USPACOM region while experiencing inefficiencies. At all times, there must be an elevated degree of teamwork and diligence applied to the problem of logistics throughput in the countries of our allies in order to support future operations and/or exercises. Money does not solve all of the problems, but this study successfully determines significant cost savings in the millions and increased joint force readiness, if the customs barriers are breached and restructured to best suit optimal joint readiness and economic responsibility in the current recession. The USMC KC-130J troop transport and refueling aircraft should still play a vital role in the USPACOM region in the transport of all items it is suited to carry, but as we proved in this study, millions of dollars can be saved if the commercial agencies were relied on more heavily while added pressure were applied concurrently to the allied customs departments. Most, or part, of the funding saved on the O&M costs to operate a KC-130J could be diverted to foreign country customs departments to help influence throughput, and in turn, money is still saved and a vital resource—the KC-130J—is freed up to conduct other, more important missions than the transport of aircraft parts, or other U.S. assets.

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