DOCUMENTED BRIEFING

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Combat Service Support Transformation

Emerging Strategies for Making the Power Projection Army a Reality

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United States Army

Arroyo Center

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PREFACE

This document analyzes the concepts that are emerging from the U.S. Army's Interim and Objective Force design efforts with regard to how they contribute to improving its power projection capability, which, along with improving the Army's business process efficiency, is one of two key emphases of the Army's combat service support (CSS) transformation. The document proposes metrics for measuring CSS transformation progress with respect to power projection goals and illustrates the use of these metrics. Most important, the briefing describes a strategic framework for organizing CSS power projection transformation initiatives that will help communicate how they will lead to the achievement of transformation goals. The framework is based upon a set of five strategies that have emerged as necessary to achieve the goals.

The intent of this research was to distill, from the Army's Interim and Objective Force design efforts and other sources, strategies for achieving the Army's power projection oriented CSS transformation goals. With respect to the proposed complementary metrics-based framework for evaluating further force design efforts, we illustrate the use of these metrics through an examination of the Stryker Brigade Combat Team (SBCT). We caution that we do not employ these metrics in the document to provide a complete evaluation of either Interim Force design or overall CSS transformation efforts. Instead, we aim to provide a common understanding of the strategies the Army is employing to improve power projection capability from a CSS perspective and to spur additional application of these strategies.

The research has been conducted for a project titled "CSS Transformation," which is intended to provide analytic support to the Army's CSS transformation effort. This research should be of interest to logisticians, materiel developers, combat developers, and operations personnel throughout the Army, as well as the Army's senior leadership. This project is sponsored by the Army's Deputy Chief of Staff, G-4, and it was carried out in the Military Logistics Program of RAND Arroyo Center, a federally funded research and development center sponsored by the United States Army.

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CONTENTS

SUMMARY

To produce a strategically responsive force, the Army has embarked on a transformation effort to make power projection capabilities a reality. To be strategically responsive, the Army must be able to rapidly move or project forces that have sufficient power to execute a broad spectrum of missions. The Army has laid out a set of three CSS transformation goals to support this overall transformation effort. The first goal is to reduce footprint in the combat zone to improve strategic mobility and to improve operational mobility. The second goal, focused on strategic mobility, is to reduce deployment timelines. The targets are 96 hours for a brigade combat team (BCT), 120 hours for a division, and 30 days for five divisions (and the requisite support). We term these two goals "power projection goals." Beyond these two goals, there is a third: reducing the cost of logistics while maintaining warfighting capability. Rather than an end in itself, this is a means to fund new Army capabilities. We term this a "business process transformation goal," which might be viewed as a second, simultaneous transformation that is focused internally on how the Army does its business. In this document we only examine the first two goals—the power projection goals—describing the strategies emerging to reach these goals and presenting metrics for assessing progress toward achieving them.

The intent of this research was to distill, from the Army's Interim and Objective Force design efforts[1] and other sources, strategies for achieving the Army's power projection oriented CSS transformation goals. With respect to the proposed complementary metrics-based framework for evaluating further force design efforts, we illustrate the use of these metrics through an examination of the Stryker Brigade Combat Team (SBCT). We caution that we do not employ these metrics in the document to provide a complete evaluation of either Interim Force design or overall

[1]As this document goes to press the term Interim Force is no longer used. The Interim Force design efforts culminated in the Stryker brigades which, with the fielding of the first SBCT, are now considered part of the current force. The term "Objective Force" has been replaced by "future force."

CSS transformation efforts. Instead, we aim to provide a common understanding of the strategies the Army is employing to improve power projection capability from a CSS perspective and to spur additional application of these strategies. In many cases, Army personnel have not "purposely" applied these strategies, but have come up with innovative ideas that reflect them. It is from these ideas that we derived the underlying strategies. The value of this document is that some of these ideas are not universally known in the Army, nor are the principles often widely understood, which is necessary for their broader application across functional areas. This document should help communicate and explain the strategies and expand the breadth of debate on the right approach to CSS transformation.

CSS TRANSFORMATION METRICS

Footprint metrics should communicate how well CSS transformation actions are contributing to increased operational and strategic mobility.

Time-phased deployment footprint affects strategic mobility. From a strategic mobility perspective, it is critical to know how many people and how much equipment must be moved to achieve initial employment capability at increasing levels of combat power—SBCT/unit of action (UA), division, and "corps-like capabilities"/unit of employment (UE). Because CSS footprint in maneuver forces also affects operational mobility, there is a second reason to measure CSS footprint at the brigade and division levels (or the UA in the Objective Force). Thus footprint should be measured at these three echelons, in terms of achieving initial operating capability, and categorized by function: combat, combat support, and CSS. Then traditional metrics can be used to evaluate each category: the number of personnel, the weight of the equipment, and the square footage (and/or possibly cube) of equipment. Deployment time metrics should reveal the effects of the three dimensions of deployment time: footprint, process throughput, and force positioning.

STRATEGIES FOR ACHIEVING CSS TRANSFORMATION

Since the Army began its Transformation Campaign, the Combined Arms Support Command (CASCOM), the Army Materiel Command (AMC), the

Army’s G-4 staff, and CSS personnel in the Army’s major force-providing commands have been developing doctrinal, force design, policy, and technological concepts for achieving the CSS transformation goals. From these concepts, we have seen five strategies emerge for achieving the CSS transformation goals.

The first strategy, **demand reduction,** is about reducing support requirements by reducing the demand of the forces being supported (to include CSS personnel and equipment) or reducing the amount of CSS personnel and equipment necessary to provide a given level of support using a given concept of support. We characterize the ways to reduce the demand for CSS resources as four substrategies. Most typically, people think of reducing demands on the logistics system through better fuel efficiency, smart munitions, and better reliability. We term this type of reduction *platform efficiency.* Significant attention is also being given to improving *force efficiency*—reducing footprint through initiatives that require fewer assets or platforms to execute a mission, such as combat multipliers, platform commonality, or common munitions. Besides increasing the efficiency of a force from an equipment viewpoint, *personnel efficiency* can also improve. Finally, demand reduction is sometimes a product of a change in *mission focus* that allows a force to more efficiently optimize for a portion of the operational spectrum.

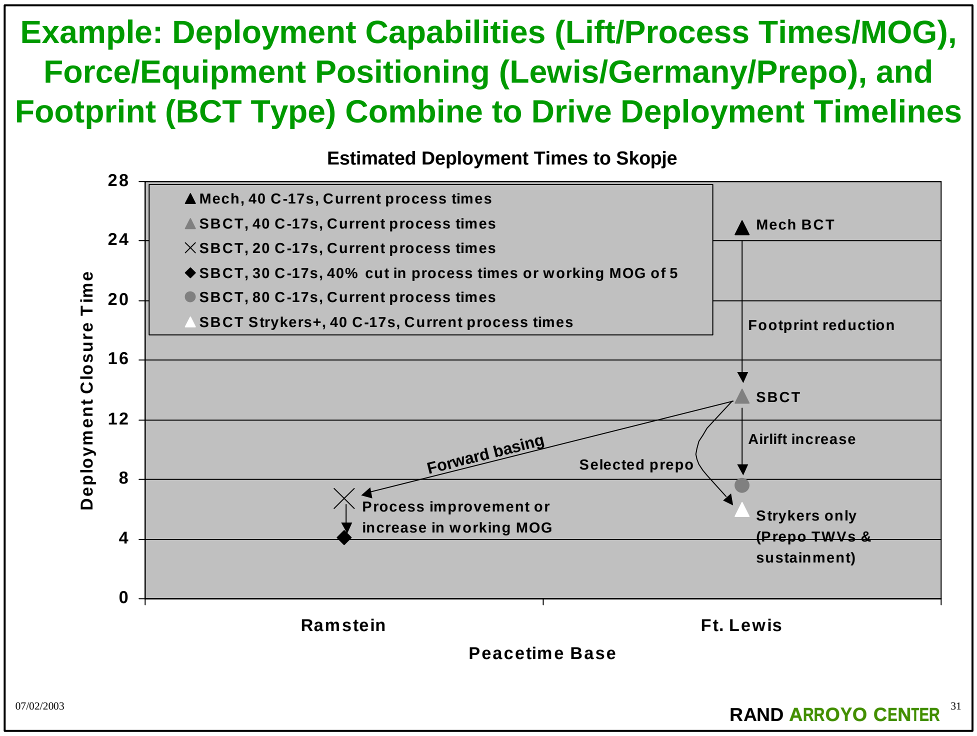
The second strategy is **modular maneuver unit support,** which limits organic support capacity to that which is essential for combat operations. All but only those capabilities absolutely essential to an organization during all phases of operations are made organic to the organization—no “luxuries,” just-in-case capabilities, capabilities that are only needed periodically, or capabilities to execute tasks that can be deferred or scheduled outside of combat operations *and* that can be provided through reach without undue risk are present. These capabilities, also important at the right time in an operation or if the mission dictates, can be phased in as the operation evolves, but keeping such capabilities as separate modules enables the ability to keep combat maneuver forces lean when this is the overriding concern, such as for rapid deployment or combat maneuver. It is critical to note that every modular support initiative requires a resourced plan for providing the removed capability when needed.

The third strategy is the continued implementation of **distribution-based logistics (DBL),** which aims to provide equal or better CSS capabilities with fewer unit resources and supplies through better distribution rather than through stockpiles of supplies held and carried around by units. It exchanges "warehousing" capacity for frequent, consistent flows. The faster and more reliable that distribution processes become across a range of environments and scenarios, the more the Army can reduce the need for inventory in maneuver units and the combat zone. The DBL substrategies described in the main body of the report reflect means for improving the speed and reliability of distribution and for making these capabilities robust across as great a range of environments and scenarios as possible. They include: process improvement, logistics situational awareness, modular and intermodal containers, common platforms with integrated load-handling systems, configured loads, precision aerial delivery, and increased intratheater lift assets.

The fourth strategy, **improved deployment capabilities,** enables faster deployment for a given level of footprint. Three substrategies for improving deployment capability have emerged. The first we term *lift capacity,* which consists of lift platforms—both new systems and increases in legacy lift. The second is *infrastructure improvement* at garrison locations and intermediate support bases to improve the throughput of nodes as well as to provide new nodes. The third consists of *process improvement*.

Forward positioning, the fifth strategy, is about moving forces or equipment closer to anticipated deployment destinations. Under forward positioning there are two substrategies. The first is the *prepositioning* of equipment on ships or on land where it is at or can quickly get to anticipated contingency locations. The second is the *forward basing* of units, such as the SBCT, closer to potential areas of operations, whether permanently, on a rotational basis, or temporarily.

The chart to the right brings the footprint reduction strategies, deployment capabilities, and forward positioning strategies together in a tradespace illustration to show how together they can help drive achievement of the CSS transformation goals. In this example, a brigade-sized unit has to deploy to Skopje, which has a working maximum on the ground (MOG) of 3. Let us walk through the three dimensions. The first data point, indicated by a black triangle, shows the air deployment time,



about 25 days, for a heavy BCT allocated 40 C-17s. Holding other factors constant, we see that in this case the change in footprint from moving to the SBCT cuts the time substantially to an estimate of 13.6 days, as shown by the gray triangle. Again, holding other factors constant, doubling the airlift to 80 C-17s substantially improves the speed to an estimate of 7.6 days. Alternatively, forward basing can reduce the time to 6.7 days and dramatically reduces the airlift requirement to just 20 C-17s, the limit of useable airlift given the distance and working MOG constraint. Thus not only can forward basing improve deployment speed, it can reduce the consumption of a constrained asset—strategic airlift. Another alternative would be to selectively preposition the SBCT's soft-skinned tactical wheeled vehicles (TWVs) and initial supply of consumable materiel, enabling a 6-day deployment time with 40 C-17s. While they consume about 60 percent of the needed airlift missions, the cost is relatively low, with the TWVs comprising only about 10 percent of the cost of an SBCT. Finally, improving offload and total aerial port of debarkation (APOD) aircraft turnaround time, combined with forward basing, would enable a 4-day deployment time with about 30 C-17s. Improved process time would have less effect with CONUS basing, because leveraging the improvement to reduce deployment time would require a substantial increase in airlift.

At brigade level, a good story is emerging for CSS transformation from the Interim Force and Objective Force development processes. Through the application of five complementary strategies, progress is being made toward transforming CSS in maneuver forces, and insights gained during SBCT development are being leveraged in Objective Force planning. Applying appropriate metrics to completed design initiatives documents this success. Modular support, DBL, and demand reduction have been applied to the SBCT—producing unit designs with CSS footprint, overall footprint, and deployment times about half that of legacy heavy forces. We should note, however, that the applications of these strategies are still being refined, and some of the technology and operational concepts necessary to enable the full realization of these strategies are still being developed, funded, and implemented.

Further good news is that the same general principles appear to offer significant opportunity in echelons above division (EAD). However, this is where the current good news ends. Within units, changes have been made by individual branches, but initiatives that could change the required and resourced number of units have yet to be implemented on a large scale.

The BCT designs have been under the control of one entity—TRADOC—and they have been implemented with top-down edicts that forced change. Similarly, the logistics force designs were changes that could be made within the control of one organization—the logistics branch chiefs and CASCOM. However, EAD requirements are the product of a process in which everyone has a hand. Perhaps there are lessons here from the BCT design efforts and CASCOM force design efforts.

Much work remains, but it seems that effective strategies are emerging for achieving CSS transformation goals. Progress to date demonstrates their potential but, combined with analyses, also suggests the need for all five. The CSS community will have to pursue DBL and modular support and advocate for improved deployment capabilities and new force-positioning options. In conjunction, the Army must push demand reduction through improvements in platform and force efficiency to achieve its power projection goals. It is hoped that more clearly illuminating these strategies will trigger the further development of specific transformative ideas. Additionally, using well-designed metrics to analyze the costs and benefits would bring rigor to the force development process, ensuring that it stays on track to produce a power projection Army.

ACKNOWLEDGMENTS

This work presents few new ideas. Rather, it organizes and evaluates a multitude of actions already taken and other ideas that have been developed by the Army to transform combat service support. Thus the root of the information in this briefing comes from the hard work and innovative thinking produced by a broad cross-section of logisticians in the Combined Arms Support Command (CASCOM) of the Training and Doctrine Command, the Army Materiel Command, the Army Staff, and its major force-providing commands. This research was made possible by the sponsorship of LTG Charles Mahan, the Army's Deputy Chief of Staff, G-4. His strong encouragement and personal involvement continues to push progress forward. The Assistant Deputy Chief of Staff, G-4, MG Larry Lust, has provided additional guidance and information that helped ensure that critical issues were addressed.

At RAND, John Dumond and Rick Eden contributed substantially to the conceptual development of this briefing as well as the construction of the messages. Several researchers at RAND influenced the discussion of deployment timelines and the need to discuss tradespaces through their prior research on Army deployment speed capabilities. They include David Diener, in partnership with one of the authors of this document (John Halliday), Daniel Norton, Charlie Kelley, Russell Glenn, Daniel Fox, Thomas Sullivan, Allan Vick, and David Orletsky. In a similar vein, BG Charles Fletcher shared the results of deployment studies led and coordinated by the Directorate of Force Projection and Distribution within the Office of the Deputy Chief of Staff for Logistics, Headquarters, Department of the Army.

A long stream of RAND Project AIR FORCE research on agile combat support structures led by Robert Tripp has provided insights into combat services support organizational design, the positioning and preparation of forces and infrastructure, and system architectures. Within this body of research, work by Lionel Galway, Mahyar Amouzegar, Richard Hillestad, and Don Snyder on U.S. Air Force deployment footprint and the design of Air Force units was a valuable source for thinking through force design modularity. Other researchers who helped build this intellectual foundation include Hy Shulman, Timothy Ramey, Charles Roll, James Leftwich, Patrick Mills, Amanda Geller, Louis Miller, Amatzia Feinberg, Tom LaTourrette, Edward Chan, Chief Master Sergeant John Drew, and one of the authors of this document (Eric Peltz).

In an early briefing, Mr. Tom Edwards, deputy to the Commanding General of CASCOM, suggested that developing a high-level, simple framework for describing CSS transformation strategies would greatly improve the logistics community's ability to communicate its achievements. BG Barbara Doornink, then Director of the Plans, Operations, and Logistics Automation Directorate within the Office of the Deputy Chief of Staff, G-4, and Colonels Don Plater, Matthias Velasco, and Robert Kleba, and Lieutenant Colonel Robin Stauffer provided feedback on ideas we were developing in the early stages of this research. Later, MG Mitchell Stevenson, the Chief of Ordnance, provided detailed comments that enabled us to further develop some of the ideas in the briefing. Lieutenant Colonel (P) Brian Layer, Chief of the G-4 Transformation Cell, helped to fully define the strategies in the document and has led the integration of this research into the Army's Transformation Campaign Plan. Ms. Debra Deville of the Logistics Management Institute and Major James Kazmierczak, members of the G-4's Transformation Cell, have assisted by providing information about enablers and the Transformation Campaign Plan and providing feedback on footprint metrics. Lieutenant Colonel Richard Wink of the Army's Objective Force Task Force has provided feedback and ideas on footprint metrics as well. Captain James Craft in the Ordnance Directorate of Combat Developments assisted with the characterization of Interim Brigade Combat Team maintenance policies and the interpretation of the manpower requirements.

Excellent reviews by David Kassing and Lionel Galway led to a sharpening of the focus and intent of the document, increased clarity, and spurred exploration of the broader implications of the strategies discussed. Similarly, a careful review by the U.S. Central Command Director of Logistics, MG Dennis Jackson, COL(P) Robert Radin, Operations Division Chief, and other members of MG Jackson's staff was extremely valuable in revising the document, in particular in the discussions of modular support and distribution-based logistics and ensuring that we recognize lessons they have been learning in the conduct of Operation Enduring Freedom. We appreciate the time these reviewers, formal and informal, took to help us

improve the quality, accuracy, and completeness of the messages in order to increase the document's potential value to the Army's CSS transformation effort. Pamela Thompson and Nikki Shacklett helped prepare and edit, respectively, the document.

GLOSSARY

Admin	Administration
AMC	Army Materiel Command
Ammo	Ammunition
AO	Area of Operations
AOE	Army of Excellence
APS	Army Prepositioned Stock
ASL	Authorized Stockage List
ASOS	Army Support to Other Services
BAS	Battalion Aid Station
BCT	Brigade Combat Team
BDE	Brigade
BN	Battalion
BSB	Brigade Support Battalion
CAA	Center for Army Analysis
CASCOM	Combined Arms Support Command
Class I	Subsistence and commercially bottled water
Class III(p)	Petroleum, oil, and lubrication products, packaged
Class IV	Construction items
Class V	Ammunition
Class IX	Spare and repair parts
Const.	Construction
CONUS	Continental United States
CS	Combat Support
CSA	Chief of Staff of the Army

CSS	Combat Service Support
CSSC	Combat Service Support Company
CSSCS	Combat Service Support Control System
CWT	Customer Wait Time
DBL	Distribution-Based Logistics
DCB	Dollar Cost Banding
DCD	Directorate of Combat Developments
DCS	Deputy Chief of Staff
DCSLOG	Deputy Chief of Staff for Logistics
DIV	Division
DL	Deadline
DLA	Defense Logistics Agency
DOS	Days of Supply
DRFT	Draft
EAD	Echelons Above Division
FA	Field Artillery
FAASV	Field Artillery Ammunition Support Vehicle
FARE	Forward Area Refueling Equipment
FASTALS	Force Analysis Simulation of Theater Administrative and Logistics Support
FBCB2	Force XXI Battle Command Brigade and Below
FDU	Force Design Update
FORSCOM	U.S. Army Forces Command
FSB	Forward Support Battalion
FSC	Forward Support Company
FT	Fort
FY	Fiscal Year

G-3	Operations and Plans
G-4	Logistics
GCSS-A	Global Combat Support System-Army
GPH	Gallons Per Hour
GS	General Support
HEMTT	Heavy Expanded Mobility Tactical Truck
HET	Heavy Equipment Transporter
HMMWV	High Mobility Multi-purpose Wheeled Vehicle
HQ	Headquarters
IAV	Interim Armor Vehicle
INF	Infantry
Info Sys	Information Systems
IOC	Initial Operating Capability
ISB	Intermediate Support Base
ISO	International Standards Organization
KM	Kilometer
LADS	Laundry Advanced System
LAV	Light Armored Vehicle
LHS	Load Handling System
LI	Light Infantry
LID	Light Infantry Division
LIF	Logistics Intelligence File
LOC	Line of Communication
LOGCAP	Logistics Civil Augmentation Program
LT	Light
LTTF	Logistics Transformation Task Force
Maint	Maintenance

MARC	Manpower Requirements Criteria
Max	Maximum
MBU	Mobile Burner Unit
MCL	Mission Configured Load
Mech	Mechanized Infantry
METT-TC	Mission, Enemy, Terrain and weather, Time, Troops available and Civilians
MI	Military Intelligence
MKT	Mobile Kitchen
MOG	Maximum on Ground
MOS	Military Occupational Specialty
MP	Military Police
MTBF	Mean Time Between Failures
MTS	Movement Tracking System
MTV	Medium Tactical Vehicle
MTW	Major Theater War
NMC	Not-Mission-Capable
NTC	National Training Center
O&O	Organizational and Operational. Use of the term O&O refers to a planning document.
OCONUS	Outside the Continental United States
OEF	Operation Enduring Freedom
OPTEMPO	Operating Tempo
OR	Operational Readiness
OTOE	Objective Table of Organization and Equipment
PLS	Palletized Loading System
POL	Petroleum, Oil, and Lubricants

POW	Prisoner of War
ROWPU	Reverse Osmosis Water Purification Unit
RSTA	Reconnaissance, Surveillance, and Target Acquisition
RTF	Ready to Fight
SBCT	Stryker Brigade Combat Team
SCL	Strategic Configured Load
SD	Strategic Distribution
SF	Square Feet
SPT	Support
SQ FT	Square Feet
SRC	Standard Requirement Code
SSA	Supply Support Activities
ST	Short Tons
STAMIS	Standard Army Management Information System
STONs	Short Tons
TAA	Total Army Analysis
TBD	To Be Determined
TC-AIMS II	Transportation Coordinator's Automated Information for Movements System II
TDD	Time-Definite Delivery
TFH	Task Force Hawk
TRADOC	Training and Doctrine Command
Trans	Transportation
TSV	Theater Support Vessel
TWV	Tactical Wheeled Vehicle
UA	Unit of Action

UCL	Unit Configured Load
UE	Unit of Employment
US	United States
USTRANSCOM	United States Transportation Command
VM	Velocity Management

1. CSS TRANSFORMATION: MAKING THE POWER PROJECTION ARMY A REALITY

CSS Transformation:
Making the Power Projection Army a Reality

11/17/2001 RAND ARROYO CENTER 1

During the Cold War, the United States Army evolved into a powerful force designed primarily for the preeminent mission and threat: the defense of Europe against the Soviet threat. Heavy forces were placed forward to guard against this threat, with equipment for additional heavy forces prepositioned in Europe. And since the heavy forces could not be moved rapidly, heavy forces were maintained forward in Korea prepared to face another strong potential enemy. While light forces provided some amount of strategic mobility, this was strategic mobility without much power. This was a force that in many ways was optimized to provide power, but not necessarily power projection capability. Desert Shield and Storm against Iraq epitomized this Army. Light forces were able to move to Saudi Arabia rapidly, but the limited power of these forces posed a high level of risk.[2] Then it took months to bring the Army's heavy power to bear. But once in place, the Army along with the other services demonstrated its dominant power, power that has only grown since. Since Desert Storm, the Army's units have been adapted to a series of small-scale contingencies and operations other than war, while remaining a mix of powerful but ponderous forces and strategically mobile but light forces. However, to guide "Army Transformation," the Army has laid out a vision of truly transforming the force to be capable of true power projection—dominant *and* rapid.

In 1999, the Army embarked on a transformation effort to make rapid, decisive power projection capabilities a reality in order to produce a strategically responsive Army. The two words of "power projection" are both key. To be strategically responsive, the Army must be able to rapidly move or project forces that have sufficient power to execute a broad spectrum of missions. Various elements of the transformation were designated for management by the Army's deputy chiefs of staff, major commands, and senior secretariat. For example, the responsibility for developing new forces with power generated to a great degree through information and speed rather than heavy platforms was given to the Army's Deputy Chief of Staff, G-3 (Operations and Plans). The Army's Deputy Chief of Staff, G-4 (Logistics) was assigned responsibility for achieving projection-oriented goals. Although, as we will discuss, power and projection are not independent; projection capabilities are affected by the design of fighting forces, and power is affected by the effectiveness and efficiency of support concepts. Achieving projection-oriented goals was deemed to form one of two significant elements of what has been termed the "Combat Service Support (CSS) Transformation." The other was to make the business of Army logistics more efficient without reducing warfighting capability in order to free resources for transforming the force.

Initially, the Army's CSS transformation work focused on power projection, with the emphasis on new force design and deployment concepts.[3] To date,

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[2]The first U.S. Army combat maneuver brigade to deploy was a brigade from the 82nd Airborne Division. It should be noted, however, that this unit was not alone. It joined ground forces of the Gulf Coast countries.

[3]As this document goes to press, certain terms used for force designs are no longer in use. The term "Interim Force" is no longer used. The Interim Force design efforts culminated in

force design work has produced Interim Force designs for brigade and below (now designated Stryker Brigade Combat Teams or SBCTs) in order to quickly enhance the Army's ability to respond effectively to small-scale contingencies, a point of perceived weakness in Army capabilities.[4] Additionally, draft Objective Force brigade-sized unit designs have been generated, and work is ongoing on echelons above brigade support for the SBCT and for above-brigade force design for the Objective Force.[5] These efforts have produced apparent progress and insights. We have found, however, that the concepts that have been developed are not widely understood, nor has the progress in those areas that have been tackled been well appreciated. This briefing synthesizes the emerging strategies for transforming the Army's power projection capabilities and provides metrics for assessing progress toward CSS transformation power projection goals. This should enable broader application of these strategies and facilitate broader debate on the efficacy of the strategies, including any potential need for modification.

More recently, the Army's Logistics Transformation Task Force (LTTF) laid out a plan for transforming Army logistics, focusing to a great degree on reducing costs or providing greater capabilities within existing costs, which has the promise to accelerate the business process transformation

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the Stryker brigades which, with the fielding of the first SBCT, are now considered part of the current force. The term "Objective Force" has been replaced by "future force."

[4]Recently, the necessary corps support group/echelons above division task organization necessary to support an independent SBCT have been identified by I Corps, U.S. Forces Command, and the Training and Doctrine Command.

From the Mission Needs Statement for Rapidly Deployable Armored Combat Forces, 22 February 2000: "An immediate need exists for a rapidly deployable force to improve the deployability and operational effectiveness of rapid response/early entry forces. This calls for organizing and equipping forces to provide high mobility (strategic, operational, and tactical) yet retain the overmatch capability to achieve decisive action through close combat centered primarily on dismounted infantry assault."

[5]The Army has termed the future modernized force structure the Objective Force. It will be composed of homogenous "medium-weight" combat maneuver brigades that leverage new technology as well as the spectrum of combat support and CSS units in echelons above brigade. The first brigade is scheduled to receive to be equipped in 2008. To provide a medium force as quickly as possible, the Army has also created an Interim Force, which will provide six brigade combat teams built around the family of Stryker medium armored vehicles, with the first unit scheduled for initial operating capability in 2003.

component of CSS transformation.[6] This effort built on the force design efforts described in this document and extended transformation throughout the Army's logistics chain and to other areas of the Army that affect logistics, such as financial policy and acquisition. This document does not describe the recommendations of the LTTF or other ongoing Army CSS transformation work focused on business process reform.

The intent of this research was to distill, from the Army's Interim and Objective Force design efforts and other sources, strategies for achieving the Army's power projection oriented CSS transformation goals. With respect to the proposed complementary metrics-based framework for evaluating further force design efforts, we illustrate the use of these metrics through an examination of the SBCT. We caution that we do not employ these metrics in the document to provide a complete evaluation of either Interim Force design or overall CSS transformation efforts. Instead, we aim to provide a common understanding of the strategies the Army is employing to improve power projection capability from a CSS perspective and to spur additional application of these strategies. In many cases, Army personnel have not "purposely" applied these strategies, but have come up with innovative ideas that reflect them. It is from these ideas that we derived the underlying strategies. The value of this document is that some of these ideas are not universally known in the Army, nor are the principles often widely understood, which is necessary for their broader application across functional areas. This document should help communicate and explain the strategies and expand the breadth of debate on the right approach to CSS transformation.

[6]Author Eric Peltz was a member of the LTTF, which formed after the release of the initial draft of this document to the Army for review.

2. CSS TRANSFORMATION GOALS AND MEASUREMENT

Outline

CSS Transformation goals and measurement

Strategies for achieving CSS Transformation

3/15/2002

RAND ARROYO CENTER 2

The briefing begins by laying out the CSS transformation goals as designated by the Chief of Staff of the Army, and it identifies metrics aligned with measuring progress toward achieving those goals aimed at power projection improvement. The next section lays out five emerging strategies being applied, to varying degrees, by the CSS community to achieve the CSS transformation power projection goals.

Footprint and Deployment Goals Dominate CSS Transformation to Support a Power Projection Army

Reduce footprint in the combat zone

- **To improve strategic mobility**
- **To improve tactical and operational mobility**
  - **Distributed battlefield, nonlinear operations**
  - **Vertical mobility**
  - **High-speed ground movement**
  - **Noncontiguous LOCs**

Reduce deployment timelines

- **To improve strategic mobility**

Reduce the total cost of logistics while maintaining warfighting capability

- **To provide resources for transformation**

The first two are power projection transformation goals

The third is a business process transformation goal

07/30/2003 RAND ARROYO CENTER 3

The Army's G-4 has been tasked by the Chief of Staff of the Army to monitor progress toward and ensure the Army achieves three CSS transformation goals. Reviewing these goals along with their underlying purposes is instructive in developing both CSS transformation strategies and metrics for measuring the value of these strategies.

The first goal is to reduce combat support (CS)/CSS footprint in the combat zone.[7] A review of Army Transformation and Objective Force literature suggests that this has two underlying purposes: to improve strategic mobility and to improve intratheater or operational mobility. With less to move, the Army can deploy faster. With fewer supporting assets to move, the Army can move a greater amount of combat forces with a given level of deployment capacity. Thus, reducing the deployment footprint of CSS forces to the combat zone will improve the Army's strategic mobility or

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[7]The Army's G-4 was given responsibility for combined CS and CSS footprint. From this point on, however, we will refer only to CSS footprint. An explanation will be provided later in this section. While some briefings have stated that the reduction goal is 50 percent, this does not appear to be a documented, formal Army goal. Rather, most literature implies the need for sufficient reduction to meet deployment timelines and enable desired operational concepts.

projection capability—the ability to quickly and flexibly respond around the world—and enable a greater proportion of the deploying force, especially early-arriving forces, to consist of combat platforms, increasing power.

But it is not enough just to be able to respond around the world. Strategic mobility must be combined with power to achieve true strategic responsiveness and thus global power projection capability. Given that traditional heavy forces cannot achieve the aggressive deployment timelines envisioned for the Army Transformation and that light forces do not have the firepower, protection, and tactical mobility to perform a broad enough spectrum of missions, the question becomes: Can a medium-weight force achieve the desired strategic mobility with sufficient power? Through wargaming, the Army's Training and Doctrine Command has concluded that a medium force can achieve sufficient power if it has information dominance and the battlefield mobility and standoff fire capabilities (whether in the unit or not) to leverage this dominance during the 2001 Army Transformation Wargame.[8] The Army is currently developing technologies and doctrine to provide medium-weight forces with these capabilities. But it is too soon to say whether the Army's ongoing research and development investments will yield the hoped-for combat capabilities. At its heart, though, this appears to be the truly transformative capability that promises to revolutionize how the Army produces combat power. It is about gaining power through information and the ability to respond almost instantly to that information with precise killing power rather than through heavy platforms delivering heavy ordnance.

This precept serves as the basis for the development of what the Army calls the Objective Force. The Objective Force is the name for what the Army will become, beginning with the fielding of the first Objective Force units in 2008

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[8]See Headquarters, U.S. Army Training and Doctrine Command, *Army Transformation Wargame 2001,* July 2001, p. 2. Also, a body of high-resolution combat modeling conducted by RAND Arroyo Center supports this contention. However, this research also finds that dense foliage and other types of restricted terrain can pose problems for a force dependent upon dominant situational awareness, as sensor effectiveness can be severely degraded and engagement ranges become relatively short. For a discussion of these topics, please see John Matsumura et al., *Lightning Over Water: Sharpening America's Light Force for Rapid Reaction Missions,* Santa Monica, CA: RAND, MR-1196-A/OSD, 2000, and John Matsumura et al., *Exploring Advanced Technologies for the Future Combat Systems Program,* Santa Monica, CA: RAND, MR-1332-A, 2002.

with a phased transition from Legacy and Interim forces through 2031.[9] Using advanced information, sensor, precision fire, unmanned platform, and platform protection technologies networked together, the Army aims to achieve breakthroughs allowing a relatively light force to be dominant across the full spectrum of conventional force employment missions.[10] The Future Combat Systems (FCS) is the name given to the networked system of systems that will form the basis of the Objective Force's maneuver formations. The FCS comprises information network and processing technologies, unmanned aerial and ground platforms, sensors, manned platforms (built around a common chassis), and soldier-enhancement technologies. It is scheduled for concept approval and entry into engineering and manufacturing development in 2003.

Objective Force concepts rely on the ability to strike rapidly with dominant force across a sizable area of operations. Operations will be distributed across a battlefield, with units capable of unprecedented tactical mobility—ground speed and operating-tempo (OPTEMPO)—and operational mobility—flexible, rapid nonlinear movement (horizontal and vertical) around an area of operations. Operational mobility is facilitated by minimizing maneuver force footprint and by eliminating mobility "bottlenecks." Reduced maneuver unit footprint makes it easier for lift assets to move the force around the battlefield in a nonlinear fashion and makes a high-OPTEMPO force easier to support. Any equipment that restricts movement speed or flexibility creates a mobility "bottleneck." Further, distributed operations create noncontiguous lines of communications, which requires maneuver force self-sufficiency for limited periods or operational pulses. This is facilitated by reducing demand, which is generated in part by CSS footprint. Thus, footprint metrics should communicate how well CSS footprint reductions are contributing to increased operational and strategic mobility.

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[9]Legacy forces are defined as the current generation of conventional Army forces made up of heavy armor and mechanized infantry divisions, light infantry divisions, and specialized infantry divisions (airborne, air assault, and mountain) that fight as part of a combined arms operation with tube and missile artillery, air defense artillery, combat engineers, Army aviation, Air Force close air support, combat support, and combat service support forces.

[10]See *Concepts for the Objective Force,* United States Army White Paper, 2001.

The second goal is to reduce deployment timelines. The Objective Force targets are 96 hours for a brigade combat team (BCT), 120 hours for a division, and 30 days for a five-division force. The purpose of this goal is also to improve strategic mobility. The faster a combat force can be deployed, the more flexible and capable the Army becomes, thus improving its value to the National Command Authorities in a wider range of situations. The more quickly a force can deploy, the longer decisions can be delayed, increasing national options. This goal overlaps with the footprint goal in that reduced deployment footprint is one means of improving deployment timelines, thus the common strategic-mobility purpose.

Achieving these first two goals is about fundamentally changing what the Army is and what its capabilities are. They change the product—the nature of the service that the Army provides to the nation. They are focused on ensuring that the Army remains a valuable, full-spectrum resource for the National Command Authorities. They make the Army a true power projection Army that is strategically responsive and dominant regardless of the situation, ensuring that the Army has a critical role to play in virtually every military action. In short, these two goals will dominate any evaluation of whether or not the CSS community has successfully fulfilled its transformation role.

Yet beyond the first two goals, there is a third: reducing the cost of logistics while maintaining warfighting capability. This is not an end in itself, but rather a means to pay for new capabilities. The purpose is to fund other initiatives or free resources for redeployment. It is not really a power projection transformation goal; rather, it is a business process transformation goal. This might be viewed as a second, simultaneous transformation that is focused internally on how the Army does its business. If ways can be found to reduce the cost of logistics without reducing capabilities, then they are always good ideas, regardless of what the Army wants to become in the future—a power projection Army or something else.[11]

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[11]We note that logistics efficiencies have often been viewed as potential bill payers. While there are probably good opportunities for reducing logistics costs, it is important to carefully assess the true cash flow savings of these initiatives. Unpublished RAND Arroyo research by Chris Hanks found that in the 1990s the realized savings of several initiatives

If the first two goals are achieved and the cost of logistics is not reduced, will the Army Transformation be successful? Maybe. If the first two goals are not achieved, but logistics cost is reduced, can the Army Transformation be successful? No. We would argue that while the Army may need to be successful at both transformations, the power projection transformation is absolutely essential, at least in terms of defining what the Army "is."

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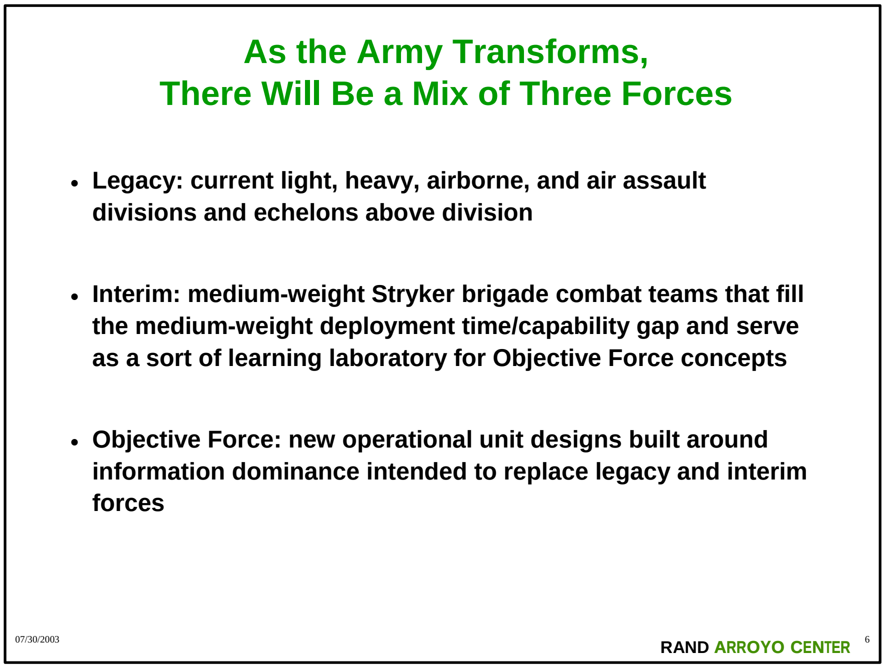
was much less than anticipated, and this led to problems because funding was reduced ahead of anticipated savings.



As a bridge to the Objective Force, the Army has begun fielding the Interim Force to consist of six medium-weight brigades that have been named Stryker Brigade Combat Teams. The first SBCT is scheduled for a certification exercise in the spring of fiscal year 2003. The Stryker is a modified off-the-shelf design selected by the Army to rapidly field an Interim Force able to effectively fill the Army's medium-weight capability gap and improve the Army's power projection capabilities until the Objective Force can be developed and acquired.[12] Similar to the intent for the FCS manned platforms, the Stryker is a family of platforms with a common chassis, limiting the SBCTs to one basic type of armored vehicle.[13] The common chassis is the basis for the brigade's infantry carrier vehicle, medical evacuation vehicle, mortar carrier, mobile gun system (in development), reconnaissance vehicle, commander vehicle, fire support vehicle (in development), engineer squad vehicle, anti-tank guided missile

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[12]The basis for the Stryker is General Motors' Light Armored Vehicle (LAV) III, currently in use by Canada, Australia, and New Zealand, and a more recent version of the U.S. Marine Corps' LAV Is and IIs.

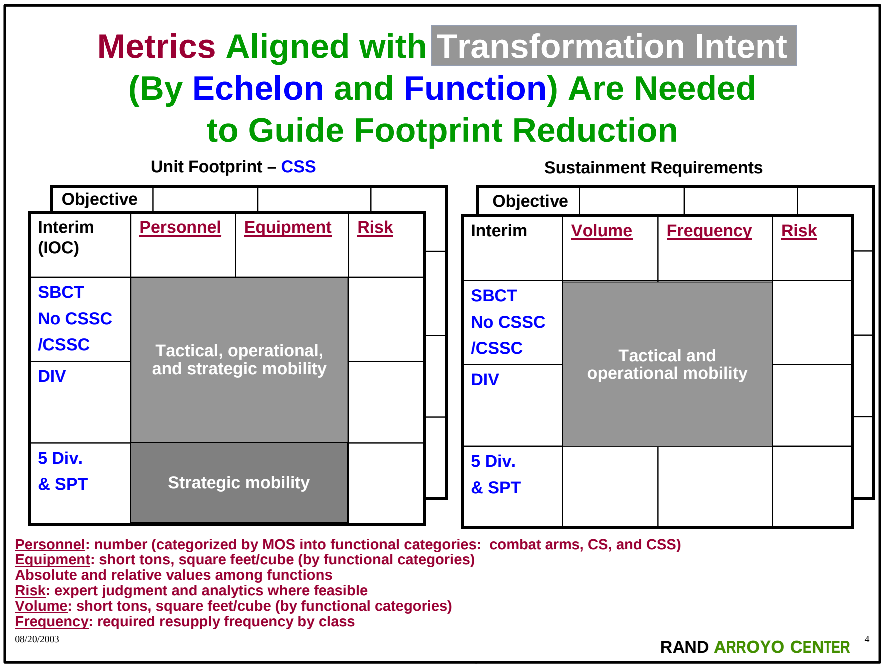
[13]Headquarters, Department of the Army, *Operational Requirements Document for the Future Combat Systems* (draft), 30 August 2002.

vehicle, and nuclear biological chemical reconnaissance vehicle (in development).

Beyond serving as a capability bridge, the Interim Force will provide valuable learning opportunities with regard to doctrine, training, leader development, organization, materiel, personnel, and facilities (DTLOM-PF). This includes the development of both operational and support concepts. In terms of force design, it represents a bridge to the future on another front. The unit's vehicles are "digitized," that is, they have advanced information technology to achieve two goals: (1) enable improved situational awareness throughout the force through synchronized and more complete dissemination of such information as operational plans, friendly positions, enemy positions, and logistics status, which together help form a common operating picture, and (2) enhance the reliability and speed of communications such as for fire support requests.[14] Situational awareness is further enhanced by robust organic signal, intelligence, and reconnaissance, surveillance, and target acquisition (RSTA) capabilities.

To a great degree, the force design builds on the Force XXI implementation in the 4th Infantry Division. Over the last several years, the Army has experimented with the application of digital information system technologies as a combat multiplier in this heavy division. Of further note, the logistics design in Force XXI serves as a forerunner of some of the SBCT logistics design concepts, including the shifting of maneuver battalion support troops to support battalions and the melding of organizational and direct support maintenance, which also reduced component repair activity in maneuver brigades. The digitization of Force XXI will be rolled out to much of the Army, but it is not clear that the organizational structure changes for CSS will be adopted. However, legacy armor and mechanized infantry battalions are being reduced from four to three maneuver companies, in line with the Force XXI design.

[14] In the Objective Force, advanced technologies are expected to enable "hunters" (platforms with sensors) to provide real-time targeting information to "killer" platforms.



To effectively communicate whether transformation actions for power projection improvement are having the desired effects, the use of metrics should be aligned with the underlying intents of the two power projection goals: operational mobility and strategic mobility. "The use of metrics" refers both to the selected dimensions of measurement (e.g., short tons) as well as to what is to be measured (e.g., the amount of CSS footprint that must be deployed to initiate brigade-level operations).

We start by examining footprint metrics. With regard to the Army Transformation goal of reduced footprint, the metrics for footprint, which footprint should be counted, and how it should be categorized have not been formally identified by the Army. As a result, they have been ill-defined by the Army to date, and agreed-upon metrics, categories, and baselines are not now in place for evaluating the CSS transformation footprint reduction goal. By ill-defined, we mean that people around the Army have differing definitions of what footprint is and different notions of how it should be categorized, and some of the definitions and categorizations are not aligned with making the Army a power projection Army. For example, footprint is sometimes defined as the space occupied on the ground, and sometimes as the amount of personnel and materiel that has to be moved. In some cases, footprint has been categorized by unit types and battlefield location and in others by the function of people regardless of unit type, resulting in different definitions of what CSS is. Footprint, in terms of assessing progress toward transformation goals, has been measured for the entire Army, for an entire major theater war (MTW), for two MTWs, and for smaller units. It has been measured for the total deployed force necessary to conduct long-term sustained operations, and it has been measured for the amount of structure necessary to get the first critical units in place.

The lack of alignment with the purpose of reduced footprint prevents the metrics from accurately portraying the transformative effects of many ongoing CSS initiatives. The proliferation of metric definitions and categorizations prevents clear communication and produces confusion. We have observed people discuss footprint for entire meetings and not realize until later that they were talking about entirely different things. Therefore, we recommend metrics designed to help guide transformative efforts and to facilitate communication within the Army. Well-constructed footprint metrics should specify measurement dimensions (e.g., short tons), category definitions (i.e., combat, CS, and CSS), unit size, and time or deployment "phase" factors.[15]

Time-phased deployment footprint affects strategic mobility. From a strategic mobility perspective, it is critical to know how many people and how much equipment must be moved to achieve *initial employment capability* at increasing levels of combat power *in, and only in, cases where speed is of the essence*—SBCT/unit of action (UA), division/unit of employment (UE) (division-level assets), and "corps-like capabilities"/UE (corps-level assets).[16] The CSS footprint in maneuver forces also affects operational mobility. Thus there is another reason to measure CSS footprint at the brigade and division levels (or the UA in the Objective Force).

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[15]The U.S. Air Force is also pursuing footprint reduction to improve strategic mobility. Lionel Galway, Mahyar A. Amouzegar, R.J. Hillestad, and Don Snyder, *Reconfiguring Footprint to Speed Expeditionary Aerospace Forces Deployment*, Santa Monica, CA: RAND, MR-1625-AF, 2002, provides a recommended footprint measurement framework for the Air Force along similar dimensions. Among other topics, it has a good discussion of measuring initial operating capability footprint versus total footprint, and it describes how the Air Force is building capability packages for deployment.

[16]The Army has decided not to use typical unit designations for Objective Force design in order to help push aside preconceived notions. Brigade-like units, though, are being called Units of Action. They are supported by different types of Units of Employment, which contain what have traditionally been division-level and corps-level assets.

How should footprint metrics be defined? From operational and strategy mobility standpoints, the first critical issue is how much has to be moved and sustained. To characterize this, traditional metrics work well: the number of personnel, the weight of the equipment, and the square footage (and/or possibly cube) of equipment. Together, regardless of unit size, these metrics drive deployment lift requirements, with the personnel metric also serving as a diagnostic metric because the number of personnel is often either a driver or an indicator (or both) of equipment and sustainment needs. From a strategic responsiveness perspective, strategic mobility is a function of how long it takes to get forces into sustainable action with the level of combat power desired. *The deployment lift requirements of those forces needed to deploy quickly to stabilize a situation on the ground and then create a positive situation for the United States are those lift requirements that most affect strategic mobility and responsiveness.* As long as these forces can be sustained, the lift requirements of later-deploying forces have much less effect on strategic responsiveness. The Army's deployment timeline goals suggest that the critical echelons for changing the dynamics of a contingency or a battlefield in today's Army at increasing levels of effect are a brigade combat team (BCT), a division, and five divisions, which must also have the requisite support elements. In addition, the footprint of BCTs and divisions affects their operational mobility by affecting the number of resources necessary for movement and the amount of force that has to be sustained. Thus we recommend that the personnel and equipment metrics be categorized at the maneuver and the "five-division-and-support" echelons divided into initial operating capability (IOC) footprint and full operating capability (FOC) footprint.[17] As long as these echelons become lighter in terms of initial deployment footprint (not combat power) and they remain sustainable, the Army becomes more strategically responsive regardless of total MTW or even total Army footprint.

For example, the amount of CSS footprint that has to deploy to make the SBCT initially employable is a critical strategic mobility driver. This level of footprint is different from the total amount of CSS footprint that must be deployed to provide sustained operating capability to an SBCT, which is

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[17]The Air Force has been increasingly defining unit footprints in terms of what is needed for IOC and FOC. Galway et al. (2002) has a thorough discussion of how dividing footprint into IOC and FOC requirements can add value from a strategic response perspective.

less than that needed for long-term presence where quality of life becomes relatively more important than in a high-risk combat situation. However, it is possible that the additional long-term sustainment footprint could be deployed at a time during an operation when strategic lift is less of a bottleneck, reducing the effect of this footprint on strategic agility. In effect, the demand for a resource—strategic lift—is smoothed over time. And perhaps some of the extended demand could be satisfied with local resources, eliminating the need for later deployments of CSS capabilities. Additionally, there will be cases where speed is not critical and it is desired to have more robust sustainment capabilities. In such cases, deployment footprint is less critical, and the unit could still unplug from heavier support assets for tactical maneuver. The same perspectives could be taken at the division and five-division levels. Getting initial capabilities rapidly into action in a sustainable manner provides power projection capability.

This categorization is not yet complete. To understand the contributions of each major set of Army functions with regard to footprint reduction, footprint should be measured separately for combat arms personnel and equipment, CS personnel and equipment, and CSS personnel and equipment, because they serve different roles for the Army. In this way, one can see how "efficient" each functional category is becoming with regard to its role alone. How much firepower, mobility, and protection are combat arms personnel and equipment providing, for what level of footprint? How much information or mobility support is CS providing, for what level of footprint? How much sustainment capability is CSS providing, for what level of footprint?

From a functional standpoint we define the categories as follows:[18]

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[18]Career military fields were categorized as follows in agreement with Army personnel:

- Combat: Infantry, Armor, Field Artillery, Air Defense Artillery, Attack/Scout Aviation, and Special Forces
- Combat Support: Engineers, Military Intelligence, Military Police, Signal, Chemical, Mobility Support Aviation, Aviation Operations, Intelligence Aviation, and Psychological Operations
- Combat Service Support: Maintenance, Ammunition, Supply and Services, Petroleum and Water, Medical, Transportation, Administration, Information Systems, Adjutant General, Chaplain, Public Affairs, Civil Affairs, Recruiting and Retention, Bands, Judge Advocate General, Finance, Dental, Veterinary, Comptroller, Acquisition, Aviation Maintenance, and Signal Maintenance

- Combat arms functions provide fire and maneuver force tactical movement capability.
- Combat support functions enhance combat power through combat multipliers. They enable an increase in the effects of combat platforms.
- CSS functions sustain a force, both people and equipment, and provide operational and strategic mobility. Both elements of CSS make it possible to deliver combat power.

This construct differs from what some might consider the more traditional one in which brigades and divisions are considered "combat" and echelons above division are considered combat support and combat service support. However, in this construct severe "distortion" can occur, which could provide incentives counter to the Army's desired direction. For example, as will be shown soon, a significant portion of personnel at the BCT and division levels are performing combat service support functions. It is the intention of new force designs to dramatically reduce these requirements in maneuver forces. These personnel should be counted as CSS so that this can be explicitly tracked and beneficial force designs and concepts rewarded. For instance, while the ideal situation is to reduce support requirements, finding ways to "reach" for support from outside the theater instead of having support within a division and thus negating the need for deployment is still a positive step. Yet in the traditional construct, this would serve to show a reduction in "combat" forces and an increase in CSS. The purpose of the CSS footprint reduction goal is to reduce the amount and proportion of CSS personnel that have to deploy, regardless of where they are in the combat zone. To date, because of the perceived importance of reducing CSS in maneuver forces, this is where the Army has focused its transformative force design efforts.

When comparing metrics among different types of forces to assess progress, this should be done in both relative terms and absolute terms. Relative terms communicate the "efficiency" of the force in terms of CSS versus what CSS is supporting. For instance, does 10 percent or 30 percent of a force have to be devoted to CSS assets? We put efficiency in quotation marks because to truly measure efficiency, we would need to be able to quantify the output capability—a measure of the amount and type of combat power—that a unit design provides. This is very difficult, and perhaps intractable, on two dimensions. The first is the problem of reducing combat effects to a single number. The second is that while one unit may be more effective along one dimension of capability, another unit type, for example one that is generally considered to be "lighter" in terms of combat power, may be more effective along other dimensions. Thus we might define efficiency in terms of each unit's given mission or for situations in which different types of units are potential substitutes (e.g., an SBCT deploying when the rapid deployment of an anti-armor defense is necessary instead of a heavy unit). Absolute terms can be translated to actual deployment, battlefield mobility, and sustainment requirements. They are the bottom-line metrics.

Sustainment resources should also be measured in traditional terms of short tons and square feet, which together describe total demand for lift. These metrics should be augmented with sustainment flow requirements—the frequency and consistency of sustainment lift needed to keep a force operational given its sustainment demand, its capacity for storing sustainment resources, and sustainment policies (e.g., top off fuel tanks every day regardless of consumption or top off every other day or as needed). Together the sustainment volume and the frequency of resupply determine the lift requirements for inter- and intra-theater distribution. Only if these requirements are resourced will the force designs reflected be sustainable.

In addition, footprint metrics should assess the degree of risk, if any, associated with the footprint reductions. Risk can be thought of in two ways. The first is akin to technical risk. Today the Interim Force SBCT design is based upon a set of performance estimates for parameters such as fuel efficiency, reliability, and lethality. For example, the number of fuel trucks is based, among other factors, on the fuel efficiency estimates of Strykers, and the number of maintainers is based upon the estimated reliability. If the actual values achieved when development and fielding is complete are different, then the force design numbers may have to change. By technical risk we mean: Will the design's assumptions and thus its projected capabilities be achieved?

We might call a second type of risk operational or concept risk. This is the risk inherent in a fielded design that does provide the expected capabilities. In what situations will the force design not work, and what are the probabilities of these events occurring? An example would be a force design dependent upon augmentation after a specified length of time. If the augmentation cannot be provided on time, what is the operational risk?

After discussing the need to measure CS and CSS separately in more detail on the next slide, in the succeeding five slides we examine SBCT CSS footprint (for situations in which speed of deployment is paramount) to illustrate these metrics and to begin to see the initial results of ongoing CSS transformation efforts from the perspective of initial deployment, whether for small-scale contingencies or major operations. Since sustained support requirements above these levels are still being developed, an evaluation cannot yet be done.

Because They Serve Different Purposes, CS and CSS Should Be Treated Separately

- **New and developing warfighting concepts may change the desired balance of combat arms and combat support in future forces:**
  - **Use of information and situational understanding as a force multiplier**
    - **Some CS functions are key *providers* of combat power in future warfighting concepts**
  - **Army might want to increase intelligence and signal assets to increase standoff capabilities, thereby decreasing the combat "tooth" to CS ratio yet increasing total efficiency (fewer total people or more efficient destructive power)**
- **CSS is a *sustainer* of combat power**
  - **Sustains both CS and combat arms**

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RAND ARROYO CENTER 5

In the Army's Transformation Campaign Plan, the Army's G-4 has been assigned responsibility for reducing CS and CSS footprint as one combined entity, so they have been measured together. However, CS and CSS serve different purposes and thus should be measured separately. CS is a provider of combat power. Some CS activities function as combat multipliers and are inseparable from combat forces during operations. Signal capabilities allow the operational elements to communicate, intelligence enables a force to apply combat power at the critical points, and combat engineers enable battlefield mobility and multiply the power of a defense. Emerging Objective Force doctrine relies even more on some CS capabilities. Information dominance (in part from military intelligence and signal capabilities) enables increased combat effects with fewer maneuver and firepower platforms by helping the commander position and move forces in the most effective manner. Information dominance enables increased use of indirect, standoff fires. Information dominance helps commanders avoid direct fire engagements, surprise, and unfavorable situations, increasing survivability. Therefore, the Army might, at some echelons and in some types of units, increase the relative size of information-providing functions.

Whether CSS is providing support to CS or combat arms functions in the combat zone is irrelevant. Both CS and combat arms create demands for CSS capabilities—just in different mixes among the classes of supply and services and the assets needed to provide the different classes of supply and services.

In addition, it is not clear why the Army's G-4 should be responsible for CS footprint reduction. The G-4 is responsible for both CSS capabilities and footprint, thus he is responsible for achieving a balance. However, the G-4 is not responsible for CS capabilities and thus lacks balanced incentives. Further, by definition the G-4 staff lacks the same degree of expertise in CS that it has in CSS and thus may not be able to accurately judge the warfighting value of CS resources, which would probably affect the prioritization of initiatives.

In short, to a great degree the Army's CS Transformation is about increasing information-oriented CS capabilities. Without radical CS improvements, a medium-weight force is unlikely to achieve the desired level of battlefield dominance. If desired information dominance capabilities are achieved without any reduction in CS footprint, this might still be acceptable, since this helps make viable a shift from heavy tanks and Bradleys to lighter weapon systems, making the entire force more mobile.

Here is an analogy to describe how the purposes of some CS and CSS functions differ and why it might be valuable to treat them separately: Think of the Objective Force as a human body. Some CS assets provide sensory capabilities, the nervous system, and information processing capability. They let the body sense and then understand what is happening around it. In response, a person may act using his muscles to move and take action—the body's combat arms function. CSS provides sustenance—the food, oxygen, water, and medical care—to *both* of these systems to ensure that they are both working properly.

CSS is most often a sustainer of combat power—that provided by CS and that provided by combat arms. It ensures that they can do their job. Generally, if sustainment becomes more efficient, total CSS resource requirements will go down. Automating CSS will generally make sense when it reduces total CSS resources. However, there are still cases when it could make sense to increase CSS footprint where it increases combat power. For example, if more CSS footprint actually increased mobility in a way that effectively increased combat power, then one might decide to accept the increase. Again, we see that an increase in a "support" function can be valuable when it increases combat power and is aligned with the purposes of the power projection goals. But generally some CS functions are being thought of as substitutes for traditional combat arms capabilities, while CSS functions are thought of more in terms of a necessary burden (except for resources that provide vertical maneuver and strategic lift capabilities). Therefore it might be acceptable to exchange CS for some combat arms footprint, but in general, such a tradeoff would not be desirable from a CSS standpoint.

Thus, in the remainder of this briefing we will discuss CSS footprint only, as we are focusing on the CSS transformation.[19] Footprint can be measured similarly for combat arms, combat support, and CSS, but these measurements should be balanced against different considerations.

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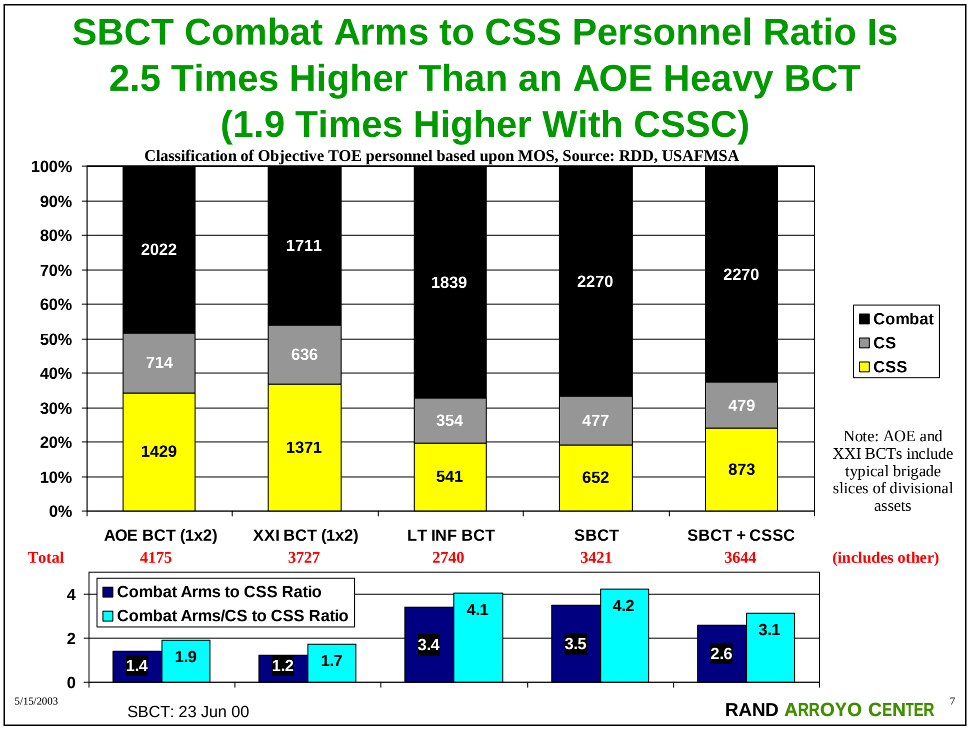
[19]While we will stay with the use of combat arms, CS, and CSS in the remainder of this document, the previous discussion suggests that a better set of terms might be useful in categorizing metrics for Army Transformation. The traditional categorizations of combat arms, CS, and CSS do not cleanly line up with Interim or Objective Force operational concepts. A new set of categories might be maneuver—firepower and movement (which would include combat engineers for mobility and counter-mobility support), information providers (i.e., military intelligence and signal corps), services and sustainment (a combination of the other CS functions and most of CSS), and perhaps a fourth called mobility providers—forces dedicated to moving other forces whether tactically, operationally, or strategically. Alternatively, in the course of our research Army personnel suggested the use of just two categories: combat power versus support and sustain. The combat power category would include maneuver and information providing forces, with the support and sustain category consisting of the services and sustainment and mobility provider categories.



This slide begins an initial examination of CSS footprint design efforts for the Interim Force. These metrics slides only show "results" in terms of footprint numbers and do not assess risk, which we will touch upon in the strategies section of the document, or combat capability. The top graph compares the relative proportion of personnel by major category across BCT types, classified by military occupational specialty (MOS), which is being used as a proxy for function at two levels: combat arms, CS, and CSS and functions within CSS. The bottom graph indicates the ratio of combat arms to CSS personnel—if you will, the tooth-to-CSS-tail ratio—and the ratio of combat arms and combat support to CSS personnel—the supported-to-sustainer ratio. The top graph provides a picture that helps one envision the structure of a force, and the ratios provide metrics that can easily be compared across different units and designs.

Nominally we have selected the legacy Army of Excellence (AOE) heavy force design as the baseline for comparison, although we also show Force XXI and light infantry designs in this and the following slides. This does not mean that we believe the SBCT to have similar capabilities to a heavy force, but rather that we see the SBCT as more of a "substitute" for missions in which heavy forces might have been seen as the default but not the ideal. However, we should also point out that the SBCT is not merely about a different level of capabilities but rather, to a degree, about different types of capabilities, so there is no perfect comparison. The Army has recognized an inability to get forces with "sufficient combat power" to many places quickly. It has also recognized that there have been many cases where a light unit is insufficient but the level of power needed is below that of a modern heavy unit. But lacking anything in between, the default often has to be the heavy unit, which creates a large time penalty. Alternatively, deploying a light unit in such a situation produces a high level of operational or force risk. The SBCT, among other missions, becomes the unit of choice for these missions where a heavy, although it was not the ideal unit, had to be used because there was no alternative. Thus we chose this as the baseline. Additionally, most units were still under the AOE design when Transformation began.[20]

The division slices for the legacy units are designed to provide like capabilities to those that were made organic in the SBCT (signal, MI, MP, FA, Engineers, support battalion). They represent typical task organizations. The SBCT was not designed to need this type of task organization, having the capabilities embedded.

We see that for the SBCT, combat arms personnel have increased as a percentage of the force as compared to heavy BCTs, and the combat arms personnel percentage is about the same as for a light infantry division. Most of this has been in exchange for a relative reduction in CSS personnel, with CSS personnel falling from 34 percent to 19 percent of a BCT (24

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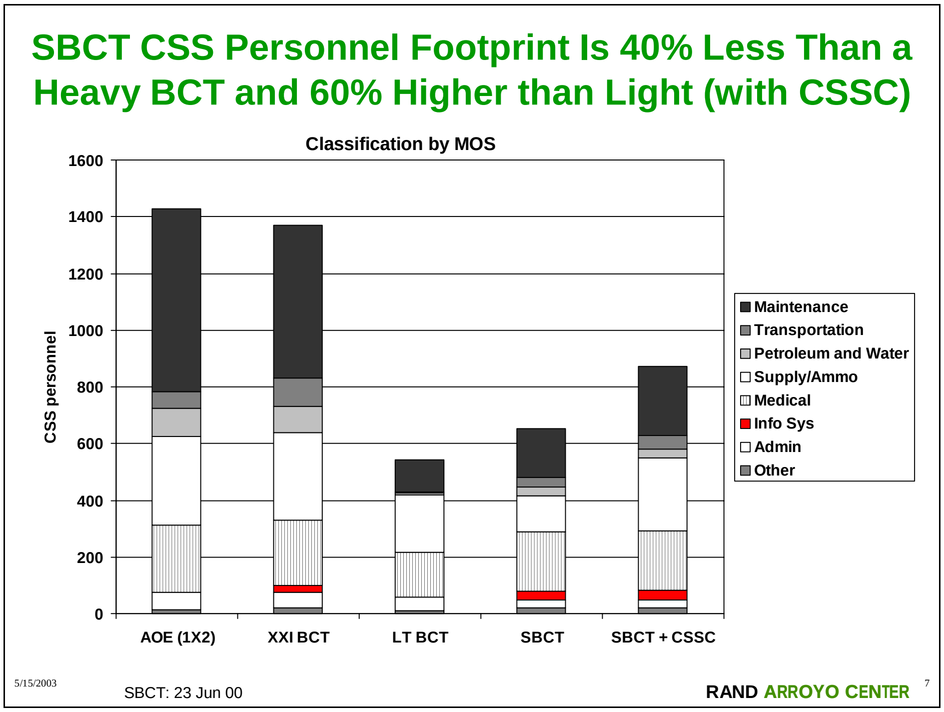
[20]According to Headquarters, Department of the Army, *The Stryker Brigade Combat Team*, FM 3-21.31, February 2003, pp. xi, 1-1, 1-5: "The Stryker Brigade Combat Team is designed to be a full spectrum, early entry combat force. It has utility in all operational environments against all projected future threats. . . . The SBCT balances lethality, mobility, and survivability against the requirements for rapid strategic deployability. . . . Although the Army was capable of full-spectrum dominance, it had not optimized its organization and force structure for discrete and rapid strategic response in the face of an increasingly broad range of operational demands posed by its participation in an MTW, SSC, or [peacetime military engagement]. Meeting these requirements demands a rapidly deployable, highly integrated combined arms force. This force must be able to achieve overmatching combat power against an increasingly sophisticated enemy in any terrain. The SBCT is equipped, manned, and designed to provide this capability."

percent with the combat service support company or CSSC).[21] A reduction in maintenance personnel provides the greatest contribution—SBCT maintenance is just one-third the relative size of maintenance in a heavy BCT. With the combat arms increase and the CSS decrease, the ratio of combat to CSS personnel is about 2.5 times higher for an SBCT than for an AOE heavy BCT (1.9 times with the CSSC). This comparison describes the relative efficiencies of the organic organizations in terms of personnel with regard to how many CSS personnel it takes to support a unit.

The improvement in relative CSS footprint remains dramatic at the BCT level even when including the CSSC. Note that the SBCT's composition of personnel is similar to a light BCT's, yet it has significantly more equipment. So while an SBCT clearly has less support requirements than a heavy BCT because its vehicles demand less fuel, ammunition, and maintenance, the entire reduction cannot be from demand alone, since the demand is still clearly much higher than for a light BCT.

[21]The CSSC contains CSS augmentation for extended operating capability or high-intensity situations that stretch the organic SBCT CSS capacity. This provides an example of a modular unit design that eases the ability to phase deployment in order to more quickly achieve initial operating capability while still preserving the flexibility to appropriately respond to situations of higher operating tempo.



This slide compares the absolute actual sizes of the CSS portions of the BCTs to examine the actual resource requirements of each brigade's CSS organization.[22] The absolute SBCT CSS footprint in terms of personnel is about 50 percent less than for an AOE BCT. Decomposing the CSS category into functional elements provides diagnostic ability. Again, we clearly see that maintenance dominates the reduction. Petroleum and water supply

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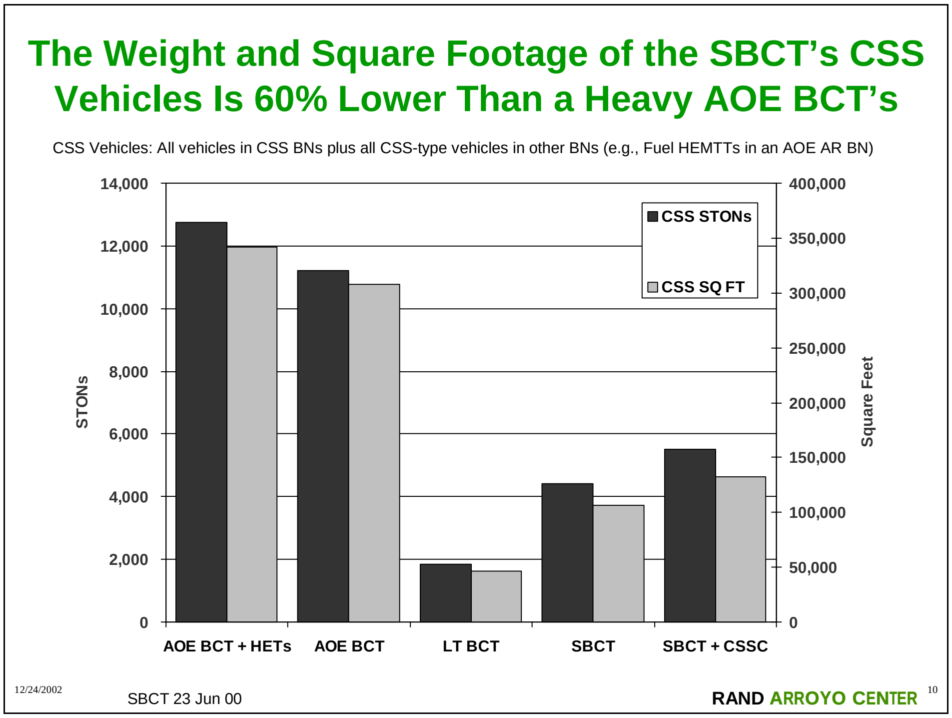
[22]Neither this slide nor others in this section should be used to make judgments about total Army CSS footprint. Rather, it only compares footprint among different types of forces that might be considered options for rapid deployment response. In fact, the SBCTs are primarily being converted from light forces, so actual CSS will grow. Considering the four active infantry brigades being converted (three light and one mechanized), CSS spaces will increase in these brigades by 440 when including the CSSCs.

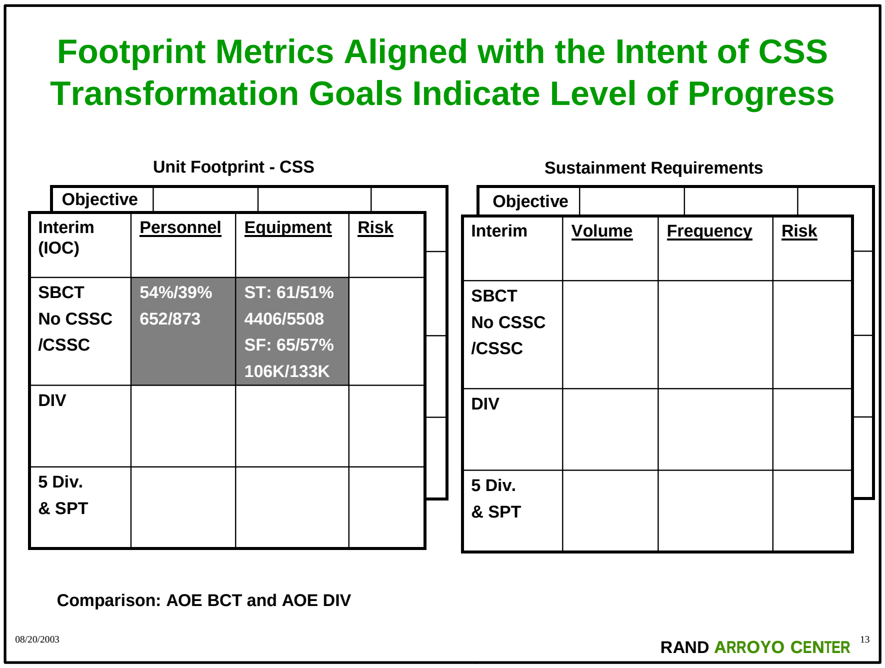
SBCT fielding schedule:

- 3rd Brigade, 2nd Infantry Division (3-2 SBCT), Fort Lewis, Washington, FY03 (until FY07, when the Army plans to convert a brigade in Germany to the SBCT design)
- 1st Brigade, 25th Infantry Division, Fort Lewis, FY04
- 172nd Infantry Brigade, Fort Wainwright, Alaska, FY05
- 2nd Cavalry Regiment, Fort Polk, Louisiana, FY06
- 2nd Brigade, 25th Infantry Division, Schofield Barracks, Hawaii, FY07
- 56th SBCT, 28th ID, Pennsylvania Army National Guard, FY10

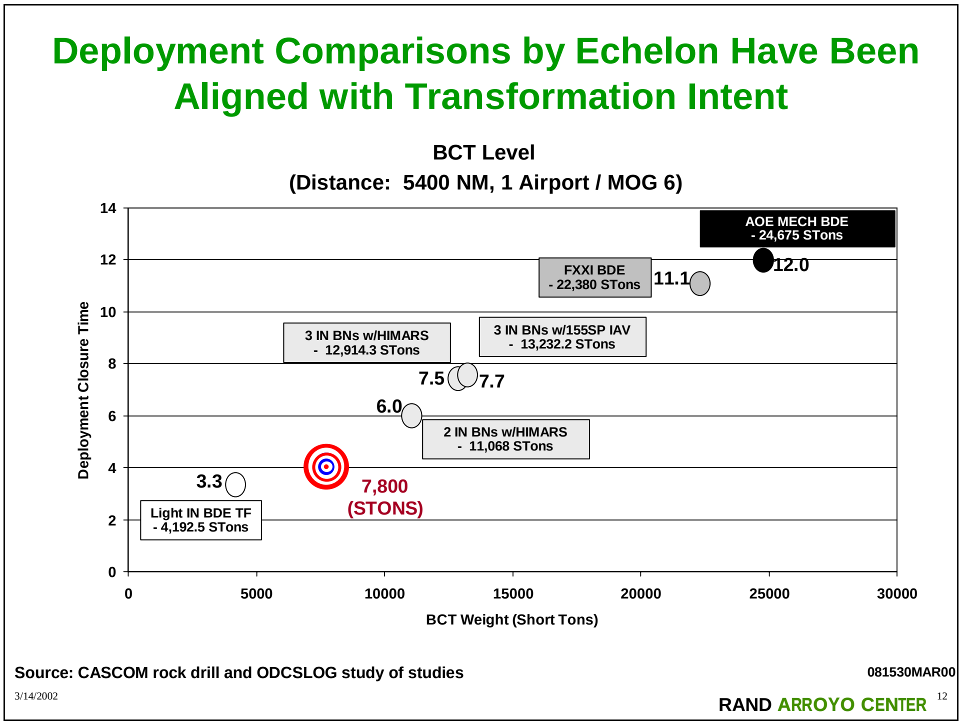
personnel have been substantially reduced as well from a relative sense, but this reduction contributes much less to the overall improvement, because of the smaller size of these functions within AOE BCTs. Other supply personnel decrease substantially in the SBCT, but many are shifted to the CSSC to be phased in at the appropriate time in an operation. Medical and transportation personnel levels stay roughly the same. Administrative personnel decrease, but this is offset by the addition of information systems personnel.



This slide compares the short tons (left columns) and square footage (right columns) of CSS vehicles in AOE, light infantry, and Stryker (with and without the CSSC) BCTs. The footprint of CSS vehicles has been reduced by more than 60 percent in the SBCT versus an AOE BCT even with the CSSC. If we add a platoon of heavy equipment transporters (HET) to the AOE BCT, the difference increases further. These numbers were calculated by manually identifying the CSS vehicles in each subunit in the BCTs. The CSS vehicles include all vehicles in CSS units (forward support battalion [FSB] or brigade support battalion [BSB]), all recovery vehicles, all field artillery ammunition support vehicles (FAASV), and all trucks (less non-CSS high mobility multi-purpose wheeled vehicles [HMMWV]) not in CSS units.



This chart depicts a potential scorecard format for communicating footprint progress. Each box would show the reduction from the baseline as well as the absolute value for each metric and category (level 1: functional category—CSS, level 2: echelon of unit, level 3: IOC versus FOC [e.g., SBCT with and without the CSSC], level 4: force—Interim, Objective). In this slide, the numbers were extracted from the previous footprint metric slides. For example, an earlier slide showed a 54 percent reduction in personnel from the baseline to the SBCT with 652 CSS personnel.



In general, the metric of deployment closure time has a fairly well understood, common definition—the time from when the first piece of a unit leaves its starting point until the entire force being measured arrives on the ground at its destination. The switch from tanks and Bradleys to Strykers slashes the weight of the SBCT, as compared to an AOE BCT. In addition, the reduced CSS footprint from the reduced resource demand of Strykers and the modular support and DBL-based force design decisions (discussed later) further reduces the weight of the SBCT. The lower weight has decreased deployment time by almost 50 percent compared to an AOE BCT. For example, CASCOM calculated a reduction from 12.7 to 7.5 days for a deployment from Fort Lewis to Skopje with a working maximum aircraft on the ground (MOG) limit of 6. This is still far from 96 hours. With current airlift capacity and likely working MOG, the 96-hour goal is not achievable from Fort Lewis to most potential contingency locations. Similar conclusions have been reached by multiple RAND studies and a G-4 study. However, this picture is not complete, because it describes only one situation and one set of conditions.[23]

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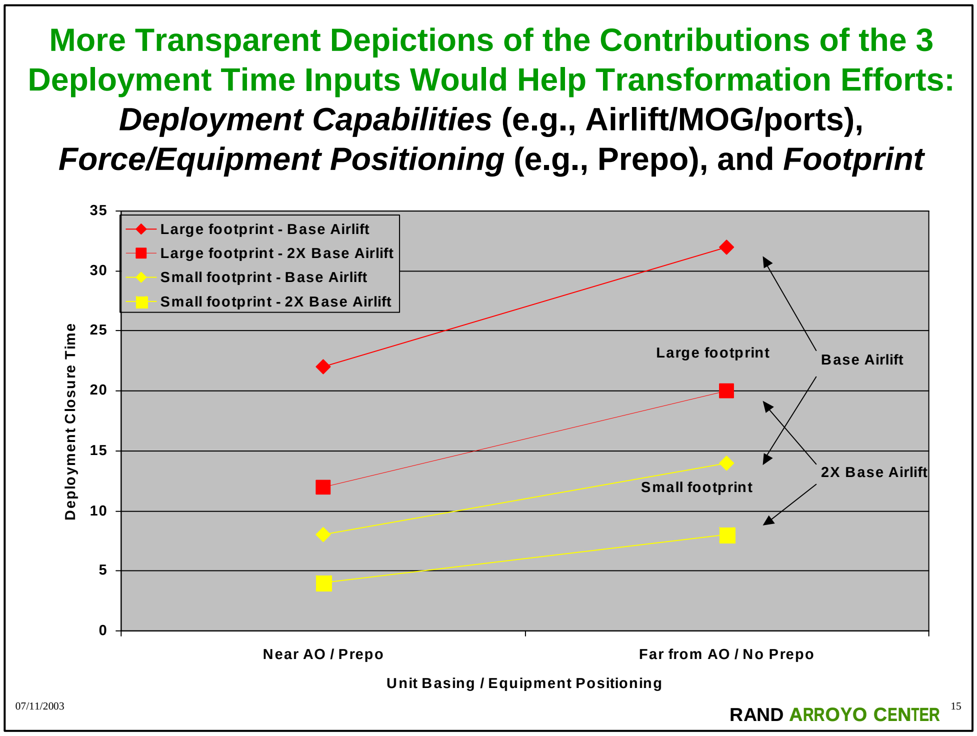
[23]The U.S. Air Force has also been examining how to reduce deployment timelines—specifically hours from deployment execution to bombs on target capability. Lionel Galway et al., *Supporting Expeditionary Aerospace Forces: New Agile Combat Support Postures*, Santa Monica, CA: RAND, MR-1075-AF, 2000, has a discussion of this goal as well as a discussion of how the Army might redesign combat support (similar to Army CSS) structures to reduce these timelines. This includes an examination of what must deploy with the unit versus what can be relied on through reach and distribution, the use of intermediate support bases, and selected prepositioning.



Deployment time measures strategic mobility, thus it is really one of two high-level results-oriented metrics for the two high level capabilities that produce strategic responsiveness: strategic mobility and combat power. But measuring deployment time alone is not that useful for understanding why deployment time is what it is and how it can be changed. For this type of understanding, diagnostic metrics are necessary. When we examined footprint metrics, we did so with an eye toward how footprint was affecting the two high-level capabilities. From a strategic mobility or deployment time sense, *deployment footprint or how much has to be moved* is just one of three main drivers. The other two are deployment capabilities, which reflect the *capacity and speed of lift* and the *throughput of nodes* such as sea and aerial ports, and the *positioning/stationing of forces and equipment*.

Examining deployment time as a function of all three strategic mobility inputs provides a more complete picture of deployment time and better facilitates decisionmaking about what the Army should do to achieve the deployment timelines it has laid out as targets. This notional graph illustrates the type of picture that would be useful, showing one aspect of each of the three strategy mobility dimensions on one graph. The darkness of the lines and markers indicates the level of footprint—large or small. The shapes of the markers indicate the amount of available airlift—baseline or two times the baseline. The position of the markers with respect to the x-axis indicates two different aspects—unit basing near the area of operations (AO) or unit basing far from the AO and prepositioning of equipment or no prepositioning of equipment. A third point on the x-axis could be unit basing near the AO combined with prepositioning. This would be an example of showing more points along any one of the three dimensions to examine the effects of combinations of initiatives within each of the three dimensions.

3. STRATEGIES FOR ACHIEVING CSS TRANSFORMATION

Outline

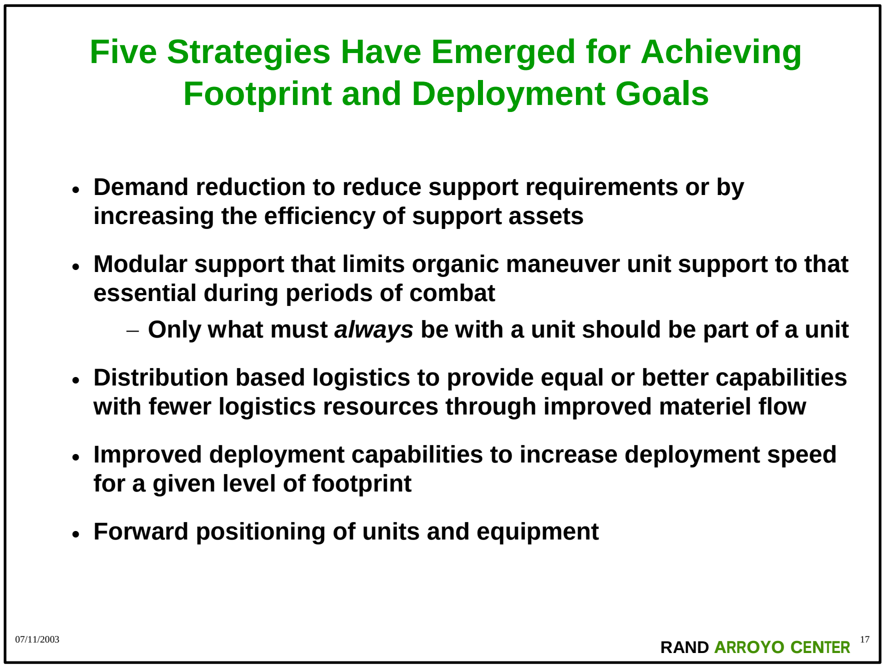
CSS Transformation goals and measurement

Strategies for achieving CSS Transformation

3/15/2002

RAND ARROYO CENTER 14

We now shift to the emergent strategies for CSS transformation goals.



Since the Army began its Transformation Campaign, the CASCOM, the Army Materiel Command (AMC), the Army's G-4 staff, and CSS personnel in the Army's major force-providing commands have been developing ideas for achieving the CSS transformation power projection goals. These ideas are documented in a variety of forms, some draft and some already formalized. In reviewing these documents, discussing ideas with CSS personnel, and attending conferences and workshops, we see the emergence of five strategies for achieving the CSS transformation goals.

The first, demand reduction, is about reducing support requirements by reducing the demand of the forces being supported (including CSS personnel and equipment) or reducing the amount of CSS personnel and equipment necessary to provide a given level of support using a given concept of support. It works on several levels. The most commonly thought of level is reducing demand for CSS capabilities through more efficient platforms, such as improving the fuel efficiency of combat vehicles or even CSS vehicles, or even by making CSS vehicles and equipment more efficient with regard to their functions. A second level is making a combat force more efficient through combat multipliers, such as technologies that create information dominance and enable a reduction in the number of combat platforms to achieve a given level of combat power. A third level is a change in mission need that shifts combat platforms to lower-demand systems. A fourth level is personnel efficiency.

The second strategy is modular maneuver unit support, *which limits organic support to those capabilities always essential during combat operations*—no "luxuries," just-in-case capabilities, or capabilities that are only needed periodically or sporadically are present. That is, only support functions and the portions of their capabilities that must always be with a unit will be part of a unit (all capabilities that must be present to enter combat immediately should be organic). This means that some capabilities are specifically excluded from a given organization, producing a mobility improvement in some situations. Support capabilities become modularized to those needed for IOC in typical combat situations, those needed for higher operating tempo or sustained combat operations, those needed for special situations, and those needed for quality of life. Each can then more easily be brought in at the appropriate time without being a deployment or operational mobility burden when the "module" is not needed. The capabilities will have to be available at a later time or on demand, depending upon the capability. In exchange for the mobility improvement in most situations, the range of intensity that a unit can handle might be limited, with augmentation necessary to prevent operational risk in situations expected to be at the higher end of the intensity scale. Activities not critical during intense combat operations will be deferred. Modular support primarily shifts footprint in time or space, thereby decreasing initial deployment footprint and decreasing the size of maneuver units. Thus it increases operational and strategic mobility, even though it does not necessarily reduce total combat zone footprint.

We note that modular support is really not new, but a return to force-design concepts that have been used in the past, such as in the World War II infantry division design, which emphasized the minimization of organic assets. Modular support tends to be applied when the need for the U.S. Army is power projection oriented, which requires high mobility. In contrast, the AOE heavy division was developed in response to the need to have powerful divisions ready to defend in a fixed location with potentially disrupted strategic lines of communication, making strategic mobility much lower in priority and creating the need to have robust capabilities on the ground in the anticipated location of a war. The assumed situation was "maximum" intensity, and the ability to augment was expected to be limited.

The third strategy is the continued implementation of distribution-based logistics (DBL), which aims to provide *equal or better* CSS capabilities with fewer unit resources and supplies through better distribution. It exchanges "warehousing" (storage, picking, packing, and reconfiguration of loads) capacity in maneuver units, or for that matter anywhere in the combat zone, for frequent, consistent flows that respond to better information. Thus it exchanges deployment footprint and lift requirements for sustainment footprint demands (the nature or pattern of sustainment flows, not the amount). This leads to an actual reduction in total combat zone footprint, and some shifting of requirements: from deployment requirements to sustainment flow requirements. Sustainment flow must become more reliable and responsive, with sustainment requirements more effectively and rapidly communicated across the supply chain.

The fourth strategy, improved deployment capabilities, enables faster deployment for a given level of footprint by improving deployment process throughput. This includes increasing lift capacity, increasing infrastructure throughput capability, and enhancing process performance, such as the time it takes to load and unload aircraft or how effectively a unit utilizes aircraft given its combat loading constraints.

Forward positioning, the fifth strategy, is about moving forces or equipment closer to anticipated deployment destinations. Thus it involves the basing of units, the prepositioning of equipment, and the movement of units or equipment to positions of advantage upon strategic warning.

Over time, better descriptions of the strategies may be developed, some may be eliminated, and others may be added. However, the key is to have widely understood strategies. They will help explain the CSS transformation effort, they may trigger ideas themselves, they provide a common language for describing why things are being done, and they give people a sense of the types of effects an initiative may have.

In the remainder of this section, we discuss how these strategies contribute to the CSS transformation goals and explain in more detail how they are and can be applied. This will lay the groundwork for grouping and linking proposed or already implemented CSS transformation initiatives and enablers to well-defined strategies tied to CSS transformation goals, which will facilitate the ability to explain why they are important to CSS transformation. It should also facilitate consideration of what other actions can be developed to further apply these strategies.

The Strategies Apply Complementary Approaches to Achieve Transformation Intent

	Improvement approach		Benefit	
Strategy	**Footprint reduction**	**Faster deployment (for a level of footprint)**	**Tactical / operational mobility**	**Strategic mobility**
Demand reduction	✓		✓	✓
Spartan support	✓		✓	✓
Distribution-based logistics	✓		✓	✓
Improved deployment capabilities		✓		✓
Forward positioning		✓		✓

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RAND ARROYO CENTER 16

The five strategies take two complementary improvement approaches to CSS transformation. Three aim to reduce footprint, and two produce benefit by increasing deployment speed for a given level of footprint. The three strategies that reduce footprint benefit both aspects of strategic responsiveness by improving mobility at the operational and strategic levels, while the two that focus on improving deployment speed for a given level of footprint only affect the strategic mobility aspect of strategic responsiveness.

There Are Many Ways to Reduce Demand for Resources

Platform efficiency

- **More efficient platforms through new technologies (e.g., hybrid engines)**
- **More efficient CSS equipment (e.g., one 1500 GPH tactical water purification system replaces two 600 GPH ROWPUs)**
- **Improved treatment of sustainment in requirements development and acquisition**

Force efficiency

- **More efficient forces through combat multipliers (e.g., improved situational awareness)**
- **More efficient forces through commonality (e.g., common chassis)**
- **Improved treatment of sustainment in requirements development and acquisition**

Personnel efficiency (e.g., operator-maintainers enabled by improved design for maintainability such as built-in diagnostic automation and plug-and-play components)

Mission Focus (e.g., medium-intensity focus with augmentation for MTWs—Strykers instead of M1s and M2s)

07/11/2003 RAND ARROYO CENTER 19

The need for CSS capabilities in the end comes down to the demand for these capabilities. While the CSS community can find ways to provide capabilities more effectively and efficiently, dramatic reductions in CSS footprint also are likely to require significant demand reduction. While the CSS community is not responsible for designing the forces and equipment that it must support, it is imperative for the CSS community to remain an advocate of demand reduction. This obviously should not be at the expense of combat capability; rather, it should be to keep the operational community aware of the "costs" associated with support requirements to ensure that this remains a key part of the force and equipment design decisionmaking processes.

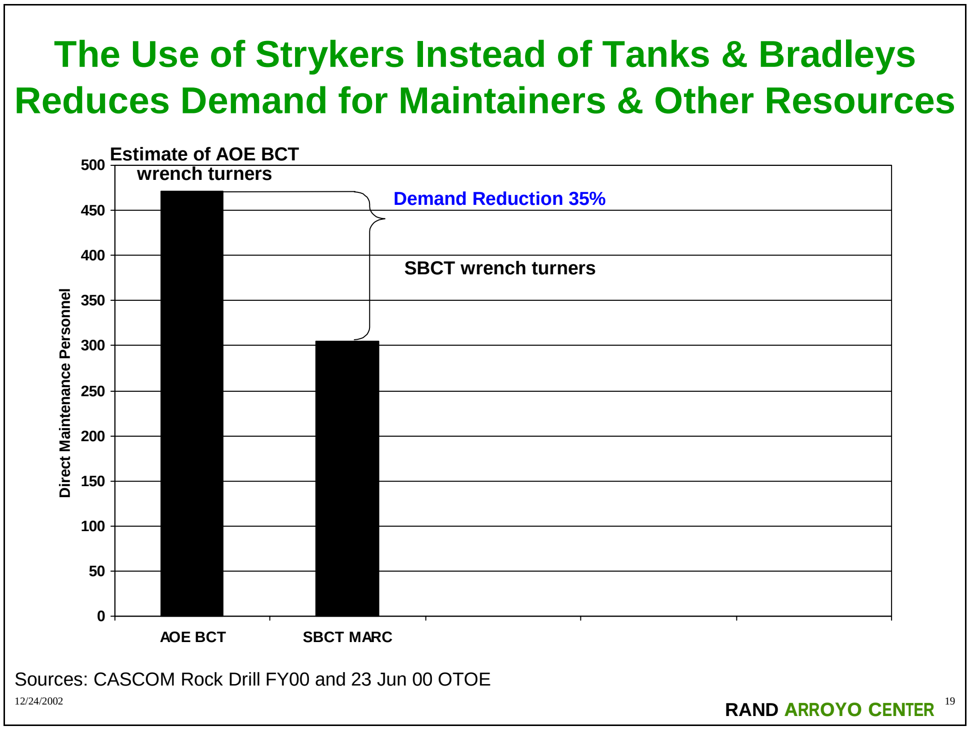
There are many ways to reduce the demand for CSS resources, which we describe as four substrategies. Most typically, people think of reducing demands on the logistics system through better fuel efficiency, smart munitions, and better reliability. We term this type of reduction *platform efficiency,* which is primarily about applying new technologies to make platforms more efficient. More efficient CSS equipment also applies to this category. An example is the 1,500 gallon per hour (GPH) Reverse Osmosis Water Purification Unit (ROWPU) that will be able to more than do the job of two 600 GPH ROWPUs. Another is built-in load-handling systems on cargo platforms that reduce the need for load-handling vehicles. One might even consider newer ideas such as onboard water generation from vehicle exhaust as "CSS platform efficiencies." These types of initiatives reduce the amount of CSS assets needed to provide a given level of capability. Thus, more efficient CSS equipment reduces the demand for CSS assets. For platform efficiency to be successful, whether in reducing the consumption demands of equipment or in making CSS equipment more efficient, these concerns must be addressed from the start and then throughout the Army's materiel development process. This requires better, more comprehensive treatment in the requirements-development and acquisition processes.

Platform efficiency is a major area of emphasis in Objective Force development. In particular, the Army is counting on improved fuel efficiency through the adoption of new technologies such as hybrid-electric engines or fuel cells, reduced maneuver force water structure and distribution requirements via onboard water generation from engine exhaust, reduced maintenance requirements from dramatic improvements in reliability and maintainability, and increased use of smart munitions.

Significant attention is also being given to improving *force efficiency*—reducing footprint through initiatives that require fewer assets or platforms to execute a mission. Combat multipliers such as information system tools that provide greater situational awareness can reduce the number of combat platforms needed to accomplish a given mission or enable a less capable combat platform to be as effective with the multiplier (e.g., medium-weight vehicle with beyond or non-line-of-sight precision fire capability networked to sensors) as a more effective system is without the multiplier (e.g., tank). The organic reconnaissance, surveillance, and target acquisition (RSTA), military intelligence, and signal assets in the SBCT provide situational awareness and information dominance over most potential adversaries, which increases the capabilities of its medium weight combat vehicles. Building upon these concepts is one of the dominant themes of Objective Force development, particularly through the creation of a common operating picture that not only gathers but interprets data, and through real-time targeting by remote sensors. Interim and Objective Force development has also emphasized vehicle commonality, which reduces support requirements for a given number of vehicles. Spare parts can be used across similar platforms, making inventory more efficient and effective (increased demand at the individual part level helps enable the ability to stock a larger percentage of a vehicle's parts). Another promising concept is common ammunition across platforms, which again makes inventory more efficient and enables CSS footprint reduction. Force efficiency success also rests upon rigorous treatment in the requirements development and acquisition processes. Attention must be given at both the platform level and a higher, integrative level that ensures each individual program fits together in a larger, overall design for the entire force.

Besides increasing the efficiency of a force from an equipment viewpoint, *personnel efficiency* can also improve. This is about initiatives that allow fewer people to do the same job. In some cases this may depend upon platform and force design issues. For example, better design for maintainability that reduces the special tools and equipment and the expertise needed to troubleshoot problems and then replace components can reduce the demand for highly trained maintenance personnel. Operators or crews could then execute many more maintenance tasks. Increasing their maintenance training could then be synergistic with vehicle design, creating even more opportunity for maneuver force maintainer reduction. Improved logistics situational awareness tools offer both better capabilities and the opportunity for logistics managers to be used more efficiently. Other possibilities, such as increasing the skill levels of those in some logistics career fields through new career management and personnel policies, offer further potential.

Finally, demand reduction is sometimes a product of a change or a specialization in *mission focus* that changes force design, as with the SBCT. By virtue of being "optimized" for medium- and lower-intensity small-scale contingencies, the SBCT does not need to have organic assets that enable it to meet any eventuality or to perform every task. Thus it does not need to have heavy weapon systems such as the Abrams tank—it is sufficient in most envisioned SBCT situations to have defensive anti-tank capability, and the need for mounted assault is limited. In essence, specialization for "medium-weight" missions allows these missions to be executed more efficiently. Elements that have been "scoped" out of a force design can still be provided as augmentation upon demand without encumbering a force all of the time through the modularization of Army forces.



This slide provides one example of the powerful effect that demand reduction can have on force design. The SBCT adopts a new mission focus—medium and lower intensity—and relies on force efficiency initiatives to enable it to be effective with Strykers. Compared to a BCT equipped with tanks and Bradleys, this force has much lower projected demand for ammunition and maintenance due to the intent to rely to a greater degree on Joint fires and better projected reliability.[24] Based upon Stryker reliability estimates, the actual direct maintenance hours and thus the number of maintainers needed is 35 percent lower than for an AOE BCT. This is depicted in this graph, which shows the AOE BCT and SBCT direct maintainer requirements based upon actual and projected manpower requirements criteria (MARC) hours for the respective BCTs.

This technique can be used to assess maneuver force design effects from demand changes. In general, CSS resources within a BCT or smaller unit are a function of unit workload. When this workload changes, the force

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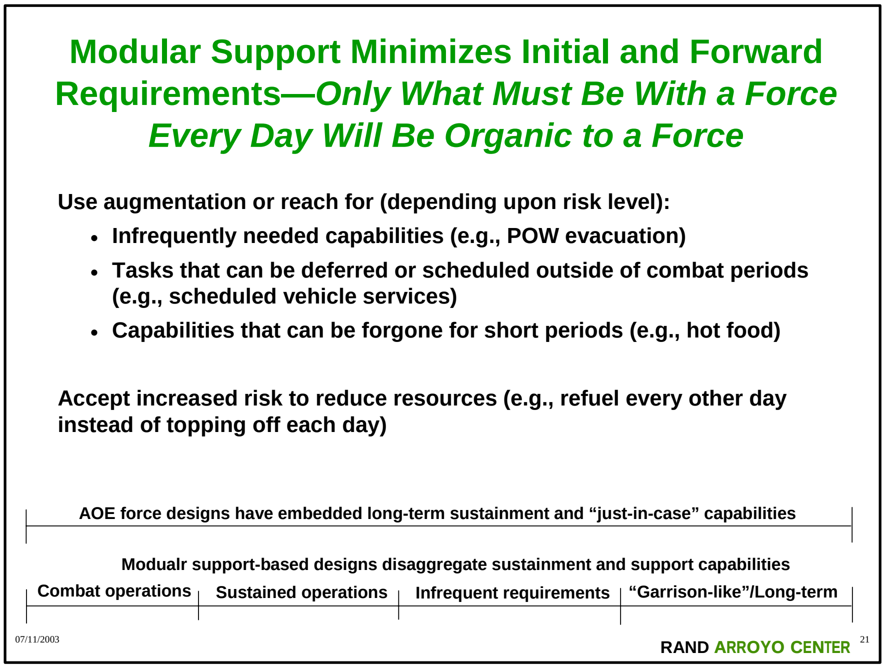
[24]As noted earlier, the SBCT is also more fuel efficient, but its expected mission profile demands greater mileage. The overall result is a roughly equal expected demand for fuel.

design process enables a mapping to the resource requirements. Above brigade, force structure requirements are more difficult to estimate. To do this, one generally has to use total force excursions through the Army's model, Force Analysis Simulation of Theater Administration and Logistics (FASTALS), or one would have to conduct a customized special study to determine an estimate.



Modular support strategies aim to reduce initial and forward CSS footprint in maneuver units through the ability to phase in capabilities appropriately according to the mission need, so that those and only those capabilities needed for a given situation are present. Only those capabilities that always have to be there and that can be provided through reach without undue risk remain organic to the unit. All other capabilities should be available as the mission demands through other "modules." At the same time, it is essential that the organic capabilities of a combat organization retain everything that is necessary to enter combat immediately.

Under modular support, the organic capability of a combat unit is stripped to the essential elements that must be there to conduct initial combat operations. As a result, in situations where deployment speed is of the essence, such as halting an enemy advance, the unit is kept lean. However, the other modules can be added back in for other situations and as the situation on the ground changes. For example, hot food capability is not necessary during periods of intense combat and adds to the deployment burden without increasing a unit's short-term fighting power. Thus it, and other base operating support capabilities, should be modular. In cases where a unit deployment does not have to be rapid—there is no emerging crisis to prevent or a situation that must be dealt with immediately—these modules can become part of the initial deployment, can follow quickly behind the initial deploying unit, or could even be set up first. In this case, providing good quality of life for the soldiers is more important than keeping the initial deploying force as lean as possible. This has the further advantage of focusing attention on the design of these modular capabilities, which may be useful in driving standardized policies for capabilities such as base operating support. Modular support also excludes capabilities from a unit that may be needed in theater at some time during a deployment but not during maneuver operations, where they would be a "burden," e.g., scheduled service capacity. Today, service capacity is hard to remove because it is not determined separately. In effect, some portion of every maintainer's "capacity" is to provide services. Instead, a dedicated organization would provide service capacity when needed.

In short, modular support is about making possible what we might call "spartan" support where it is of value. Support should remain "spartan" only as long as the mission need dictates but no longer. Beyond this, the Army should carefully consider how long a unit should operate in "spartan" conditions. Thinking through support capability modules and the situations in which various capabilities may be needed may have the second beneficial effect of actually improving the robustness of support when robust support is called for. In summary, modular support improves the ability to quickly and appropriately tailor the level of support to the situation. Making it work requires new ways of thinking about units and their designs.

Generally, modular support can be applied in two ways. The first is to reduce the scope of capabilities organic to a given unit by removing infrequently needed capabilities, those that can be forgone for a short period, or those that enable the execution of tasks that can be deferred outside of "operational pulses." When determining the scope of needed organic capabilities, it is critical to ensure that all functions of the military unit are considered—not just CSS. For example, the support battalion needs to have enough soldiers for force protection in the brigade support area and for the distribution of supplies—whether as a duty of the CSS personnel or perhaps dedicated support battalion personnel. The second way is to accept increased risk to reduce resources. In general, this is about reducing the safety stock of supplies, regardless of class. For example, a policy of refueling only when fuel levels drop to a specified level or every other day, whichever is sooner, enables a force to have fewer organic fuel trucks.

It is critical to note that every modular support initiative requires a resourced plan for providing the removed capability when needed. Such plans should include time requirements both from the perspective of how quickly a capability must arrive when called for and how long a unit can go without the capability. Options include military unit augmentation, host nation support, locally contracted support, and LOGCAP. Such capabilities must be available in peacetime at home station as well as in deployed environments. Further, plans must be developed that enable the delivery of nonorganic capabilities without forcing warfighting pauses. If, for a given capability or class of supply, this is not feasible, then the resources should be included as part of the capabilities and resources considered necessary to generate a unit's IOC. If there are only certain scenarios where this will be the case, the capability in question could become a module separate from the unit that deploys in the initial deployment flow with the unit when appropriate. Otherwise, such capabilities should become organic resources.

The SBCT Organizational and Operational Concept (O&O) planning document and the resulting force design heavily incorporates modular support and distribution-based logistics. Before beginning a discussion of how they have affected the SBCT's footprint, though, a warning is in order. To a certain degree, the personnel reductions we will discuss (and that are indicated in the metrics section of this document) were at least partially imposed on CSS functions prior to thorough analysis. In effect, caps were set that pushed the Army toward the CSS goals. This forced the CSS community to determine how these numbers could be reached without compromising essential mission needs, which drove new ways of thinking about CSS support. This resulted in the application of modular support policies and increased the speed of an ongoing evolution to DBL. The CSS community was pushed hard to think about what functions and capabilities must always be part of a unit and then to think about how those capabilities that do not have to be embedded in a unit can be provided when necessary. Some of the decisions produce tradeoffs between footprint and capabilities as well as between organic maneuver force resources and other resources; thus, some in the CSS community view them as negative. They should be viewed positively, however, in that innovative thinking was applied, producing changes that most likely would not have occurred had the traditional branch-centric bottom-up force design process been employed. In addition, in the test and evaluation process, shortfalls in capabilities can be eliminated. The key is that adding resources back in takes rigorous justification; it would be harder if not impossible to take resources out in this phase if certain functions were found to be over-resourced.

It is important, however, that the CSS community clearly explain the resulting tradeoffs from implementing modular support—both in terms of capabilities and resource requirements (what is needed to make the changes work), along with the benefits and risks these decisions have produced. In addition, it is imperative that the ideas developed with regard to how to provide capabilities not embedded in a unit are implemented.

Modular support has greatly reduced organic SBCT CSS footprint. For example, SBCT organic maintenance will not have scheduled service capability, will conduct very limited component repair, will complete deadlining and safety repairs only, and will have constrained capacity. All of these policies reduce the number of direct maintainers or wrench turners, the number of maintenance supervisors needed, and the number of maintenance vehicles required. Similarly, vehicle self-recovery and like-vehicle recovery capabilities have personnel and materiel implications: fewer recovery vehicles and fewer recovery personnel. A shallow (but hopefully still broad) Authorized Stockage List (ASL) of spare parts, augmented by controlled exchange, limits cube requirements. To the extent possible, each such decision should be evaluated for its effect, even if an estimate, so that the Army understands the costs and benefits of decisions. This will be illustrated for these maintenance policy decisions on the next slide and for DBL initiatives later. In some cases, it may be hard to isolate effects to one initiative; in these cases the appropriate group of initiatives should be evaluated together.

SBCT Modular Support Generates the Need for Augmentation and Other Enablers

Maintenance policies require some combination of:

- Garrison augmentation (services, component repair; installation maintenance, contractors)
- Additional Class VII
- Augmentation after initial operations (CSSC or contractors)
- Rapid and TDD replenishment to ASL

Transportation

- No capability to move replacements, POWs, or evac of US citizens
  - Requires augmentation on demand
- Deliver fuel every other day (or as needed) – not every day
  - Trades footprint for risk and augmentation for high OPTEMPO

Supply - Limited ammunition reconfiguration capability

- Requires: configured loads

Field services - No hot food for 20 days (104 people and 19 MKTs)

- Requires: CSSC augmentation or contractors/host nation support

08/20/2003 Source: CASCOM Rock Drill RAND ARROYO CENTER 23

This slide describes the modular support concepts that have been applied to the SBCT's CSS functions, and indicates the requirements for capabilities and resources outside of the SBCT that must be resourced to make the modular support policies viable. The modular support initiatives generally exchange one type of resource for another or shift the location of a resource in time or space. But they do so in a way that increases operational and strategic mobility.

The maintenance policies primarily consist of moving capabilities from the SBCT that are not critical or not normally done during combat operations or that it can do without for limited periods. The "removed" or "modularized" capabilities include scheduled service capacity, nonessential unscheduled maintenance capacity, and component repair. These policies require augmentation in garrison for services and for the full, unscheduled maintenance workload, and deployed long-term sustainment requires augmentation. In garrison, this augmentation is being provided by the CSSC, contract services, and the directorate of logistics on post. In a deployment, the CSSC will have to augment the SBCT after some period of time, depending upon the intensity of operations (doctrinally three weeks); for longer deployments, service capabilities will have to be provided, either through contract support or military unit augmentation as the situation demands. The reduced maintenance capacity was initially thought to lead to a need for extra ready to fight (RTF) end items in some situations to make up for maintenance backlogs. However, CASCOM and RAND Arroyo analyses indicate that this does not appear to be the case—maintenance backlogs do not develop in simulations. However, even in this case, targeted RTFs still appear to have value for sustaining readiness to make up for repair process delays resulting from parts unavailability or extremely difficult or time-consuming repairs. Currently, RTF plans are under evaluation by the Army Staff, CASCOM, and Forces Command (FORSCOM). And a shallow ASL requires rapid, consistent replenishment (time-definite delivery [TDD]) to remain effective. What this ASL will look like is being developed by the first two SBCTs in coordination with CASCOM and FORSCOM. To ensure that replenishment needs can be met, the Army continues to work with the Defense Logistics Agency (DLA) and the United States Transportation Command (USTRANSCOM) to ensure that a system for providing rapid and time-definite delivery of spare parts is in place and robust across a range of global scenarios.[25] Additionally, the Advanced Distribution Management Initiative continues the distribution performance improvement the Army has made through Velocity Management.

Transportation capabilities were reduced by eliminating capacity to move replacements, prisoners of war (POW), or U.S. citizens. If these capabilities become needed, the SBCT will have to be augmented. Operational risk was accepted in fuel delivery, with a move to every other day or as needed (if sooner) fuel delivery. Current practice calls for topping off every day regardless of fuel consumed in order to be as ready as possible just in case, which is really a method of maintaining a high level of safety stock. Again, if OPTEMPO increases so that fueling becomes necessary every day or the environment elevates the risk, then the SBCT will need fuel truck augmentation. Additionally, DBL principles mitigate the risk through information. Traditionally, the amount of fuel remaining in each vehicle is unknown; having this information enables more targeted refueling and thus more efficient utilization of assets.

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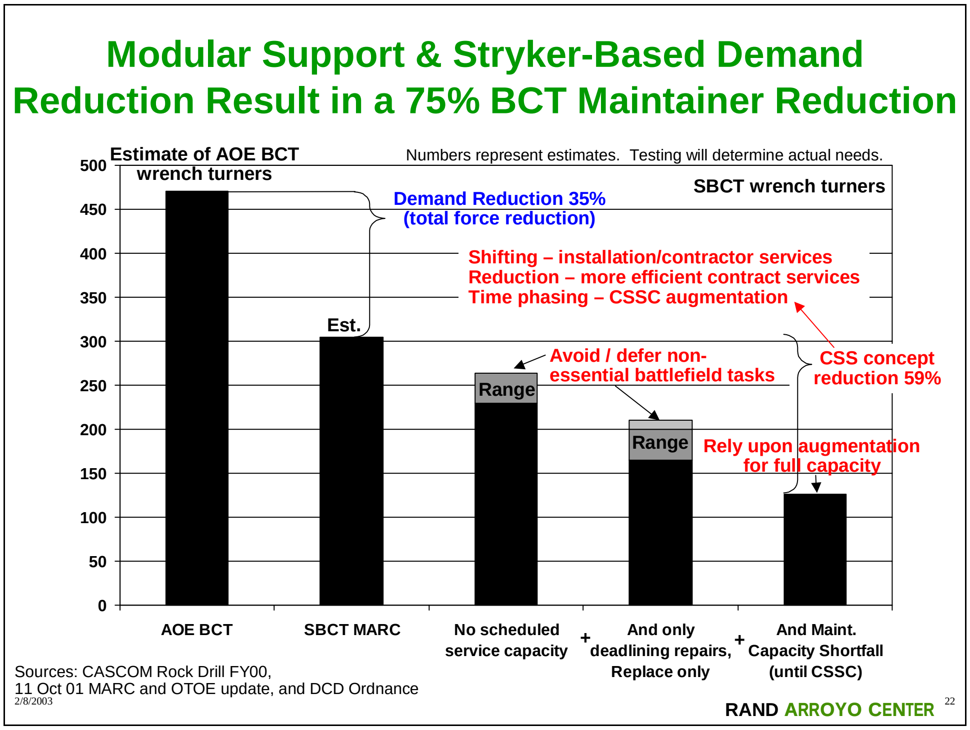
[25]Currently the Army and other services are part of a partnership with DLA and USTRANSCOM to improve the speed and reliability of worldwide distribution capability called Strategic Distribution (SD).

Limiting ammunition configuration capability (as well as that for other classes of supplies) reduces the number of supply personnel needed, but it requires that the SBCT receive configured loads. An integrated process team made up of personnel from Fort Lewis, DLA, AMC, FORSCOM HQ, and CASCOM is developing and implementing configured loads for Class I, bottled water, II, III (packaged), IV, V, and VI supplies.

No hot food capability for the first 20 days of a deployment eliminates 104 personnel and 19 mobile kitchens (MKT). Food service capability augmentation, to be provided by the CSSC, becomes necessary after this period.

What we describe here represents a plan and is intended to illustrate how modular support principles can be applied. Continued CASCOM analyses, combined with feedback from the SBCT and operational testing, will be used to evaluate the plan and to determine whether modifications need to occur to provide the expected capabilities. In addition and as has been described, many of the requirements necessary for this and other modular support policies in the SBCT design to work successfully, such as those listed on the bottom of the slide, are still in the process of development and implementation.



In this slide we depict the personnel footprint effects of SBCT design decisions with regard to maintenance (in this document we do not evaluate the capability effects of these changes) to illustrate the effects that modular support can have. We saw earlier that in comparison to an AOE BCT, the switch from tanks and Bradleys to the Stryker represents a major demand reduction initiative from a maintenance standpoint (as well as for other resource requirements). For the SBCT design, the total maintenance demand for the equipment is estimated to be about 35 percent lower than for an AOE BCT. This is based upon unadjusted MARC hours, which include estimates for the Stryker family of vehicles.

Force design policy decisions then reduced the maintenance personnel by 59 percent from the unadjusted MARC level. These policy decisions affect the SBCT design requirement by shifting responsibility for some maintenance actions to organizations outside the SBCT, namely services, and by deferring some maintenance actions from operational pulses: noncritical maintenance (nondeadlining or nonsafety faults) and complex repairs and potential backlog. *Thus we see that the reduction primarily shifts maintenance requirements by echelon and time.* This should not simply be dismissed as mere shifting; it can provide significant value toward the footprint reduction goals. Separating maintenance into two categories—what has to reside in the maneuver force and what is necessary for long-term support—enables more rapid deployment and employment through a more flexible overall Army force design. In addition, some actual reductions do occur. For example, in garrison the SBCT is being augmented with contractors to conduct services. Since they do not have competing demands on their time for nonmaintenance military activities and because they generally have higher skill levels (from higher experience levels and the ability to focus exclusively on maintenance), contract maintainers are often more productive than Army military maintenance personnel. Thus it takes fewer contract maintenance personnel to conduct services. In addition, centralizing a pool of like assets generally enables them to be used at a higher rate without negative wait time consequences. This increases the potential productivity of the assets.

In the original SBCT design, subject matter experts attempted to estimate the effects of key maintenance policy decisions. They estimated that shifting service capacity out of the SBCT reduced its organic maintainer requirement by 10 to 25 percent, and that shifting noncritical unscheduled maintenance and most component repair capacity reduced the SBCT organic maintainer requirement by a little more than 20 percent. However, this still left a projected gap between the needed maintainers and the SBCT organic force design that is equivalent to 13 percent (38 maintainers) of the unadjusted MARC hours. This euphemistically becomes the "planned backlog." The potential need for RTFs originally resulted from this planned backlog, although simulations indicate that if the Stryker meets its design reliability requirements, the SBCT probably has adequate maintenance capacity.

The SBCT design has recently been adjusted, resulting in an increase in equipment and thus an increase in maintenance requirements. At present, only the effects of services have been assessed from the new numbers. Program management offices estimated this at about 10 percent of the requirement. Noncritical repairs and component repairs have not been reassessed as a percentage of the MARC.

The effects of the maintenance policies on personnel requirements are only "paper" study estimates today, though. Stryker operational testing should begin to bring more accuracy to the analysis of true maintenance needs.

When the Strykers have been fully fielded and the organization operates in a field environment at the projected OPTEMPO using the designated maintenance policies, the efficacy of the force design can be fully assessed.

Distribution-Based Logistics Increases the Speed and Reliability of Logistics Processes, Reducing the Need for Inventory and Associated Resources

Process effectiveness and efficiency

Real-time, complete, precise information for situational awareness

Modular, intermodal containers

Common platforms with integrated load-handling systems

Configured loads

Precision aerial delivery

Increased intratheater aerial lift assets

07/11/2003

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DBL is about providing the same or better support through distribution rather than through stockpiles of supplies held and carried around by units. The faster and more reliable that distribution processes become, across a range of environments and scenarios, the more the Army can reduce the need for inventory in maneuver units and the combat zone. Reducing the need for inventory reduces the need for resources to hold the inventory, which reduces the need for containers and vehicles, the personnel to operate them, the personnel to maintain the vehicles and support the operators, and so on. The DBL substrategies on this slide reflect various means for improving the speed and reliability of distribution and for making these capabilities robust across as great a range of environments and scenarios as possible.

The first substrategy is simply to *ensure that processes are as well designed as possible*. This involves trying to find ways to eliminate all delays in which materiel just sits, removing non-value-added steps from processes to increase their speed, and identifying and removing common errors that hinder distribution. This is what the Army's seven-year-old Velocity Management (VM) effort has been about (recently renamed the Army Distribution Management Initiative). It has not been about improving process times through investment in additional resources or better technology; instead, it has been about finding ways to use existing resources more effectively. VM's successes have proved that significant gains can be made just through better process design. We will illustrate the potential magnitude of these gains with an example on the next slide.

A crucial element of effective distribution-based logistics through reach is knowing as quickly as possible when and where resources are needed and whenever these needs change before delivery is complete. Thus, *real-time, complete, and very precise information*—in other words, as close to perfect logistics situational awareness as possible—becomes vital. The faster the logistics system knows to respond to a demand and the more precisely and accurately it knows logistics resource status, the less inventory needs to be held in forward units. The more effectively the entire system's inventory can be leveraged, the more effectively forward units can be supported without increasing total inventory. Rather than additional safety stock needed to account for uncertainty, information provides protection. An example is the fuel truck decision in the SBCT, which leverages better knowledge of fuel status to mitigate risk. A host of new information system tools and capabilities are currently being fielded or are in development to achieve better logistics situational awareness.

Several information system tools to support DBL have been fielded in the SBCT. These include the Force XXI Battle Command Brigade and Below (FBCB2) system, which provides real-time situational awareness to users (e.g., electronic maps with friendly forces, estimates of enemy forces, and operational graphic overlays) and the Movement Tracking System (MTS), which monitors the location of vehicles to enable real-time, in-transit visibility of vehicles and cargo as well as the ability for logistics leaders to reroute vehicles. These two systems are on all SBCT CSS vehicles that provide direct support to other units—that is, CSS vehicles that move independently on the battlefield, such as fuel trucks. Additionally, leaders have the Combat Service Support Control System (CSSCS), which draws data from Standard Army Management Information Systems (STAMIS) to provide near-real-time logistics resource status. The utility of CSSCS is still limited due to its reliance on legacy STAMIS, with batch processing and holes in data capture. Further, vehicle platforms do not automatically record and transmit some data items, such as fuel levels. To resolve issues with legacy STAMIS, the Global Combat Support System–Army is in development to replace the full range of the current transactional and unit logistics management systems. Objective Force equipment and force planning is reviewing platform-centric data capture needs (e.g., maintenance faults, fuel status, and ammunition status) and how to most effectively make this information available to those who need it.

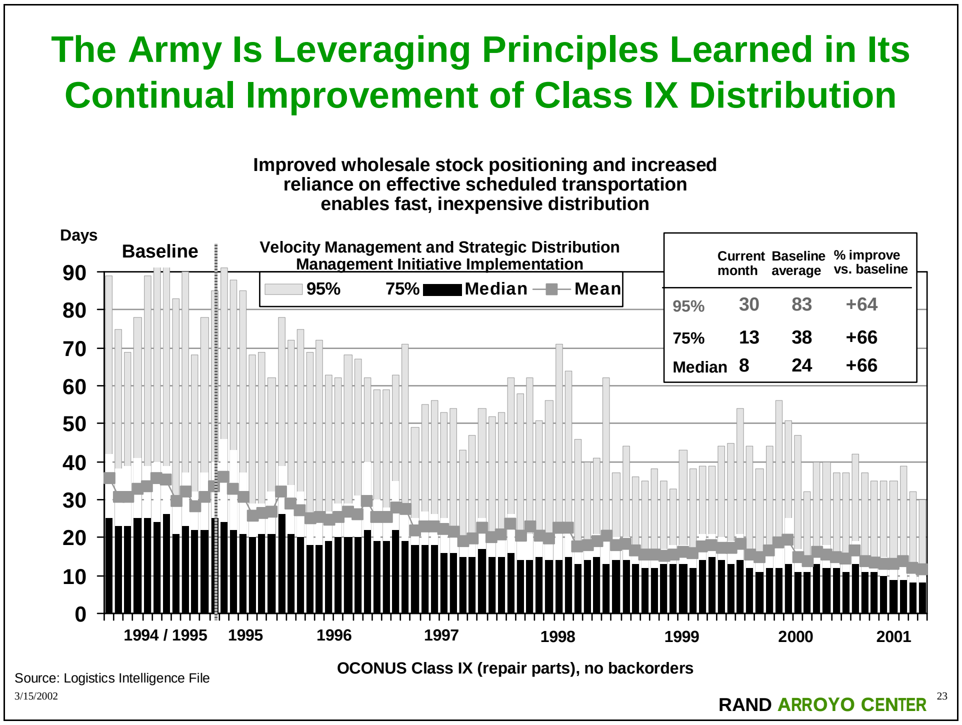
Distribution-based logistics is made more effective when materiel movement speed is maximized. Minimizing materiel-handling time at distribution system nodes can have a substantial effect on overall distribution time. More efficient materiel-handling processes and equipment also reduce the footprint of this equipment. Many of the identified enablers, some of which are reflected in the SBCT O&O, facilitate distribution-based logistics by improving the efficiency of physical materiel flows. Within this physical materiel flow group, we identify three subgroups that work in concert to generate their benefits: *modular, intermodal containers*; *multimodal platforms* with embedded load-handling systems; and *configured loads*. In some cases, the enablers are only effective together, such as the heavy expanded mobility tactical truck load with an integrated load-handling system (HEMTT-LHS) and compatible containers. In many respects, these technology and materiel solutions create the same types of benefits as process improvement and thus are complementary.

The Army expects that the Interim Force, and to an even greater extent the Objective Force, will have to be sustained over long distances from support bases and without secure lines of communication. This demands that distribution capabilities be able to provide sustainment through *precision aerial delivery* and *intratheater airlift*, depending upon the situation. Even when there are seemingly secure ground lines of communication, though, airdrop may have to be rapidly available when such lines are cut either by natural causes or enemy interdiction. For example, during Operation Enduring Freedom (OEF), an avalanche cut the only ground line of communication from the north at one point. At other times, weather, runway damage, and surface-to-air missile threats impeded or temporarily halted airfield operations.[26] "Rapid" is an operative word here, because under DBL, forward units will often have at most only a few days of supplies on hand. For similar reasons, the ability to rapidly provide aerial

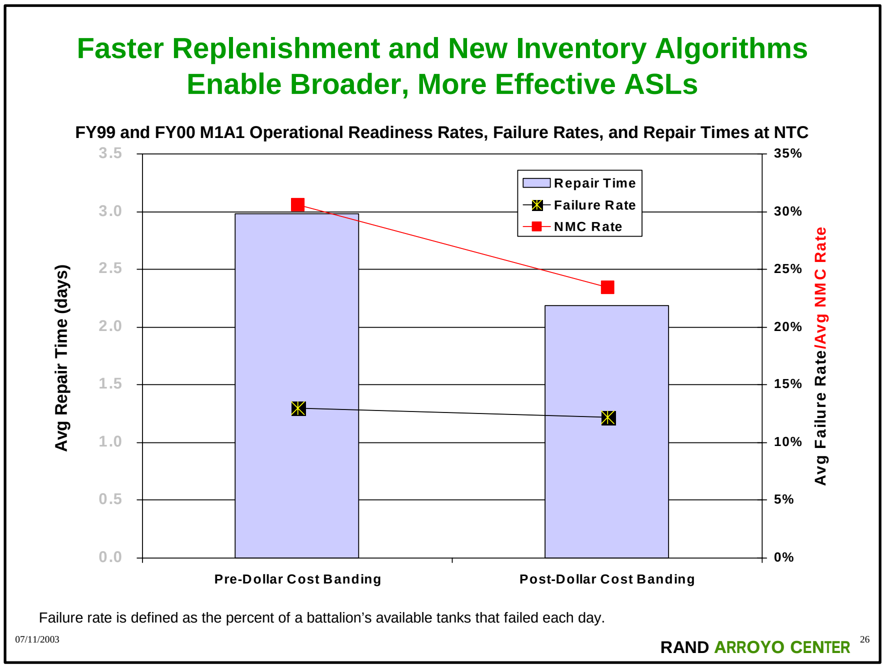
[26]Dennis K. Jackson, Director of Logistics, United States Central Command, letter to the authors, June 22, 2002.

delivery of supplies is crucial, because there is always a risk of having air lines of communication cut.

The authors are unaware of studies assessing how far DBL can be taken in terms of reducing stockage forward, given the potential risks. If these have not been done, assessments of aerial resupply capability should be made and incorporated into the force design process. Additionally, for situations deemed relatively high risk in terms of having lines of communications cut, which would include aerial delivery (e.g., weather or threat), support modules designed to increase unit storage capacity (e.g., a truck platoon or company) could be deployed with the unit.



Through the continuation of VM as the Army Distribution Management Initiative and the more recently initiated Strategic Distribution (SD) initiative, the Army, together with the DLA and USTRANSCOM, is well on its way to making rapid TDD a reality and is showing the tremendous power of process improvement efforts. This chart shows that the delivery speed of nonbackordered parts from the wholesale system to locations outside the continental United States (OCONUS) has improved by about two-thirds since 1994 and that the 95th percentile, an indicator of process variability, has shown similar improvement (95 percent of all requests were received by the 95th percentile time). The CSS community is leveraging the lessons learned in improving spare parts distribution performance to now begin improving distribution of all classes of supply.



In some cases, DBL can actually improve capabilities where inventory has been constrained below what is needed for desired levels of sustainment capability as the result of financial or mobility constraints. In these situations, DBL enables better performance within these constraints. This slide provides such an example.

The Army has recently adopted an alternative retail inventory algorithm (Dollar Cost Banding [DCB]) that produces much greater inventory breadth. Several years ago, this increase in breadth would not have been affordable or mobile, because with slow replenishments the depth for each line has to be substantial to provide good service. With fast, consistent replenishment, a high level of service for stocked items, as measured by the satisfaction rate or the probability that a stocked item will be available when ordered, can be attained with much shallower depth.

The effect can be powerful. This slide shows the benefit that accrued to armor battalions during National Training Center (NTC) rotations after the implementation of DCB at the NTC. In the period prior to the DCB implementation, rotational operational readiness (OR) rates for M1A1-equipped armor battalions averaged just under 70 percent. Post implementation failure rates were about the same as before, while the repair time dropped from about 3 days on average to 2.2 days as the fill rate climbed by 25 percent. As a result, OR rates climbed to an average of about 77 percent.

SBCT Distribution-Based Logistics Cuts Footprint & Introduces New Sustainment Flow Requirements

Distribution-based logistics reliant on reach (SBCT force design)

- Limited days of supply upon initial deployment – 72 hour limit for water (bottled), I, III(p), IV (barrier), and V and 96 hours for IX
- Limited carrying/storage capacity – Cargo and fuel trucks
- Bulk water and bulk fuel must come from reach immediately – zero deployment stock
- Reduced patient holding capacity

Sustainment flow requirements

- Configured loads
- Must establish immediate sustainment flow, concurrent with deployment (preplanned and resourced)
- Sustainment flow must be frequent and consistent
- Real-time, complete situational awareness
- Aerial sustainment as required by METT-TC
- Broad, shallow ASL with rapid replenishment (96-hour TDD)
  - TDD requires low backorder rate

07/11/2003 Source: CASCOM Rock Drill

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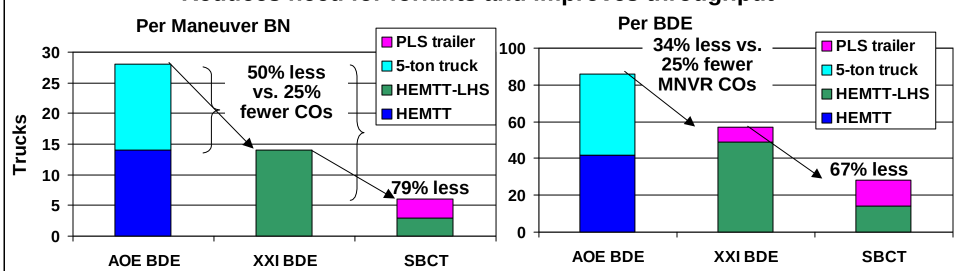
DBL is a dominant theme in the SBCT O&O. Storage and "warehousing" (including repackaging) capacities have been kept low for all classes of supply. Thus the SBCT must "reach" elsewhere on a frequent, reliable basis for sustainment materiel, which requires a high level of situational awareness across the logistics system. Such flows must be established immediately upon deployment, calling for the Army to preplan and ensure that these sustainment flow requirements are resourced in all geographic combatant commands. Additionally, initial sustainment to the SBCT may have to be by air. Beyond a distribution system capable of rapid, time-definite delivery, DBL requires that the requisite resources, whether spare parts or other classes of supply, be available for distribution when needed.

Not only does the reduced warehousing capacity reduce storage, it also reduces materiel-handling and thus materiel-reconfiguration capability. Therefore, configured loads become essential. They have the secondary benefit of improving process speed by taking the materiel-reconfiguration time out of the process. In effect, this moves configuration of materiel off the critical path of delivering materiel to a customer after a need has been identified.

SBCT Distribution Based Logistics Enablers and Demand Reduction Combine to Reduce Footprint

SBCT cargo truck requirements based upon:

- **Only configured loads – SCL, MCL, UCL**
  - **Limited ammunition reconfiguration capability**
- **Max capacity of 72 hours of supply**
- **Enhanced containers and loading handling systems**
  - **Flatracks**
  - **HEMTT-LHS with PLS trailers**
  - **Reduces need for forklifts and improves throughput**



Reductions a result of digitization (force structure), limited DOS, change in mission focus, new hardware, and configured loads

12/24/2002 Source: CASCOM Rock Drill

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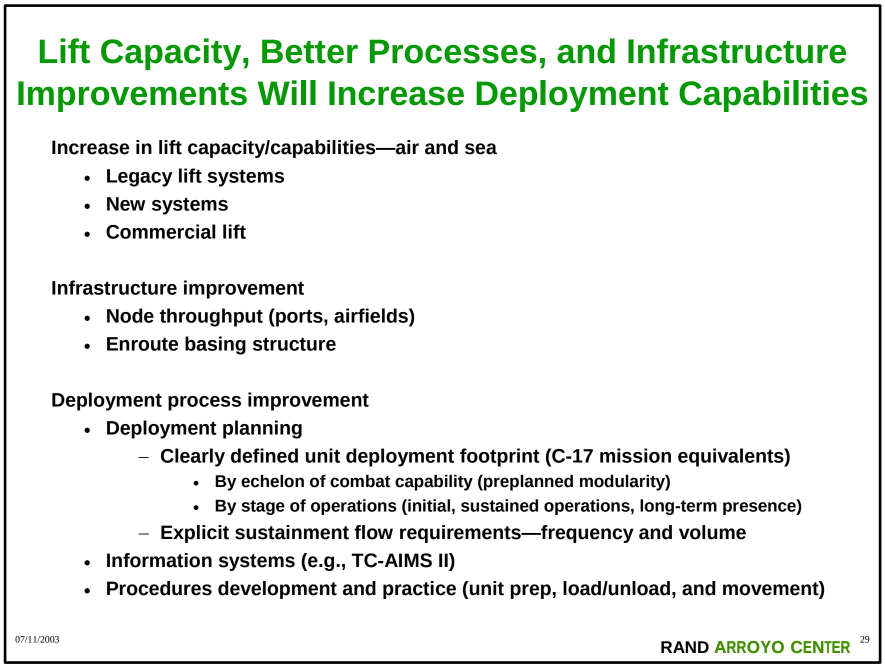
Multiple DBL substrategies and demand reduction have combined to help reduce SBCT CSS footprint. Two types of enablers have been proposed or implemented for the SBCT. Hardware consists of cargo trucks with built-in load handling systems (LHS) and compatible, intermodal containers. By themselves, hardware enablers produced a substantial reduction in cargo trucks in Force XXI as compared to the AOE design. SBCT doctrine (now being implemented) relies on configured loads to produce even greater benefit. Configured loads delivered to battalion drop points further reduce cargo truck requirements, and they also enable a reduction in personnel necessary to handle and reconfigure ammunition.

This slide compares the number of cargo trucks necessary to support AOE, Force XXI, and SBCT maneuver battalions and the total brigades based upon the indicated types of cargo trucks and configured load assumptions. Some of the reduction in Force XXI came from demand reduction from reduced companies in maneuver battalions. This was driven by improved situational awareness from digitization, which has been assessed to increase the coverage area of company-sized elements. Similarly, some of the SBCT's footprint reduction came from reduced demand at the platform level, arising from the use of Strykers instead of tanks and Bradleys and the continued emphasis on situational awareness as a force multiplier.



Three substrategies for improving deployment capability have emerged. The first we term *lift capacity*, which consists of lift platforms—new systems, increases in legacy lift, and increased use of commercial assets. The most promising near-term new lift technology is the theater support vessel (TSV), an adaptation of commercial catamaran-type ships that provide high-speed sealift and have shallow drafts expanding port access dramatically. TSVs would be valuable for intratheater movement and potentially for the rapid movement of prepositioned materiel. Recently, funding was approved for the expansion of the C-17 fleet, improving deployment capacity. Finally, the Army is exploring new lift technologies, such as ultralarge dirigibles and airframes.

The second substrategy is *infrastructure improvement* at garrison locations and enroute bases to improve the throughput of nodes. Analyses have been conducted at all planned SBCT bases to determine infrastucture bottlenecks for outload, and several construction projects have been funded as a result. Infrastructure improvement could also include the addition of new deployment nodes such as enroute bases.

The third substrategy consists of *process improvement* techniques and technologies. These include VM-like process improvements that improve the speed of existing processes such as unit movement preparation and the loading and unloading of lift platforms, new information systems that enable deployment plan changes to be processed faster, and detailed deployment planning. Good deployment planning prepares a unit to be ready to move in the most efficient manner possible while still providing a logically sequenced deployment flow that leads to graduated levels of capability on the ground. Further, it enables geographic combatant commanders and lift providers to know exactly what it will take to move a unit, facilitating their planning.

Forward Positioning of Equipment or Units Can Speed Deployment

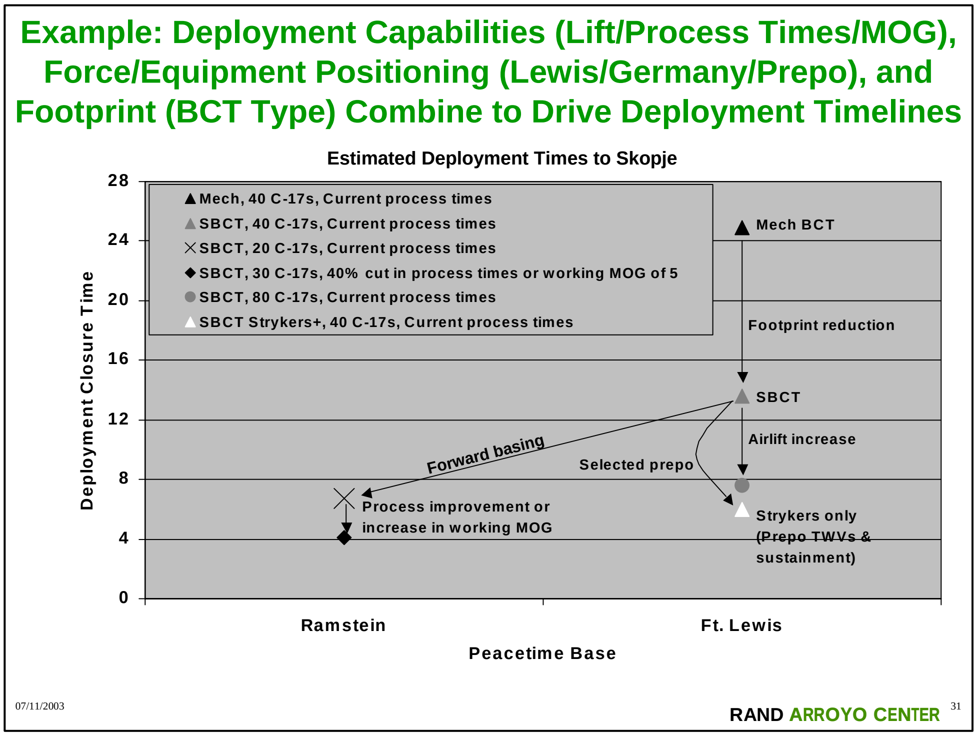
Prepositioning of equipment
- **Low-cost, low-technology asset strategy**
  - Tactical wheeled vehicles
  - Low-cost ammunition
  - Save high-value, constrained airlift for high-value assets
- **Sharing of common assets between Interim & Legacy force units**

Permanent forward basing of units
- **Benefit based upon improved responsiveness to key areas of interest**
- **Feasibility / "cost" considerations**
  - Training area
  - Existing U.S. / allied forces infrastructure
  - Political conditions
  - Force management / quality of life implications
  - Financial cost

07/11/2003 RAND ARROYO CENTER 30

Under forward positioning there are two substrategies. The first is the *prepositioning* of equipment on ships or on land where it is at or can quickly get to anticipated contingency locations. This requires an evaluation of which situations can by aided by prepositioning and which assets make the most sense to preposition. For example, one might want to preposition relatively low-cost and low-technology assets such as tactical wheeled vehicles (TWV). Buying additional sets of such equipment would be relatively inexpensive, and this type of equipment poses a lower maintenance burden than more complex equipment. Additionally, such assets may be usable by legacy heavy forces, light forces, and interim forces.

The second substrategy is the *forward basing* of units close to potential AOs, either on a permanent, rotational, or temporary basis. For permanent basing, the benefit of each potential location depends upon the criticality of the AOs it could support (in terms of the probability of a contingency in the AO and the severity of the consequences of slow response). This benefit must be balanced against the feasibility and costs associated with the location. Feasibility considerations would include the ability to train, the presence of existing support infrastructure, and the political environment. Besides financial costs, cost considerations should have to include quality of life and force management implications.



In this slide we bring the footprint reduction strategies, deployment capabilities, and forward positioning together in a tradespace illustration. In this example, a brigade-sized unit has to deploy to Skopje, which has a working MOG of 3. Let us walk through the three dimensions. The first data point, indicated by a black triangle, shows the air deployment time, about 25 days, for a heavy BCT allocated 40 C-17s. Holding other factors constant, we see that in this case the change in footprint from moving to the SBCT cuts the time substantially to an estimate of 13.6 days, as shown by the gray triangle. Again, holding other factors constant, doubling the airlift to 80 C-17s substantially improves the speed to an estimate of 7.6 days. Alternatively, forward basing can reduce the time to 6.7 days and dramatically reduces the airlift requirement to just 20 C-17s, the limit of useable airlift given the distance and working MOG constraint. Thus not only can forward basing improve deployment speed, it can reduce the consumption of a constrained asset—strategic airlift. Another alternative would be to selectively preposition the SBCT's soft skinned TWVs and an initial supply of consumable materiel, enabling a 6-day deployment time with 40 C-17s. These assets would consume about 60 percent of the needed airlift missions, but because the TWVs comprise only about 10 percent of the cost of an SBCT, prepositioning them is relatively low cost. Finally, improving offload and total aerial port of debarkation aircraft turnaround time combined with forward basing would enable a 4-day deployment time with about 30 C-17s. Improved process time would have less affect with CONUS basing, because to leverage the improvement to reduce deployment time would require a substantial increase in airlift.

Objective Force CSS Planning Is Building on the SBCT Design

- Significantly increased emphasis on demand reduction—targeting a further doubling or even more of the supported to supporter ratio
- Similar application of modular support policies and emphasis on DBL
- Self-sufficiency during pulses added as a requirement
- Conceptual exploration of new prepositioning strategies
- Not clear that force positioning decisions fully integrate strategic responsiveness considerations

3/24/2003 RAND ARROYO CENTER 32

Current Objective Force CSS planning primarily represents an evolution of SBCT designs and concepts. Most of the anticipated change revolves around dramatic demand reduction. In the SBCT, much of the demand reduction simply came from the adoption of a medium-weight platform. The Army expects that with the opportunity to develop new platforms for the Objective Force, technology can push demand reduction much further, particularly with regard to fuel efficiency, onboard water generation, reliability, and maintainability. Thus, the planned ratio of supporters to supported is much more aggressive than for even the SBCT. Additionally, the number of platforms is expected to be lower as the result of increased use of information technology, remote sensors, and long-range precision fire capabilities. As a result, the draft UA—the Objective Force's BCT—is about one-third smaller than an SBCT, and the draft CSS footprint is extremely small. More important, though, than the potential CSS improvements is the application of advanced technologies with the intent of enabling a force built around 16- to 18-ton platforms to be dominant at the heavy end of the conventional force spectrum.

However, even though the CSS footprint within the UA is targeted to be relatively small compared to the SBCT, the UA is expected to be self-sufficient with regard to all supply and maintenance during the course of 72-hour high-intensity operational pulses. This further drives the need for demand reduction.

There is a recognition that prepositioning strategies should be reconsidered and that force positioning can have a significant effect on strategic responsiveness, but little in the way of specifics has yet been laid out.

The Five Strategies Should Also Apply Well to Echelons Above Division

- **Demand reduction reduces total support requirements**
- **Modular support above division level enables more precise support**
  - **Two-level maintenance provides an opportunity to eliminate component repair from the theater depending upon the situation**
- **DBL promises to reduce theater stockpiles**
- **Deployment capacity and force positioning are most critical for EAD CSS from the perspective of rapidly supporting early deploying forces**

3/24/2003

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We now briefly discuss how the five strategies might affect echelons above division (EAD). Demand reduction should drive down CSS requirements across all echelons above division support. For example, given no changes in support strategies such as theater policy for days of supply, the amount of resources needed would be lower. In this example, a lower overall level of storage capacity would be needed and hence there would be some reduction in CSS support above division.

Modular support can provide EAD benefit as well. By "modularizing" capabilities, the Army can more precisely tailor support requirements to the mission and theater, ensuring that only needed capabilities are deployed. In particular, some of the maintenance concepts can be expanded to EAD. Two-level maintenance separates on-system repair (field maintenance) from off-system repair (sustainment maintenance). Once this is done, the sustainment maintenance can be done anywhere, with a reliance on distribution for moving the carcasses and delivering repaired components. Thus there could be opportunity to reduce component repair activities in direct and general support maintenance activities.

DBL is a support concept with significant potential at EAD, perhaps even much more than in BCTs. Planned theater stock inventories can be substantial—upwards of 30 days of supply compared with just a couple in BCTs. This drives substantial EAD CSS structure—both units and bases, which drive a need for other forces, such as for force protection. The major promise of DBL is reducing these stockpiles and the structure they drive. Instead of needing 30 days of supply, the theater might only need 15 days. Combined with demand reduction, the overall reduction in theater stocks and the associated structure could be substantial.

In general, the two strictly strategic response strategies are less applicable beyond early-arriving forces. Bottlenecks are most severe for airflow, and air has an advantage primarily in the first couple of weeks. For a large force, sealift is faster than air. However, positioning options are still valuable from the standpoint of strategically positioning small portions of echelons above brigade support to support initial deploying units. Elements of one corps support group must be ready to support a brigade-sized operation. SBCT planning suggests that this must be on the order of a composite battalion. Such equipment could be prepositioned with SBCTs or made available in a common support configuration that could support light, medium, or heavy forces. In the latter case, operationally loading ships with prepositioned materiel would enable the downloading of the right items to support various brigade types.

In fact, two separate high-level Army studies have shown that these strategies could substantially reduce EAD structure. However, in contrast to the BCT level, little progress has been made thus far at the EAD level.

In 1999 a Task Force conducting a CS/CSS Review for Army Transformation led by (ranks and organizations at the time of study) MG Mahan (Army Materiel Command), MG Cannon (Acting Army Deputy Chief of Staff for Logistics), MG Cosumano (Director of Force Development, Office of the Deputy Chief of Staff for Operations and Plans), MG St. Onge (Director of SS, Office of the Deputy Chief of Staff for Operations and Plans), and BG Odierno (Directorate of Force Development, Office of the Deputy Chief of Staff for Operations and Plans) asked the Center for Army Analysis (CAA) to conduct several FASTALS excursions to examine the potential benefits of several force design strategies. From these excursions, the task force estimated the following effects of using modular support ("don't do in the battlespace" that which can be done elsewhere—rely on reach) and DBL:

- Eliminating general support from the combat zone, a form of modular support, would reduce 19 percent of the EAD force structure in the two canonical MTWs used for Army force structure analysis.
- Reducing theater stocks by 50 percent through DBL would eliminate 8 percent of the EAD structure.
- Reducing POL by 25 percent would eliminate 7 percent of the EAD structure.

Combined, this produces a total of 32 percent (some overlap exists among the three).

The same study concluded that reducing fuel consumption by 50 percent would reduce demand by 144,000 gallons per day for an armored division, equivalent to the capacity of 56 HEMTTs and 29 tankers, which represents an EAD requirement. At the time, these were estimates they used to recommend detailed examination.

In 2002, the Army's Logistics Transformation Task Force (LTTF) revisited some of the same options examined by the 1999 task force. Again, the LTTF turned to CAA to model how the implementation of several initiatives would affect force structure. Each initiative was modeled separately, and then two excursions were run that combined several initiatives—with the first group representing the implementation of viable logistics concepts and the second adding demand reduction to the logistics concepts. It should be noted that some of these initiatives simply align force structure with current doctrine. The logistics concepts in the first composite excursion include the following:

- *Align supply structure with current distribution doctrine*. ("Delete GS Supply units in the corps rear.")
- *Implement two-level maintenance.* ("Delete 60 percent of GS Maintenance units throughout the theater.")
- *Align water structure with current estimates of consumption requirements.* ("No water purification and distribution requirements from non-divisional water units supporting divisional units, apply Laundry Advanced System (LADS) water consumption factor for laundry

operations EAC, and Theater water reserve DOS limited to 1 DOS in west campaign and 2 DOS in east campaign.")

- *Eliminate excess days of supply stockage in the theater reserve—currently above doctrinal requirements.* ("75 percent Theater reserve kept in COMMZ and 25 percent kept in corps forward.")
- *Account for other service doctrine and the deployment flow in determining Army Support to Other Service (ASOS) requirements.*
- *"Maximize use of contractors in the communications zone (COMMZ).* This excursion should indicate how force structure is effected by maximum use of contractors (LOGCAP, Host Nation, or DLA support) providing logistic support services with water, fuel, mail, barrier materiel, and food distribution; mess, laundry and bath service—all for units assigned in the COMMZ, peacekeeping activities, and operations within an ISB. Additionally CSS and medical support would be contracted to support Homeland Security."
- *Estimate the effects of onboard water generation and 50 percent improvement in fuel efficiency.*

The first excursion implementing the logistics concepts resulted in an 18 percent force structure and 37 percent requirement reduction as compared to the official Total Army Analysis (TAA) 09 results.[27] With the demand reduction added, the actual force structure would come down an estimated 25 percent and the requirement 42 percent from TAA-09. Additionally, the LTTF estimated that full implementation of DBL and more aggressive two-level maintenance implementation (modular support) than that modeled could produce further benefits beyond these numbers. Finally, the LTTF estimated that increased implementation of multifunctional battalion headquarters for logistics units could substantially reduce logistics headquarters elements.

[27]TAA is a process the Army employs to determine its force structure requirement. The output of a set of models produces a force requirement estimated to be needed to accomplish a set of missions. This requirement is constrained against available resources through a qualitative process that produces the final "resourced" force structure. Thus this modeling excursion reduced the "requirement" by 37 percent. However, some portion of the eliminated requirement is not currently resourced, so the actual projected force structure reduction is only 18 percent.

Beyond these initiatives, Quartermaster, Ordnance, and Transportation company and below force design updates are expected to reduce personnel by 10 to 15 percent through streamlining units, modularizing capabilities, and implementing DBL techniques and technologies.

Summary

The logistics community is pursuing five complementary and necessary strategies for achieving a Power Projection Transformation

- **Demand reduction**
- **Modular support**
- **Distribution-based logistics**
- **Deployment capabilities**
- **Forward positioning**

These strategies are producing significant progress in moving the Interim Force toward Transformation goals

- **Some dependence upon enablers—both funded and unfunded**
- **Need to be validated through test and evaluation**

Use of metrics aligned with Transformation goals will help evaluate the effects of initiatives

Application of these strategies in Objective Force development will produce further progress

07/15/2003 RAND ARROYO CENTER 34

At brigade level, a good story is emerging for CSS transformation from the Interim Force and Objective Force development processes. Through the application of five complementary strategies, progress is being made toward transforming CSS in maneuver forces, and insights gained during SBCT development are being leveraged in Objective Force planning. Applying appropriate metrics to completed design initiatives documents this success.

Further good news is that the same general principles appear to offer significant opportunity in EAD. However, this is where the good news ends. Within units, changes have been made by individual branches, but initiatives that could change the required and resourced number of units have yet to be implemented on a large scale.

The BCT designs have resided under the control of one entity—TRADOC—and they have been implemented with top-down edicts that forced change. Similarly, the logistics force designs were changes that could be made within the control of one organization—the logistics branch chiefs and CASCOM. However, EAD requirements are the product of a process in which everyone has a hand. Perhaps there are lessons here from the BCT design efforts and recent CASCOM force design updates (FDU) that have made EAD support more modular.

Much work remains, but it seems that the CSS community has developed strategies for achieving CSS transformation goals. It is hoped that more clearly illuminating these strategies will trigger the further development of specific transformative ideas. Additionally, using well-designed metrics to analyze the costs and benefits would bring rigor to the force development process, ensuring that it stays on track to produce a power projection Army.

Appendix: OBJECTIVE TABLES OF ORGANIZATION AND EQUIPMENT

87000F100, DIV XXI HVY DIV (AR) 4MECH, 28 Aug 1998

47100F300, IBCT, 18 May 2000

87000A700, AR DIV 1ST CAV, 28 Aug 1998

87100L100, HEAVY SEP BRIGADE (ARMOR), 03 Jun 1997

87100L200, HEAVY SEP BRIGADE (MECH), 03 Jun 1997

77000A000, LID (DOCTRINAL), 19 Nov 1998

63390F000, CBT SER SPT CO (CSSC) BSB, 06 Sep 2000

Interim Division (draft), 9 Feb 2001, FOUO.

BIBLIOGRAPHY

"The Army's CS/CSS Transformation: Executive Summary," briefing, January 21, 2000.

Army Logistics Transformation Task Force, *TAA 11 Recommendations,* Decision Paper, August 2002.

Concepts for the Objective Force, United States Army White Paper, 2001.

"Corps WFX briefing," 1st COSCOM, January 2002.

Enabler Funding, ODCSLOG spreadsheet, January 28, 2002.

Future Combat Systems Solicitation (FINAL), July 18, 2000.

Galway, Lionel A., Mahyar A. Amouzegar, R.J. Hillestad, and Don Snyder, *Reconfiguring Footprint to Speed Expeditionary Aerospace Forces Deployment*, Santa Monica, CA: RAND, MR-1625-AF, 2002.

Galway, Lionel, Robert S. Tripp, Timothy L. Ramey, and John G. Drew, *Supporting Expeditionary Aerospace Forces: New Agile Combat Support Postures,* Santa Monica, CA: RAND, MR-1075-AF, 2000.

Headquarters, Department of the Army, *The Stryker Brigade Combat Team*, FM 3-21.31, February 2003.

The Interim Brigade Combat Team, Organizational and Operational Concept, v 4.0, June 30, 2000.

Interim Division Concept for Combat Service Support Operations, Ver. 1.44.

Interim Division Sustainment Rock Drill 27–30 August 2001 After Action Review.

Jackson, Dennis K., Director of Logistics, United States Central Command, letter to John Dumond with comments on an earlier draft, June 22, 2002.

Kedzior, Richard, *Evolution and Endurance: The U.S. Army Division in the Twentieth Century*, Santa Monica, CA: RAND, MR-1211-A, 2000.

"Maneuver Sustainment for the Objective Force: Building and Sustaining Combat Power," Requirements Review Council Briefing.

Matsumura, John, Randall Steeb, John Gordon IV, Tom Herbert, Russell W. Glenn, and Paul Steinberg, *Lightning Over Water: Sharpening America's Light Force for Rapid Reaction Missions,* Santa Monica, CA: RAND, MR-1196-A/OSD, 2000.

Matsumura, John, Randall Steeb, Thomas J. Herbert, John Gordon, Carl A. Rhodes, Russell W. Glenn, Mike Barbero, Fred Gellert, Phyllis Kantar, Gail Halverson, Robert Cochran, and Paul Steinberg, *Exploring Advanced Technologies for the Future Combat Systems Program,* Santa Monica, CA: RAND, MR-1332-A, 2002.

May, Dr. Ingo, "Future Combat Systems Technologies Briefing: Summary of Army Programs," January 11, 2000.

Mission Needs Statement for Rapidly Deployable Armored Combat Forces, February 22, 2000.

Objective Force Combat Service Support Workshop, September 25–29, 2000.

Objective Force: Organization and Operations Concept, Final Draft, February 5, 2001.

Peterson, Stephen P., "FRED2 (Footprint Reduction Phase 2)," Interim Results Briefing to ODCSLOG, April 2, 2001, FOUO.

Sixty Years of Reorganizing for Combat: A Historical Trend Analysis, Combat Studies Institute, Fort Leavenworth, KS: U.S. Army Command and General Staff College, CSI Report No. 14, January 2000.

Tripp, Robert S., Lionel Galway, Timothy L. Ramey, Mahyar A. Amouzegar, and Eric L. Peltz, *Supporting Expeditionary Aerospace Forces: A Concept for Evolving to the Agile Combat Support/Mobility System of the Future*, Santa Monica, CA: RAND, MR-1179-AF, 2000.

Unit of Action Maneuver BattleLab, "Operational Requirements Document for the Future Combat Systems (draft)," Fort Knox, KY: August 30, 2002.

U.S. Army Forces Command, "9–13 Sep 02 SBCT EAB CSS Update Briefing," October 1, 2002.

The United States Army Objective Force Operational and Organizational Plan for Maneuver Unit of Action, Draft, Fort Monroe, VA: United States Army Training and Doctrine Command, TRADOC Pamphlet 525-3-90/O&O (draft), July 20, 2002.

Van Fosson, Marion, Program Manager Future Combat Vehicle, "FCS Industry Day Program Overview Briefing," January 11, 2000.