

ARMY AVIATION INTRATHEATER LIFT OPERATIONS
AND ITS RELEVANCE AND CAPABILITY
TO SUPPORT THE FUTURE FORCE

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the US Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

ARMY AVIATION INTRATHEATER LIFT OPERATIONS AND ITS RELEVANCE AND CAPABILITY TO SUPPORT THE FUTURE FORCE, by MAJ Anthony P. Bolante, 106 pages.

US Army aviation is undergoing an organizational and doctrinal evolution in order to be a relevant and capable force in the contemporary operational environment and on the battlefields of the future. Aviation has traditionally provided a unique operational capability of providing, in the third dimension of airspace, the mobility, agility, logistics, sustainment, and ability to mass significant combat power at the right place and time in support of ground maneuver forces. However, recent and ongoing operations in Iraq and Afghanistan are being prosecuted in austere, remote, and noncontiguous theaters. These conditions have exemplified the importance of aviation's tactical and logistical support to the warfighter on the ground. The Army's organic intratheater lift fixed-wing and rotary-wing assets, specifically the C-23B Sherpa cargo airplane fleet and the CH-47D Chinook heavy-lift cargo helicopter fleet, have been heavily employed in the high operations tempo in Iraq and Afghanistan, and it has been determined that their legacy organizations and aircraft are not optimized to support protracted operations under such demanding conditions. This thesis focuses on analyzing the current and projected Army intratheater lift assets including the Future Cargo Aircraft and the under-development improved cargo helicopter program to determine whether Army aviation is headed down the right path to achieve operational success in the future. This study will also analyze the Army's projected aviation transformation organizational structure in order to make conclusions and recommendations to determine if the Army's intratheater fixed-wing and rotary-wing cargo assets will be relevant and capable to support the Future Force.

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TABLE OF CONTENTS

	Page
MASTER OF MILITARY ART AND SCIENCE THESIS APPROVAL PAGE	ii
ABSTRACT	iii
ACKNOWLEDGMENTS	iv
ACRONYMS	vii
ILLUSTRATIONS	xii
TABLES	xiii
CHAPTER 1. FUTURE FORCE ARMY AVIATION	1
Introduction: Evolution of a Fighting Force	1
“Expeditionary” Army Aviation	4
Army Aviation Cargo Helicopter and Fixed-Wing Transformation	11
US Marine Corps and US Air Force: “Old Hat” Expeditionary Forces	16
“Big Sky, Little Airplane”	16
Proposed Research Questions	17
Assumptions	18
Definitions	18
Limitations	19
Delimitations	20
Significance of the Study	20
CHAPTER 2. LITERATURE REVIEW	22
CHAPTER 3. RESEARCH DESIGN	28
Why is this research important?	28
Analyzing Current Army Intratheater Cargo Aviation Assets	29
Reviewing Army Aviation’s transformation plan	29
Correlating current operational information and Future Force aviation	30
Sister service considerations regarding intratheater aviation operations	31
Qualitative Review of Quantitative Information and Recommendations	31
CHAPTER 4. TRANSFORMING ARMY AVIATION’S TRANSPORTERS	33
Understanding Army Aviation’s Helicopter and Fixed-Wing Cargo Assets	33
Army Aviation’s Fixed-Wing Cargo Aircraft the C-23B Sherpa	34

Projected Employment and Assessment of the Army’s Cargo Airplane in the Future Force	49
Assessing the CH-47D Chinook assets and capabilities in recent operations	65
Projected Employment and Assessment of the CH-47 in the Future Force	66
CHAPTER 5. THE PLIGHT AND FLIGHT OF THE FUTURE FORCE	88
REFERENCE LIST	96
INITIAL DISTRIBUTION LIST	104
CERTIFICATION FOR MMAS DISTRIBUTION STATEMENT	105

ACRONYMS

Aircraft:

C-130	Lockheed Hercules
C-17	Boeing Globemaster II
C-23	Shorts Sherpa
C-27	Alenia Spartan
C-295	EADS CASA
C-9B	McDonnell Douglas Skytrain
C-35C/D	Cessna Citation
C-330	Shorts Skyvan
CH-46	Boeing Sea Knight
CH-47D	Boeing Chinook
CH-47F	Boeing ICH (Improved Cargo Helicopter)
C-5	Lockheed Galaxy
CH-53	Sikorsky Sea Stallion
MH-53J	Sikorsky Pave Low
MH-60G	Sikorsky Pave Hawk
RAH-66	Boeing-Sikorsky Comanche
UC-12B/F	Beech King Air
V-22	Bell-Boeing Osprey
- CV-22	Bell-Boeing Osprey (USAF Variant)
- MV-22	Bell-Boeing Osprey (USMC Variant)

AAR	After Action Report
ACE	Aviation Combat Element
AEF	Air Expeditionary Force
AGL	Above-Ground Level
AMC	Air Mobility Command
AO	Area of Operation
APOD	Aerial Port of Embarkation
ASE	Aviation Survivability Equipment
AVCRAD	Aviation Classification Repair Activity Depot
BCT	Brigade Combat Team

BDE	Brigade
BG	Brigadier General
BOS	Battlefield Operating System
CALL	Center for Army Lessons Learned
CARL	Combined Arms Research Library
CASEVAC	Casualty Evacuation
CDD	Capability Development Document
CE	Command Element
CGSC	Command and General Staff College
CGSOC	Command and General Staff Officer Course
COE	Contemporary Operational Environment
CS	Combat Support
CSA	Chief of Staff of the Army
CSAR	Combat Search and Rescue
CSS	Combat Service Support
CSSE	Combat Service Support Element
CTAC	Center for Army Tactics, US Army Command and General Staff College
DA	Department of the Army
DCSAOps	Deputy Chief of Staff of the Army for Operations
DIV	Division
DOD	Department of Defense
EADS	European Aeronautic Defence and Space
EDSA	European Distribution System Aircraft
FARP	Forward Arming and Refueling Point

FCA	Future Cargo Aircraft
FCS	Future Combat System
FM	Field Manual
FOB	Forward Operating Bases
GAO	General Accounting Office
GCW	Ground Combat Element
GSAB	General Support Aviation Battalion
HLVTOL	Heavy-Lift Vertical Takeoff and Landing Aircraft
HMH	Heavy Marine Helicopter (Squadron)
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HvyHC	Heavy Helicopter Company
ICD	Initial Capabilities Document
ISB	Intermediate Support Bases
JFC	Joint Forces Commander
JFHQ	Joint Forces Headquarters
JMVX	Joint Multi Mission Vertical Lift Aircraft
JP	Joint Publication
JROC	Joint Readiness Oversight Council
JTF	Joint Task Force
Kts	Knots
LAV	Light Armored Vehicle
LOC	Line of Communication
MACG	Marine Air Control Group
MAG	Marine Aircraft Group
MAGTF	Marine Air Ground Task Force

MAW	Marine Air Wing
MEDEVAC	Medical Evacuation
MEF	Marine Expeditionary Force
MFAB	Multifunctional Aviation Brigade
MPH	Miles Per Hour
MSO	Mission Sustainment Operations
MTOE	Modified Table of Organization and Equipment
MWHS	Marine Wing Headquarters Squadron
MWSG	Marine Wing Support Group
NGB	National Guard Bureau
NM	Nautical Mile
NVD	Night Vision Device
O&O	Operational and Organizational
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
OPTEMPO	Operations Tempo
OSA	Operational Support Airlift
OSAA	Operational Support Airlift Agency
OSACOM	Operational Support Airlift Command
PA	Pressure Altitude
PAM	Pamphlet
PBD	Program Budget Decision
RFP	Request for Proposals
RRITA	Rapid Response Intra Theater Airlifter
ROMO	Range of Military Options

SBCT	Stryker Brigade Combat Team
SME	Subject Matter Expert
SPOD	Sea Port of Embarkation
SRO	Sustainment Replenishment Operations
SDHSS	Super Short Takeoff and Landing Aircraft
SPMAGTF	Special Purpose Marine Air Ground Task Force
STARC	National Guard State Area Commands
STOL	Short Takeoff and Landing
SSTOL	Super Short Takeoff and Landing
TDA	Tables of Distribution and Allowances
TRADOC	US Army Training and Doctrine Command
TSM	TRADOC System Manager
TTP	Tactics, Techniques, and Procedures
UA	Unit of Action
UE	Unit of Employment
UE _x	Division-Similar Unit of Employment
UE _y	Corps-Similar or Theater-Similar Unit of Employment
UK	United Kingdom
US	United States
USAAVNC-DCD	US Army Aviation Center, Directorate of Combat Developments
USAF	United States Air Force
USAFDD	US Air Force Doctrine Document
USAR	United States Army Reserve
USMC	United States Marine Corps
VSTOL	Vertical Short Takeoff and Landing

ILLUSTRATIONS

	Page
Figure 1. Transformation to a Modular Force	2
Figure 2. The UEx	3
Figure 3. Task Organized UEx for Different Operations	6
Figure 4. Aerial Sustainment of the UA (BCT)	8
Figure 5. Aviation Modernization Strategy	11
Figure 6. UEx and Subordinate BCTs-Brigades	30
Figure 7. C-23B Sherpa Landing	34
Figure 8. Aerial Sustainment of the Future Force	39
Figure 9. Aviation Sustainment Operations in a UEx AO	43
Figure 10. US Army Fixed-Wing Modernization Design Goals.....	50
Figure 11. Future Cargo Airplane Complements the Chinook	51
Figure 12. C-27A Spartan employed by USAF between 1990-1999.....	54
Figure 13. EADS CASA C-295	56
Figure 14. Future Cargo Aircraft Fixed-Wing Battalion Structure	61
Figure 15. Proposed Future Cargo Aircraft OSA Theater Aviation Battalion Structure ..	62
Figure 16. CH-47D Chinook Conducting External Slingload	65
Figure 17. Future Force Multi-functional Aviation Brigade (MFAB).....	68
Figure 18. Aviation Transformation Heavy Helicopter Company (HvyHC).....	69
Figure 19. Future Force General Support Aviation Battalion (GSAB).....	69
Figure 20. USMC CH-53E Super Stallion Slingloads Two HMMWVs.....	78
Figure 21. V-22 Osprey Slingloads During Evaluation	83
Figure 22. Takeoff and Landing Comparisons.....	87

TABLES

	Page
Table 1. Comparison of the C-23B with Potential FCA Aircraft/ C-130E data included for reference	57

CHAPTER 1

FUTURE FORCE ARMY AVIATION

Army aviation's greatest contribution to the battlefield is providing the ground maneuver command the ability to apply decisive combat power at critical times virtually anywhere on the battlefield. (2004, A-2)

FMI 3-90.6, *The Heavy Brigade Combat Team*

Introduction: Evolution of a Fighting Force

The US Army is currently undergoing transformation into a modular tactical operational construct centered on the Brigade Combat Team (BCT) that is to be supported by a higher headquarter unit of execution, either UEx or UEy. This evolution is the result of the Army's assessed need to reorganize the force in order to be more efficiently and effectively employed in the global contemporary operating environment (COE). UExs, which are somewhat comparative to the traditional warfighting division-to-corps headquarters organizations, and UEys, which are comparable to the traditional corps-to-army headquarters organizations, are the organizations to which Army aviation must adapt to in order to be effective and successful on the battlefields and tactical operational areas of the future. These UEx and UEy organizations are illustrated in figure 1. "Wartime missions and circumstances have forced the Army to adapt to enemies and conditions pragmatically, changing old arrangements decisively and quickly. . . . Since 1999, the US military has evolved dramatically under the pressure of strategic challenges, combat experience, and technological change. This evolution has transformed operations from specific mission developed, service-dominated operations into fully integrated, mutually supportive joint campaigns" (Task Force Modularity 2004, vii).

UEy and UEx

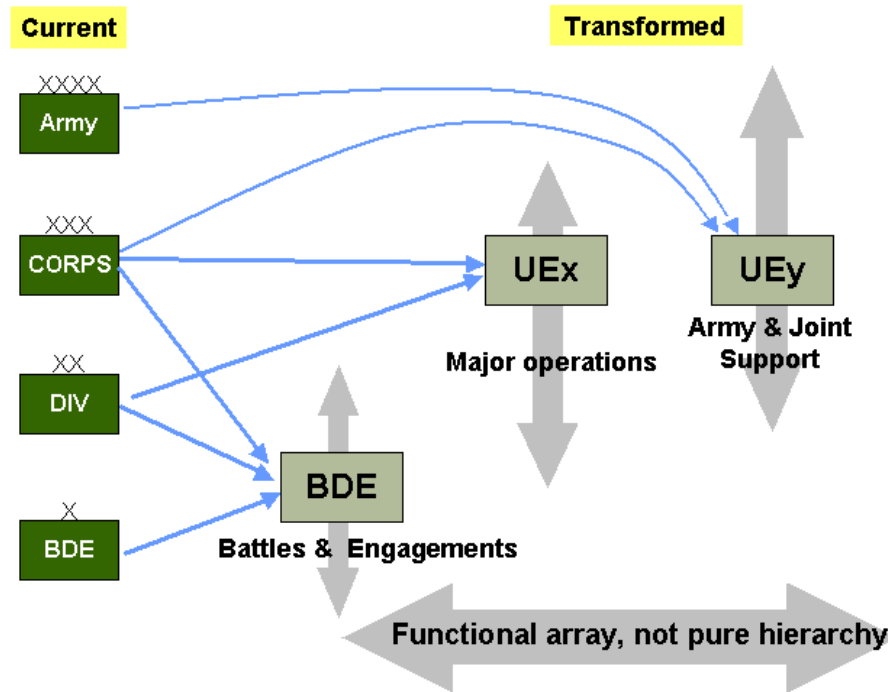


Figure 1. Transformation to a Modular Force

Source: Task Force Modularity, *Army Comprehensive Guide to Modularity* (Fort Monroe, VA: US Army TRADOC, 2004), 1-6.

This shift from the long-established division-based construct to the new modular BCT-based construct, as illustrated in figure 2, essentially involves an integration of combined arms assets with maximum utilization of joint “sister service” support in order to make BCTs more lethal and operationally effective in the COE or battlefield. The fundamental concept behind this shift from a division-based army to a modular BCT-based army relies heavily upon effective command and control, technology, mobility, and speed in order to defeat the enemy. BCTs currently operating in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) have shown “an impressive ability to fight

independently in widely separated, semi-independent engagements. Closer, faster, more dependable integration of joint fires and intelligence support bolstered that greater independence” (Task Force Modularity 2004, 4).

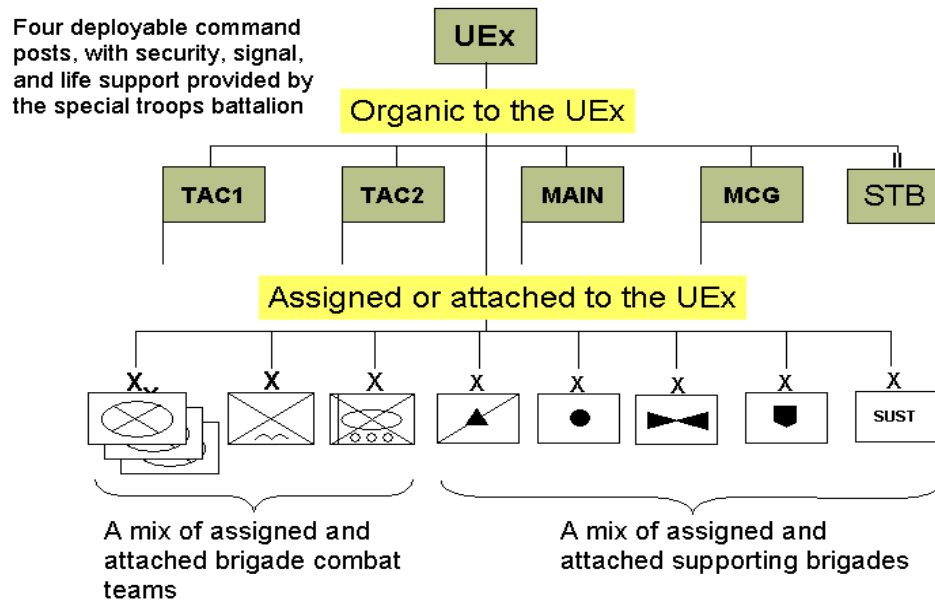


Figure 2. The UEx

Source: Task Force Modularity, *Army Comprehensive Guide to Modularity* (Fort Monroe, VA: US Army TRADOC, 2004), 1-8.

Thus, this creates a demand upon Army aviation to support full-spectrum operations within contiguous and noncontiguous areas of operations (AOs) and reinforces the concept that Army aviation must evolve concurrently with other Army battlefield operating systems (BOS) in order to better support ground maneuver units operating in the COE. Army aviation intratheater lift fixed-wing and helicopter assets provide the mobility and speed needed to support ground maneuver BCTs in order to win on the

battlefield. This has been made evident by the characteristics of recent and current OEF-OIF operations.

“Expeditionary” Army Aviation

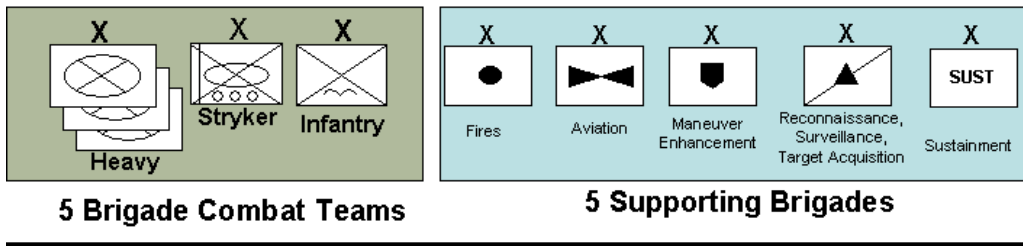
The Army’s current strategic and transformational objectives focus on becoming more “expeditionary” in organization and capabilities by centering unit structures and operations around “primary” ground maneuver BCTs. The Army has developed organizational and operational plans for these ground maneuver BCTs, whether it be armor (heavy), medium (Stryker) or infantry, to be stand-alone warfighting organizations much like divisions of past Army constructs. These primary BCTs are insufficiently organized to sustain themselves in terms of firepower, logistics, and maneuver capabilities in the COE. In the current evolution of the force, the Army has officially embraced a practice long applied by battlefield commanders, specifically those commanders at the traditional division-level headquarters. The effective teaming of unique but supporting BCTs centered around a primary ground maneuver BCT in order to accomplish full-spectrum operations in the range of military operations (ROMO) is the direction the Army is moving towards. ROMO includes combat, support, and stability strategic missions. The Army’s current shift toward creating multifunction, BCT-centered organizations coincides with the concept that future Army units be “expeditionary.” This expeditionary mind-set demands self-sufficiency in operational and tactical respects. However, recently developed Army doctrine has announced a more uniform approach to making these future BCTs to be more self-sufficient and lethal, especially in the noncontiguous COE. The long-practiced application of BCTs is based upon the Army’s tactical commanders operating on the concept that “success against either conventional or

unconventional enemies has always been based upon securing or retaining the initiative and exercising it aggressively to defeat the enemy. Destruction of an enemy is best achieved by throwing the enemy off balance with powerful initial blows from unexpected directions and the following up rapidly to prevent his recover” (Task Force Modularity 2001, 5). This expeditionary concept forces these smaller tactical units, the BCTs, to be more self-sufficient by capitalizing on modern weapons, intelligence gathering and communications technology, and the ability to synergistically employ those assets to be effective on the battlefield. These BCTs, although relatively self-sufficient on the battlefield, are going to be the building blocks upon which operational commanders will employ maneuver units on the battlefield. There will be two higher headquarters that will replace the current organizations of divisions, corps, and echelons above corps. Again, those two organizations are the UEx that will be the primary warfighting and operations organizations in the COE and the UEy that will be the headquarters providing the traditional theater operational and joint-combined operations coordination. Figure 3 from the *Army Comprehensive Guide to Modularity* published in October 2004 illustrates general UEx organizational options. The UEx is centered around three primary ground maneuver BCTs and is supported by five unique BCTs, as previously mentioned including fires, maneuver enhancement, battlefield surveillance, sustainment, and lastly, aviation BCT. This research will review the Army’s plans for the employment of the heavy-lift helicopter company (HvyHC), comprised of twelve CH-47D Chinook cargo helicopters, of the General Support Aviation Battalion (GSAB) in the newly organized aviation BCT, otherwise known as the Multifunctional Aviation Brigade (MFAB). An

assessment of the capabilities of the HvyHC to support the UExs ground maneuver BCTs will be reviewed.

Each UEx is tailored for a specific operation; the composition of the UEx is completely variable

Example: Offensive Operations



Example: Stability Operations

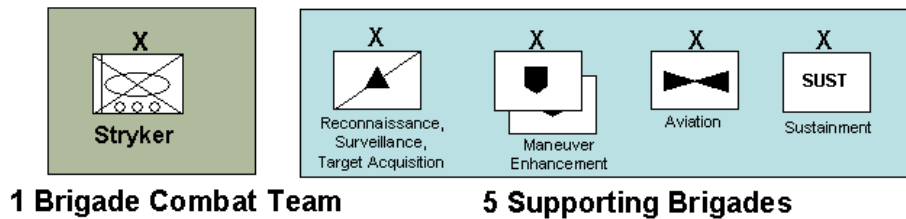


Figure 3. Task Organized UEx for Different Operations

Source: Task Force Modularity, *Army Comprehensive Guide to Modularity* (Fort Monroe, VA: US Army TRADOC, 2004), 1-11.

The challenges of evolution in Army aviation to remain relevant are not limited to its rotary-wing assets. Recent lessons learned from operations in the COE have also significantly challenged the Army’s fixed-wing cargo carrying assets. “The doctrine emerging from the concepts for the Future Force, along with lessons learned from recent operations in OEF-OIF clearly indicated the urgent need for a more capable fixed wing cargo and utility aircraft. It appears likely that acceptance of Future Force concepts, with

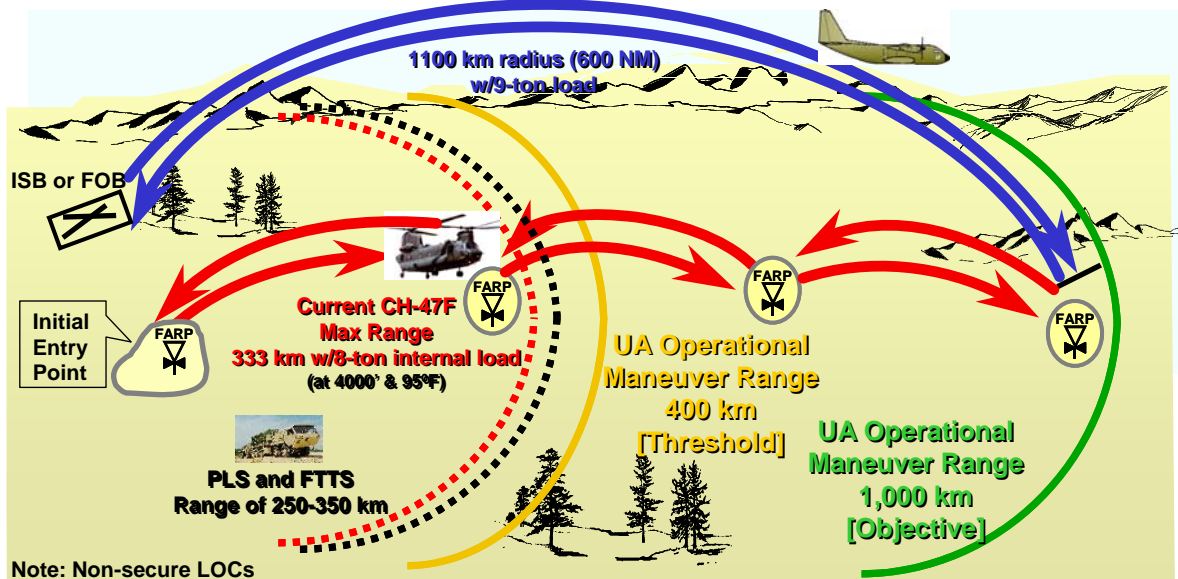
its non-linear battlefield and dispersed fighting units, will exacerbate the logistics problems associated with distributed operations” (Aerial Sustainment Capability ICD Development Team 2004, 10). Simply, the current extensive employment of the Army’s small fleet of intratheater cargo carrying C-23B Sherpa airplanes has been heavily utilized out of the sheer need to support military operations in both Iraq and Afghanistan. The Army’s doctrinal plans for the employment of its fixed-wing cargo assets, including the C-23B fleet and then eventually the Future Cargo Aircraft (FCA), requires that these airplanes

will support a full range of sustainment operations and will transport time-sensitive/mission-critical supply items and/or personnel over operational/tactical distances to forward-deployed Future Forces, in remote and austere location. These fixed wing aircraft will normally operate from permanently established bases in the theater, and will operate as required from forward bases to include: Intermediate Staging Bases (ISB), theater aerial ports of debarkation (APOD), and airfields located near sea ports of debarkation (SPOD). Aerial sustainment will be required in greater degree to support Future Force mobility and agility, especially given Future Force dispersion, high OPTEMPO, noncontiguous operations, and expanding operational radii, all of which impact the sustainment time/distance paradigm. (Aerial Sustainment Capability ICD Development Team 2004, 5)

Also, “in order for the BCT to meet deployment timelines, it will carry enough supplies to be self-sufficient for a three-day period at a high operating tempo (OPTEMPO). Once deployed, a BCT will be capable of immediately maneuvering up to 400 kilometers to an objective area. Instead of being resupplied daily, each BCT will be logistically supported every three to seven days by sustainment pulses. This concept of operation will necessitate a change in the way the Army sustains its Future Force--great emphasis will be placed on aerial resupply” (Aerial Sustainment Capability ICD Development Team 2004, 4). These concepts are graphically illustrated in figure 4.

Aerial Sustainment of the UA

Fixed Wing vs. Rotary Wing Cargo



- Upon arrival, FCS combat units immediately employ over operational distances (up to 400 km) to designated area(s) of operation, as a coherent, integrated, combined arms team. [FCS ORD, 22 Jan 2003]
- The FCS FoS must be capable of employing over ranges of 750 km (Threshold) and 1000 km (Objective). [FCS ORD, 22 Jan 2003]
- Within a range of 250-350 km, preliminary analysis has shown that current PLS and projected FTTS would both be adequate, but with significant requirements for protection. However, beyond this range and in terrain conditions rendering ground transportation infeasible, aerial resupply capability will be required. [CASCOM AAR for ATWG 02, 31 MAY 02]

Figure 4. Aerial Sustainment of the UA (BCT)

Source: Army Aviation Fixed-Wing Cargo and Utility Aircraft ICD Development Team, *Initial Capabilities Document (ICD) for Army Aviation Fixed-Wing Cargo and Utility Aircraft* (Washington, DC: Department of the Army, 2004), 40.

Current OEF-OIF operations are significantly challenging the US Air Force's (USAF) intratheater airlift assets, the C-130E Hercules fleet (Tirpak 2004, 36). The USAF is struggling to maintain logistic and on occasion, tactical airlift support for Army ground maneuver units operating in theater. The USAF's limited C-130E fleet, which is also frequently tasked with intertheater airlift support for the US military, places significant demands upon Army aviation's organic cargo assets to support its own ground maneuver units. "The [UEy] area is likely to grow as much as 500 x 500 kilometers. . . .

[T]his means a significant distance gap may exist between where the USAF can deliver supplies and where Army rotary wing aircraft can pick up the supplies to further support sustainment operations” (TRADOC Pam 525-3-04 2003, 126). On a related note, the document also states, “Army cargo and utility fixed-wing force structure requires sufficient personnel and equipment to sustain the higher operational readiness rates and continuous operations (24/7) of the Future Force. Collectively, they will provide the UE and the combatant commander with a rapid and highly mobile means to respond to an operational need” (TRADOC Pam 525-3-04 2003, 136).

The phased retirement of each of the 172 C-141B Starlifters, which is scheduled for completion in 2006, has already had an impact upon the total available USAF theater airlift assets (Strategy Page 2004, 1). The USAF’s Air Mobility Command (AMC) manages the 311 C-130E Hercules aircraft in the force. Of that total number of C-130Es, 86 of those aircraft are specifically designated to support operations in Southwest Asia (Tirpak 2004, 38). USAF intratheater airlift handled approximately 15,400 short tons of cargo in support of the prosecution of OEF between 2001 and 2004 (Tripp, Lynch, Drew, and Chan 2004, 62). This great demand for cargo transportation has put a significant strain on USAF’s intratheater airlift aircraft. A limited number of C-130Es, coupled with the operational support demands by BCTs operating in austere and remote locations that require airlift support operation at airfields that require short takeoff and landing (STOL) aircraft capabilities, is straining the USAF intratheater airlift fleet. While the USAF’s C-17 Globemaster IIIs and C-130Es are both often tasked as intratheater airlift support assets since they are capable of operation in remote and austere tactical environments, these aircraft “while maximizing load capacities . . . require at least a 3,000-foot runway

and in many cases may require larger runways when carrying sizeable loads” (*US Army Transformation 2003 Roadmap 2003*, 8-15). In a tactical operational area, a 3,000-foot runway, though unimproved, is a sustainment asset not always readily available. These limitations of USAF intratheater lift assets have had a trickle-down effect to the Army’s C-23 Sherpa cargo airplane fleet and further down to the CH-47D Chinook cargo helicopter fleet. The C-23B Sherpa, in comparison to the C-17 and the C-130E, can land fully loaded with a 7,000-pound payload, on an unimproved runway as short as 1,856 feet. As a result, Army aviation’s organic fixed-wing cargo and cargo helicopter assets have been pushed to the forefront of operations and also to the performance limits of their operational capabilities as Army logisticians have turned to the small cargo airplanes to aerially resupply forward deployed ground maneuver units. “Aviation assets will play a significant role in the Future Force sustainment operations. Intratheater air movement of time-sensitive/mission critical supplies and aerial resupply to forward-deployed troops and/or widely dispersed forces, are combat enablers of the Future Force” (TRADOC Pam 525-3-04 2003, 17). With those concepts in mind, this thesis will present an analysis that supports the concepts that current Army fixed-wing cargo and cargo helicopter assets must also evolve in order to more effectively and efficiently support ground-maneuver tactical operations of the future. Issues that will be discussed include the Army’s current fixed-wing cargo fleet; associated operational limitations of those airplanes, fleet retirement, and modernization plans; and the challenges of having a Reserve Component command and controlled cargo airplane fleet will be addressed in this research.

Army Aviation Cargo Helicopter and Fixed-Wing Transformation

Army aviation and its correlative transformation with the Army’s UEx, UEy, and BCT restructuring plans implies that aviation must also evolve in order to be relevant on the battlefield by providing the speed and maneuver capability to support these units whose success often depends on rapid movement around and in support of the battle. As previously mentioned, the current Army aviation helicopter and fixed-wing infrastructures are concurrently undergoing their own evolutions and modernizations in order to adapt to supporting future ground maneuver BCTs (see figure 5).

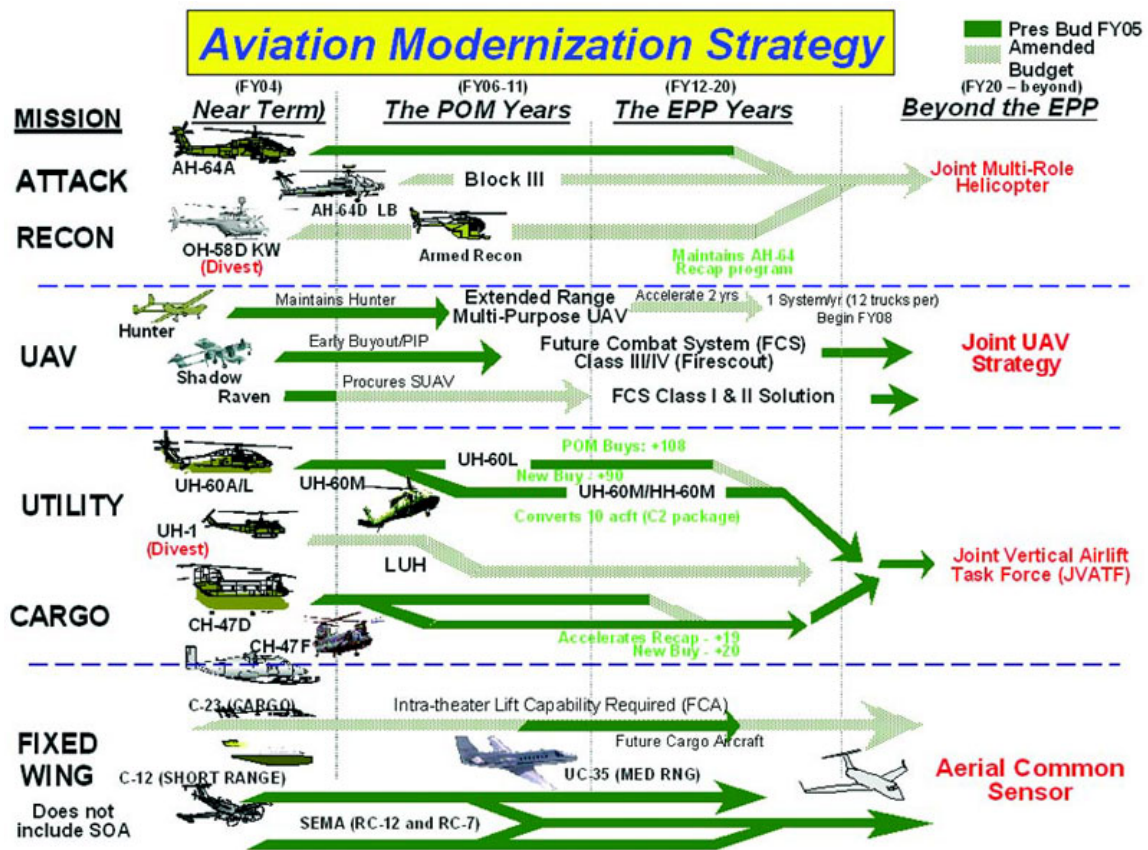


Figure 5. Aviation Modernization Strategy

Source: BG E. J. Sinclair, *Aviation Transformation* (Monroe, CT: AAPI 2004), 10.

This poses new and major challenges to aviation units that must provide combat, combat support (CS), and combat service support (CSS) to these rapid-maneuver capable units. The Army's stated strategic purpose of reorganization into these modular units "is to provide superior tactical units that are more responsive and provide greater mission potency at no increase in the logistical burden" (Task Force Modularity 2004, 5). Operations in the COE frequently require BCTs to function in remote and austere AOs. These conditions have strained and continue to strain the Army's limited intratheater aviation lift assets tasked to support those BCTs currently operating in Afghanistan and Iraq. The Army's organic intratheater aviation lift assets, the C-23B Sherpa cargo airplane and the CH-47D Chinook heavy-lift cargo helicopter, have been the combat multiplier and mission-enabling assets that have provided maneuver and sustainment capabilities to ground maneuver units. Since 11 September 2001, the deployments of the majority of the C-23B and CH-47D assets in support of the global war on terrorism and OEF-OIF missions reaffirm the essential role that the Army's intratheater aviation lift assets provide to support the success of ground maneuver units. This research focuses on the Army's aviation unit organizations; operational doctrine plans and modernization strategy regarding its intratheater aviation lift support elements and the employment of its heavy-lift assets, the C-23B Sherpa and the CH-47D Chinook; and whether these current and near-future aviation assets and organizational constructs are able to support the BCT-centric Army of the future. Recent operational employment assessments of C-23B assets in OEF-OIF and how the Army's "lessons learned" from those operations have influenced the development of the organization of future C-23B units in the Army's transformation restructuring plan will be reviewed. The C-23B fleet has provided much

needed intratheater aviation lift support capability that has developed due to the nature of austere and remote airfield operational conditions in Afghanistan and Iraq. Also, an assessment of the Army's current and near future C-23B aircraft fleet numbers that correlate to the UE and BCT restructuring will be made in order to assess whether there are sufficient C-23Bs available to support the Army's transformation operational requirements for future operations in the COE. Considering that there are only forty three C-23B Sherpas in the Army and that airplanes from all of those Army fixed-wing units have been deployed since 2001, this thesis will address whether there are sufficient C-23Bs in the Army to support the employment of future UExs and BCTs. This research will also discuss the Army's intratheater aviation fixed-wing modernization plan and how those plans may affect support operations of future BCTs. Although the C-23B fleet has reportedly performed extremely well in support of OEF-OIF, the limited numbers of C-23Bs in service have presented Army leaders with a new challenge to sustain and even increase capabilities of intratheater aviation lift support. C-23B Sherpas have proven their effectiveness in the theaters of Afghanistan and Iraq by providing a short-takeoff and short-landing capable aircraft that the US Air Forces' (USAF) C-130E Hercules transports cannot provide. The USAF has acknowledged that its strategic and theater airlift assets are operating at record-level volumes, and the C-130E Hercules cargo aircraft is frequently unavailable or is assessed as being cost ineffective in supporting small-to-medium-sized cargo transportation within a theater (Tirpak 2004, 34). As a result, the C-23B Sherpas have provided Army ground commanders with a fast and efficient method of operational and occasionally, tactical support, at more cost effectiveness than the CH-47D Chinook's rather expensive per-hour operational costs.

“Currently, the majority of aerial movement of time-sensitive/mission-critical supplies and key personnel is being accomplished by rotary wing assets, primarily the CH-47 aircraft. While this accomplishes the tasks, it does so at high operating costs and with significant aircraft service life impacts” (Aerial Sustainment Capability ICD Development Team 2004, 7). It costs approximately \$4,000 per hour to operate a CH-47D during a typical cargo-carrying mission (Aerial Sustainment Capability ICD 2004, Appendix E). The C-23B Sherpas are basically bridging the gap between the USAF’s C-130E Hercules and the CH-47D Chinook’s short-haul capabilities. Despite the effectiveness of the C-23B fleet in theater, plans for those airplanes’ phased retirement, which begins in 2007, have the Army continually working towards enhancing its future intratheater fixed-wing capabilities by employing a plan to replace the C-23B fleet and employing a modernization and upgrade plan focused on the acquisition of a Future Cargo Aircraft (FCA). This FCA initiative, which was started before 2001 but recently has risen to the forefront of the Army aviation modernization efforts due to the robust OPTEMPO of aircraft in OEF-OIF, is focused on the Army’s acquisition of an airplane “more capable” than the C-23B. The Army wants to upgrade its fixed-wing capabilities to include the development of tactical operational plans for employment of the FCA: a planning concept that did not precede the acquisition and employment of the C-23Bs which were a congressionally mandated program during the 1990s conducted in support of individual State Army National Guard mission homeland security requirements. Plans for the FCA are expected to focus on improving the intratheater tactical operational capabilities of the selected aircraft using “lessons learned” from OEF-OIF in order to better support BCTs operating in the COE. Preliminary requirements set by the Chief of

Staff of the Army (CSA) indicated that the aircraft that will be selected for the FCA to replace the C-23B Sherpa fleet will be able to carry more cargo, fly farther and faster, and will be STOL capable. These increased performance capabilities are all focused on providing better combat and CS to those BCTs operating in the COE. Early proposals for the FCA include the acquisition of a total of 160 aircraft; that is nearly four times the number of fixed-wing cargo aircraft that currently exist in the Army inventory (Futures Development Division 2004, 159).

This research will also review recent operational employment assessments of CH-47D Chinook assets in OEF-OIF and how the Army's "lessons learned" from those operations have influenced the future construct organization of future CH-47D Chinook assets in UEx aviation brigades. The CH-47D Chinook's current and near future aircraft fleet numbers will be correlated to the UEx restructuring in this thesis in order to assess whether there are sufficient CH-47D Chinook assets available to support the restructuring plan to meet the Army's transformation milestones. Considering that there are only about 432 CH-47D Chinooks currently in the Army inventory and that the great majority of those aircraft organizations has been deployed since 2001, this thesis will address whether there are enough heavy-lift cargo helicopter assets in the Army to support the future UE aviation BCT restructuring plan. Again, the current robust OPTEMPO of CH-47Ds operating in Afghanistan and Iraq has produced secondary and tertiary challenges to Army aviation including significant aircraft major service issues, including a shortage of major aircraft component parts that are needed due to the increased maintenance service requirements and combat-induced aircraft damage.

US Marine Corps and US Air Force: “Old Hat” Expeditionary Forces

The Army’s evolution towards a modular, multimission, rapid-deployable, self-sustaining force based upon a BCT construct is not a new concept for the sister services. The USMC’s Marine Air and Ground Task Force (MAGTF) and the USAF’s Air Expeditionary Forces (AEFs) have proven successful in OEF-OIF. The TTPs, organizational constructs, combined arms equipment, and some of the “lessons learned” from MAGTF operations in Iraq and Afghanistan will be reviewed in this research and correlated with Army aviation’s future plans. Additional analysis that will be addressed in this research includes what types of aviation equipment, including the short takeoff and landing (STOL) MV-22A Osprey aircraft, are projected to be employed by the USMC in that service’s force modernization plans.

“Big Sky, Little Airplane”

The Future Force goals that have been placed upon Army Aviation by Army leadership will prove to be a great burden on current and near-future intratheater aviation lift assets. As previously mentioned, the conditions of limited aircraft fleet resources, both C-23B Sherpa and CH-47D Chinook, are currently challenging ground maneuver commanders with trying to effectively support both maneuver and aerial logistic sustainment with the various limitations of the Army’s intratheater aviation lift assets. The Army’s reorganization objective of establishing 77 to 82 modular BCTs, and its secondary objective of the structuring of the appropriate supporting BCTs, to include the Aviation BCT or Multifunctional Aviation Brigade (MFAB), is a difficult task to do in “less demanding” peacetime OPTEMPO. However, the reality of current combat operations nearing four years since the 2001 commencement of OEF and then later,

concurrently during OIF, is challenging Army aviation to be effectively and efficiently employed in order to sustain its essential contribution to the combat effectiveness of Future Force BCTs. Therefore, this research aims at assessing Army aviation's intratheater cargo assets by learning from recent Army and sister-service combat operations by discussing the TTPs that could best be applied by Future Force aviation assets in order to more effectively employ intratheater cargo in assets in support of Future Force BCTs. This research focuses on discussing the concepts that could, if employed, possibly enhance and improve the effectiveness of Army aviation's limited intratheater cargo assets on the battlefield.

Proposed Research Questions

The primary research question of this thesis is, Is the Army's future operational and organizational plan for its heavy-lift cargo helicopter and fixed-wing cargo assets adequate to maintain Army aviation relevant for the current military operations COE and battlefields of the future? Numerous secondary and tertiary questions will be developed in this research and will be addressed in order to quantify the analysis of the primary question addressing the capabilities of the current intratheater lift aircraft focused on the C-23B Sherpa and the CH-47D Chinook and how these assets will be unit organized in order to operationally support future UExs and ground maneuver BCTs. Secondary questions, such as: What is the Army's plan to upgrade or modernize its rotary-wing and fixed-wing cargo aircraft fleets? Another supporting question that will be addressed in this research is, What can Army Aviation learn from sister services, such as the USMC's Marine Air Ground Task Force (MAGTF) and its CH-53E Super Stallion helicopters of the Marine Heavy Helicopter (HMH) Squadron, compared to the CH-47D Chinooks of

the Army's Heavy Helicopter Company (HvyHC)? Comparing the Army CH-47D HvyHC to the Marine CH-53E HMH Squadron can provide some quantitative data for comparison and some insight to potential concepts that could be applied to assist Army aviation to best organize and employ its heavy-lift cargo helicopter assets in order to be relevant in supporting the Future Force in the COE and future battlefields.

Assumptions

The most important assumption in this research is that the planned evolution of current Army Aviation force structure is going to change into the organizations as outlined in the most recent doctrinal publications, such as the *Army Fiscal Year 2005 Gameplan* published in November 2004 and the *Army Comprehensive Guide to Modularity* published in October 2004. The formal publishing of those documents significantly implies with great certainty that these changes will be employed in the near future and the most prudent course of action for this research would be to quantitatively assess how these future organizational constructs will keep Army aviation as relevant and capable in COE and battlefields of the future. The chief goal of this thesis is to focus on assessing the relevance of the Army's its intratheater aviation lift assets and to make subjective conclusions and recommendations of those capabilities.

Definitions

The term relevant is used extensively throughout this research and in this writing. Relevant in regards to this research directly relates to the concept of whether Army aviation is organized and equipped effectively in order to achieve its strategic, operational, and tactical goals in the COEs and battlefields of the future. Relevant

analysis will include quantitative analysis of those Army aviation assets, specifically the CH-47D Chinook and the C-23B Sherpa aircraft, and the Army's plans for employment and organizational structure of those assets in order to adequately support the BCTs of the future and thus be relevant in the COEs and battlefields of the future.

Limitations

Public information and documents made available through the Combined Arms Research Library (CARL), the Center for Army Lessons Learned (CALL), electronic databases, and information gained from subject matter experts (SMEs) through interviews and questionnaires are the primary sources of information for this research. However, as previously mentioned, the nature of writing about emerging doctrine can significantly limit the availability of sometimes critical documents or information that somehow significantly contribute to analysis, conclusions, and recommendations. Therefore, in order to mitigate this condition, every effort has been made to reflect the most current and up-to-date official Army doctrinal information possible in the writing of this thesis. Information included or discussed in this thesis will reference only research information and sources published prior to 4 March 2005. This research will also make every effort to accurately deduce and interpolate, with a limited degree of speculation, the numerous dynamic sources of information that the Army is concurrently publishing about transformation and force modernization with the goal of making assessments that are realistic and relatively subjective in nature. Any conclusions and recommendations discussed in this thesis that are objective in nature will be clearly identified.

Delimitations

The nature of this thesis subject, in comparison to the limitations previously discussed, provides for a diverse and in certain circumstances, an unlimited amount of information and documentation that contribute to the research of the subject. On-going operations in OEF-OIF have provided some unclassified after-action reports (AARs). Also, firsthand interviews with SMEs provide a unique and dynamic research resource to this thesis. As the Army conducts major operations in Iraq and Afghanistan, these operations provide a real-time, real-life assessment of data which Army leaders can use to adjust future aviation asset employment and organizational construct. Simply, the resource pool of objective information available for this thesis is limited to the creativity of the author and the research time available.

Significance of the Study

The US Army is immersed in a high OPTEMPO environment prosecuting the global war on terrorism concurrently with the challenge of force-wide transformation. This thesis' significance is important to Army leaders and strategists who must consider the resultant implications of these modernization changes to Army aviation of the future. It is my goal that this research will reveal to some, and in some cases assert to others, the understanding of Army aviation's importance on the battlefield as a combat multiplier providing rapid maneuverability and aerial sustainment support to ground maneuver forces and that understanding how to best employ Army aviation is essential to success in the conduct of tactical operations. Combat, combat service (CS), and combat service support (CSS) planners alike will benefit from the information covered in this thesis since assessments in this research are focused on analyzing how effective Army aviation will

be employed decisively and efficiently to win battles and to achieve operational objectives in the COE of the future. The long-range success of Army aviation directly impacts the successful employment and combat effectiveness of the Army's ground maneuver assets on the battlefield and ultimately, the security of the US's tactical, operational and strategic objectives. This research is aimed at providing some analytical insight for Army leadership to consider ensuring the viability of Army aviation of the Future Force.

CHAPTER 2

LITERATURE REVIEW

The dynamics of researching a subject that is evolving concurrently during the process of writing about that subject is double-edged. On one hand, the currency of a relatively new subject with limited historical collective analysis elevates the significance of the resultant research. On the other hand, the dilemma of being a pioneer researcher of that new subject challenges the writer with having to learn about a complex doctrinal subject that is a rapidly evolving topic during the process of research is a challenging task. This dilemma is especially true when documentation about the rather new subject is limited in number. However, this thesis subject's research material has progressed significantly and concurrently as transformation has progressed throughout Army aviation during the research period. The documents that significantly impacted the choice of this research topic with a focus on aviation modernization and transformation were national strategic documents, such as the *Fiscal Year 2005 Gameplan* published on 1 November 2004. This document was developed under the direction of Chief of Staff of the Army (CSA) General Peter Schoomaker. Schoomaker says in this document that "transforming the force, which is critical to our ability to fight and sustain our commitments in Iraq, Afghanistan and other theaters in the Global War on Terrorism, while remaining ready to deter aggression and execute our strategic commitments elsewhere, is a challenge. . . . Our three principal objectives--modularity, rebalancing and stabilization--will enable us to serve the National while caring for our Soldiers and their families" (Chief of Staff, US Army 2004, I). Also, former CSA General Eric Shinseki states in the US Army white paper "Concepts for the Objective Force" and the August

2003 Training and Doctrine Command (TRADOC) Pam 525-3-04, *Operational and Organizational Plan: Aviation Warfighting*, likewise states “The [Future] Force will be designed for full spectrum success while optimized for major theater war. The force design means that formations will possess the inherent versatility to operate effectively anywhere on the spectrum of military operations without substantial augmentation to perform diverse missions within a single campaign” (TRADOC Pam 525-3-04 2003, 11). Shinseki also states, “The [Future] Force will be more responsive, more deployable, more agile, more versatile, more lethal, more survivable and more sustainable than today’s forces, ready to provide precise and dominant capabilities for land campaigning” (TRADOC Pam 525-3-04 2003, 21).

The November 2003 *US Army Transformation Roadmap*, also authored by Schoomaker, focuses on the Army’s transformation on its aviation assets by stating, “The most significant new capabilities required to improve the Joint and Future Force strategic responsiveness and operational agility include . . . Super-short take-off and landing (SSTOL) aircraft, and advanced heavy-lift vertical take-off and landing (HVTOL) aircraft” (Chief of Staff, US Army 2003, 3-12). This comment is directly focused on the Army’s organic intratheater aviation fixed-wing and rotary-wing assets.

The Army Comprehensive Guide to Modularity published in October 2004 further details the Army transformation plans by stating, “today’s operations require Army forces to respond rapidly with forces that move quickly and commence operations immediately upon arrival in distant theaters of operation. . . . Further, the tactical agility of the [transformation building block] BCT allows it to destroy larger enemy formations disrupted by joint effects and exposed to rapid maneuver. Joint air and sealift may allow

land forces to extend the depth of maneuver and increase the speed of operations to such a degree that the enemy's command and control breaks down and the enemy begins a cycle of cascading deterioration (Task Force Modularity 2004, 1-2). This statement challenges Army aviation to provide that speed, massing capability and agility needed to support the BCTs of the Future Force.

Additionally, the 21 October 2004 final approved draft TRADOC Pam 525-3-04 elaborates, "Army aviation is the critical enabler for the Future Force, in the conduct of shaping and sustainment, joint operations. Aviation . . . conducts maneuver, maneuver support, and maneuver sustainment operations across the spectrum of conflict. . . . Future Force aviation units are designed to operate at a tempo that affords the enemy no rest or relief and no means of responding effectively. Aviation units develop situations while the ground force is out of contact, maneuver to positions of advantage, engage enemy forces beyond the range of their weapons, destroy them with precision fires, and provide close support to the tactical assault at the time and place of the JFC's choosing" (2004, 5). This increased demand upon Army aviation to transform effectively in order to support the BCT-centric Future Force also requires that "Army aviation enhances deployment and maneuver through increased speed and range of operation, and the delivery of timely and accurate supporting fires" (TRADOC Pam 525-3-04 2004, 16). This document also adds, "Aviation assets will play a significant role in the Future Force sustainment operations. Intratheater air movement of time-sensitive/mission critical supplies and aerial resupply to forward-deployed troops and/or widely dispersed forces are combat enablers for the Future Force" (2004, 17).

The concepts discussed in these documents and other documents supporting the research for this thesis focused on Army aviation's intratheater lift operations and have provided a foundation of information to analyze and review the Army's developmental plans toward the reorganization to the BCT-centered warfighting construct and to develop the analysis and conclusions that are presented in this writing. Other sources of information that contributed to this research include information acquired from military aviation subject matter experts (SMEs), such as interviews with Army aviation's Operational Support Command (OSA) commander COL Jackie Reaves of the National Guard Bureau (NGB) and his staff whose command and control responsibilities of all of the Army's cargo and utility fixed-wing assets, provide a unique perspective from the headquarters spearheading the Future Cargo Aircraft (FCA) airplane modernization initiative. John Fain, a Department of the Army (DA) senior analyst contractor who is a strategic and operational planner for Army aviation's Training and Doctrine Command (TRADOC) System Manager for Lift Aircraft (TSM-Lift) office at the US Army Aviation Center (USAAVNC) at Fort Rucker, Alabama, has provided insights into this research as his office is the proponent agency that develops and enforces the criteria for the assessment and selection of future Army aviation cargo helicopter and fixed-wing assets. Fain's insights into the process of the US government's Joint Requirement Oversight Council (JROC) and the ongoing process of the potential acquisition of a FCA airplane and the implementation into the US Army's combat systems, have been invaluable to this thesis. Fain's department contributed significantly to the development of the *Capability Development Document (CDD) for the Future Cargo Aircraft (FCA)* dated 22 April 2004. This document, which is used extensively as a primary research

source for this thesis, says, “During wartime, Army fixed-wing assets will be assigned to a Unified, Combatant Command structure. While in this capacity, these assets ... will support combatant commander-directed operations through the conduct of personnel transport and logistical support missions. Joint Task Force (JTF) commanders will employ cargo aircraft to fill the gap in the Joint Airlift Capability – between where the strategic/operational missions performed by the United States Air Force (USAF) aircraft end and where the tactical air-maneuver and movement, performed by Army rotary wing aircraft begins” (*Capabilities Development Document for the Army Future Cargo Aircraft* 2004, 11). This statement clearly challenges Army aviation to adapt and modernize fixed-wing cargo assets in order to effectively support Future Force operations.

On the other end of the spectrum, research, such as contemporary data including operational and tactical assessments from Army aviation commanders in Iraq and Afghanistan is incorporated into this thesis. Information gathered from C-23B Sherpa and CH-47D Chinook strategic and operational leaders provide unique frontline insights into the conditions of the current employment of the Army’s heavy-lift cargo helicopter and theater fixed-wing operations.

Periodical research resources were significant to this research as military technology journalism provided a second-party perspective to the current conditions of Army aviation transformation and modernization. In many instances, the numerous magazine articles researched for this thesis provided a critical and revealing analysis of issues, such as, helicopter fleet modernization in regards to the CH-47D Chinook and CH-47F ICH aircraft models, and fixed-wing acquisition issues pertaining to high-profile

Army systems, such as the FCA. Especially since anytime the Department of Defense, in this case the Army specifically, proposes to acquire new and expensive equipment, such as a new airplane, civilian military technologists often discuss the “ugly” reality of the fiscal and budgetary competitions that occur between government agencies. In the case of the potential replacement to the C-23B Sherpa’s current forty-three-airplane fleet, which is proposed to be replaced with the modern aircraft goal established by the FCA initiative, the prospect of selecting and acquiring a multiturbine engine aircraft fleet of some 160 modern and “more capable” airplanes has been a topic of much recent coverage by the civilian journalism community, especially by news agencies that monitor, investigate, and report on the government and its spending (Futures Development Division 2004, 159).

CHAPTER 3

RESEARCH DESIGN

Why Is This Research Important?

As identified in chapter 1, this thesis focuses on assessing the Army's intratheater aviation assets and its transformation during modernization and reorganization toward supporting Future Force goals as set forth by the CSA and the DA. The C-23B Sherpa and the CH-47D Chinook are the Army's two organic heavy-lift and cargo aviation assets that are the primary focus of this analysis. The tenuousness of transforming the Army's fighting force while concurrently conducting combat operations in Iraq and Afghanistan presents challenges but also present vital information that should be factored into the Army's plans of transforming aviation into a viable force for the future. The goal of this research is to review, analyze, and correlate this information and then present recommendations following assessment of this information with the goal of providing data that should be informative to Army and DA leaders that are engaged with the task of transforming the fighting force. The analysis of this research is significant since it is a collective review of contemporary subjects including current transformation plans and current tactical and warfighting operations. Because of the contemporary nature of this subject, there has been very little written about the Army's aviation transformation plan and its correlation to "lessons learned" from operations in Iraq and Afghanistan. This thesis is significant in that it presents general recommendations centered on making a correlation between currently ongoing operational TTPs in relation to the Army's future plans for its intratheater lift aviation assets and organizations. Simply, this thesis will briefly correlate those "lessons learned" with Army aviation transformation.

Analyzing Current Army Intratheater Cargo Aviation Assets

The initial research of this thesis involves a review and understanding of unit organizations and basic operational capabilities of the Army's C-23B Sherpa and CH-47D Chinook force structures. The subjective approach of this research analysis regarding this information includes a review of Army aviation units' associated modified tables of organization (MTOE), which outlines the construct of these units and of the doctrinal standards as established in Army field manuals (FMs) and other related publications. The objective approach of this research includes a basic review of combat and operational AARs, interviews with SMEs including aviation commanders with recent combat experience, and also an assessment of projected operational conditions for the C-23B Sherpa and CH-47D Chinook forces of the future.

Reviewing Army Aviation's Transformation Plan

A review of recently published Army documents including the CSA's fiscal year 2005 Army transformation guidance, interim and finalized organizational documents including the *Army Comprehensive Guide to Modularity* and other modularity and transformation publications provides the guidelines by which current intratheater aviation operational assessments can be assessed in respect to capabilities and unit organization in order to make recommendations to improve tactical aviation operations of the future. Transformation considerations, such as Future Force organization and modernization includes the creation of newly structured units, such as the UEx's Multifunctional Aviation Brigade (MFAB) or Aviation BCT (see figure 6) and its subordinate and supporting Ground Support Aviation Battalion (GSAB), were essential to this research.

UEx Menu

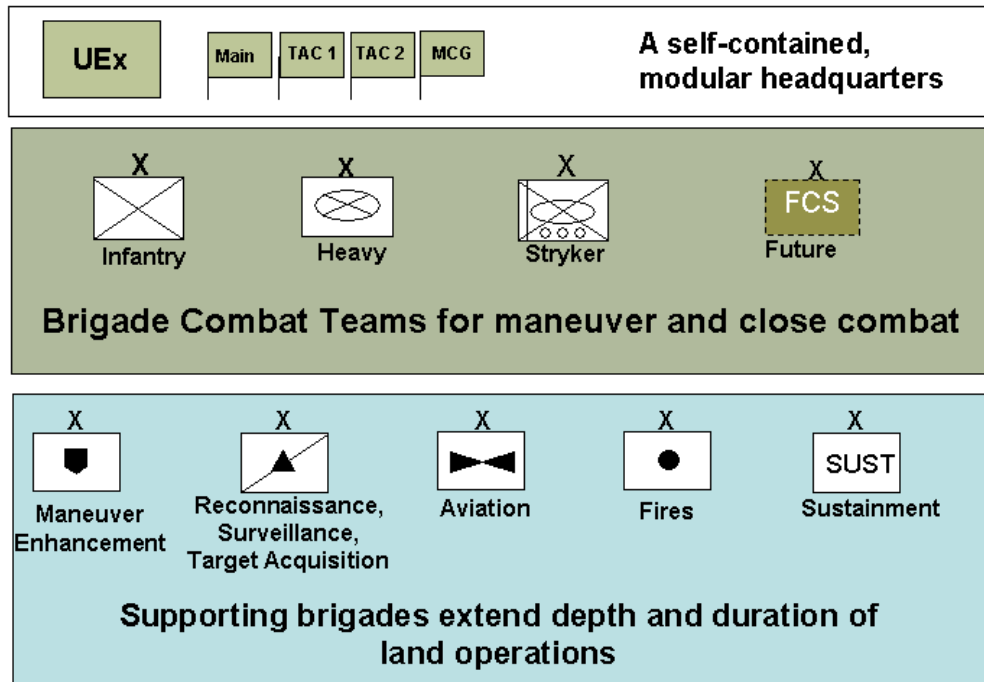


Figure 6. UEx and Subordinate BCTs-Brigades

Source: Task Force Modularity, Army Comprehensive Guide to Modularity (Washington, DC: US Army TRADOC, 2004), 5-21.

Other transformational considerations include aircraft component improvements and potential equipment replacement, such as the FCA initiative to replace the C-23B Sherpa fleet with a newer, more-capable airplane, will be considered in this analysis. This research will review the operational assessments of the potential aircraft selected for the Army’s cargo airplane fleet.

Correlating Current Operational Information and Future Force Aviation

As previously mentioned, correlating Army doctrinal transformation plans and current tactical operational assessments will require both subjective and objective analysis. However, it is the convergent assessment of these transformational plans and

operational AARs from OEF-OIF that makes this thesis unique in that research is conducted from a tactical operational leader's perspective with the goal of producing recommendations focused on maximizing the effectiveness of the employment of the Army's future intratheater aviation assets.

Sister Service Considerations Regarding Intratheater Aviation Operations

Understanding similar and related concepts of other branches of the military in reference to Army transformation and modularity was essential in the conduct of this research. A review of the USMC doctrinal publications that outline the employment and organization of the MAGTF was vital in the overall assessment of the Army aviation of the Future Force. Special assessment focus is made upon the utilization of the MAGTF's Heavy Marine Helicopter (HMH) Squadron and its organic heavy-lift cargo helicopter asset the CH-53E Super Stallion. Also briefly reviewed in this research is the USMC's aviation modernization plans to employ the MV-22A Osprey. Considerations as to why the USMC has plans to acquire and integrate the MV-22A Osprey into its MAGTAF operations and unit organization will be incorporated into the assessments and recommendations made in this research.

Qualitative Review of Quantitative Information and Recommendations

After collectively reviewing and assimilating the above-mentioned data, the conclusions and recommendations made as a result of this research are designed at determining the suitability of the employment and organization of the Army's Future Force intratheater aviation fixed-wing assets. Specifically, the C-23B Sherpa, the FCA, the CH-47 Chinook, and of the units and organizations of which those assets are to be

assigned. Simply, this thesis is aimed at answering the primary thesis question, Are Army aviation's intratheater aviation assets relevant and capable of supporting the Future Force?

CHAPTER 4

TRANSFORMING ARMY AVIATION'S TRANSPORTERS

Understanding Army Aviation's Helicopter and Fixed-Wing Cargo Assets

The Army's organic intratheater aviation lift assets have become the force multipliers for battlefield commanders and this concept has been most recently validated during operations in Iraq and Afghanistan. The nature of warfare in the COE has reinforced the concept to not only sustain the Army's existing intratheater aviation lift assets force structure but also to expand and improve upon these aircraft and their organizations in order to be better suited to sustain support for future major operations. While the mission requirements for the existing Army organic intratheater aviation assets to support these operations are high, what has developed operationally is a "gap" between the USAF's intratheater assets and existing Army organic intratheater aviation assets. A critical assumption stated in TRADOC Pam 525-3-04 dated 31 March 2004, states, "There will be a gap in the Joint Airlift Capability between where the strategic [and] operational missions performed by the United States Air Force (USAF) aircraft end and where the tactical, air maneuver and movement, performed by Army rotary wing aircraft begins" (Futures Development Division 2004, 541). The Army's intratheater aviation lift assets, the C-23B Sherpa cargo airplane and the CH-47D Chinook heavy-lift cargo helicopter, have proven their value in their sustainment and maneuver support to battlefield commanders. Understanding the existing Army aviation intratheater lift asset force structure is essential in making recommendations and assessments of the projected Future Force.

Before analyzing the Army's intratheater aviation lift assets the C-23B Sherpa cargo airplane and CH-47D Chinook heavy-lift cargo helicopter, a basic working knowledge and description of the operational capabilities of these aircraft will assist in a better understanding why these aircraft are assets to the Army and to Army ground maneuver commanders. The majority of aircraft performance data and operational information comes from the *Encyclopedia of World Military Aircraft*, 2000 edition, and *Jane's All the World Aircraft*, 2002-2003 edition. Other sources of aircraft information will be annotated in parenthetical references throughout this thesis.

Army Aviation's Fixed-Wing Cargo Aircraft the C-23B Sherpa (see figure 7)

The principal contribution of Army Fixed-Wing Aviation will be those missions which lie between the strategic and intratheater missions performed by the United States Air Force (USAF) and the tactical air maneuver and movement performed by Army rotary wing assets. (2004, 60)

TRADOC Pam 525-3-04, *Aviation Warfighting*



Figure 7. C-23B Sherpa Landing

Source: Edelstein, C-23B Sherpa Landing, 1; Available from [http://www.airliners.net/search/photo.search?aircraft_genericsearch=Shorts %20C-23%20Sherpa&distinct_entry=true](http://www.airliners.net/search/photo.search?aircraft_genericsearch=Shorts%20C-23%20Sherpa&distinct_entry=true); Internet; accessed 1 February 2005.

A basic conceptual understanding of the Army's C-23B Sherpa cargo airplane assets in regards to aircraft capabilities, aircraft fleet organization, and doctrinal operation and employment is essential prior to assessing the Army's relevance in near-future plans for these assets. The C-23B Sherpa fleet's employment in future Army aviation operations as outlined by transformation initiative plans.

The C-23B Sherpa is a twin-engine, turboprop fixed-wing aircraft and is the military version of the Shorts C-330 Skyvan civilian commuter airplane and is manufactured by the Shorts Brothers in Belfast, Ireland, which is a subsidiary of Bombardier of Canada. Each of the Army's boxy, but utilitarian, C-23B Sherpa starts its career off of the manufacturing line at Shorts as a C-330 Skyvan. That airplane is then shipped to West Virginia Air Center that is operated by Bombardier Defence Services who then modifies the Shorts C-330 Skyvans into C-23Bs before distribution to their assigned National Guard aviation units. The C-23B is a second-generation model of the original C-23A Sherpa which were Shorts C-330 Skyvans modified for military use and sold initially to the USAF which bought eighteen aircraft to shuttle aircraft parts between maintenance and distribution centers and frontline bases throughout Europe. Those C-23A Sherpas served from 1984 until 1990 when the European Distribution System Aircraft (EDSA) program ended. After the discontinuation of the EDSA mission, the C-23A Sherpas were then distributed to US Forestry Service and to various State Area Commands (STARCs), which are now called Joint Forces Headquarters (JFHQ), and Aviation Classification Repair Activity Depot (AVCRAD) facilities of Army National Guard organizations throughout the US (Donald and Lake 2000, 384). Since 1990, the Army National Guard upgraded its C-23A Sherpas and has continued to purchase

additional new aircraft to have a current fleet total of 43 C-23B Sherpas (Donald and Lake 2000, 384). The C-23B Sherpa's primary missions include cargo transport, paratrooper airdrop, aerial airdrop resupply, and aeromedical evacuation. The minimum crew required to fly this unarmed aircraft is a pilot, copilot, and flight engineer. The aircraft can be configured to carry 30 seated passengers or 27 paratroopers or 18 litters with two medical attendants. The C-23B Sherpa weighs approximately 14,700 pounds empty and has a maximum gross weight of 25,500 pounds. It has the potential of carrying up to 7,100 pounds of cargo. The C-23B has an operational radius of about 350 nautical miles while carrying a practical payload of approximately 5,000 pounds of cargo. The C-23B has a maximum continuous airspeed of 190 knots and although the airplane does not have a pressurized cabin, it has a service ceiling of 20,000 feet that requires aircrew members and passengers to wear and use auxiliary oxygen masks for sustained flights above 10,000 feet (FM 3-04.111 2004, O-23 through 25). The C-23B Sherpa has a five-foot, six-inch square internal cabin section and an unimpeded cargo hold area of 29 feet in length and has a narrow cabin with a small side-cabin cargo door. C-23Bs have a full width cargo ramp access door at the tail of the airplane similar to that found on the C-130E or the CH-47D. However, due to weight limitations and cargo hold size dimensions, the C-23B Sherpa is not capable of carrying a military vehicle like the Army's HMMWV. Additionally, the C-23B's cargo hold cannot accommodate the standard, full-sized DOD 463L aircraft cargo pallet system that is the universal US military aircraft cargo pallet. This means that any cargo downloaded from USAF airlift aircraft, such as the C-130E Hercules, C-17 Globemaster IIIs, or C-5B Galaxy aircraft at theater airfields or aerial port of debarkations (APODs) must be removed from their 463L

pallets and repacked to be placed upon the C-23B Sherpas for further delivery to forward tactical AOs. This requirement results in an increase in additional resources, equipment, and manpower to reconfigure these payloads and thus places a significant operational burden on ground support units conducting airlift sustainment operations. The result is a delay in supply support to those forward-deployed tactical units. What exacerbates this situation and thus causes a resultant delay is that after a C-23B delivers its cargo, that cargo must frequently be repalleted onto a full-sized DOD 463L aircraft cargo pallet before emplacement upon CH-47D Chinooks for further delivery and distribution to forward-operating tactical units located in extremely remote locations. The CH-47Ds move that cargo forward to locations, such as airfields or landing zones, where the C-23B is unable to land at. Full-sized DOD 463L aircraft cargo pallets are 4 x 88 x 108-inch aluminum pallets capable of carrying 10,000 pounds of cargo and are basically too large to fit inside a C-23B. However, what makes the C-23B Sherpa unique in comparison to other DOD organic intratheater lift aircraft, such as the much larger C-130E, is that the C-23B meets the US Army's short takeoff and landing (STOL) capability requirement. The C-23B, with its 74-foot wingspan and 58-foot length, fully loaded is able to takeoff and land at remote and unimproved airfields as short as 2,000 feet, whereas the USAF's C-130E requires at least a 3,000-foot runway to takeoff and land when fully loaded (Aerial Sustainment Capability ICD 2004, 32). "Fixed-wing aircraft capable of landing on short (i.e., 2,000-foot), unimproved runways (i.e., sod, dirt, clay, or gravel) could fill the gap and support the ground commander's ability to fight. The capability of operating on a 2,000-foot runway (over that of a 3,000-foot runway) almost doubles the number of recognized airfields that the aircraft could utilize worldwide, plus it increases the

possibility for improvised landing strips” (Aerial Sustainment Capability ICD Development Team 2004, 7).

Although the C-130E Hercules’ maximum payload is about 35,000 pounds, about five times that the cargo capacity of the C-23B Sherpa, the C-130’s larger size and longer-runway requirements significantly limit its employment in support of forward deployed Army tactical units. Another important consideration is that the approximately \$30-million per aircraft value of the C-130E is a significant risk consideration when employing the airplane in forward, hostile operational areas (Pedeleose 2004, 7). While the C-130E is designed to support forward deployed tactical operations, the combat loss of a single C-130E would have an impact in the USAF’s limited C-130 fleet of 311 airplanes. Simply, the risk of flying the larger and thus somewhat more vulnerable C-130E into hostile terrain in many cases presents a significant risk of a valuable defense asset. In comparison, the C-23B Sherpa costs about \$246,000 per aircraft and thus provides tactical commanders with a low-cost airplane with limited cargo carrying capabilities to deliver a limited amount of time-sensitive and critical logistics to forward areas on the battlefield (Mulcahy 2004, 1). The C-23B’s 7,000-pound cargo load provides tactical commanders with a limited logistic support capabilities by filling the intratheater airlift gap that exists between the USAF’s strategic and theater lift assets and the CH-47D Chinook’s direct support lift capability to forward deployed units. However, the Army’s C-23B Sherpa fleet has significant performance and operational limitations that are presenting numerous challenges for tactical ground maneuver commanders. The result has been an increased demand for a “more capable” Army-organic fixed-wing cargo

aircraft that has enhanced capabilities to provide the ground maneuver commander better logistics reach-back support through aviation (see figure 8).

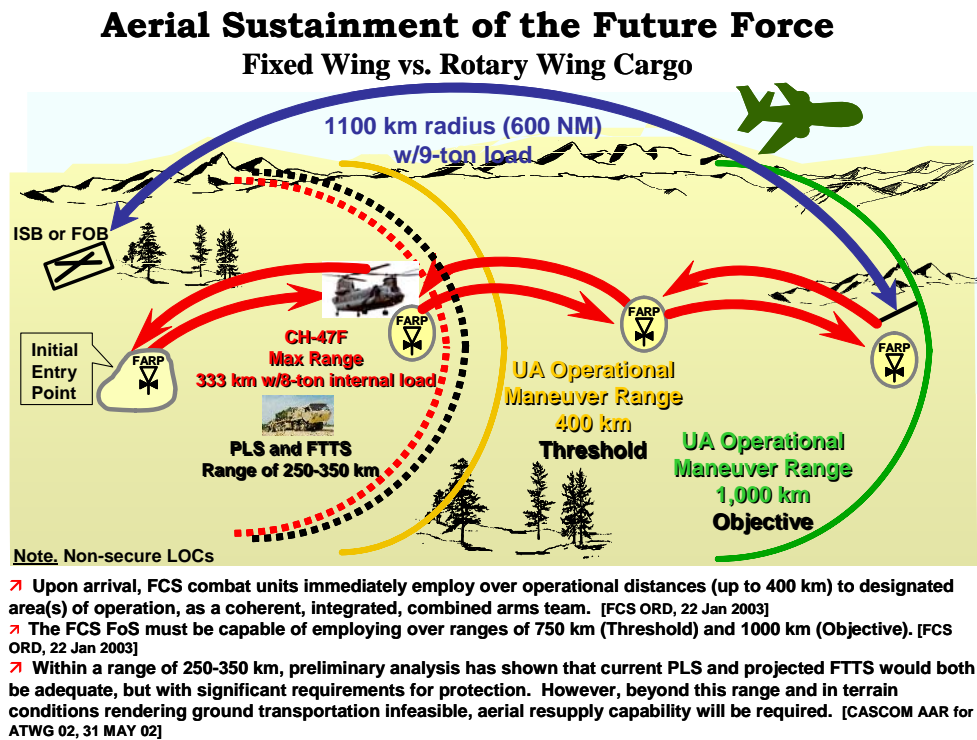


Figure 8. Aerial Sustainment of the Future Force
 Source: Aerial Sustainment ICD Development Team, *Initial Capabilities Document (ICD) for Aerial Sustainment* (Washington, DC: DA, 2004), Appendix E.

Figure 8 illustrates that the CH-47F ICH, which is similar in operational capabilities to the legacy CH-47D Chinook, has a practical operational range of about 333 kilometers while carrying a practical operational cargo load. This limits the CH-47D's capability to provide aviation support beyond that range without refueling. Also, figure 8 also indirectly illustrates that the C-23B Sherpa's maximum 1,240 kilometer (670 nautical mile) range does not meet the FCA operational requirement of having 2,222 kilometer (1,200 nautical mile) range which was established with the concept that the

Army-organic cargo airplane be capable of conducting a roundtrip aerial logistic support mission for BCTs that may be remotely located as distant as 1,000 kilometers from rear logistic support areas, such as, forward operating bases (FOBs), intermediate support bases (ISBs), sea port of debarkations (SPODs) and aerial port of debarkations (APODs) (*Army Aviation Fixed-Wing Cargo and Utility Aircraft Initial Capabilities Document* 2004, 14). Figure 8 also illustrated the FCA airplane capability to carry an objective 18,000 pounds of cargo. Again, the C-23B can only carry a maximum cargo payload of about 7,000 pounds. An analysis of the capabilities of C-23B Sherpa cargo aircraft and the CH-47D Chinook heavy-lift cargo helicopter during recent operations is essential data the Army must consider in order to prepare for and best employ its aviation assets to support the Future Force. The following is a brief assessment of those Army aircraft and their associated current unit organizations.

Assessing the C-23B Sherpa Assets and Capabilities in Recent Operations

The Army's C-23B Sherpa current fleet of 43 aircraft is designated as Theater Aviation fixed-wing assets and are command and control assigned under the Tables of Distribution and Allowance (TDA) organization of the Operational Support Airlift Agency (OSAA), a subcomponent of the National Guard Bureau (NGB) (Howl 2004, 1). TDA units have a support mission for which a TOE does not exist and they are unique in that they are developed based on the nature of the unit's specific and often unique mission (US Army War College 2004, 59). OSAA is a Department of the Army (DA) TDA field operating activity headquartered at Davison Army Airfield in Fort Belvoir, Virginia and "is also the Army National Guard's proponent agency for fixed-wing policy, procedures and training" (Chesbro 2001, 28). Of the 43 aircraft in the Army's fleet, eight

C-23Bs are assigned to the 1-207th Command Aviation Battalion of the Alaska Army National Guard located at Fort Richardson, Alaska. Thirty-two other C-23B Sherpas are assigned to four Modified Table of Organization and Equipment (MTOE) Army theater aviation companies and each company has four C-23B airplanes assigned. These four “line” companies are National Guard headquarter-based in the states of Mississippi, Rhode Island, Georgia, and Oregon. Each Theater Aviation Company is made up of four, two-aircraft detachments. Each two-aircraft detachment is also located in a different State. Three C-23B Sherpas are assigned to the US Army Fixed-Wing Training Site at Clarksburg, West Virginia, while a single C-23B is assigned to the Aviation Applied Technology Directorate at Fort Eustis, Virginia, where C-23B aircraft mechanics are trained. Since the beginning of operations in Iraq in 2002, aircraft from each of the four C-23B Theater Aviation Companies have been, currently are deploying, or are planning to deploy to Iraq in support of combat operations. The current rotation schedule of the existing C-23B fleet to deploy to the Middle East in support of OIF may require a second deployment of aircraft from I-Company, 185th Aviation Regiment of the Mississippi Army National Guard (ARNG). I-Company was the first C-23B unit to deploy to Iraq in 2002. That would mean that I-Company’s ARNG reservist would potentially have to again mobilize and deploy for a second time within a five-year period. This need for a second possible deployment for that same unit demonstrates the demand and need for an Army organic intratheater lift cargo airplane and a fleet greater in number than the existing limited 43-aircraft C-23B Sherpa fleet.

In regards to aircraft capabilities, C-23Bs, such as those from I-Company, have self-deployed from the continental US to the Middle East. For example, the C-23B

detachment from I-Company deployed to Iraq by flying a route originating from the Continental US to Canada, Newfoundland, Iceland, Scotland, Germany, Italy, Israel, and over Iraq into Kuwait for basing operations in support of OIF (Johnson 2004, 1). The potential for a more capable Army organic intratheater lift cargo airplane would only enhance the capabilities of the Army's Future Force aviation resources by getting into theater quicker and more efficiently.

The Army's C-23B Sherpas of the Theater Aviation Companies and Battalions have become vital and integral force-multipliers by providing an Army-organic aviation asset that can conduct resupply and airdrop support to ground maneuver commanders in OEF-OIF that are operating in remote operational locations. The evolution of predominant COEs, such as Afghanistan and Iraq are straining the logistic support capability of the Army including the aviation assets that conduct all of the cargo and personnel transport throughout the battlespace. Cargo aircraft, especially the C-23B fleet, have been challenged with supporting a nonlinear, noncontiguous battlespace characterized by nonsecure ground lines of communications (LOCs). Austere conditions and underdeveloped ground LOCs and air transportation facilities infrastructure of these AOs have forced Army aviation assets to conduct aerial support missions over extended distances. Figure 9 illustrates the nature of combat operations in the COE and how many of the missions conducted by Army aviation assets may require aerial resupply flights of several hundred miles from rear area UE bases to forward deployed BCTs.

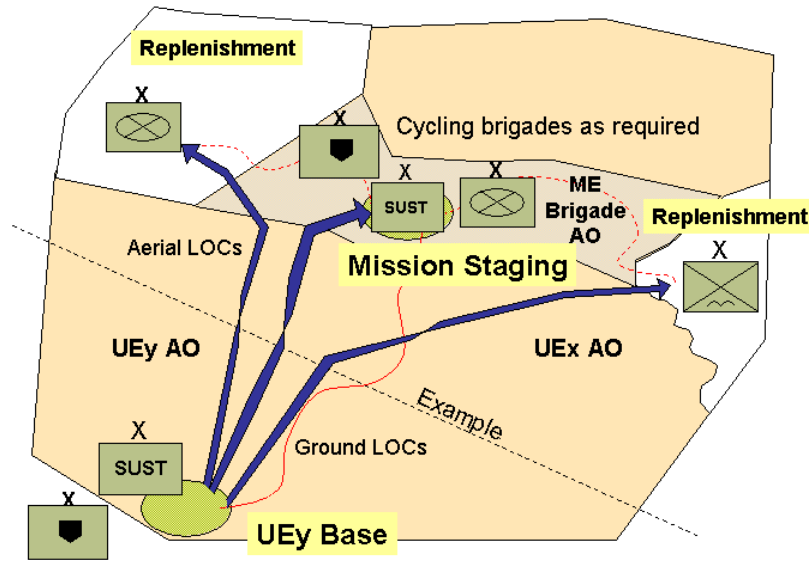


Figure 9. Aviation Sustainment Operations in a UEx AO

Source: Task Force Modularity, *Army Comprehensive Guide to Modularity* (Fort Monroe, VA, 2004), 5-23.

For example, during the first one hundred days of OEF, the USAF's intratheater airlift assets, primarily the C-130E Hercules, transported approximately 15,400 short tons of material to resupply troops at bases throughout Afghanistan (Tripp et al. 2004, 104). That great volume of supplies that were transported by air to remote combat locations throughout Afghanistan placed a significant demand on the limited USAF's intratheater lift assets in support of the Army combat operations against Taliban and Al-Qaeda forces. Army aviation's C-23Bs were never integrated and employed into the OEF theater of operations due to that aircraft performance limitations that prevent it from operating effectively in the high-altitude and mountainous terrain of Afghanistan. Thus, no C-23B Sherpas have deployed to conduct OEF support missions in Afghanistan (Howl 2004, 1). Instead, the Army has contracted US civil commercial fixed-wing companies to provide

fixed-wing support throughout the Afghanistan AO due to the “gap” between the USAF intratheater lift assets C-130E Hercules and the Army’s CH-47D Chinook assets operating in support of OEF (Howl 2004, 1). This reality only reinforces the concept of the need for an enhanced and more-capable Army-organic fixed-wing cargo aircraft in order that DOD not to be so reliant upon civil contract air operations to support high-altitude, high-risk tactical operations in mountainous AOs, such as Afghanistan.

However, in comparison to Afghanistan, C-23Bs have been and are currently employed extensively throughout Iraq in support of OIF. Despite hot and dusty conditions where hostile small-arms weapons and surface-to-air anti-aircraft threat is high, the C-23Bs have operated extensively and successfully in support of critical-component logistics sustainment, administrative personnel movements and occasionally in ground maneuver support throughout the deserts of Iraq (Howl 2004, 1).

The Army concept of focused logistics requires Army fixed-wing cargo assets “to provide the Joint Force the right personnel, equipment, and supplies in the right place, at the right time, and in the right quantity, across the range of military operations” (Aerial Sustainment Capability ICD Development Team 2004, 3). The C-23B Sherpa airplanes that have been deployed to and have been based within Iraq have proven their value to that theater’s combatant commander by transporting one-half-million tons of cargo and have ferried some 9,000 passengers between May and October 2004 in direct support of OIF (Gittler 2004, 4).

C-23Bs from theater aviation companies, such as H-Company, 171 Aviation Regiment of the Georgia ARNG, have been deployed to Iraq since early 2004. This unit, which has since redeployed to the continental US, has been replaced by A-Company,

249th Aviation Regiment of the composite Oregon and Washington ARNG in February 2005. These C-23Bs are based at an airfield in Balad located in central Iraq and conducted aviation support operations as far North as Mosul and as far South as Kuwait (Howl 2004, 1). This AO for the C-23B Sherpas encompasses about a 200 nautical mile radius for flight operations. During their tour in Iraq, H-Company's C-23Bs conducted critical flight missions including transporting blood and ammunition to Fallujah to replenish Marines embroiled in heavy fighting that took place in that central Iraq city, 50 miles West of Baghdad (Gittler 2004, 4). Although the C-23B Sherpas are not designed to fly in high-threat and hostile combat areas near the forward edge of the battlefield, examples, such as H-Company's successful critical mission support and survival in such tactical environment, reveal the emerging importance of these airplanes. C-23B Sherpas, such as those from H-Company operating in Iraq, "may be slow, but [they] can reach most distant airfields without a fuel problem. Its appetite for fuel is much less than the CH-47 Chinook. . . . Because of this, it's economical to fly the Sherpa when speed is not essential" (Johnson 2004, 1), in comparison to intratheater airlift support conducted by USAF C-130Es.

As of 4 March 2004, no C-23B Sherpas have been shot down due to hostile fire in Iraq (Howl 2004, 1). However, the C-23B is an aircraft that, although not armed, does employ Aviation Survivability Equipment (ASE). ASE is aircraft operational accessories and equipment, such as ballistic protection, surface-to-air missile tracking-guidance radar, and electronic countermeasures, such as flares and chaff to deter those surface-to-air missiles to increase the survivability of Army aircraft. To compensate for this high-threat environment in which C-23B Sherpas have not previously been exposed to prior to

OIF, aircrews have had to readjust their TTPs in order to safely conduct flight operations within Iraq. This threat of enemy surface-to-air missiles and small-arms fire have forced aircrews to adjust their flight techniques to minimize the risk of getting shot down. “A lot of (flying) tactics are determined from reaching back in our brains to our helicopter (pilot) days. Although you’re moving a lot faster than a helicopter, it’s not very different,” says Major John Boyer, commander of H-Company (Gittler 2004, 2).

Aircrews have adopted the technique of flying at high altitudes that are out of the range of small-arms weapons or common shoulder fired surface-to-air missiles during the cross-country, enroute segment of a flight in order to stay out of range of enemy small arms fire. Then, upon nearing a destination landing area, the C-23B Sherpa would pitch down in a near-dive maneuver to rapidly lose altitude in preparation for landing while flying at speeds of up to 190 knots, leveling off only 50-feet above the ground, dodging power lines, trees, and buildings in terrain masking flight technique in preparation for landing to prevent from being engaged by hostile ground fire. “What we’re doing here (in Iraq) is proof of concept. This (employment of C-23B Sherpas in combat zones) is definitely going to change Army aviation indefinitely,” says Boyer (Gittler 2004, 4).

However, criticism of the future employment of the C-23B Sherpa and its associated performance limitations have surfaced in Army aviation’s Future Force doctrinal plans recently published (Aerial Sustainment Capability ICD Development Team 2004, 12). As previously mentioned, the C-23B’s lack of pressurized oxygen capability that requires aircrew and passengers to use oxygen masks prohibit the practical use of aeromedical evacuation (MEDEVAC) or casualty evacuation (CASEVAC). Also having a maximum airspeed of about 190 knots is well below Army aviation’s desired

speed of 300 knots for the FCA. In summary, the C-23B Sherpas' inability to utilize the DOD standard 463L aircraft cargo pallet system, its payload weight limitation of 7,000 pounds, and its inability to carry a tactical vehicle, like the HMMWV, are its significant cargo-carrying performance limitations. Army aviation's goal for a cargo airplane of the future is that the FCA must be able to carry 18,000 pounds of cargo for a range of 1,200 nautical miles. Again, the C-23B Sherpa has an approximate maximum 670 nautical mile range while carrying a useful 5,000-pound payload (Donald and Lake 2000, 384). Also, the C-23B is not capable of in-flight aerial refueling which is a deficiency that can be associated to its limited operational maximum effective range. Although the C-23B is capable of self-deploying practically anywhere in the world, its slow maximum airspeed of 190 knots requires lengthy enroute flight times that must be factored into deployment planning considerations. Again, the C-23B does employ ASE, specifically the AN/APR-39(V)2 radar transmission detection system, the AN/ALQ-156(V)1/2 electronic countermeasures set which detects the approach of anti-aircraft missiles, and the M-130 flare and chaff dispenser system which is designed to dispense countermeasures against infrared-seeking missiles (FM 3-04.111 2004, J-3) . All of these ASE systems used in concert provide the C-23B with passive and active countermeasures against threat air defense systems.

The one FCA operational requirement that the C-23B fulfills, depending on internal cargo load weight and environmental conditions that affect aircraft performance, such as pressure altitude and ambient air temperature, is that the Sherpa marginally meets the Army's STOL requirement of a 2,000-foot or less runway to takeoff or land. Army aviation planners have designated this capability essential in aviation support of future

tactical operations by stating that “an aircraft with STOL capability [must be] able to operate on unprepared surfaces would greatly enhance the logistical support available to the BCT, freeing the Future Force from reliance on fixed airfields for aerial logistics support . . . and providing the commander with the freedom to maneuver to advantage against an enemy. Additionally, increased range and speed would enhance the long range aeromedical evacuation (MEDEVAC) capability” (Aerial Sustainment Capability ICD Development Team 2004, 10). However, considering the performance and operational limitations of the C-23B Sherpa, the following assessment extracted from the *Aerial Sustainment Capability Initial Capabilities Document* draft version 3.2, dated 19 August 2004, states Army aviation’s critically clear assessment of the C-23 and what the plans are for the future of the Sherpa. “The C-23 cannot be modified to carry projected loading requirements. Neither can its speed and range be expanded enough to be useful for future operations” (Aerial Sustainment Capability ICD Development Team 2004, 14). In addition, “the limited capabilities and minimum performance parameters of the C-23 make it inadequate to support sustainment operations for Future Force units operating in dispersed locations on a non-linear battlefield” (Aerial Sustainment Capability ICD Development 2004, 12). Despite all of the limitations of the C-23B Sherpa fleet, these cargo aircraft are proving themselves invaluable in concept as intratheater lift assets supporting current combat operations. The C-23B’s successes in supporting OIF is reinforcing the mission-essential concept that the Army must not only maintain, but also enhance its existing organic intratheater cargo airplane assets to better contribute to the BCT-centric force of the future. The challenge that Army aviation is faced with during conduct of combat operations is mitigating the limitations of current aircraft, such as the

C-23B while effectively and efficiently employing these airplanes until a replacement theater fixed-wing cargo airplane, such as the FCA can be tested, chosen, integrated, and then successfully employed in a timely manner in order to continue to support ground maneuver commanders on battlefields of the future.

Projected Employment and Assessment of the Army's Cargo
Airplane in the Future Force

Without a modernization effort that significantly increases the capabilities and aircraft performance, Army fixed-wing aircraft will not be able to adequately support the Future Force mission to the level required. Increased speed, range and payload will allow the utility and cargo fixed-wing aircraft to support the joint concepts of dominant maneuver and focused logistics in support of the future force. (2004, 7)

Aerial Sustainment Capability ICD

The venerable C-23B Sherpa fleet's operational capabilities have been both praised and severely criticized as discussed. However, despite this cargo aircraft's shortfalls, the value of an Army-organic intratheater cargo airplane have only been validated by the C-23B Sherpa fleet's extensive employment in Iraq. Instead of upgrading the existing C-23B Sherpa fleet, whose limitations are clearly known, Army aviation modernization plans include the search for a more capable cargo airplane that meets the requirements of what Army leadership has identified as the intratheater airlift "gap" between USAF assets, the C-130E Hercules fleet and the CH-47D Chinook helicopter fleet (Army Aviation Fixed-Wing Cargo and Utility Aircraft ICD Development Team 2004, 5). What developed as a result of this need to increase the Army's intratheater lift airplane capability was the Army's C-XX program, which as of 4 March 2005 is identified as the FCA program (*Capabilities Development Document for*

the Army Future Cargo Aircraft 2004, 3). The FCA initiative has the goal of replacing the aging C-23B Sherpa fleet which Army plans to phase-retire between 2007 and 2013 (Troshinsky 2004, 1).

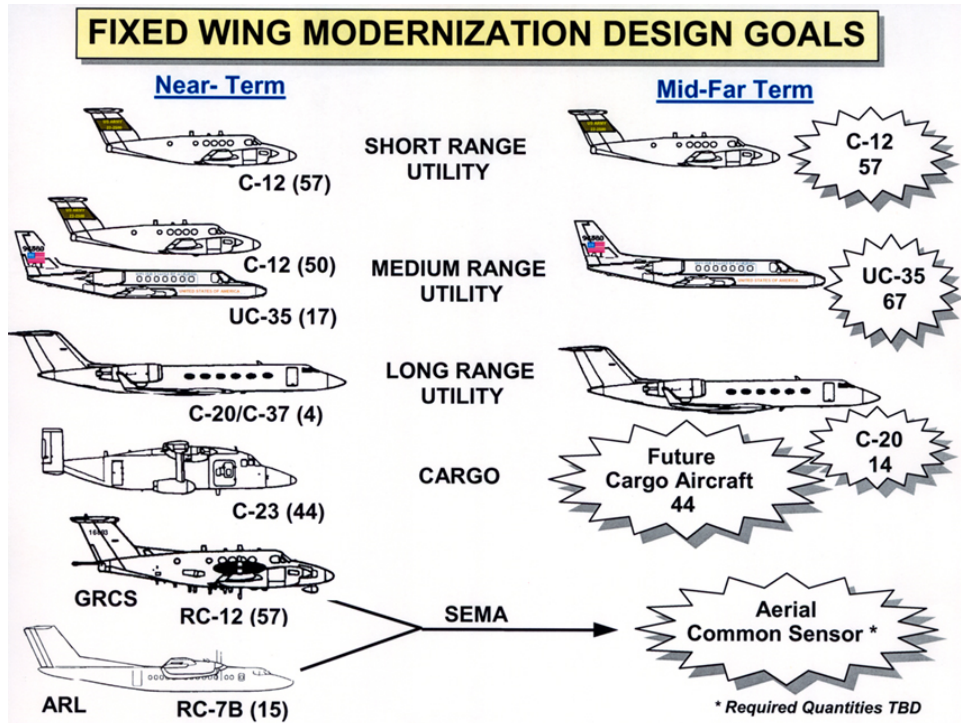


Figure 10. US Army Fixed-Wing Modernization Design Goals

Source: Federation of American Scientists Military Analysis Network web page; US Army Aviation S&T Roadmap, figure 2; available from http://www.fas.org/man/dod-101/sys/ac/docs/aviation_st_roadmap_army.htm; Joint Aeronautical Commanders Group (JACG), August 1997.

According to Paul Bogosian, deputy program executive officer for Army aviation, “Current C-23s . . . are not capable of meeting combat logistical mission requirements from intermediate staging base to forward support base . . . (the C-23B Sherpas) also aren’t as interoperable as they should be. . . . [W]e have to take a pallet off an Air Force C-130 and break it down into two parts to put on two Sherpas. Then we have to put the pallet back together to put it on a CH-47. With the FCA, we won’t have to do this”

(Troshinsky 2004, 1). Because it takes two C-23B Sherpas to move the payload equivalent of one CH-47D Chinook, for the sake of expediency or convenience, Army operational and tactical level logisticians often opt for direct off-loading of palletized supplies from a C-130E Hercules directly onto a CH-47D Chinook, thus bypassing C-23B Sherpas altogether. The impact is “the Army is burning up the engine, rotor and airframe life of its CH-47 heavy-lift helicopters by using them for such long-distance work. . . . [This] extra operational demand has convinced Army officials that they need the (FCA)” (Fulghum and Wall 2004, 1) (see figure 11).

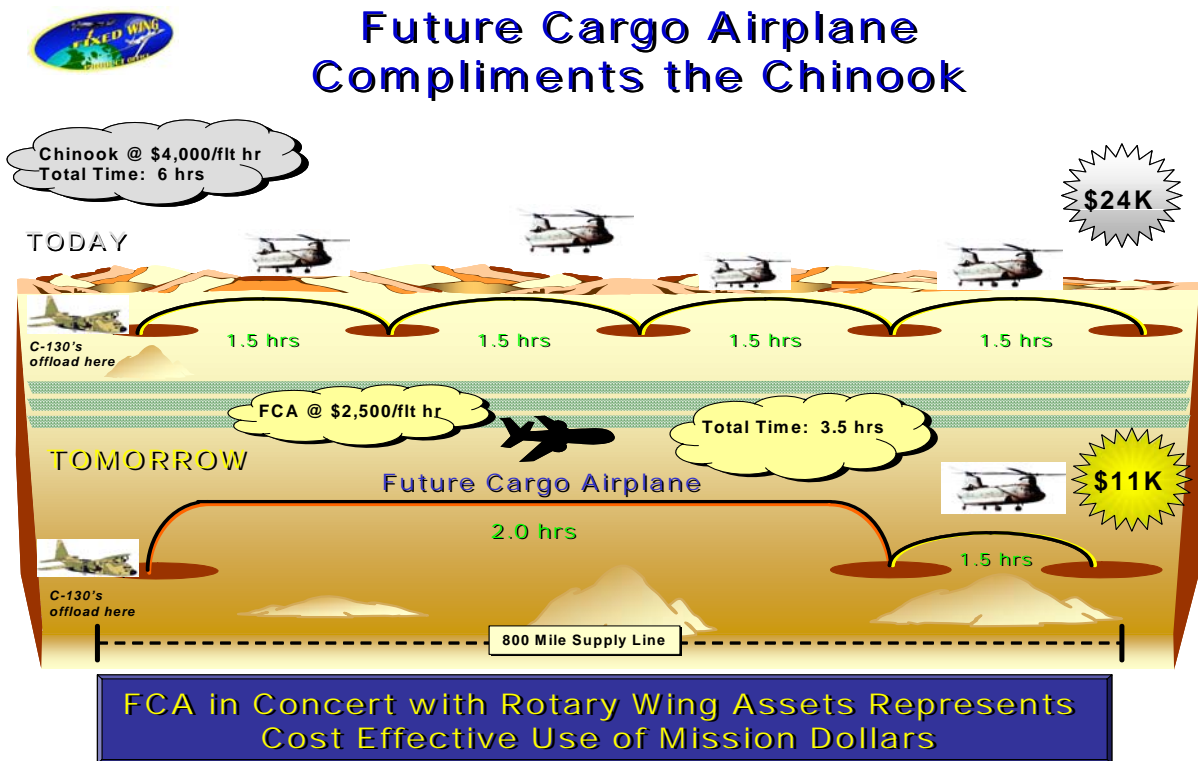


Figure 11. Future Cargo Airplane Compliments the Chinook
 Source: Aerial Sustainment ICD Development Team, *Initial Capabilities Document (ICD) for Aerial Sustainment*, (Washington, DC: DA, 2004), Appendix E.

To mitigate this impact, the Army's plan calls for the acquisition of a target total 160 FCA aircraft to bridge the gap between USAF airlift assets and the CH-47D (Futures Development Division, 2004, 159). Figure 11, extracted from the 19 August 2004 *Initial Capabilities Document (ICD) for Aerial Sustainment Capability* draft version 3.2, illustrates the current and the projected complimentary employment of the FCA and the CH-47D Chinook-CH-47F ICH. Figure 11 also illustrates a simplified description of the current aerial sustainment operations in the COE, such as those battlefields in Iraq and Afghanistan. The upper portion of figure 11 labeled "today" illustrates how Army aviation has most recently conducted logistics and maneuver support operations in remote AOs.

Using an 800 nautical mile distance to illustrate the distant but realistic AOs of current operations, such as OEF-OIF, the Army's CH-47D Chinooks are frequently employed as the long range aerial sustainment delivery vehicles to forward deployed tactical units that are located commonly in remote areas. Downloading directly from USAF intratheater lift C-130E Hercules at APODs or tactical airfields directly onto CH-47D Chinooks that must fly more than six hours carrying a near maximum capacity cargo load, costs approximately \$24,000, or \$4,000 per flight hour, and significantly impacts the lifespan of aircraft components of the heavy-lift cargo helicopter fleet due to these helicopters flying extended distances that would better be suited for cargo airplanes. The lower portion of the figure 11 labeled "tomorrow" illustrates Army aviation planners' vision of the employment of the Future Cargo Airplane and how such an aircraft would significantly bridge the aerial sustainment gap between USAF intratheater lift C-130E

Hercules and the forward deployed tactical units. The modern FCA would be a more mission effective and cost efficient resource for conducting aerial sustainment operations in the COE. As illustrated, the combined operation of an FCA and CH-47D can fly the same aerial resupply mission in 3.5 flight hours and would cost only approximately \$11,000, less than half of a CH-47D flying that same 800 nautical mile aerial resupply mission. Also, such an employment of the FCA in-concert and in support of the CH-47D would reduce the flight time of the CH-47D Chinook by 75 percent to conduct the mission as illustrated in the “today” portion of figure 11.

Preliminary studies of candidate aircraft for the FCA program have produced two initial competitors who have actively expressed competition for the FCA. The C-27J Spartan, manufactured by the Lockheed Martin Alenia Tactical Transport Systems, and the C-295 built by the European Aeronautic Defence and Space (EADS) Company, are the first contenders in the FCA initiative (Army Aviation Fixed-Wing Cargo and Utility Aircraft ICD Development Team 2004, 13).

The C-27J Spartan indirectly has an established history in the US military inventory. During the 1990s, the USAF employed a fleet of 10 C-27A Spartans that were assigned to the 24th Wing at Howard Air Force Base (AFB) in Panama as its rapid-response intratheater airlifter (RRITA) to support US Southern Command operations in Latin America (see figure 12). However, the USAF shelved the C-27A Spartans in 1999 attributing high maintenance expenses for the small and specialized aircraft fleet (FAS Military Network Analysis 2004, 1). The C-27J Spartan is an upgraded and more modern version C-27A Spartan that, like its predecessor, is a twin-turboprop, all-weather, day-night transport suited for short-to-medium operations on unimproved runways. The C-27J

Spartan has update avionics and electronic components compared to its 1990s predecessor, the C-27A.



Figure 12. C-27A Spartan employed by USAF between 1990-1999
Source: FAS Military Analysis Network, *C-27A Spartan* (Washington, DC: FAS Military Analysis Network, 15 January 2005), 1.

The C-27J Spartan utilizes many common components of the most modern version of the Hercules, the C-130J. The C-27J has same turbine engines, transmission gearboxes and propellers as the C-130J. However, it is important to note that the December 2004 Congressional cancellation of the USAF's acquisition of the C-130J Hercules which might have an impact on the DOD selection process for the FCA (PBD 753 2004, 8). There are obvious benefits of having and operating two DOD aircraft with similar components. There are implied and obvious cost-effective and operationally effective benefits to the US military whenever multiple aircraft share common parts. Whether the cancellation of the acquisition of the C-130J has an impact on the potential aircraft choices for the FCA selection process has yet to be determined.

The C-27J Spartan is sometimes informally referred to in the USAF community as the “Baby Hercules” due to its similar appearance and commonality of components to the C-130J. The C-27J uses two of the same engines found on the four-engine C-130J. The C-27J, which requires a minimum crew of three including two pilots and one loadmaster, has a 25,000-pound maximum payload capacity. The C-27J can transport 68 passengers using a high-density seating configuration, forty-six combat troops, or 34 paratroopers or 24 litters for aeromedical evacuation (MEDEVAC). The C-27J Spartan’s cargo bay has a rear-loading cargo ramp is capable of accommodating four standard DOD 463L aircraft cargo pallets. The C-27J Spartan is also capable of carrying one HMMWV tactical vehicle in its cargo bay using its full-sized tail ramp for loading. With a maximum gross operational weight of 66,000 pounds, the C-27J Spartan can takeoff and land at airfields less than 2,000 feet, thus meeting Army aviation’s STOL requirement. The C-27J Spartan can fly a maximum airspeed of 250 knots for 3,000 nautical miles on one fuel load while carrying a maximum payload of at least 18,000 pounds (GlobalSecurity.Org C-27 Spartan 2004, 1). The C-27J Spartan’s modern electronic glass cockpit is also night vision device (NVD) compatible which is a tactical consideration for Army planners. The C-27J Spartan, while a prime candidate for the FCA, is not the sole competitor in the FCA selection and acquisition process.

The other major initial contender in the FCA program is the EADS CASA C-295 (see figure 13). The C-295 is the military variant and slightly larger version of the CASA CN-235 commercial regional airline jet. Like the C-27J Spartan, the C-295 is also a twin-turboprop, all-weather, day/night transport. The C-295 also requires a minimum crew of three: two pilots and one loadmaster, and the aircraft has a 21,385-pound maximum

payload capacity. It can transport 78 passengers in a high-density configuration, 53 combat troops or 40 paratroopers or 27 litters for aeromedical evacuation (MEDEVAC) (GlobalSecurity.Org CN-295 2004, 1).



Figure 13. EADS CASA C-295

Source: European Aeronautic Defence and Space Company website, *EADS CASA C-295* (Munich, Germany: European Aeronautic Defence and Space Company, 1 February 2005), 1.

The C-295's cargo bay also has a rear-loading cargo ramp and is capable of accommodating five standard DOD 463L aircraft cargo pallets. Although the C-295's cargo bay is narrower than the C-27J's, the C-295 can hold and transport one HMMWV tactical vehicle within its cargo bay. The C-295 has a maximum gross operational weight of 51,146 pounds, 14,854 pounds less than the C-27J Spartan; and the C-295 requires a 3,156-foot runway to takeoff and at least a 2,541-foot runway to land while carrying a maximum payload (GlobalSecurity.Org C-295 2004, 1). It is the C-295's takeoff and landing performance capabilities that do not meet Army aviation's STOL requirements

that are critical to the FCA’s operational requirement capabilities. Also, the EADS CASA C-295 can fly a maximum airspeed of 275 knots for 2,985 nautical miles on one fuel load while carrying a maximum payload of approximately 19,481 pounds. That is just 15 nautical miles less than the C-27J Spartan is capable of flying, a rather negligible difference in maximum range between the two aircraft. Table 1 illustrates a comparison of FCA initial candidates’ performance capabilities.

Aircraft	Number Aircraft in Fleet	Payload >= 18,000 lbs. (Maximum)	DOD 463L Pallet Capability (Capacity)	Range >= 1,200 NM W/Max Payload	STOL <= 2,000 ft Capability	Takeoff / Land at Unimproved Runway
C-23B Sherpa	43	NO (7,100 lbs. Max)	NO (0)	NO (670 NM)	LIMITED	YES
C-27J Spartan	TBD (FCA goal of 160)	YES (25,000 lbs. Max load)	YES (4)	YES (3,000 NM)	YES	YES
CASA EADS C-295	TBD (FCA goal of 160)	YES (21,385 lbs. Max load)	YES (5)	YES (2,985 NM)	NO	YES
C-130E Hercules	311	YES (35,000 lbs. Max load)	YES (6)	YES (1,910 NM)	NO	YES

Source: Donald and Lake, *The Encyclopedia of World Military Aircraft* (London, UK: Aerospace Publishing, Limited, 2000), 29, 227, 384.

According to John Fain of the TRADOC-Lift proponent at the US Army Aviation Center at Fort Rucker, Alabama, the *Capabilities Development Document (CDD) for the Future Cargo Aircraft*, outlines the parameters and requirements for the FCA is undergoing final review and staffing for approval signature by the chairman of Joint Requirements Oversight Council (JROC) as of 4 March 2005. Fain’s office was a

significant contributor to the development of this CDD document for the FCA program. Projected approval of the CCD and its associated aircraft performance criteria for the FCA selection process is slated for implementation during spring 2005. If and when the CCD is approved, then analysis and testing of potential FCA candidate aircraft is expected to start sometime during summer 2005. Again, as of 4 March 2005, the C-27J Spartan and the EADS CASA C-295 are the initial aircraft candidates in competition for the FCA. Actual procurement of the selected FCA is projected for 2007 which coincides with the phased retirement of the C-23B Sherpa aircraft fleet in which all 43 airplanes will be retired by 2013. According to the Deputy CSA for Operations Brigadier General Jeffrey Schloesser, who is also the director of the Army aviation task force directing modernization, the Army plans an initial purchase plan of 33 FCA airplanes (Roosevelt 2004, 2). “Funding for the acquisition [of the FCA] is part of the reallocation of the \$14.6 billion in resources from [fiscal year 2005 to fiscal year 2001] from the cancelled Boeing-Sikorsky developed RAH-66 Comanche [Attack-Reconnaissance] helicopter” (Roosevelt 2004, 1). The RAH-66 Comanche development and acquisition plan was cancelled in February 2004. The purchase of an initial fleet of 33 FCA aircraft provides a rough baseline to quantitatively assess the capability of such an intratheater airlift support capability compared to the employment of the C-23B Sherpa during recent combat operations.

The projected acquisition and operational employment of the initial 33 Future Cargo Aircraft will significantly enhance the Army’s fixed-wing cargo asset capability (Roosevelt 2004, 2). For example, a DOD proposed initial 33-aircraft fleet of C-27J Spartans carrying their maximum capacity payload of 25,000 pounds would be capable of

airlifting a total 825,000 pounds of cargo in comparison to the total 305,300 pounds of cargo that can be carried by the current 43-airplane C-23B Sherpa fleet. This notional employment of the C-27J as the FCA yields a 170 percent increase in the airlift payload capability compared to the current 43-aircraft C-23B Sherpa fleet's airlift capability. Also, the C-27J Spartan's ability to fly at a maximum speed of 336 knots, is 77 percent faster than the C-23B Sherpa's 190 knots maximum airspeed. Also, the C-27J Spartan can carry 34 seated passengers in a pressurized cabin while the C-23B Sherpa can carry only 20 passengers in an unpressurized cabin. Again, aircraft pressurization capabilities are essential to Army aeromedical (MEDEVAC) and aircraft survivability considerations. This consideration for the FCA requires that the aircraft cabin must be pressurized for the safety and comfort of medical patients that are being evacuated on the airplane. A pressurized cabin also allows the airplane the capability of flying at higher altitudes to provide conditions for best aircraft performance. The C-27J for example can maintain a comfortable interior cabin pressure while flying as high as its service ceiling of 25,000 feet for such MEDEVAC missions (Donald and Lake 2000, 29). Flying at higher altitudes utilizing a pressurized cabin for the safety and comfort of the flight crew and passengers also contributes to mitigating surface-to-air threats and increases aircraft survivability by providing the aircraft the ability to fly out of the range of hostile ground fire. Finally, both the C-27J Spartan and the EADS CASA C-295 can carry at least one 6,000-pound HMMWV tactical vehicle within its cargo bay due to both their payload capabilities and rear-cargo loading ramps. Again, the C-27J and the C-295 both are capable of carrying more than two DOD standard 463L pallets of cargo which facilitate logistics throughput from C-130E down to the CH-47D Chinook. Although the initial

purchase of 33 FCAs is 10 aircraft less than the existing lesser-capable, 43-aircraft C-23B fleet, the Army proposes to eventually buy an objective 160 FCA airplanes (Futures Development Division 2004, 159). Both the C-27J Spartan and the EADS CASA C-295 are clear examples of potential candidates for the FCA and either aircraft, if selected, is a clear capabilities improvement over the existing C-23B Sherpa fleet.

While the Army projects phased retirement of the C-23B Sherpa fleet to occur from 2007 through 2013 (Troshinsky 2004, 1), what is clear is that, despite operational and performance limitations, the C-23B Sherpa fleet has proven the relevance for the concept of an Army-organic, intratheater lift aircraft with an operational mission focus of “filling the gap” between USAF’s strategic airlift and the Army’s organic rotary-wing assets like the CH-47D Chinook heavy-lift cargo helicopter. While the C-23B’s capabilities do not meet Army aviation’s FCA criteria requirements, such as, cabin-pressurization considerations for MEDEVAC operations, compatibility with standard DOD 463L aircraft cargo pallet system, a 300 knot maximum airspeed and a 1,200 nautical mile range, which are all operational requirements for the FCA, the existing C-23B fleet has made contributions and provided concept viability for the Future Cargo Aircraft. The Army’s legacy organic intratheater fixed-wing cargo assets, the C-23B, have served clearly as force-multipliers to Army units conducting operations in the tactically demanding AOs of Iraq. These C-23Bs have proven the concept relevance and the need for an enhanced-capabilities and expanded fleet of an Army-organic FCA in order to meet requirements of the responsive, agile, and capable Future Force Army. If the Army is successful in acquiring an FCA aircraft that meets the aircraft capabilities selection criteria previously mentioned, and the goal for an initial aircraft fleet of 33 or

more aircraft is achieved, the performance calculations made in this chapter indicate that such a fleet would be initially capable of sustaining the BCT-centric Army of the future (Feickert 2004, Figure 3).

The Draft TRADOC Pam 525-3-04, dated 31 March 2004, outlines the Army's strategic and organizational plans for the FCA and indicates that a projected goal of up to 160 FCA aircraft be acquired for distribution to OSA's projected construct for theater aviation battalions as illustrated in figure 14.

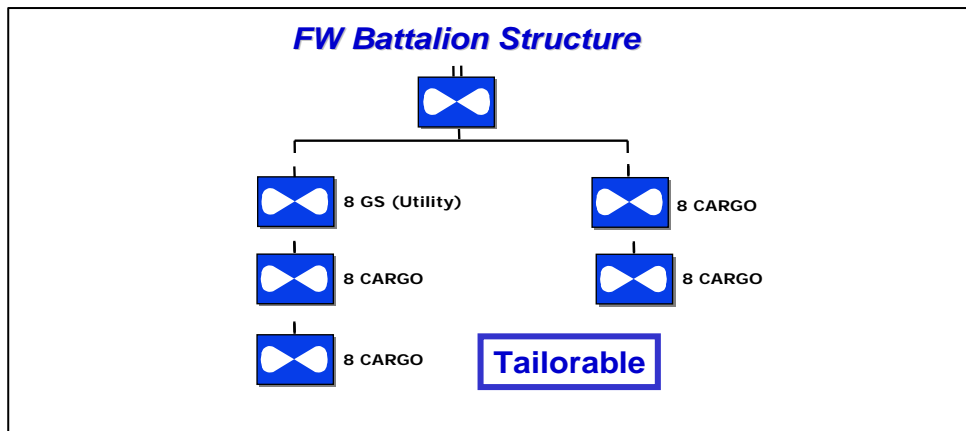


Figure 14. Future Cargo Aircraft Fixed-Wing Battalion Structure
Source: Futures Development Division, *FW Battalion Structure* (Fort Rucker, AL: DA, 31 March 2004), 158.

As of 4 March 2005, the proposed organizational and operational plan TRADOC Pam 525-3-04 is still pending approval from JROC for further action and development of the FCA acquisition process. Also, to be determined following the approval of TRADOC Pam 525-3-04 is the proposed MTOE organizational and force structure for the Army's organic fixed-wing cargo assets. Speculating on JROC approval of the TRADOC Pam

525-3-04, such a significant enhancement in fixed-wing cargo aircraft capabilities and force structure clearly provides an increased capability by Army aviation to support the BCT-centric Army of the future (Fain 2004, 1). The Army’s draft proposal for the FCA includes the acquisition of a total of 160 FCA airplanes that are to be distributed to four OSA theater aviation battalions, such as those organizations illustrated in figure 15 (Futures Development Division 2004, 159).

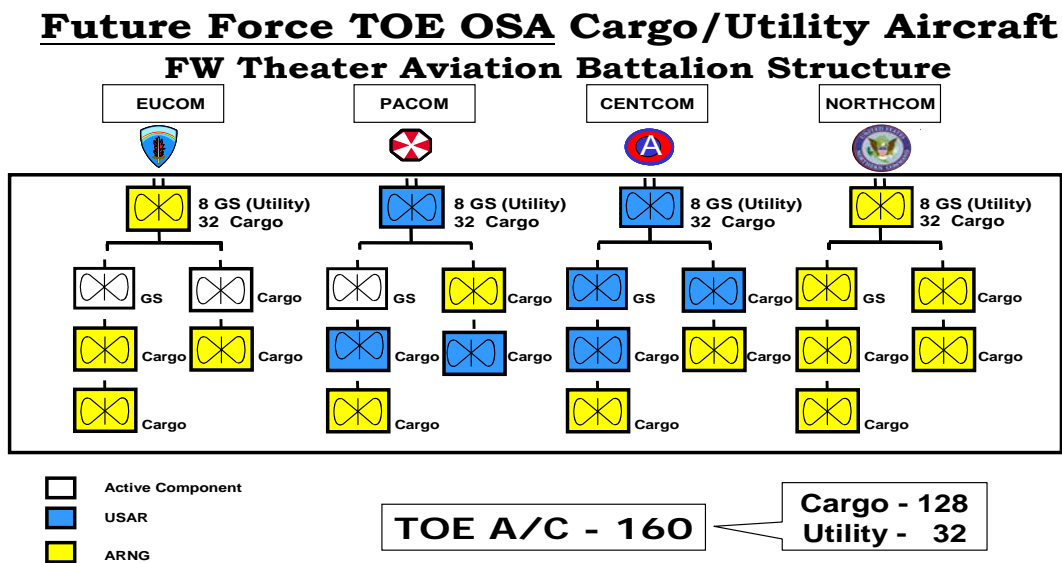


Figure 15. Proposed Future Cargo Aircraft OSA Theater Aviation Battalion Structure
Source: Futures Development Division, *Future Force TOE OSA* (Fort Rucker, AL: DA, 31 March 2004), 159.

Figure 15 illustrates the projected Future Force Table of Organizational Equipment (TOE) for aircraft assignment and distribution for the Army’s proposed projected goal of 160 FCA aircraft. While some 32 FCA aircraft are designated as “GS” or general support-utility, and another 128 aircraft are designated as “cargo,” all of the 160 aircraft will be configured from the base FCA airframe. This proposed construct

provides the four geographically separated Combatant Commanders each with 40 organic fixed-wing cargo aircraft under their command to provide aviation support in their respective theaters of operations. The establishment of the fourth Theater Aviation Battalion for Northcom will also provide support for Homeland Security operations within the continental US along with providing supplementary fixed-wing cargo assets to support the other combatant commanders that are conducting operations across the globe (Futures Development Division 2004, 157). The demanding performance and operational requirement conditions as set by the *Capabilities Development Document (CDD) for the Future Cargo Aircraft* and the proposed increase from an existing force of 43 C-23B Sherpas in the existing OSA construct to a targeted goal of 160 FCA airplanes clearly indicates the Army's focus and priority in enhancing aviation capabilities to support the Future Force. Calculation comparing the performance between the legacy 43-aircraft C-23B Sherpas fleet and a proposed initial fleet of 33 airplane FCA fleet with the objective goal of 160 aircraft clearly indicate that Army aviation intratheater fixed-wing lift assets will be able to effectively and efficiently support the Future Force.

Army Aviation's Heavy-Lift Cargo Helicopter the CH-47D Chinook

A basic conceptual understanding of the Army's cargo helicopter assets in regards to aircraft capabilities, aircraft fleet organization, and doctrinal operation and employment is essential prior to assessing the Army's relevance in near-future plans for these assets. This base information for this summary of the CH-47D Chinook is derived from the *Encyclopedia of World Military Aircraft*, 2000 edition and Jane's *All the World Aircraft*, 2002-2003 edition. Other sources of aircraft information will be annotated in parenthetical references throughout this thesis. This information will be useful in the

analysis of the CH-47D Chinook fleet's employment in future Army aviation operations as outlined by transformation initiative plans. It is important to note that the US Army is in the process of modernizing and upgrading its heavy-lift cargo helicopter fleet with goals set on the acquisition and employment of the CH-47F improved cargo helicopter (ICH). The CH-47D Chinook, as pictured in figure 16, is a twin-turbine engine, tandem-rotor helicopter manufactured by the Boeing Helicopters of the US. The CH-47D Chinook is a fourth generation model of the original CH-47A Chinook first produced and delivered to the US Army in 1962 (Donald and Lake 2000, 83). Of the approximately 472 CH-47D Chinooks manufactured from 1982 until the present, about 432 of these aircraft went to and remain in service with the US Army. The remainder of these aircraft was sold to US allies, such as the United Kingdom (UK) and Australia. The CH-47D's primary missions include air assault, artillery raids, and air movement of troops, cargo, vehicles, and weapons. Other roles include Forward Arming and Refueling Point (FARP) operations, CSAR, CASEVAC, downed aircraft recovery, parachute operations, disaster relief, firefighting, and heavy construction. The minimum crew required to fly it is a pilot, copilot and flight engineer. Additional crewmembers, as required, may be added for more complex tactical missions. The aircraft can be configured to carry 31-seated combat troops or 24 litter patients and two medics. The CH-47D is designated a heavy-lift cargo helicopter due to its maximum gross weight of 50,000 pounds. The CH-47D can carry up to 26,000 pounds of cargo, a restriction that is a structural limitation of the helicopter's external load-carrying center cargo hook. Practical operational cargo weights for the CH-47D are approximately 16,000 pounds in normal operational aircraft configuration. It has a combat range of about 230 nautical mile carrying 31-seated combat troops or 50

nautical miles with 16,000 pounds of cargo that can be carried internally or externally via three cargo hooks or any combination thereof (FM 3-04.11, O-19). The CH-47D Chinook has a maximum continuous airspeed of 170 knots and has a service ceiling of 22,100 feet (Donald and Lake 2000, 83). It is this unique high-altitude and heavy-lift cargo capability that makes the CH-47D Chinook valuable to Army operations.



Figure 16. CH-47D Chinook Conducting External Slingload

Source: Cooper, Aviation Operations and Training Branch (NGB, 15 October 2004), 1.

Assessing the CH-47D Chinook Assets and Capabilities in Recent Operations

The CH-47D Chinook has been invaluable on the COE battlefield. As made evident in OEF-OIF, “operations will be characterized by dispersed units operating over a wide area in a non-contiguous battle space. Army aviation is likewise transforming itself by moving many Aviation resources from theater and corps down to the division level, into aviation brigades. This includes the Army’s heavy-lift helicopters, CH-47s, which will focus on their primary mission of tactical support to maneuver units” (Aerial Sustainment Capability ICD Development Team 2004, 5). Hopefully, lessons learned from recent operations in Iraq and Afghanistan are helping planners to plan and execute

the Army's transforming to the BCT-focused Future Force. This restructuring transformation and the methods in which BCTs are employed in the COE of the future pose a new challenges to the CH-47D Chinook fleet. "The operational employment and force structure changes associated with Aviation Transformation will effectively reduce the availability of CH-47 for aerial sustainment operations. . . . Today priority logistics missions are being handled primarily by CH-47/UH-60 aircraft. This is stressing the maintenance capability, and reducing the overall rotary wing fleet availability for tactical missions" (Aerial Sustainment Capability ICD Development Team 2004, 5). As of October 2004, CH-47D Chinooks have flown in excess of 13,000 flight hours in support of OEF in Afghanistan and more than 24,000 flight hours in support of OIF in Iraq (Cooper 2004, 4). This high OPTEMPO has had major impacts upon the Army's heavy-lift cargo helicopter fleet and has been a critical consideration for the development of future CH-47D organizational plans and has also been correlated to the FCA airplane initiative. It is the Army's effort toward constructing an aviation force of the future whose fixed-wing cargo and helicopter cargo assets not only work more effectively and efficiently than they have in the past, but that those assets also operationally complement each other. The Army's efforts toward modernizing both types of aircraft are critical to the success of Army aviation's successful support of future operations in the COE.

Projected Employment and Assessment of the CH-47 in the Future Force

The US Army's transformation plans as previously mentioned in chapter 1 with respect to BCT modularity, involves the establishment of an Aviation BCT, or MFAB, to organically support UEx. "The bulk of Army aviation combat power resides in the functional and multi-functional (Aviation BCTs) assigned to Units of Employment (UE).

These brigades are expansible and tailor able to the mission” (TRADOC Pam 525-3-04, 7). Also, these aviation BCTs will “perform crucial tasks in providing support to maneuver sustainment to the forces as a whole during Sustainment Replenishment and Mission Staging Operations (SRO/MSO)” (TRADOC Pam 525-3-04 2003, 10). As illustrated in figure 17, the MFAB will have a subordinate GSAB (graphically represented by the “GS” icon) that will organically have a subordinate Heavy Helicopter Company (HvyHC) consisting of 12 CH-47D Chinooks. Again, the CH-47D Chinook will eventually be replaced by the CH-47F ICHs under the same Future Force HvyHC unit organization. Missions for the HvyHC include conducting “team insertion/extraction, air movement, air sustainment, limited air assault, and casualty evacuation (CASEVAC) support. HvyHCs also support FARP emplacement and FARP sustainment” (FM 3-04.118 Coordinating Draft, 5-8). The resultant challenge to the Army’s heavy helicopter assets will be that 12 CH-47D Chinook or CH-47F ICH helicopters will have to provide support to as many as three ground maneuver BCTs.

Prior to 2003 when the Army Transformation significantly began to evolve into the Future Force modular-focused construct, the CH-47D Chinook fleet’s organizations included two Heavy Helicopter Battalions and 15 Heavy Helicopter Companies which comprise the approximately 314 CH-47D Chinooks organically assigned to tactical operational commands, such as divisions and corps. The 118 remaining CH-47D Chinooks are assigned to either aircraft flight training or maintenance qualification training centers at Fort Rucker, Alabama, and Fort Eustis, Virginia. The Army’s plans to transform from a 17 division force composed of 71 Brigades into a 17 UEy force composed of 77 to 82 BCTs significantly challenges the current 314 CH-47D Chinook

aircraft fleet into supporting that increase in additional BCTs (Deputy Chief of Staff of the Army for Operations 2004, 9).

Aviation Brigade

Mission: Plan, prepare, execute and assess aviation and combined arms operations to support UEx and maneuver brigade scheme of maneuver to find, fix, and destroy enemy forces at the decisive time and place.

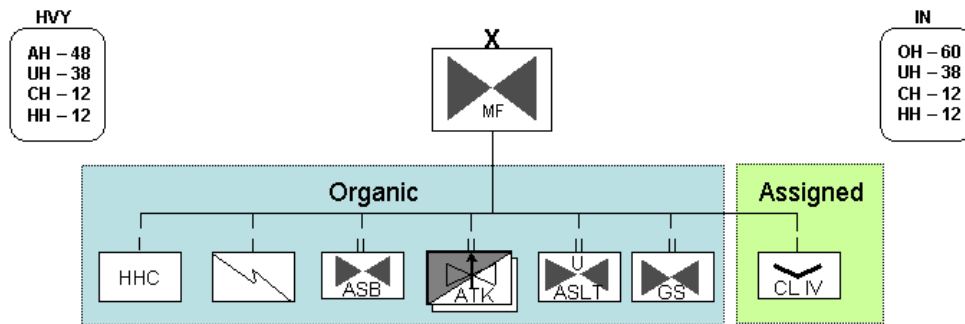


Figure 17. Future Force Multifunctional Aviation Brigade (MFAB)
 Source: Task Force Modularity, *Army Comprehensive Guide to Modularity* (Fort Monroe, VA: US Army TRADOC, 2004), 5-18.

One method of addressing the issue is the Army’s plan to reorganize and downsize existing CH-47D Chinook Heavy Helicopter companies from a 16-aircraft company to a 12-aircraft company organization as illustrated in figure 18.

This restructuring has occurred due to Army’s effort at equitably redistributing its limited CH-47D Chinook fleet into smaller units to support the increase in the number of operational BCTs in the Army. The Future Force HvyHC of the General Support Aviation Battalion (GSAB) is a good example for baseline analysis (see figure 19).

AVIATION TRANSFORMATION

Multi-functional Aviation Brigades optimized to support up to four BCT's

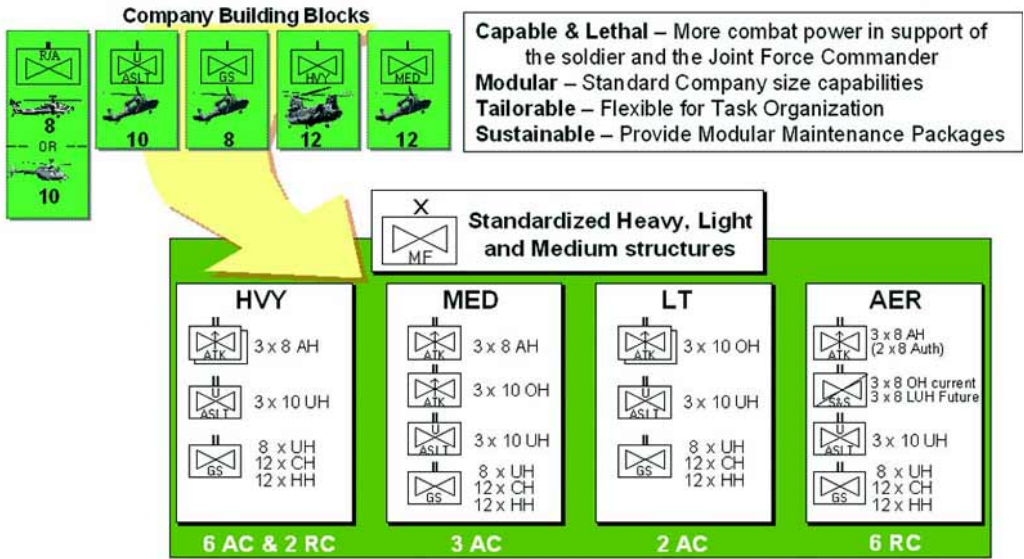


Figure 18. Aviation Transformation Heavy Helicopter Company (HvyHC)
 Source: Sinclair, *Aviation Transformation* (Monroe, CT: AAPI, 2004), 10.

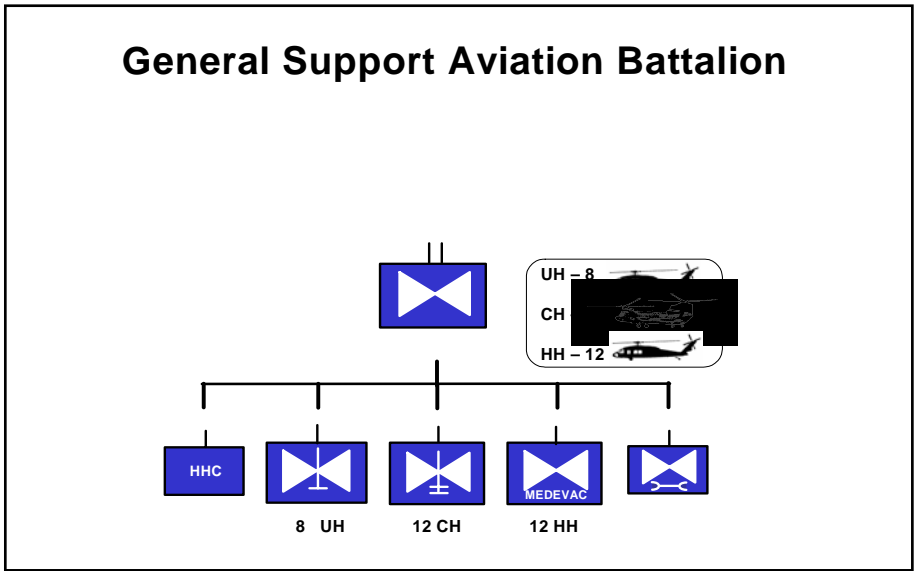


Figure 19. Future Force General Support Aviation Battalion (GSAB)
 Source: HQ, US Army TRADOC, TRADOC Pam 525-3-04, 27.

A simple calculation shows that the redistribution of 314 CH-47D Chinook airframes to twelve-aircraft companies equates to about 24 CH-47D HvyHCs to support the projected 77 to 82 BCTs of the Army's transformation plan. Using a number of 80 BCTs to further simplify calculations since the final projected number of BCTs of the Future Force is still being determined, that equates to a twelve-aircraft CH-47D Chinook HvyHC to support a Future Force UEx typically comprised of three primary ground maneuver BCTs, whether it be a Heavy (Armor), Medium (Stryker), or Light (Infantry). That equates to a potential payload capacity of 273,576 pounds of cargo that can be carried by the twelve-aircraft CH-47D Chinook HvyHC. Using one 4,000-soldier mechanized infantry brigade to represent a Future Force BCT for illustration, one mechanized BCT would require a 671,400-pound one-day ammunition supply rate to conduct and sustain a hasty attack (*Combat Service Support Battlebook 2004, 4-11*). Using the projected Future Force construct, that equates to 2,014,200 pounds of ammunition alone to sustain a 12,000-soldier mechanized UEx comprised of three BCTs that are decisively engaged in the scenario of conducting hasty attack offensive operations. This calculation is an appropriate and realistic correlation for sustainment considerations that challenges the Army's intratheater cargo helicopter assets because future UExs will be operating in the COE of remote, extended, austere noncontiguous battlefields. This scenario analysis provides that a GSAB's twelve-aircraft HvyHC will only be capable of providing aerial resupply support for only 33 percent of the authorized and planned one-day ammunition supply rate of a mechanized, three-BCT UEx conducting a hasty attack (*Combat Service Support Battlebook 2004, 4-11*). Although it would be highly unrealistic that all ammunition resupply for a mechanized three-BCT

UEx would be conducted solely by heavy-lift cargo helicopters, this calculation illustrates the limited capability of a single CH-47D Chinook HvyHC to support the hasty attack scenario. A caveat to this calculation will be that this scenario does not address any of the other eight classes of supply including Class I (food and water) or Class III (petroleum products, such as, fuels, oils and lubricants) that would be needed to sustain that same mechanized UEx comprised of three BCTs. Plainly, the HvyHC of the Future Force has a daunting task of adequately providing aviation support in sustaining Future Force UExs especially in operational conditions. However, the augmentation of an existing GSAB's HvyHC in order to support the sustainment of a UEx's operations relies heavily upon the Army Transformation asset plug-and-play capabilities. The future HvyHC, which again will consist of only 12 CH-47Ds in the company, provides for the augmentation of additional Heavy Helicopter platoons to be OPCON or TACON to other organic MTOE CH-47D Chinook units in order to fulfill the mission requirements of a primary HvyHC. Also, slated for delivery to the US Army in 2007, the CH-47F ICH has significant modernization improvements, such as, more powerful engines, digital fuel control, enhanced cockpit instrumentation, and an improved rotor system. However, despite these improvements, the CH-47F ICH will retain the same 50,000 pounds maximum gross weight capacity of its predecessor the CH-47D Chinook (Crosby 2005, 14). Therefore, since there is no increased cargo load capacity of the CH-47F ICH compared to its predecessor the CH-47D Chinook, this analysis scenario of the mechanized three-BCT UEx mentioned is an applicable assessment of the CH-47D Chinook/CH-47F ICH assets. Also, the CH-47F ICH retains the 230-nautical-mile operational radius of its predecessor the CH-47D, thus, there are no changes or improvements regarding the CH-47F's

operational range. This scenario's calculations reveal the challenge CH-47D Chinook and CH-47F ICH Heavy Helicopter Companies of the GSAB will have in conducting positive-effects operational support for UExs of the Future Force. However, between 2005 and 2018, the Army plans to upgrade the entire fleet of CH-47D Chinooks to the CH-47F ICH and to purchase an additional 55 new-built CH-47F ICHs to contribute to mitigating this Army operational requirement for more heavy-lift cargo helicopters (Deagel.Com 2004, 1). The additional 55 aircraft, coupled with the existing fleet of 314 CH-47D Chinooks that are planned to be converted to CH-47F ICHs, will equate to an increase in 37.5 percent increase in the aircraft fleet's cargo carrying capability (Crosby 2005, 14).

To further validate the projected capabilities of the MFAB's heavy-lift cargo helicopter capabilities, Brigadier General E. J. Sinclair, who is Army aviation branch chief and commanding general of the US Army Aviation Center at Fort Rucker, Alabama, made an analysis statement of recent aviation tactical operations of Joint Task Force (JTF) Wings in Afghanistan provides recent support to the proposed modular construct of the GSAB and its capabilities (Sinclair 2005, 10). Sinclair said, "Joint Task Force Wings (JTF Wings), led by the aviation brigade of the 25th Infantry Division (Light), fully exemplifies the capabilities of the Multifunctional Aviation Brigade (MFAB). . . . Since May 15, 2004, JTF Wings has simultaneously supported four brigade combat teams (BCT) under the command and control of Combined Joint Task Force 76 (CJTC-76). . . . JTF Wings' task organization emulates the design of the MFAB. It's an example of how the new modular brigade is tailorable for the most demanding combat missions" (2005, 6). Sinclair added, "JTF Wings meets the Army aviation

Transformation goal of a capable and lethal, modular, tailorable and sustainable MFAB. . . [T]he accomplishments of JTF Wings, organized around the MFAB concept, conducting combat missions in Afghanistan while detaching units to Iraq, [attest] to the warfighting capability of the Army's Multifunctional Aviation Brigade" (2005, 10). JTF Wing, whose organization is very similar to the Future Force MFAB, included a CH-47D Chinook HvyHC, F-Company, 131 Aviation Regiment of the Alabama and Georgia ARNG. Sinclair asserts that JTF Wings' success, including the performance of its CH-47Ds in Afghanistan, provides an early example of the capabilities and success of the projected Future Force aviation construct including the HvyHC of the modular MFAB. Successful operations by CH-47Ds and CH-47Fs on the battlefields of the future are reliant upon the concurrent successful employment of the Future Cargo Aircraft program and how those two aircraft work in concert (Aerial Sustainment Capability ICD Development Team 2004, 16). The successful employment of an objective 160-aircraft FCA fleet will clearly reduce the demand of the Army's limited CH-47 fleet. Simply, the success of the CH-47 fleet of the future can be significantly enhanced if the plans for the FCA are prosecuted in concert as intended by Army leadership as indicated in the August 2004 *ICD for Aerial Sustainment Capability*.

Correlating MAGTF and Army Aviation Cargo Assets

Aviation is an integral part of the naval expeditionary air-ground team – it extends the MAGTF's operational reach and flexibility and expands its warfighting power. (2000, Foreword)

MCWP 3-2, *Aviation Operations*

The USMC has long employed the Marine Air-Ground Task Force (MAGTF) as a firepower-potent, task-organization-tailorable, mission-flexible combat force. MAGTFs

are typically characterized as combined-arms, self-sufficient combat organizations and that MAGTFs' successes are based upon the USMC's operational doctrine that in many respects has similarities that can be compared to the Future Force Army aviation. There is doctrinal-employment and task-organizational similarities that can be identified when comparing the MAGTF with Army aviation elements, such as the MFAB's Heavy Helicopter Company and OSAA's fixed-wing Theater Aviation Companies. A brief assessment of similar capabilities, organizations, and aircraft of the MAGTF may provide Army aviation planners with insights that might contribute to the successful employment of the transformational Army aviation organizations of the future.

Briefly comparing USMC MAGTF and USMC OSA aviation to Future Force Army aviation assets of the MFAB and Army OSA provides an opportunity for Army strategist and planners to consider "lessons learned" from the successes of the MAGTF and to perhaps better apply those concepts to better employ the Army's fixed-wing cargo and heavy-lift cargo helicopter assets in the COE. Since UExs and BCTs are designed to function self-sufficiently for a limited period of time in tactical operations, comparing the doctrinal concepts of the employment of the USMC MAGTF and the Army Future Force UEx will give some insight into the potential of the future of Army aviation's organic intratheater lift operations. Before comparing the MAGTF with Future Force Army aviation organizations and assets, understanding the basic concepts and doctrine of the MAGTF is essential. While the conceptual information covered in this subchapter may be laborious, it is important to understand the basic concepts of the MAGTF's construct and the organization's historically successful operational employment. Such information may provide insight into USMC concepts that may be applied as "lessons learned" to better

employ Army aviation assets of the future. Doctrinal information discussing the MAGTF in this research is derived primarily from USMC reference publication MCWP 5-12D, *Organization of Marine Corps Forces*, except as otherwise annotated. By definition, MAGTFs are combined-arms warfighting organizations that “provide self-contained and self-sustained air, land, and sea strike forces, operating from a protected sea base, that can be tailored to meet any contingency. . . . [MAGTFs] provide self-contained and self-sustained air, land, and sea strike forces, operating from a protected sea base that can be tailored to meet any contingency” (MCWP 5-12D 1998, 1-1). MAGTF operations are built on a foundation of six special core competencies:

1. Expeditionary Readiness
2. Combined-Army Operation
3. Expeditionary Operations
4. Seabased Operations
5. Forcible Entry from the Sea
6. Reserve Integration

MAGTFs are “balanced, combined-arms forces with organic ground, aviation and sustainment elements. They are flexible, task-organized forces that respond rapidly to a contingency anywhere in the world and are able to conduct a variety of missions” and are designed to be mission focused and task-organized around any one of the three echelons of Marine warfighting organizations, the largest being the Marine Expeditionary Forces (MEFs). A MEF is the USMC’s principal warfighting and maneuver organization and can vary in size from 60,000 to 90,000 personnel, similar in the manning of an Army Corps that consists of 40,000 to 100,000 personnel. A MEF, like an Army Corps, is

capable of functioning as the Joint Task Force (JTF) command in a theater of operations. MEFs are capable of sustaining itself for 60 days in an AO. Each MEF consists of a Command Element (CE), one Marine division, one Marine Air Wing (MAW) and one Force Service Support Group (FSSG). These three major command elements are “the primary reservoir of combat capabilities from which MAGTFs are sourced” (MCWP 5-12D 2-3). MEF-sized MAGTFs typically conduct major operations in a large geographical area. However, depending on the mission and the mission’s task-organization requirements, MAGTFs may also be task-organized around USMC warfighting organizations smaller than the MEF, such as a Marine Expeditionary Brigade (MEB) of 13,500 to 18,000 personnel or a Marine Expeditionary Unit (MEU) of about 2,500 personnel. MAGTFs may also be created and task organized in order to meet special mission operational requirements that would produce a Special Purpose MAGTF (SPMAGTF).

Any MAGTF is comprised of four major elements. These four elements include the Command Element (CE) that is the MAGTF headquarters that provides command and control to the entire organization. The second element is the Ground Combat Element (GCE) and is the ground maneuver and combat operations element of the MAGTF. The third element is Aviation Combat Element (ACE) that is a multi-type aircraft aviation element of the MAGTF that employs numerous rotary-wing and fixed-wing assets and is normally a Marine Air Wing (MAW). Finally, the fourth element is the Combat Service Support Element (CSSE) that provides a full range of CSS functions and capabilities to support the MAGTF. The elements of the MAGTF that will be discussed in this research focuses on the MAGTAF’s organic ACE heavy-lift cargo helicopter assets and the

USMC's strategic aviation support assets from Operational Airlift Support (OSA) which provide intratheater fixed-wing cargo support to the MAGTF.

The ACE element supports and works complementarily with the MAGTF's Ground Combat Element (GCE) as part of the combined-arms combat organization. The ACE's aviation assets have the MAGTF's combat operations enabler by providing firepower, maneuverability and logistic sustainment to the GCE's ground maneuver assets. The MAGTF's ACE, which is typically built around a primary aviation organization, a Marine Air Wing (MAW), is comprised of four major elements: a Marine Aircraft Group (MAG), a Marine Wing Headquarters Squadron (MWHS), a Marine Air Control Group (MACG) and a Marine Wing Support Group (MWSG). The MAG is the element of the ACE that command and controls the aviation assets of the MAGTAF. MAGs are administrative and tactical command elements and are task organized for an assigned mission. There are two types of MAGs. The first type of MAG is the fixed-wing aircraft MAG and is designated as MAG VF/VA. The MAG VF/VA is comprised of attack and close-air-support aircraft, primarily the F/A-18 Hornet, but has no airlift aircraft. The second type of MAG is the rotary-wing aircraft MAG that is designated as MAG VH. The MAG VH or helicopter MAG is the organization that will be focused upon in this comparison between USMC and the Army's Future Force heavy-lift cargo helicopter organizations and assets.

The MAG VH is comprised of numerous helicopter squadrons. The MAG VH's largest unit is the Marine Heavy Helicopter Squadron that is designated as HMH. The MAG's Heavy Helicopter Squadron is normally comprised of 16 CH-53E Super Stallion heavy-lift cargo helicopters (MCWP 5-12D 1998, 3-27).

The CH-53E Super Stallion, as pictured in figure 20, is the largest helicopter in the US military, and it is a triple turbine-engine helicopter manufactured by Sikorsky Aircraft Corporation of the US (FAS Analysis Network, V-22 Osprey 2005, 1



Figure 20. USMC CH-53E Super Stallion Slingloads Two HMMWVs
Source: CarolinaBreeze.Com, *CH-53E Super Stallion*, 1; available from <http://www.carolinabreeze.com/marine/airrefueling.php>; Internet; accessed 1 February 2005.

The CH-53E Super Stallion has a greater maximum gross operational weight and a heavier maximum cargo payload capacity than the Army's CH-47D Chinook. The CH-53E Sea Stallion is a fifth generation model of the original CH-53A that was first produced and delivered to the USMC in 1966. Sikorsky-produced new-build CH-53Es were delivered to the USMC in 1981 and have since incrementally replaced earlier versions of the CH-53 throughout the USMC's Heavy Helicopter Squadrons and

concurrently operate with a few remaining CH-53D Sea Stallions in the USMC inventory which are to be phased out of service (Marine Corps Concepts and Programs 2004, 173). There are approximately 160 CH-53E Super Stallions currently in operation with the USMC (Donald and Lake 2000, 388). The US Navy and the USAF also employ their service-specific variations of the CH-53. The USMC CH-53E's primary missions include combat assault transportation of heavy weapons, equipment, supplies and personnel. Other roles include forward arming and refueling point (FARP) operations, combat search and rescue (CSAR), casualty evacuation (CASEVAC), aircraft recovery, parachute operations, and ship-to-shore logistics support. The minimum crew required to fly it is a pilot, copilot, and a crew chief. Additional crewmembers, as required, may be added for more complex tactical missions. The aircraft can be configured to carry up to 55-seated passengers, 38 combat-equipped troops or 24 litters for CASEVAC. The CH-53E is also NVD compatible. The CH-53E is designated a heavy-lift cargo helicopter by the USMC due to its high maximum gross weights of 73,500 pounds which includes an external sling-load or a maximum gross weight of 69,750 pounds which may include carrying an internal cargo load. The CH-53E has a normal range of 223 nautical miles, but is capable of mid-air refueling which extends its range indefinitely. A practical operational external cargo payload for the CH-53E is that it can sling-load carry a 16,000-pound M198 Howitzer or a 26,000-pound light armored vehicle (LAV). The CH-53E Super Stallion has a maximum continuous airspeed of 172 knots and can fly to an altitude service ceiling of 18,500 feet (Donald and Lake 2000, 388).

For comparison of operational capabilities between USMC and Army aviation assets, a MEB-size MAGTF's organic Marine Heavy Helicopter Squadron (HMH)

comprised of 16 CH-53E Super Stallion heavy-lift cargo helicopters will be compared to the capabilities and the assets of the Army MFAB's organic 12-aircraft CH-47D Chinook Heavy Helicopter Company. This comparison is being conducted for these comparable-sized USMC and Army warfighting units. The MEB, typically of 13,500-18,000 personnel, is similar in size to the Army's Future Force UEx comprised of 10,000-18,000 personnel. Both a USMC MEB and an Army UEx both doctrinally conduct operations in AOs of comparable geographical and operational AOs (MCWP 5-12D 1998, 2-3; and Task Force Modularity 2004, 1-9).

Since CH-53E are capable of carrying a maximum 36,000-pound external cargo payload, this capability provides the 16 CH-53Es of a Marine HMH Squadron with the potentially capability of carrying a total of 576,000 pounds of cargo in support of a MEF-sized MAGTF. In comparison, the CH-47D Chinook's ability to carry a 18,000-pound maximum external cargo payload provides the twelve-aircraft Army HvyHC with the potential capability of carrying a total of 216,000 pounds of cargo in support of a UEx. That translates into an approximate 176 percent greater cargo carrying capacity by the CH-53D Super Stallions of the MEB-size MAGTAF's organic HMH Squadron in comparison to the Future Force UEx's organic CH-47D Chinook Heavy Helicopter Company.

While the USMC employs a fleet of approximately 80 KC-130H Hercules aircraft in dual mission support roles of aerial refuelers and occasionally as a cargo transporters, Marine Operational Support Airlift (OSA) aircraft assets are most comparable in terms of operational capabilities in comparison to the Army's OSAA intratheater fixed-wing assets. Therefore, Marine OSA aircraft will be compared to the Army's fixed-wing cargo

assets. Marine OSA employs four types of fixed-wing aircraft that are designed to support the MAGTF in an operational concept similar to the employment of the Army's organic C-23B Sherpas. Like the Army's OSAA intratheater fixed-wing assets, such as the C-23B Sherpa fleet, Marine OSA fixed-wing assets are not organically organized under maneuver units, such as the MEF and rather, they belong to a separate organization at the strategic asset level to provide for use and employment in support of worldwide USMC operations (*Marine Corps Concepts and Programs 2004* 2004, 81). Marine Corps OSA mission is

to provide the time sensitive air transport of high priority passengers and cargo between and within a theater of war (and OSA) is a critical element to ensuring the warfighter has what he needs, when he needs it. OSA transports passengers and cargo with time, place or mission sensitive requirements. Unpredictable, short-notice movements of high priority people and cargo require an immediate response that is not usually compatible with the USTRANSCOM and USAF airlift missions. . . . Marine OSA's inherent flexibility is vital to the (MAGTF) commander's establishment of on site logistics, communications, and security during the initial phases of deployment. . . . OSA (also) provides time critical and flexible air logistics support required to fully sustain MAGTF combat operations. (MCWP 3-27 2003, 2-1 through 2-3)

The four aircraft types employed by Marine OSA include the Beech UC-12B/F King-Air, Cessna C-35C/D Citation, the Gulf Stream Aerospace C-20G Gulf Stream-IV and the McDonnell Douglas C-9B Skytrain. Of these four types of aircraft, the C-9B Skytrain is the only aircraft near comparable to the concept of a USMC-organic intratheater cargo airlift support provided by the Army's organic C-23B Sherpas. A comparison of these two aircraft is not even comparable, however, due to the enormous disparity between the capabilities of the C-9B Skytrain and the C-23B Sherpa. The other Marine OSA aircraft, such as, the light-transport 12-passenger UC-12B/F King Air, the executive-jet seven-passenger C-35C/D Citation, the commercial-jet 26-passenger C-20G Gulf Stream-IV all

carry between 300 pounds and 6,000 pounds of cargo and are not designed for being employed in the characteristically austere and remote airfields of the forward edge of a battlefield. Therefore, the only Marine OSA aircraft remotely similar in concept to the C-23B Sherpa is the C-9B Skytrain which is the military variant of a McDonnell Douglas DC-9 (Donald and Lake 2000, 264). This aircraft is a military version of a civilian commercial jetliner, the C-9B Skytrain, and thus has a high-capacity 90-passenger seating configuration and has a 108,000-pound maximum gross weight with a cruise speed of 490 knots. However, The C-9B's predominantly commercial aircraft characteristics requires an improved airfield for takeoff and landing which makes this aircraft unsuitable to conduct aviation support operations to the MAGTF in a combat zone. The C-9B Skytrain requires a 7,400-foot runway to takeoff or a 4,720-foot runway to land when fully loaded and it does not employ any ASE (Donald and Lake 2000, 264). These requirement and conditions are just not conducive to successful operations in a tactical environment of a battlefield and the C-9B thus cannot be adequately compared to the Army's current C-23B Sherpa fleet or even the FCA of the future. USMC strategic plans do address this intratheater lift capabilities "gap" that exists between the aviation support provided by Marine OSA. The USMC's C-9B are essentially required to conduct operations out of APODs and developed airfields while CH-53Es are tasked to conduct operations in forward tactical AOs. These USMC concepts are from the April 1995 Joint Multi-Mission Vertical Lift Aircraft (JMVX) Operation Requirement plan. The JMVX, which is a project that was developed to provide the Marine Corps, Air Force and Navy with a modern aircraft capable of conducting assault support and long-range missions that require vertical takeoff and landing capabilities with an aircraft that can both carry a

cargo payload comparable or great than the CH-53E Super Stallion and the CH-46E Sea Knight of the USMC, MH-53J Pave Low and MH-60G Pave Hawk of the USAF and to provide the Navy with a special ship-to-ship and ship-to-shore capable aircraft. This research will briefly review the MAGTF's projected employment of the V-22 Osprey for comparison with projected Army Future Force intratheater lift fixed-wing and rotary-wing assets. The V-22 Osprey, as pictured in figure 21, and the tiltrotor vertical and short takeoff and landing (VSTOL) program thus evolved and is designed to provide airlift support to Marine landing force operations as well as providing logistics sustainment for the MAGTF following an amphibious operation or operations in a noncontiguous environment



Figure 21. V-22 Osprey Slingloads During Evaluation

Source: FAS Military Analysis Network, *V-22 Osprey* (Washington, DC: FAS Military Analysis Network, 1 February 2005).

“The MV-22 will be the cornerstone of the Marine Corps’ assault support possessing the speed, endurance, and survivability needed to fight and win tomorrow’s battlefield. This combat multiplier represents a quantum improvement in strategic mobility and tactical flexibility for expeditionary and propositioned maritime forces,” (Marine Corps Concepts and Programs 2004, 173). The MV-22 is the Marine variant of the V-22 Osprey and is a revolutionary, advanced-technology aircraft in that it has the capability to takeoff and land as a helicopter in one mode of flight and to takeoff and land as a conventional airplane in another mode of flight and is scheduled to replace the CH-53E Super Stallion and the CH-46E Sea Knight (Marine Corps Concepts and Programs 2004, 173). The MV-22 Osprey, which is manufactured jointly by Boeing and Bell Helicopter Textron, is a twin-turbine engine aircraft with modern fly-by-wire flight control systems and is made of composite materials that contribute to the mechanical capability of the aircraft to rotate, or tilt, its three-bladed prop-rotors whose drive shafts are interconnected thru engine transmission nacelles that rotate vertically and horizontally to change the thrust vector for vertical or horizontal flight modes. This vertical flight capability allows for the MV-22 Osprey to takeoff and land in undeveloped landing areas and the horizontal flight capability provides for the ability to carry a heavier internal cargo payload by being able to conduct a long-run takeoff, like a conventional airplane. This horizontal mode of flight also increases the MV-22 Osprey’s maximum cruise airspeed. The MV-22 Osprey has a basic operational weight of 36,000 pounds and in vertical flight takeoff configuration, can carry an 11,500-pound internal cargo payload. In short-running takeoff mode, the MV-22 Osprey can carry a 19,000-pound internal cargo payload. The MV-22 Osprey requires a minimum crew of two pilots, has a maximum

airspeed of 275 knots, and has a maximum range of 2,100 nautical miles on one fuel load. The MV-22 Osprey is capable of carrying 24 combat equipped Marines or a 10,000-pound external load. The MV-22 Osprey is capable of a maximum gross weight of 60,500 pounds in self-deployment configuration and is capable of aerial refueling which extends its operational capabilities indefinitely. While the MV-22 Osprey internal cargo hold dimensions are too small to accommodate carrying a tactical vehicle, like the HMMWV, the MV-22 can carry a HMMWV externally. The MV-22 Osprey is also designed to be aircrew NVD compatible and is designed with ballistic tolerance technology and ASE equipment employed in order to make this \$80 million aircraft survivable in combat operations. While the MV-22 Osprey had encountered three major crashes during testing in 1991, 1992, and 2000 where a total of eight personnel were killed, the aircraft has survived scrutiny to continue development where the aircraft will continue OPEVAL through 2005 (FAS Military Analysis Network V-22 Osprey 2004, 2). Current DOD plans call for building 458 V-22 Ospreys in the three variations: 360 Marine MV-22 Ospreys, 50 USAF CV-22 Ospreys, and 48 Navy HV-22 Ospreys (FAS Military Analyst Network 2004, 2). While testing is scheduled to continue through 2005 to determine if the MV-22 Osprey should go into full production, tentative plans for mass manufacturing of the MV-22 Osprey is scheduled for 2006.

What makes the V-22 Osprey program a priority for the USMC, USAF, and the Navy is a combination of the aircraft's unique capabilities, such as VSTOL, the special operations and doctrinal employment of the MV-22 Osprey by these services, and the need to modernize the heavy-lift and medium-lift cargo helicopters of these services. The Army has considered the V-22 Osprey's operational capabilities and has determined that

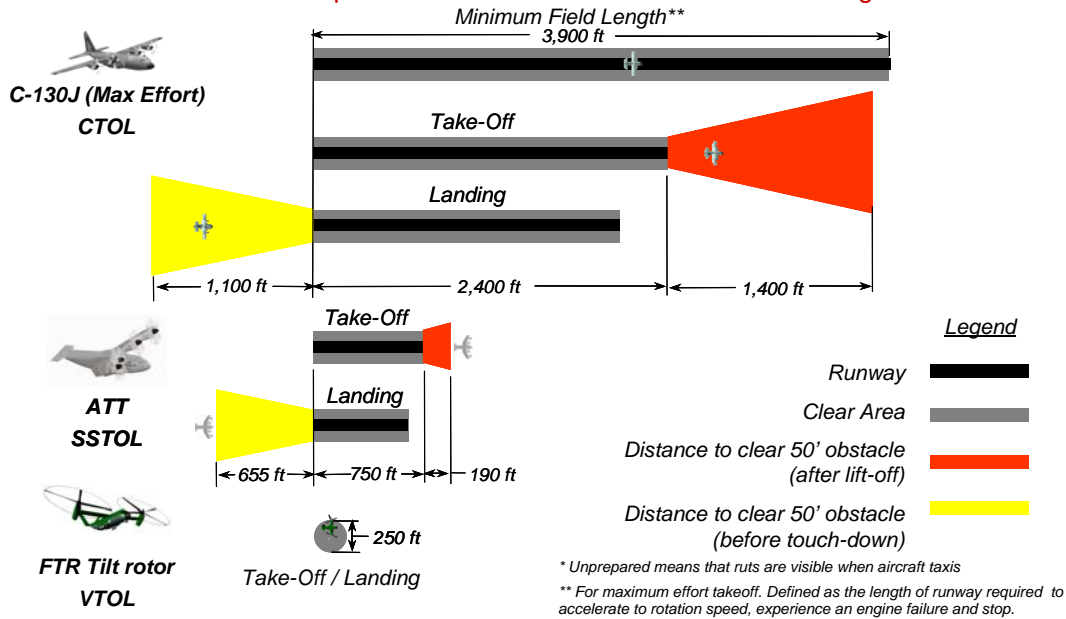
the V-22 does not fit in with aviation modernization and transformation plans (*Army Aviation Fixed-Wing Cargo and Utility Aircraft ICD 2004*, 12). Thus, Army leadership has not pursued any interest in acquiring for employment any variations of the V-22 Osprey and has opted to rather modernize its intratheater fixed-wing cargo assets by replacing that legacy the C-23B Sherpa airplane and to increase the overall number of aircraft in the fixed-wing cargo fleet to 160 airplanes (Futures Development Division 2004, 159). Also, the Army plans on modernizing the CH-47D Chinook heavy-lift cargo helicopter with upgrades to the CH-47F ICH and expanding the CH-47 fleet by 55 additional newly-built helicopters (Crosby 2005, 14).

While the V-22 Osprey currently meets a few of the operational and performance requirements for potential consideration for possible assessment in the Army's FCA program, the V-22 Osprey has considerable operational and performance capability deficiencies that make it an unlikely FCA candidate (*Army Aviation Fixed Wing Cargo and Utility Aircraft ICD 2004*, 12). Although the V-22 Osprey has a pressurized cockpit, its cargo hold is not pressurized for passengers. Also, the V-22's 17,500-pound maximum cargo capacity is 500 pounds less than FCA criteria. Also, the V-22's small internal cargo hold prohibits the loading of a tactical vehicle, like a HMMWV, internally and its cargo hold can only accommodate two DOD standard 463L half-pallets. There are performance limitations Army planners have considered in their process of ruling out acquisition of the V-22 (*Aerial Sustainment Capability ICD Development Team 2004*, 13). However, figure 22 illustrates and simply explains the Army's assessment of for the lack of potential DA interest and acquisition for the V-22 Osprey in the Future Force Aviation.

Take-Off / Landing Comparisons

at Unprepared* Landing Zones (4000ft/95°)

- Conventional Versus Super-Short Versus Vertical Takeoff / Landing



- The requirement for Cargo aircraft to support sustainment operations for the Future Force is a STOL capability to operate from unimproved landing zones of 2,000 ft length. While the C-130 has a max-effort landing and takeoff capability at a reduced payload, it is still considered conventional takeoff and landing and requires 3,000 ft landing zones by Air Force regulations for max-effort operations.
- Although this graphic depicts information for the future ATT SSTOL and the FTR VTOL, these aircraft are not current off the shelf aircraft and are not presently available as a solution to the Army airlift problem.

Figure 22. Takeoff and Landing Comparisons

Source: HQ, US Army TRADOC, *ICD for Army Aviation Fixed-Wing Cargo and Utility Aircraft* 2004, 41.

CHAPTER 5

THE PLIGHT AND FLIGHT OF THE FUTURE FORCE

If we do not build a transportation system that we can meet the needs of tomorrow, then it doesn't matter much what kind of force we have because it won't be able to get there – General John Shalikashvili, Chief of Staff of US Army (Hazdra 2001, 1)

Fairchild Paper, Air Mobility: The Key to the US National Strategy

Conclusions and Recommendations

Nearly fifty years has passed since the first CH-47 Chinook helicopter was put into Army service. Similarly, the Army's C-23 Sherpa is rapidly approaching its second decade of service and their planned phased retirement of its fleet. While numerous advancements have been made toward improving the capabilities of these aircraft to sustain their operations over the years, the Army leadership has arrived at a major decision point concerning the next evolution of the Aviation Branch and its assets and organizations. The current high OPTEMPO of protracted operations in Iraq and Afghanistan has placed overwhelming burdens upon Army aviation. This reality coupled with the uncertainty of modernization and transformation leaves many in the Army aviation community anticipates a positive outcome of transformation, reorganization and modernization impacts to improve aviation in order to better conduct and sustain operations and to be better prepared for future contingencies. Considering all of the background information already discussed in this thesis, there are two major points that strategic and operational planners must consider in order to ensure that Army aviation will be effectively employed in support of the Future Force. Firstly, there must be a significant expansion in the number of both fixed-wing cargo and cargo helicopters in

order to adequately support future operations in the COE. Secondly, Army aviation must maximize modern technologies to the fullest extent in order to best capitalize on these limited, but highly expensive, immensely combat enhancing aviation assets. While the Army plans to begin the phased retirement of its C-23B Sherpa fleet in 2007, the FCA initiative has yet to be approved as of 4 March 2005 and the program's associated *Capabilities Development Document (CDD) for the Future Cargo Aircraft* is still pending approval from the Joint Requirements Oversight Council (JROC) in Washington, D.C. However, as evidenced throughout this research, the need for an expanded aircraft numbers and an enhanced capabilities Army-organic intertheater lift airplane is a clear necessity in order to maintain adequate support of the current and projected OPTEMPO in the COE. Although the C-23B Sherpas fleet of 43-aircraft fleet has proven invaluable in support of OIF, the Army's existing fixed-wing cargo fleet has shown to have major capabilities limitations, such as, a limited cargo carrying capabilities, a short maximum effective range, an unpressurized cabin, a slow maximum cruise airspeed and the unreliability of the C-23B to conduct STOL operations due to a very limited maximum gross weight, have Army aviation leaders concerned about being able to support future Army operations with the existing legacy C-23B fleet. Instead, Army aviation leadership must capitalize on the current successes of the C-23B fleet's operations in OIF as an example of "proof of concept of employment" to solidify the Army's necessity of its organic intratheater lift assets and thus capitalize on this need to the politicians and budget decision makers in order to press the necessity for a more advanced fixed-wing cargo airplane. Specifically, Army aviation must ardently lobby-for and acquires adequate funding to support the projected FCA and its objective 160-airplane fleet. That

objective number is four times the current number of Army organic cargo airplanes and that concept alone would boost the capabilities of Army aviation's capacity to support future operations. Not to mention, the overwhelmingly significant increase in capabilities that the FCA has in comparison to the legacy C-23B fleet. Again, the FCA's cargo payload capability alone is about a 180 percent increase in cargo payload carrying capacity in comparison to the C-23B Sherpa. Also, as previously stated in this research, there are other numerous capability requirements that make the FCA a "more capable" cargo airplane. Again, the FCA's required compatibility of being able to internally load cargo using the standard DOD 463L pallet system. This capability speeds up aircraft loading along with a threefold increase in maximum effective range in comparison to the C-23B. Also, the proposed capabilities requirement that the FCA be able to takeoff and land at austere airfields under 2,000 feet in length is an incredible combat multiplier capability to a ground maneuver commander operating in austere battlefields. Also, the FCA's proposed required faster cruise airspeed will expedite self-deployment of the aircraft into AOs. It is capability requirements, such as these that clearly support Army leadership's efforts toward gaining approval for the concept, acquisition of the absolute best airplane to meet the Army's needs for the FCA and the timely employment of these aircraft in order to better support future Army tactical operations.

It is a widely recognized in the American military that AOs characterized by unsecured LOCs over distant and rugged terrain requires that Army aviation be that combat multiplier to provide maneuver flexibility and sustainment reliability to the ground commander. The FCA's projected objective fleet of 160 cargo-utility airplanes is a significant increase in the Army's organic intratheater lift capabilities and is giant leap

forward toward evolving to adequately and relevantly supporting the BCT-centric, modular Future Force. However, Army leadership must overcome the first challenge of initial JROC approval for the FCA capabilities concept, and only then can there be some assurance that the fixed-wing cargo aircraft fleet of the future will be able to provide the required support to the ground force of the future. Army aviation is faced with the daunting task of transforming and modernizing into a force that will be able to support the transformed ground maneuver units of the Future Force. The FCA and its interoperability with the CH-47D and CH-47F is the key to the future success of Army aviation's intratheater lift assets' support of the Future Force. Army aviation needs the FCA, whether it be my primary recommendation of the C-27J Spartan, or another capable similar aircraft, such as the EADS CASA C-295, the FCA program needs to get its feet on the ground as soon as possible in order that Army aviation be able to overcome the operational challenges of the future. Although the V-22 Osprey was considered during early concept development studies of the FCA program, the Army's decision to focus on the coordinated and complimentary support of an FCA airplane and a modernized CH-47 Chinook is the right course of action to take considering the differences between the USMC and the Army. The doctrinal concepts behind the ship-to-shore focused MAGTF are so very different from the employment of the Army UEx's ground based operations. A large fleet of FCA that is interoperable with the CH-47s of the future is more logical and more effective to support Army operations in the COE as is being made evident in Iraq and Afghanistan. The dispersed nature of non-linear battlefields that the Army will be operating on requires "more" aircraft to support those disperse ground maneuver units. The Army's proposed and concurrent plans for the FCA and the CH-47F aircraft fleets

are the best way to achieve future operational success. The USMC's V-22 Osprey program's high per-aircraft cost and rather limited operational capabilities are not in line with the doctrinal concepts and operational requirements of the Army. Not only must the Army aggressively develop the FCA program it must also prosecute its proposed plan of organizational restructuring and expansion of the fixed-wing cargo fleet in order to conduct operations more effectively and efficiently. An example of this would be the Army Aviation Center's Directorate of Combat Development's aviation transformation plan which calls for the standup of a fourth theater aviation battalion. This additional Battalion organization of FCA will only vastly improve the capabilities of the Army's intratheater lift capabilities. This fourth battalion along with an objective 160-airplane FCA fleet equates to nearly four-times the number of current fixed-wing cargo aircraft available for future operational support. Also, the proposed creation of three new active-component theater aviation companies which includes 17 reserve component companies totaling 20 companies with eight airplanes per company, is a major advancement towards an effectual unit organization of the Army's organic fixed-wing cargo assets. These 160 airplanes would provide a significant enhancement in cargo lift carrying assets in comparison to the current C-23B fleet's unit organization of five eight-airplane companies. The Army needs the FCA, and it needs it now.

The CH-47D Chinook community has succeeded valiantly despite the incredible OPTEMPO and resultant maintenance strain placed upon the existing 432-aircraft fleet due to recent operations in Iraq and Afghanistan. Although the overwhelming majority of the CH-47D's fleet has deployed in those theaters of operation, CH-47D units have surpassed expectations to keep pace with operational requirements for cargo helicopter

operational demands in those theaters. However, keeping pace with operational demands have had some negative impacts upon the CH-47D Chinook fleet. The extreme wear and tear of major aircraft components of the CH-47Ds operating in the harsh environmental conditions of Iraq and Afghanistan has resulted in an enormous demand for and phased “reset” maintenance which requires major aircraft component refurbishment, repair or replacement. That demand for operational aircraft in-theater has pressed maintenance crews into working tirelessly in order to sustain an aircraft readiness rate adequate for battlefield operational demands for cargo helicopters. For example, in-theater phase-maintenance of major aircraft components on CH-47D Chinooks in Afghanistan were frequently completed in less than 20 days in order to sustain operational requirements (MacNealy 2005, 14). It has been an impressive feat that maintenance crews have been able to sustain the fleet, but the long-term effect of this increased OPTEMPO is that the wear and tear on the CH-47D aircraft components are compounded by the harsh operational conditions along with the high OPTEMP. These factors have rapidly aged the CH-47D fleet in a mere three years since the initial prosecution of the global war on terrorism. The planned remanufacturing of the entire CH-47D fleet into the CH-47F entails major component rebuild including replacing the entire airframe with new, modern-technology monolithic machined frame components, newer more powerful engines and a fully integrated digital cockpit, for example (Crosby 2005, 14). Such progressive maintenance measures are only going to significantly improve the capabilities of the CH-47 fleet of the future. Additionally, the Army’s plan to purchase an additional 55 new-build CH-47Fs is a six-percent increase in the total numbers of aircraft in the fleet. Coupled with each CH-47F potentially being able to carry 3,800 pounds of

additional cargo due to a 27 percent increase in available power while consuming five percent less fuel is only going to enhance the future capabilities of the heavy-lift cargo helicopter fleet. The impact that Future Force transformation has upon Army aviation's heavy-lift cargo helicopter fleet is yet to be validated as the modularity transformation is still in process. However, after reviewing and quantitatively assessing the Army's modularity transformation plans for the MFAB, the GSAB and the HvyHC organizations reviewed in Chapter 4 of this research, it has been determined that the CH-47 fleet will be challenged but will be able to successfully sustain the Future Force. That success depends heavily upon the assumptions that sufficient maintenance of the current CH-47D fleet is accomplished to maintain an adequate mission-capable fleet, that the upgrade of the CH-47D to the CH-47F is initiated progressively thru the next few years, and that the CH-47 fleet expands by at least seven percent. What Army aviation leaders must not overlook are the effects of the rapid airframe aging of the entire legacy CH-47D fleet to ensure that there is adequate funding for major component repair of current CH-47Ds and to eventually refurbish that entire fleet into the CH-47F to sustain these aircraft for the projected service life of these helicopters. The Army wants to employ the CH-47F until at least 2020 (Sinclair 2004, 10).

According to Army aviation's Futures Development Division, "Army aviation is a critical enabler for the Future Force and will continue to be an instrumental contributor in achieving land force dominance throughout the joint battlespace" (Futures Development Division 2004, 4). The Future Cargo Aircraft fleet and OSA's four projected Theater Aviation Battalions, along with the CH-47F ICHs of the 12-aircraft HvyHCs in the MFABs are the keys to success of attaining the Army's goal of achieving dominance of

land warfare. It is imperative that Army aviation leadership proactively drive with modernization and transformation plans for its intratheater aviation assets in order to not only sustain current ongoing operations in Iraq and Afghanistan, but also to be able to appropriately support the BCT-centric Future Force. Army aviation maintaining the status quo would be disastrous considering the near-retirement status of the legacy C-23B Sherpa fleet and the limited and heavily-worked fleet of the CH-47D Chinook. Army aviation cannot be that combat multiplier to the supported ground maneuver commander of the future if Army aviation stagnates in its current condition of legacy equipment and organizations. It is important that Army aviation act now and act decisively in order to keep abreast of the modularity transformation of the Future Force. The FCA initiative and its related organization changes, and the GSAB's CH-47F fleet-upgrade plans are critical steppingstones to the successful employment of Army aviation on the COE and battlefields of the future. These improvements are the keys to ensuring that the Army's intratheater lift assets are relevant and capable to support the Future Force.

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