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NON-STANDARD FIXED WING AVIATION:

THE RECIPE FOR

ADDRESSING SPECIALIZED MOBILITY SHORTFALLS

by

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ABSTRACT

The unique requirements of Special Operations Forces (SOF) make it necessary to employ specialized tactics and equipment in order to successfully operate in hostile, denied, or sensitive environments. The preponderance of these types of missions are quick reaction demanding low-visibility and greater assumption of risk. America's SOF teams require an additional level of aviation support to execute national level missions. This decade is faced with tighter defense spending and cutbacks to the small aircraft inventory, an increased number of contracts with commercial aviation companies have been the hasty solution in order to maintain readiness and meet operational requirements.

If properly balanced and with the right oversight, a mix of contract and military air assets could meet the needs of SOF and the Department of Defense to fill the non-standard aviation shortfalls being experienced globally. The analysis identifies shortfalls in specialized mobility capabilities and logistics and evaluates the utilization of available non-standard aviation aircraft for Special Operations and compares the effectiveness and efficiency between using organic military assets to that of investing in specialized mobility contract aviation. For USSOCOM, and DoD as a whole, to maintain a global presence in austere locations while meeting the specialized mobility needs of SOF, there are three areas identified to fill eliminate shortfalls: Adjust the waiver process for contracting air carriers; improved utilization of the USASOC C-27J aircraft; and modification to the hub and spoke approach that is tailored to SOF. This research paper uses a mixed-methodology of problem/solution framework and evaluation framework. The paper is divided into three main sections: overview of the problem, analysis of the problem, and the recommended solutions.

INTRODUCTION

> *"A reduction in resources will require innovative and creative solutions to maintain our support for allied and partner interoperability and building partner capacity. However, with reduced resources, thoughtful choices will need to be made regarding the location and frequency of these operations."*
>
> -Leon Panetta, U.S. Secretary of Defense, January 2012

Overview of the Study

Nearly every special operations mission relies on specialized air assets to accomplish the objective. Whether it is a strike platform, intelligence, surveillance, and reconnaissance (ISR) platform, or a mobility platform, these aircraft are necessary and sufficient to a capable Special Operations force. The SOF aviation fleet is relatively small in size for the amount of capability it brings to the warfighter. Under certain circumstances, there are not enough military aviation assets to meet the requirements in austere locations such as on the African continent and South America or across the expansive Pacific area of responsibility (AOR). This study will evaluate how specialized aviation is utilized to support SOF in locations where there is limited freedom of maneuver, and then examine ways to improve the efficiency and effectiveness of the balance between contract aviation assets and organic military assets being utilized to help meet the requirements. In order for SOF to maintain a small footprint with high flexibility and agility, it is paramount that there are dedicated and habitual relationships between these air assets and the supported SOF ground components. In undeveloped regions where those relationships are non-existent, our deployed forces nevertheless require rapid, low-volume passenger and cargo transportation capability, most readily accessible by foreign contract air carriers.

The Nature of the Problem

Special Operations Forces have unique requirements for tactical employment and equipment in order to successfully operate in hostile, denied, or sensitive environments. The majority of their missions are usually time sensitive with the need for low visibility and a higher acceptance of risk. "Support to SOF is tailored to the situation and mission with flexibility to withstand dynamic operational environments."[1] Specialized airlift has played an important role in enabling SOF to operate in austere and remote locations especially in expansive regions such as Africa. Air Force Special Operations Command's (AFSOC) non-standard aviation (NSAv) program has been integral to the SOF mission by providing light and medium fixed wing aircraft to the warfighter for dedicated specialized airlift to these small, geographically separated SOF teams.

Since 2009, when U.S. operations increased in remote areas such as Africa and South America, the requirement for NSAv has seen an increased demand in the AFRICOM and SOUTHCOM area of responsibility (AOR). This demand has been met with light-fixed wing C-145's and medium-fixed wing C-146's which have both been the workhorses of the NSAv inventory. Unfortunately, due to budget cuts and Congressional efforts to reduce and shift OCO spending to baseline budgets along with force restructuring, NSAv has suffered significantly by downsizing the fleet. AFSOC has recently retired two-thirds of its C-145 fleet, keeping just five at Duke Field, Florida for the purpose of training military allies across the globe.[2] The remaining inventory of NSAv aircraft are the C-146's which will ultimately be a fleet of 17. The gap that has been created by this reduction of aircraft has forced the Theater Special Operation Commands (TSOC) to contract with commercial air carriers to meet their needs of specialized mobility. Recently the status quo has become contracting out

NSAv for SOF support. The lack of training and or proper equipment as well as the inability of a commander to effectively command and control (C2), all pose problems to the warfighter. It has been proven that "Ad-hoc attachment of air assets and capabilities simply fails to create the habitual relationships and 'no-fail' proficiency required by SOF."[3]

In Category 2 (Cat 2) countries where SOF conduct missions, compliance with Department of Defense Instruction (DoDI) 4500.53 *"DoD Commercial Air Transportation Quality and Safety Review Program"* is extremely difficult when dealing with low-volume and low-density airlift operations. Due to the lack of aviation oversight in these countries, a waiver to DoDI 4500.53 is required at a level of authority well above the operational commander accepting risk for the mission. The current waiver process is not only unfeasible to the timeliness of SOF missions, but has also become a deterrent which effects overall mission accomplishment.

Purpose of the Study

The purpose of this study is to evaluate the air assets and processes available for specialized mobility that are capable of supporting SOF in remote locations and can be utilized to address non-standard fixed wing aviation shortfalls. Through an examination of the problem that small aircraft fleet reductions are having on the warfighter and a look at how the current fleet of available assets is being utilized, this research will provide leadership with an evaluation of assets that can be utilized to help balance the supply of contract and military air assets with the ability to meet the current and future demands of the Theater Special Operations Command (TSOC) ground forces.

Key components to meeting the demand for this specialized mobility requirement are the non-standard aviation fixed-wing aircraft, remote basing locations, and how the aircraft

are operated and maintained. The current force reductions and restructuring that has affected Air Force Special Operations Command's (AFSOC) ability to provide enough small aircraft platforms to effectively support the combatant commanders justifies exploring the benefits of investing in NSAv and whether or not that investment should be made towards sustaining an organic military fleet or towards specialized mobility contract solutions.

Research Question

Specialized mobility contracts have become the status quo to providing non-standard air mobility support to SOF because the services and USSOCOM components do not have the resources available to provide this high demand capability in austere locations. During a period of constrained military budgets and reductions to the small aircraft fleet, the TSOCs have found it necessary to contract with commercial aviation companies in order to meet mission objectives. There are some who claim that contract aviation is cost-effective and more-accessible however there is a risk cost and a fiscal cost to how contract aviation is employed as well as limitations to how they operate. The research question for this study is therefore "How can the Department of Defense help to balance military and contract air assets to address non-standard aviation shortfalls across all levels of war?"

Definition of Terms

Non-Standard Fixed Wing Aviation. The best interpretation of the term "Non-Standard Aviation" is "Not a variant of the C-130."[4] This classification of aircraft is used to describe platforms that provide ground forces with freedom of maneuver in and around the battle space with the capability to operate with a small footprint, low visibility, and to haul a small number of passengers and cargo to unimproved locations at a lower risk to the mission.

Specialized Air Mobility (SAM). The conduct of rapid, global infiltration, exfiltration, and resupply of personnel, equipment, and materiel using specialized systems and tactics. These missions may be clandestine, low visibility, or overt and through hostile, denied, or politically sensitive airspace using manned or unmanned platforms.[5]

Category 2 Country. Cat 2 countries do not comply with US standards. The Federal Aviation Administration assessed this country's civil aviation authority (CAA) and determined that it does not provide safety oversight of its air carrier operators in accordance with the minimum safety oversight standards established by the International Civil Aviation Organization (ICAO).

Organic Military Aircraft. Aircraft owned and operated by a military entity. Organic military aircraft are an essential part of the inventory for the branch of service in which they are associated and where they are provided for by military resources such as maintenance.

Research Methodology

This research paper will utilize a mixed-methods framework. This approach will utilize the problem/solution framework and evaluation framework to objectively describe and analyze the requirements, processes, and current utilization in which the TSOCs employ low-volume/low-density non-standard fixed wing aircraft. The research will start by highlighting the background on the current non-standard aviation fleet, as well as the gaps that contract aviation is filling. A vignette will be provided to the reader that will analyze C-145a mobility support in Africa and what the impacts are to replacing the capability with contract air. This vignette will draw out the many problems that are associated with non-standard air mobility such as low-density, high cost, tyranny of distance, and logistics. The evaluation framework will assist in gathering the analysis data from the vignette as well as emails, interviews, and

bibliographical sources to collect contracting data, requirement data, and organizational data. This analysis will be used to define criteria needed to solve the problem and measure the feasibility of alternatives. Finally, the research paper will conclude by providing a recommendation on what balance of contract and military aircraft along with the process by which they are utilized is the best option to addressing the small non-standard fixed wing aircraft shortfalls.

LITERATURE REVIEW

This section of the research presents the literature categorized by its contribution to the paper. The literature begins by addressing the issues the non-standard aviation community is facing, which prevents it from meeting the full requirement of the warfighter. Next the review will look to address how specialized SOF mobility is being employed and evaluate how the current strategy for small non-standard fixed wing aircraft is meeting those needs. Finally, the review will focus on relevant literature that evaluates potential solutions that could increase the effectiveness of SOF and ease the impact of non-standard aviation shortfalls.

Issues the SOF Mobility and the NSAv Community Face

In Brian Everstine's (2015) article highlighting the retirement of the 6th Special Operations Squadron C-145 aircraft, the author cites statements made by the squadron commander and the AFSOC Commander, Lt. Gen. Heithold (see Appendix A for more information on the C-145 aircraft). AFSOC current position is in considering various leasing options as an alternative to maintaining the C-145 fleet. This review will be used to analyze a very relevant issue being discussed today of how military reductions are effecting the balance of non-standard air mobility.

In a few studies conducted by the RAND Corporation, the rise in contract logistic support and concerns over the changing demand for military aircraft are studied. In John Birkler et al.'s (2003) study reviewing the competition and innovation in the U.S. fixed-wing military aircraft industry, it provides key analysis of military fixed-wing aircraft that will help develop certain criteria to base a proposed solution and other alternatives. Most importantly, the RAND study assesses the changing demand for military aircraft. This study translates Congress' concerns in order to addresses four areas of military aviation that includes characterizing the current military aircraft industry structure and capabilities, needs to maintain innovation, assessment of future aircraft-demand scenarios, and suggestions to help DoD policymakers.

Michael Boito et al.'s study, which takes a look at Contract Logistic Support (CLS) as one of the choices the military has when looking at the affordability of aircraft, reviews how CLS can be utilized more effectively. The study reviews data from the Headquarters U.S. Air Force to examine the reasons why the Air Force has chosen, more often than not, the use of CLS over organic support for sustaining weapon systems and components. It examines the key cost drivers, the growth of CLS lately, advantages and disadvantages, and other characteristics.

Specialized SOF Mobility Employment and Non-Standard Aviation Strategy

The literature on specialized SOF mobility and non-standard aviation is mostly found in empirical literature and military doctrine. A key piece of strategic guidance reviewed for this portion of the study is the *2010 Quadrennial Defense Review Report* which tasked the United States Air Force to "field light mobility and light attack aircraft in general purpose force units in order to increase their ability to work effectively with a wider range of partner

air forces."[6] This document is utilized to help shape strategy and processes that will provide the United States with effective warfighting and national security capabilities for the future.

Two important pieces of Air Force doctrine, which are analyzed in this study, is *Air Force Doctrine Document (AFDD) 3-05: Special Operations*, 2011 and the United States Department of the Air Force. *Irregular Warfare (IW) Strategy*, 2013. *AFDD 3-05* provides a foundation for Air Force Special Operations Forces (AFSOF) doctrine. It builds on basic doctrine and provides an understanding of how AFSOF organizes and employs forces at the operational level of war. Essential to this product is the incorporation of SOF Truths and the fact that AFSOF cannot be mass-produced.

The guidance of General Mark Welsh, CSAF, and Eric Fanning, SECAF, are captured in the *IW Strategy*, 2013. Their views on the *Irregular Warfare Strategy* shape how the Air Force addresses IW and the Total Force. Analysis of the document highlights discussions on the high demand for light mobility and the requirement to establish a means to meet that demand. The document discusses the USAF goal to be positioned to meet global light aviation demands with United States aircraft and services. This doctrine document compares to and draws from the previously mentioned *2010 Quadrennial Defense Report.*

Kyle Porter addresses non-standard fixed wing aircraft for irregular warfare uses in his research for *Air & Space Power Journal*, 2011. An analysis through the lenses of personnel recovery provides a case study to discuss the role of non-standard aviation in austere locations. The notional scenario with Combined Joint Task Force-Horn of Africa (CJTF-HOA) presents a good framework to build solutions for issues with aviation in Africa.

Potential Solutions

Organic Military Air

There is some literature on fixed wing aircraft that exists in the military inventory that could be re-allocated to meet the current shortfalls. The C-27J Spartan aircraft could be considered as an option for SOF specialized air mobility. Kenneth Horn et al.'s (2010) study on using the C-27J aircraft for conducting Army mission critical, time sensitive (MCTS) missions in counterinsurgency operations (COIN) evaluates the US Army's Mission Critical Time Sensitive (MCTS) approach and how they are looking to replace the C-32 Sherpa aircraft in order to fulfill this mission. Historically, this has been a very relevant issue for the Army in conducting COIN operations in Iraq and Afghanistan. Similarly, SOF is experiencing this same issue in Africa and is faced with a lack of military aircraft that can meet the requirements. Since this study was conducted five years ago, the Army has moved forward with retiring C-32 Sherpas but has decided on not currently replacing them. The information gathered will be used to provide an analysis in my research on the viability of using C-27Js available to meet SOF requirements.

Contract Aviation

As the demand for non-standard fixed wing aircraft has grown, due to the expansion of operations in places like Africa and South America, contracts with commercial aviation have become the status quo. *Department of Defense Instruction 4500.53, "DoD Commercial Air Transportation Quality and Safety Review Program"* (2010), limits the ability to conduct timely low volume / low density operations in austere locations. A review of this instruction will identify ways to modify how DoD is currently doing business in order to help meet the current shortfalls.

Limited empirical literature is found on existing contract air assets being utilized for specialized SOF mobility. It is known that CASA-212s are contractor operated to support military operations in austere environments. A review of literature on how this aircraft is employed along with some of the operation considerations for using contract air will help determine it's validity amongst the other options considered.

Air Logistics

There is a good amount of literature on the significance of distance on military operations and the challenges that poses. Many factors need to be considered when encountered with the problem of conducting military operations in austere locations far away from home. Joseph Gaddis' research for *Army Sustainment Professional Bulletin (2012)* analyzes data collected from daily operations in US Army Africa (USARAF), to test the hypothesis that adaptable air logistics and long-term solutions can be developed for austere locations to overcome problems of distance and time. In this article, the findings cover the challenges air logisticians face in Africa from airfield suitability and the tyranny of distance.

Air logistics research also conducted by Brian Hall for *Air & Space Power Africa (2010)* analyzes strategic access in Africa and test the hypothesis of the role expeditionary forces play in the Africa region after years of neglect. His findings address the difficulties of African access and how the Air Force has dealt with the problem. The discussions on large-footprint air packages versus smaller expeditionary airpower are very important to provide a foundation to the problem of not having enough small non-standard aircraft especially in areas of Africa.

ANALYSIS

"Perfection is not attainable, but if we chase perfection we can catch excellence."

-Vince Lombardi

Aviation Evolution

Typically, special operations aviation requires highly trained operators and highly specialized equipment to accomplish special operations mission objectives. Joint Publication 3-05: Special Operations defines Special Operations as:

> *Special operations require unique modes of employment, tactics, techniques, procedures, and equipment. They are often conducted in hostile, denied, or politically and/or diplomatically sensitive environments, and are characterized by one or more of the following: time-sensitivity, clandestine or covert nature, low visibility, work with or through indigenous forces, greater requirements for regional orientation and cultural expertise, and a higher degree of risk.*[7]

When it comes to supplying this type of capability to special operations, it comes at a high price and large logistical footprint. This fact, coupled with the changing operational environment and fiscal constraints the military faces, forces leadership to adjust priorities and strategy while accepting increased risk.

AFSOC's original plan for an intra-theater, non-standard aviation fleet demanded for ten Pilatus PC-12 light single-engine aircraft, ten Polskie Zaklady Lotnicze (PZL) Mielec C-145A Skytruck light twin-engine aircraft, and seventeen Dornier C-146A Wolfhound medium twin-turboprop aircraft to meet global requirements.[8] The C-145A's were heavily deployed to Afghanistan and Africa between 2009 and 2015 providing the TSOCs with a light specialized mobility capability as viewed in Figure 1. Although the PC-12 is categorized as a small passenger and cargo utility aircraft, it has been primarily configured for other specialized missions supporting intelligence, surveillance, and reconnaissance (ISR).

Figure 1. Photo of C-145A performing airdrop in support of SOF in Afghanistan.[9]

The C-146A is a tactical transport workhorse that conducts multiple types of non-standard aviation missions. The C-146A capabilities will be analyzed in the following organic military analysis section.

The big changes in the Air Force's budget for FY 2013 – FY 2017 are all centered on aircraft programs. The Air Force has since divested itself of its C-27J Spartan fleet and cancelled its Light Mobility Aircraft (LiMA) program.[10] Figure 2 shows the requirement of the LiMA program. Concurrently, AFSOC has retired a majority of their C-145A Skytruck fleet. The decision was made to return the C-145A from deployment and reduce the size and cost of this fleet of specialized aircraft. Eleven of the sixteen C-145As that were supporting SOF in locations such as Africa will be sent to the Davis-Monthan Air Force Base boneyard. While operations tempo remains the same but with less airframes to utilize, the military is left

with a gap that needs to be filled by another means.[11] Restructuring of the fleet has focused on small specialized aircraft assets in order to pursue multi-role platforms that are more useful across the range of military operations. Although, this way of thinking helps leadership to consolidate expensive training and logistics, these decisions have driven a shortfall in specialized mobility for SOF operators and planners in an environment of increased demand.

> The Light Mobility Aircraft (LiMA) program will fill an Air Force light mobility gap by acquiring Commercial-Off-The-Shelf (COTS) aircraft, which are also suitable for building partner capacity (BPC) especially in lesser developed partner nations (PN). Suitable aircraft may be single or multi-engine, fixed-wing and capable of operating from austere, unprepared surfaces. This program supports irregular warfare efforts that help prepare partner nations to defend and govern themselves by demonstrating an airlift capability that is consistent with their needs for supporting infrastructure, performance, anticipated methods of employment, acquisition and sustainment costs, and multi-role/multi-mission capability. the LiMA must be able to carry a minimum of six pax and crew, operate from "austere landing surfaces" and carry a minimum of 1800 pounds with crew. The plane needs a loading door that can take litters and a 36 inch warehouse skid and have two pilot stations but be able to be flown by one pilot.

Figure 2. U.S. Air Force Light Mobility Aircraft Requirement[12]

"The Air Force's own rhetoric about the need to 'take risk' across the inventory, and the value of 'multi-mission' aircraft, focuses on business, not war…is evident in statements where the Chief of Staff of the Air Force, Gen. Mark A. Welsh III, says that various multi-mission platforms can do the mission "…maybe not as well, but reasonably well."[13]

Similar to the LiMA program described above, specialized mobility missions supporting SOF require light and medium category aircraft with the flexibility and capability in supporting austere and remote locations that are not serviced by reliable and safe commercial aviation service. Additionally, for NSAv missions, aircraft are required to be civilian-like in order to blend into the regional environments.[14] Desired aircraft characteristics for supporting specialized mobility can be found in Table 1.[15]

Table 1. Desired Specialized Mobility Aircraft Characteristics.

Desired Specialized Mobility Aircraft Characteristics
Short takeoff and landing (STOL) Capable
Prepared and Semi-prepared Airstrip Capable
Day/Night/All Weather Capable
Night Vision Device (NVD) Compatible
Low Visibility (Civilian-Like)

Given the information in this section, this research paper accomplishes an analysis of organic military and contract fixed wing aircraft capable and available for potential tasking, the process for employing commercial aviation aircraft, and air logistics to determine the best systematic balance to meet warfighter requirements. Following the evaluation of these options, the research will identify the appropriate solution to maximize utilization of specialized mobility and reduce the impact of today's fiscally constrained environment.

Organic Military and Contract Aircraft Capabilities Analysis

The past decade has witnessed tightening DoD budgets, shrinking of an already small aviation fleet, all while expanding SOF global operations. The result is an increasing shortfall, which needs to be addressed by finding a better way to utilize the assets available whether it be conventional forces (CF), Air Force special operations forces (AFSOF), United States Army Special Operations Command (USASOC), or supplemented by a contract force. This section explores the distinctive characteristics that will determine what non-standard aircraft are available to be tasked to meet the demands for specialized air mobility.

Organic AFSOF, when available, has the inherent capability and is doctrinally tied to special operations missions as shown in Figure 3. The conventional Force, in this case the

> Air Force special operations forces (AFSOF) are relatively small forces that may operate independently from other friendly forces. Air Force special operations are often conducted at great distances from major bases in a distributed manner with relatively small footprints. They employ sophisticated communications systems and special means of infiltration, support, and exfiltration to penetrate and return from hostile, denied, or politically sensitive areas. AFSOF should complement and not compete with, nor be a substitute for CF. As an example, an AC-130 gunship should not be employed when a conventional aircraft would be more appropriate for the target and the operational conditions.

Figure 3. AFSOF Definition from Annex 3-05 Special Operations.[16]

U.S. Air Force, has transferred or divested all light/medium tactical air mobility capability such as the C-27J Spartan. The primary CF aircraft considered for tactical air mobility is the C-130 Hercules and the C-17 Globemaster, both not the ideal choice when the requirement is for a low-visibility, small footprint capability. Within AFSOF, there are the MC-130 aircraft and C-146A aircraft with associated crews that provide the organic tactical, intra-theater lift for USSOCOM. Only the C146A, operated by the 524th Special Operations Squadron, meets the low-visibility, small footprint while they "execute non-standard aviation missions in support of joint-special operations forces while directly supporting theatre special operations commanders by conducting night vision goggle (NVG) infiltration, exfiltration, resupply and other combat tasking on unimproved runways."[17] Since they are spread throughout the world, a fleet of seventeen has challenges keeping up with the increasing demand across the TSOCs. Through the shakedown of budgets and aircraft transfers, USSOCOM gained ownership of seven C-27J Spartans in November 2014 and assigned them to USASOC's Flight Company (UFC) to be utilized for military freefall training. Now that this asset is organic to SOF, it

warrants an evaluation to be utilized for the purpose of meeting the specialized mobility requirement compared with the C-146A and the contract aircraft available.

In 2007, the C-27J was chosen as the platform for the Joint Cargo Aircraft (JCA) program between the Army and Air Force (see Appendix B for more detailed factsheet on the C-27J aircraft). The JCA's mission was to fill a tactical airlift capability gap and provide time-sensitive, mission critical air mobility for ground forces. Then in 2009, the Secretary of Defense directed the program be transferred to the Air Force. Due to budget cuts in 2013, these aircraft were "deemed a luxury the Pentagon could no longer afford."[18] As a result, 7 of 21 C-27J aircraft were transferred to USASOC UFC. Figure 4 displays this time line. This evaluation examines if the C-27J can fill a shortfall in SOF specialized mobility.

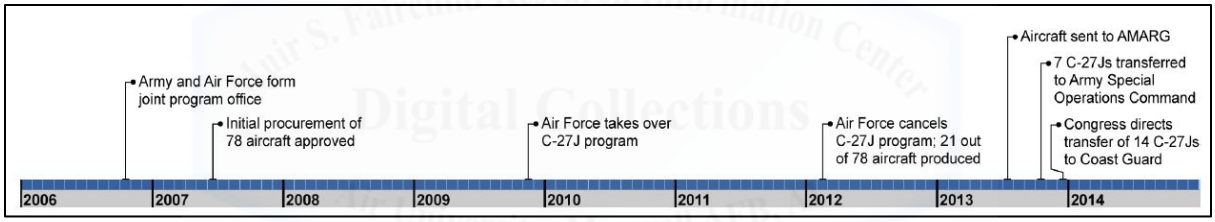

Figure 4. Timeline of the History of the C-27J Aircraft.[19]

The C-27J has been combat proven by many of our allies and thoroughly evaluated during consideration for the JCA program. It is designed to be utilize at austere airfields in the most difficult types of terrains found in the Middle East, Africa, and South America. With its cargo ramp and door configuration, close to 70,000 pounds maximum takeoff weight, and a maximum payload range of 1,000 miles the C-27J could be considered a feasible platform for specialized mobility.[20] The C-27J is produced by Alenia Aermacchi based out of Naples, Italy and is operated by 13 countries around the world.[21] The one drawback for NSAv capabilities is that the C-27J is a military transport aircraft only and has no civilian-like characteristics or counterparts.

Figure 5. Photo of C-27J[22]

Figure 6. Photo of C-146A[23]

The most simplistic way to conduct low visibility missions is to actually execute the objectives by utilizing civilian aircraft. This is accomplished through contract air. Contracting aviation capabilities has become the stop-gap solution for specialized air mobility in austere locations until a better solution to source and organize is discovered. Nowhere in the world has the use of contract air been more prevalent recently than in Africa and South America. Hunting Joseph Kony throughout the Congo, Central African Republic (CAR), Sudan, and Uganda plus targeting Al-Qaida in the Islamic Maghreb(AQIM) and Boko Haram terror groups across the region is serious business for the United States and the DoD is investing millions in a 'privatized flying taxi service' to fly SOF everywhere from Mauritania in West Africa to Tanzania in East Africa.[24] Contract airlift used in this fashion meets the need of flexible, short-notice, high-risk transportation while keeping a small U.S. military footprint. However, the use of contract air comes with a higher acceptance of risk for commanders.

There are many prevalent types of civilian aircraft models employed by contractors and utilized by countries of interest around the world. The comparison in this section compares the available organic military assets discussed above to the most prevalent civilian

aircraft that best fit the desired specialized mobility characteristics displayed in Table 1. The EADS-CASA C-212 and its larger sibling the EADS-CASA C-235 are among the most popular fixed-wing aircraft utilized by countries of interest for specialized air mobility.[25] Table 2 shows the top five mobility aircraft utilized in countries of interest. This quality helps meet the civilian-like characteristic considered important for non-standard aviation missions. The An-26, An-2, and An-32 are built in the Ukraine by the Antinov State Company and are not considered acceptable for use by U.S. military personnel therefore they will not be considered in this evaluation.

Table 2. Top Five Non-Standard Fixed-Wing Mobility Aircraft Across Countries of Interest.[26]

RANK	MODEL	# COUNTRIES	%COUNTRIES	# AIRCRAFT
1	CASA 235	12	15%	90
2	An-26	12	15%	85
3	CASA 212	12	15%	61
4	An-2	11	14%	52
5	An-32	10	13%	138

Long-term lease or charter of commercial aircraft is the responsibility of United States Transportation Command (USTRANSCOM).[27] USTRANSCOM uses the Acquisition Procurement Forecast to identify contracting opportunities for high dollar transportation programs such as contract aviation.[28] This forecast highlights present and future contract awards for fixed-wing programs in the Central African and Afghanistan regions. AAR Airlift Group, Berry Aviation, and Erickson Transport, Incorporated are among the primary contractors who compete for this business. A review of these companies and their fleet of aircraft is also an indicator of popular aircraft suited for specialized mobility as shown below in Table 3.

Table 3. Government Contractor Fleet Currently Available.

Company	Aircraft
AAR Airlift Group[29]	De Havilland Canada Dash-8, CASA 212
Berry Aviation[30]	De Havilland Canada Dash-8, De Havilland Canada Dash-6, Dornier 328(C-146A equivalent), Embraer Brasilia 120ER, Metro 3
Erickson Transport, Inc[31]	CASA 212, Beechcraft 1900D

By comparing popular aircraft among civilian companies with the organic military aircraft that are available, an analysis reveals the suitability of each aircraft for meeting specialized mobility requirements. Table 4 compares the organic military aircraft available to the most prolific civilian aircraft available worldwide. The key specifications chosen for comparison take into account the aircraft's ability to transport personnel and cargo representative of small SOF teams conducting missions in remote locations. The C-130J is used in this comparison to show how it's capabilities compare to the smaller sized, non-standard aircraft. The C-130J does not provide the small footprint, low-visibility required for the missions being considered. This comparison is warranted because it shows that the C-27J is a viable option for specialized mobility missions exceeding the C-146A, CASA 235, and CASA 212 in payload capacity and range.

Table 4. Comparison of Aircraft Specifications.[32]

Comparison of Aircraft Specifications					
	Organic Military			Contract Air	
Specification	**C-130J-30**	**C-146A**	**C-27J**	**CASA 235**	**CASA 212**
Maximum Payload (lbs)	44,000	6,843	25,353	13,117	6,170
Payload for Max Range (lbs)	35,000	3,300	13,277	6,600	2,200
Range with Max Normal Payload (nm)	1,700	500	1,000	390	850
Takeoff Runway Length (ft)	4,700	2,530	2,100	1,251	1,925
Operating Cost per Hour (thousand)	$9.1	$2.3	$5.3	$1.8	$1.0
Cargo Ramp	Yes	No	Yes	Yes	Yes

The drawbacks of the C-27J are in it's military appearance and it's higher operating costs. Those two characteristics are advantages of the civilian-like C-146A currently conducting non-standard aviation missions. However, without cargo ramp or doors, the C-146A is restricted from conducting airdrop missions and limits the capability of moving oversized cargo. Both the CASA 235 and the smaller CASA 212, as shown below in Figure 7, are suitable to fill gaps in specialized mobility but there are certain characteristics of contract air that need to be analyzed in the next section.

Figure 7. Photo of CASA 212(top) and CASA 235(Bottom).[33]

Commercial Aviation Analysis

Commercial air carriers provide a rapid, flexible solution making contract air the simpler solution over organic military, but contract solutions often come with increased risk and reduced mission effectiveness. Specialized mobility training for aircrews is not cost effective for a company in the business of making a profit and therefore this costly training is

very limited. In commercial operations, contractors make up for this by hiring very experienced pilots and crewmembers.[34] The requirement for a contractor to maintain proficient aircrews is the 14 U.S. Code of Federal Regulations (CFR) and applies to U.S. companies that would be conducting NSAv operations because of the size and scope of the aircraft and mission. 14 CFR Part 135 applies to "on-demand operations" and requires a pilot in command to have a minimum of 1500 hours experience and a commercial pilot license.[35] Pilots that hold a commercial pilot license must be examined by a certified flight instructor every 24 months. Certified flight instructors may be anyone in the company qualified to give examinations, leaving room for leniency. Without any requirement for pilot proficiency training, there is increased risk of mission failure. A review of recent cases highlights the pilot proficiency problem revealed by an accident in South America and an incident in Central Africa.

In October 2013, the crash of a contractor operated Dash-8 aircraft while flying a mission near Columbia, South America was determined to be the result of pilot error. Air Combat Command (ACC) released the following:

> *The mishap aircraft was operated by Sierra Nevada Corporation under a contract with the United States Air Force. The mishap aircraft departed a forward operating location in the Republic of Panama at 10:45 p.m. on Oct. 4, 2013, and proceeded to its tasked area of operations in the Caribbean Sea off the southeastern coast of Panama. Although intending to remain over water during the operation, the pilots unintentionally flew over land and impacted the terrain at 12:42 a.m., Oct. 5.*
>
> *The board president found, by clear and convincing evidence, the cause of the mishap was the pilots' failure to ensure the aircraft remained over water, which resulted in unplanned night flight over land at low altitude, and subsequent controlled flight into the terrain. Additionally, the board president found four other factors that substantially contributed to the mishap: inappropriate delegation of terrain avoidance responsibility; ineffective communication among the aircrew; an inoperative Enhanced Ground Proximity Warning System; and a lack of operational oversight.*[36]

Another incident in July 2014 highlights contractor operations and pilot proficiency when pilots of a CASA 212 made an emergency landing on a Ugandan highway. While transporting nine U.S. military members from Entebbe to South Sudan, approximately 500 miles, the pilots ran out of fuel after being forced to divert due to poor weather conditions.[37] The results of this mishap shed light on U.S. operations in the region highlighting U.S. Africa Command's reliance on contract aviation to move troops throughout the continent with low-visibility. As the passenger and cargo transportation demand from forces deployed to these undeveloped regions increases, the use of foreign contract air carriers provide another option to commanders.

In AFRICOM and SOUTHCOM, local foreign carriers provide a significant potential for meeting low-density transportation needs. Use of these indigenous commercial air carriers is particularly beneficial for short notice scenarios where they can alleviate political barriers and provide low-visibility transportation that is vital in certain operating environments. DoDI 4500.53 limits the ability to contract with many of the countries in these regions due to their Category 2 status because of lack of aviation oversight with civil aviation authorities that do not meet International Civil Aviation Organization (ICAO) standards.[38] Figure 8 shows a world map comparing aviation safety oversight across the globe. There is a significant financial investment for air carriers in these regions to invest in the requirements to meet ICAO/DoD standards in order to gain or retain DoD business.

Figure 8. Where Safety Oversight is Worst[39]

Since the preponderance of a low-volume air carrier's business is non-DoD, there is no incentive for a company to make the necessary improvements. One important factor to consider is that, in many cases, transporting small numbers of personnel on an air carrier from a Cat 2 country is safer than moving them by other modes of transportation such as surface transport. The approval authority for DoDI 4500.53 waivers to use an air carrier from a Cat 2 country rests at a minimum of the 3-star Deputy Combatant Commander level.[40] The DoDI 4500.53 waiver process includes an on-site safety assessment conducted by CCMD-designated evaluators.[41] This waiver process is very time and resource intensive plus makes it difficult for the air carriers, and U.S. forces they support, to maintain a low-signature while working to be unaffiliated with U.S. government organizations. The advantage of local air carriers is the logistics backbone already in-place which organic and contract air lacks.

Air Logistics Analysis

The military drawdown over the past decade has posed a problem with the logistics of conducting military operations in austere locations. Continuing with Africa as the example, because of the region's distinctive access challenges, there is a lack of suitable airfields and infrastructure to support air mobility. Through AFRICOM military exercises such as NATURAL FIRE and ATLAS DROP, the challenges with air logistics are highlighted. Employing C-130 aircraft is problematic, faced with many "suitable but unusable" airfields because of runway weight restrictions. [42] ATLAS DROP 2011 provided a canvas for logistics planners to use multiple aircraft platforms from the Ugandan military, US Air Force, and contract airlift to test the dynamics of the logistics between organic tactical airlift and contract air. These exercises give commanders the opportunity to evaluate different airfields and plans for meeting the theater's specialized mobility requirements.

Approximately 207 airfields in Africa are acceptable for C-130 operations, which is merely 15 percent of African airfields across the whole continent.[43] If C-130's in Africa can only access one or two airfields or hubs in any given country, then smaller non-standard aircraft will need to be looked at as an option for the last leg or spoke of the trip.[44] Air logistics is a fine balance between aircraft capabilities and the locations they can operate out of and planners must consider how these remote, limited forward operating bases (FOBs) are to be sustained. An efficient hub and spoke network provides a way to take advantage of distinctive aircraft capabilities and the airfields that can accommodate them.

A hub and spoke air transport system is a way of increasing flexibility and reducing infrastructure costs as shown in Figure 9. In austere locations across regions of Africa, access is made possible through a well-planned system of capable airfields in "remote areas ripe for

subversion."[45] The hub and spoke operations are defined in Joint Publication (JP) 3-17: *Air Mobility Operations* as:

> *Intertheater air land operations normally offload personnel and materiel at a main operating location within the theater. Subsequently, intratheater airlift moves designated personnel and equipment to forward operating locations, an employment concept referred to as a hub and spoke operation. Hub and spoke operations allow planners to maximize the capabilities of each aircraft type and they provide a safe location for transloading operations by avoiding flights into high-threat or contaminated locations. This is particularly important for nonmilitary aircraft which typically lack defensive countermeasure equipment.*[46]

Effective specialized air mobility requires access to austere fields that are close in proximity to SOF operations. Range with maximum payload is a key characteristic analyzed in a previous section. Aircraft must have the range required to fly from the main logistical hub to the required FOB while factoring in required payloads for the remote airfields. A proper air logistics plan will allow for a smaller footprint and accommodate various NSAv options.

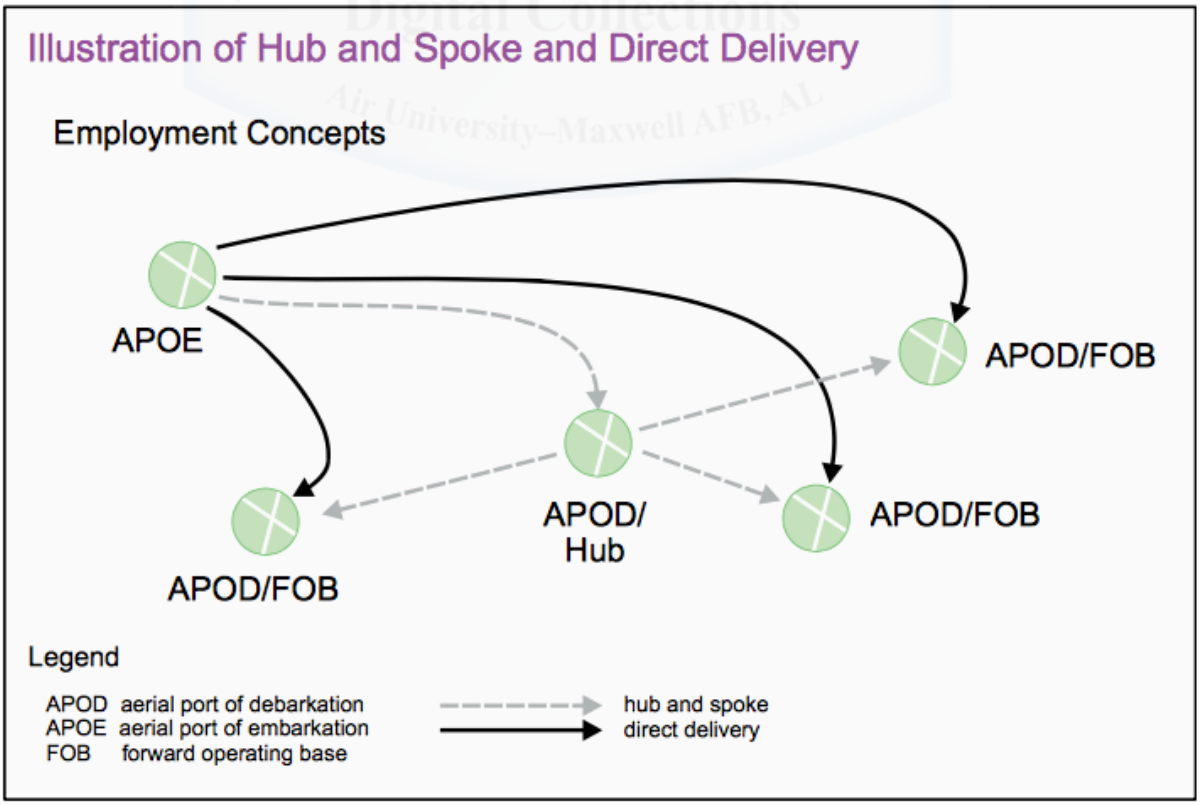

Figure 9. Illustration of Hub and Spoke and Direct Delivery.[47]

RECOMMENDATIONS

For USSOCOM, and DoD as a whole, to maintain a global presence in austere locations while meeting the specialized mobility needs of SOF, the following three recommendations can help fill the non-standard fixed wing aviation shortfalls based on the results of this study. 1) Adjustments to the waiver process for contracting air carriers. 2) Utilizing the USASOC C-27J aircraft. 3) Modify the hub and spoke approach for SOF.

Adjustments to the Commercial Air Carrier Waiver Process

Analysis of commercial aviation shows that local foreign air carriers are a viable source of specialized air mobility. Local foreign carriers that are indigenous to the areas in which they operate can provide the warfighter with rapid, low-visibility transportation. DoDI 4500.53 limits the ability contract with these types of air carriers especially in Cat 2 countries by imposing an arduous waiver process. The simplest, most immediate solution is to modify DoDI 4500.53 for the waiver authority to grant or extend waivers down to the level of TSOC commander. This non-material solution is minimal cost, requiring only a change to policy. The waiver should not exceed 180 days in duration and be renewable for additional periods of 180 days if warranted by the TSOC commander. Since the approval authority currently rests at a minimum of the 3-star Combatant Command level, a lower level of authority would expedite mission accomplishment by decreasing the staffing time and align closely to the operational authorities. This adjustment would increase mission efficiency via decreased administrative burden. Simultaneously, it places operational risk management decisions and accountability with the commanders with operational control of forces being air transported. Streamlining this process would give USSOCOM more access to potential contract air carriers in the austere locations they operate.

Utilizing the USASOC C-27J Aircraft

Evaluation of the non-standard fixed wing aircraft available to SOF that meet many of the specialized mobility requirements showed that the C-27J Spartan could accommodate SOF missions. Based on the criteria of aircraft specifications evaluated in this study, the C-27J platform could reasonably fill a specialized mobility role in austere environments. Aside from their military appearance, the C-27J with its cargo ramp door out-performs AFSOCs C-146A in versatility. Since there are seven C-27Js assigned to USASOC's flight company, these aircraft would be readily accessible for USSOCOM tasking if given the right priority and funding. Although currently supporting USASOC military free-fall training, there is enough merit that warrants further study to see if at least two C-27J aircraft could support operational specialized mobility requirements on a rotational basis.

Modify the Hub and Spoke Approach For SOF

Analysis of air logistics in austere environments coupled with deficient hub and spoke systems highlights great challenges for SOF operating in these areas such as Africa and South America. By studying where the majority of SOF missions are being executed and pairing the nearby austere airfields with organic air assets or contract air assets available, a modified hub and spoke approach would increase mission efficiency by decreasing lag in response times. A modified hub and spoke approach that can be tailorable to the size and scope SOF missions is favorable for improving air mobility in these locations. A plan is needed that utilizes existing military or commercial airfield hubs with proper infrastructure for aircraft maintenance and basing. The modification to this traditional hub and spoke plan would be to create temporary spokes where the mission dictates with minimal infrastructure for refueling and minor maintenance. This type of system is adaptable to the IW environment in which SOF operates.

CONCLUSION

Specialized air assets are critical to accomplish the objective for nearly every SOF mission. The organic military fleet of air assets available to SOF is relatively small in size and therefore struggles to meet the increasing demand in today's operational environment. Shortfalls in specialized air mobility, especially in austere locations such as on the African continent and South America or across the expansive Pacific area of responsibility (AOR), are exaggerated by current fiscal constraints. A lack of balance between contract aviation assets and organic military assets is an inefficient and expensive way to operate. To remain mission effective, DoD and USSOCOM must adapt to meet the requirements for non-standard fixed wing aviation. Improvements in current organic and contract aircraft utilization, coupled with a refined air logistic process, would provide SOF deployed in austere environments with the right amount of capability where and when they need it.

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APPENDIX A[48]

C-145A FACT SHEET

C-145A

Published December 17, 2013

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Mission

The C-145A's primary role is to support U.S. Special Operations Command's Aviation Foreign Internal Defense mission to assess, train, advise and assist foreign aviation forces in airpower employment, sustainment and force integration. Secondly, the C-145As provide the theater Special Operations Commands a light mobility capability. These mission sets are conducted by AFSOC's Combat Aviation Advisors.

Features

The C-145A is a twin-engine, high-wing aircraft with twin vertical fins and a non-retractable tricycle landing gear capable of short takeoff and landings to unprepared runways. The C-145 is reconfigurable to support both airland and airdrop of cargo (max 2,400 lbs) and personnel, casualty evacuation, combat search and rescue, humanitarian assistance and disaster relief operations. The C–145A can carry a maximum of 16 passengers or 10 combat rigged paratroopers. Maximum cargo weight is 5,000 lbs, or up to four litter patients. Missions can be conducted to prepared and semi-prepared airfields around the world.

Background

The C-145A aircraft was originally bought to support the non-standard aviation mission in 2009. In 2010, Congress authorized the purchase of 16 light twin engine aircraft to support the AvFID mission. As a result, the C-145A was selected for this role. The aircraft has been continually deployed since March 2011. The Air Force Special Operations Warfare Center currently has 10 C-145As and is scheduled to receive its final six aircraft by April 2014.

General Characteristics

Primary Function: Aviation Foreign Internal Defense and light mobility
Builder: PZL Mielec
Power Plant: Two Pratt and Whitney PT6A-65B Turboprops
Thrust: Takeoff power 1,100 shaft horsepower
Wingspan: 72 feet 4 inches
Length: 43 feet
Height: 16 feet 1 inch
Max Cruise Speed: 223 knots
Max Range: 1,010 nautical miles
Service Ceiling: 25,000 feet (with supplemental oxygen equipment)
Maximum Takeoff Weight: 16,534 lbs. (7,500 kgs)
Crew: 3 (2 pilots, 1 loadmaster)
Unit Cost: Approx. $14M per aircraft
Inventory: Active duty,10 (End state: 16 by fiscal 2015); Reserve/ANG, 0

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APPENDIX B[49]

C-27J FACT SHEET

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