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Increased Capacity Utilizing Aggregation and Consolidation of Contingency Cargo

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THESIS

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Abstract

Maximizing use of limited airlift assets is a common problem during large contingency operations. Requirements often exceed airlift capacity and fiscal constraints driving the need to aggregate conveyance loads both within and across business lines (Unit Line Number (ULN), Special Assignment Airlift Mission (SAAM), and sustainment). Current methods of consolidation are completed by planners at the 618th Air Operations Center. This process is completed by piecing email correspondence and making individual localized decisions which are not always consistent with big picture efficiency. United States Transportation Command requested a study to create standard business rules or a methodology that can benefit both manual and automated airlift aggregation decisions.

Therefore, this research focuses on the opportunities for reducing the required sorties for the 621st Contingency Response Wing's Joint Task Force through aggregation and/or consolidation of unit type codes. A working group was created from various subject matter experts to create a methodology that would best work for contingency movements. A literature review was conducted to determine multiple aggregation and consolidation methods that subsequently utilize available vertical cargo space on the aircraft. The methods identified and prescribed by this research reduced the number of sorties required from six to four, resulting in a 33% reduction in required airlift.

Dedication

A special thank you to my wife and children for your patience and support; and finally, a heartfelt thanks goes to my parents for your continued support and reassurance.

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Thank you to my thesis advisor Dr. Jeffery Weir for guiding me throughout this process; to Capt Michael Kretser, my reader for his attention to detail and pushing me to finish; to CMSgt James McElwee for his sponsorship of this research as well as accommodating data collection and personnel to assist in a working group; to the working group of SMEs: MSgt Dan Briscoe, MSgt Crystal "Chea" Sullivan, MSgt Timothy Manning, MSgt Harley Ricketts, TSgt Mitchell Williams that were vital in creating the research methodology; Mr. Christopher Odell for his advice throughout the process; Finally, great appreciation to Lt Col Christopher Lambert and CMSgt Jamie Vanoss for your much needed support in my selection to AFIT.

Cassidy L. Wilson

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I. INTRODUCTION

1.1 Problem Statement

With recent Department of Defense fiscal constraints, it is vital to capture all available cost-savings opportunities. Cost savings measures are being accomplished in nearly all areas of business except for contingency mission execution. These cuts include shrinking the Army to its smallest size since before World War II, as well as eliminating entire fleets from the Air Force fighter aircraft inventory (Simeone, 2014). This research attempts to capture possible savings on real-world contingency missions by seeking all aggregation and consolidation opportunities across Unit Line Number (ULN), Special Assignment Airlift Mission (SAAM), and sustainment missions.

Currently the 621st Contingency Response Wing (CRW) at McGuire AFB, NJ is responsible for deploying a Joint Task Force-Port Opening (JTF-PO) team, which currently requires up to nine C-17 aircraft. Reducing this requirement by even one aircraft would not only help with fiscal requirements but would likely enhance effective mission capability.

1.2 Research Objectives/Questions

The objective of this research is to develop a process to aggregate/consolidate multiple Unit Type Codes (UTCs) from a Time Phased Force Deployment Data (TPFDD) plan to reduce required airlift for the Air Force JTF-PO heavy alert package.

1.3 Research Focus

The focus of this research will be limited to the JTF-PO package currently supported by the 621st CRW. The research will focus on aggregation, consolidation, and load planning techniques that could greatly impact maximum aircraft utilization while maintaining operational requirements and chalk order priority of all cargo.

1.4 Investigative Questions

1. Does the current deployment process allow for full utilization of both pallets and aircraft capabilities?
2. Can aggregation and consolidation of UTCs reduce required airlift for the Air Force JTF-PO heavy alert package?
3. Will aggregation and consolidation of UTCs reduce or mitigate any current CRW capabilities?
4. What other types of deployment movements can benefit from aggregation and consolidation of UTCs or requirements?
5. What are the current limitations that prevent full utilization of pallets and full utilization of Aircraft?

1.5 Methodology

This research will require data from past JTF-PO deployments including: load plans, packing lists, and passenger/cargo manifests. Data from the 618th Air Operations Center (AOC) will be crucial to know how many aircraft were requested versus how many were actually tasked to complete the mission. This data would show how much cargo was required to be pared and

tailored down to meet mission requirements versus aircraft availability, resulting in possible diminished mission capability.

A working group will be utilized to bring the Subject Matter Experts (SMEs) together to create methodology and reproducible business rules to create efficient and effective load-plan techniques to reduce previously required airlift.

1.6 Assumptions

The main assumption is that all Squadrons within the 621st CRW own the same type of cargo within each Unit Type Code (UTC). This assumption is important since regulations allow for suitable substitutes, which can result in the same UTC having different weight and dimensions. This allows each Squadron to purchase similar UTC equipment to meet the needs of their unique mission. Without this assumption, this research would be required for every Squadron within the CRW. Finally, this research assumes that the entire JTF-PO package will be tasked and not pared down to reduce capabilities. It will also be assumed that all current regulated methods pertaining to deploying UTCs can and will be able to be modified. Another assumption is that only C17 aircraft will be utilized for this study. Although future studies can be conducted to compare the best mix of aircraft for each deployment, most taskings for the CRW are completed utilizing the C17.

1.7 Implications

This research will allow all contingency, SAAM, ULN, and sustainment missions to become more efficient and more effective while maintaining fully capable mission requirements.

II. LITERATURE REVIEW

2.1 Introduction

The purpose of this thesis is to define the process of reducing airlift requirement for deploying the Air Force JTF-PO heavy alert package through efficient load-planning techniques, Unit Type Code (UTC) consolidation/aggregation efforts, and the implementation of the Bi-Level Aircraft Loading System (BALS). This chapter defines key terms, definitions and terminology utilized, while establishing a theoretical framework for the research. All key models, prior studies, and case studies that are referenced will be included as supporting research. Finally, this study is defined in the context of explaining the gap in research that this thesis will fill.

2.2 Key Terms

Unit Type Code (UTC)

According to the Air Force Operations Planning and Execution AFI10-401, "UTC is a potential capability focused upon accomplishment of a specific mission that the military service provides." It can consist of manpower force element (MFE) only, equipment logistics detail (LOGDET) only, or both manpower and equipment (AFI10-401, 2006). The current process is to maintain UTC integrity to ensure full capability is maintained together with each unit. For this study, we will look at not keeping full UTC integrity by utilizing options to move partial UTCs on earlier than planned chalks, while maintaining priority and on-time arrival of the entire UTC.

Joint Task Force Port Opening Team (JTF-PO)

According to William Krahling, "the Expeditionary Theater Opening (ETO) concept formed the Joint Task Force Port Opening (JTF-PO) designed to provide the Geographic

Combatant Commanders (CCDRs) a rapidly deployable force, flexible in employment throughout a full spectrum of military activities. The jointly trained, air and sea port command and control elements effectively addresses many of the issues that hinder regional Combatant Command CCMD and joint force headquarters ability to manage the flow of forces being introduced into a theater of operation" (Krahling, 2013). The JTF-PO concept was intended to eliminate the following capability gaps in rapidly opening a port of debarkation.

1. Ad hoc command and control (C2) of deployment and distribution operations at the Point of Debarkation (POD).

2. Limited ability to establish a theater distribution network.

3. Limited capability to provide movement control at the POD.

4. Inability to coordinate onward movement from the POD.

5. Lack of intransit visibility (ITV) of material and forces transiting through the POD.

"While individual JTF-PO capabilities already existed within the service components, the methodology of a pre-designated, trained and ready force can mitigate many of the shortcomings that occurred at the aerial and seaports in the past. The true value of an on-call, pre-configured deployable element under the control of United States Transportation Command (USTRANSCOM) has the capability arrive ahead of the Time Phased Force Deployment Data (TPFDD) forces" (Krahling, 2013).

Aggregation

Dictionary.com explains aggregation as a "sum, mass or assemblage of particulars; at total or gross amount" (Dictionary, 2015). This paper specifically looks at the concept of aggregation as taking two or more UTCs and combining the contents in a way that best fits into maximum aircraft utilization for the JTF-PO. Aggregation will allow for splitting UTCs onto

separate pallets. An example of aggregation would be to break down a baggage pallet and distribute the baggage evenly throughout the other pallets. This concept would eliminate an entire pallet from the load plan.

Consolidation

Dictionary.com explains consolidation as "bringing together (separate parts) into a single or unified whole; unite; combine" (Dictionary, 2015). This study defines consolidation as combining complete UTC's together without splitting pallet contents other than to combine the entirety of the UTCs contents on the same pallet together. Consolidation will allow complete UTC's to remain on the same pallet and allow for ease of inventory control at the Airfield of Debarkation (APOD). There are two examples of consolidation: first is to take a small baggage pallet and add small loose cargo items to the pallet; the second would be to utilize the Bi-Level Airlift Loading System (BALS) to stack two pallets on one another thereby eliminating a required pallet position from the load plan.

Maximum Aircraft Utilization

According to 4500_9_R_Defense Transportation Regulation (DTR) Part III, maximizing aircraft utilization includes maximizing the aircraft by ensuring it is configured and loaded to maximum capacity using the Allowable Cabin Load (ACL), passenger limits, and aircraft load specifications for each aircraft. For the purpose of this study this definition will also include another factor: that all pallet positions PPs will be maximized to include weight, cube, and height.

Maximum Pallet Utilization

Per Sandra J. Wilson, "A 463L pallet can be considered max utilized if it is 90% of max allowed weight or 80% of maximum allowed volume" (Wilson, 2011).

This can become difficult to determine since each position on an aircraft can't sustain the maximum weight that a pallet can contain. It is also difficult to figure maximum pallet utilization for outsized pieces of cargo that require a pallet train.

Each military aircraft is broken down into pallet positions (PP) that are either separated by 108 inches or 88 inches-depending on how the aircraft is loaded. For the purpose of this study, a PP will be defined as either an 88 x 108 (max height of aircraft available) or 108 x 88 (max height of aircraft available).

463L Pallet/Rail System

The current 463L pallet was designed in the 1950s, but was not incorporated into the Air Force until 1963 (Schroeder, 1997). The purpose of the pallet and rail system was to increase the upload and download speed of cargo. The pallet is designed of an aluminum skin covering balsa wood weighing 290 pounds with the dimensions of 108 x 88 inches with six tie down rings on each 108 inch side and five tie down rings on each 88 inch side. The 463L pallet is susceptible to damage if not stored properly. There are approximately 120,000 463L pallets in the war reserve material and nearly 8,000 pallets are returned for repair annually (Schroeder, 1997).

2.3 Load-Planning Techniques

Current load planning of the CRW is conducted by the host wing upon deployment, taking place after the Joint Inspection and is completed according to Priority of cargo and forces given by the deploying unit. According to the Defense Transportation Regulation (DTR) Part III Mobility, vehicles must be backed onto both C-130/C-17 aircraft for ease of offload (DTR Part III, 2015).

2.4 Vertical Utilization

2.4.1 Bi-Level Airlift Loading System (BALS)

The BALS is a revolutionary concept of stacking two 463L aircraft pallets on top of each other to maximize aircraft utilization. The BALS prototype design passed tests in 2004; however, the design was not implemented due to fiscal constraints for the total cost of ownership within Air Mobility Command (AMC) (Vatcher, 2012). The BALS system was selected as the "Proposed Design" to enhance Airlift fuel efficiency through increased utilization of cargo capacity (Reiman, Main, Anderson, 2013). They further state that the capability to break down the system for storage is an added benefit. Unlike the 463L system, the BALS must include the required load limitation on down force for the pallet and cargo that is on top of the stack. Figure 1 shows the current load testing that was required of the new system in accordance with Section V of the Aircraft Dash 1 (Reiman, et al., 2013).

Table 1 Load Limitations

Direction	G Limits
Forward	3
Aft	1.5
Lateral	1.5
Up	2
Down	4.5

Figure 1. Bi-Level Airlift Loading System

The following are features/limitations for the BALS (seen in figure 1) in a project review (Vatcher, 2012).

- Attaches to Standard 463L Pallets
- Fits all USAF cargo aircraft logistic rail systems
- One 3/4 in wrench for assembly
- Assembles in 15 minutes
- Folds flat for storage
- Upper pallet height adjustable 48in to 64in (4in increments)
- Struts removable for side loading
- Weight <850lbs
- Capacity: 6000lbs (lower) 3000lbs (upper)
- Meets Mil-Hdbk 1791 Crash Loads requirements

2.4.2 Tonneau covers

Similar to the BALS is the idea of utilizing a tonneau cover or truck bed cover to place cargo on top of a truck bed that otherwise wouldn't fit into the truck bed. Utilizing this technology would likely enhance the desired airlift capabilities of many military units as to include the 621st CRW. The main benefactor for this technology would be for the transportation of the CRW's All-Terrain Vehicles (ATVs). With a variety of different options available, tonneau covers can provide much needed relief of unused floor space while utilizing vertical cargo space as seen in figures 3 and 4. One drawback to the addition of this technology to a military vehicle is that all vehicles with this addition would require a new Air Transportation Test Loading Agency(ATTLA) certification to become air worthy on United States Air Force cargo aircraft.

(DiamondBack ATV Series, 2016)

Figure 2. Single Tonneau Cover Large ATV

Figure 3. Tonneau Cover Dual ATVs

2.5 Air Transportation Test Loading Agency (ATTLA)

The Air Transportability Test Loading Activity (ATTLA) is the Department of Defense agency responsible for the approval of airlift cargo (DODI 4540.07) on fixed wing USAF cargo aircraft. An item should be evaluated as an air transportability problem item if it exceeds any of the parameters listed below (see list of parameters). ATTLA gives assistance to all branches of the federal government, and works directly with contractors and procurement offices to ensure the design of new pieces of equipment allows for air transportability. ATTLA also provides evaluation on aircraft aerial delivery systems, air delivery support equipment, airdrop systems and parachute systems, as well as authoring and maintaining MIL-STD-1791 (ATTLA, 2014).

The following parameters are used to determine if an ATTLA certification is required for each cargo item:

- Length: Greater than 20 ft. (commonly palletized outsized cargo such as pipes, wood, helo blades, light oversized cargo, etc. does not require ATTLA Certification)
- Height or Width: 8 ft
- Weight: Greater than 10,000 lbs
- Floor contact pressure: Greater than 50 psi
- Axle loads: Greater than 5000 lbs
- Wheel loads: Greater than 2500 lbs
- Any item which requires special equipment or procedures for loading and/or securing for flight.
- Unfamiliar items designed to be loaded directly into the aircraft rail system.
- Cargo that exceeds the conditions of certification stated in an existing cert letter.

Exceptions:

- If the cargo exceeds the criteria listed above and load planners/joint inspectors have confirmed an ATTLA Certification letter is not listed on the ATTLA SharePoint site, then the load planner/joint inspector will utilize the following criteria to make the determination if an ATTLA Certification letter is required.

- Items that exceed the allowable loading limits of the aircraft as described in the applicable aircraft TO 1CXXX-9 (Dash -9).

- Items that require special equipment or loading procedures not listed in the applicable aircraft's Dash -9.

- Items designed to interface with the aircraft rail systems (i.e., LSA Adapters) not contained in the applicable aircraft's Dash -9.

- Any type of watercraft/fixed-wing and rotary-wing aircraft not identified in the applicable aircraft's Dash -9.

- Enclosed items (airtight containers, on-board tanks, etc.) not designed with pressure relief devices or items that cannot be configured in a way to allow for aircraft cabin pressure changes.

- Non-palletized items with questionable structural integrity or items with significant damage to the frame or structural components (i.e., Battle damaged equipment).

- Items that cannot be restrained using standard restraint procedures listed in the aircraft's Dash -9 or items requiring specific restraint procedures.

- Items that operate in flight.

- When load planners/joint inspectors make determinations on ATTLA Certification, they must also account for any planned trans-load at downline stations, (i.e., C-17 to C-130, etc.). If an ATTLA Certification letter is required at the trans-load station, load planners/joint inspectors will ensure that the ATTLA Certification letter accompanies the shipment.

- If load planners/joint inspectors cannot determine that an item required an ATTLA Certification letter, contact ATTLA.

Since many of the vehicles already have a certification letter the vital change would be that the tonneau covers would now exceed the conditions of certification stated in the existing certification letter. Therefore, additional certifications could be required for each piece of equipment.

2.6 Limitations

One limitation for this study will be the added difficulty of modifying cargo loads to maintain all current safety and security measures. These limitations include hazardous cargo loading criteria, as well as security requirements for sensitive or classified cargo. Many

limitations in transportation are placed on hazardous cargo. There are nine classes and a total of twenty subclasses of hazardous cargo (AFJMAM 24-204, 2012). The subclasses are shown in Figure 4.

HAZARD CLASS/ DIVISION NUMBER	HAZARD CLASS/ DIVISION NAME	HAZARD CLASS/ DIVISION NUMBER	HAZARD CLASS/ DIVISION NAME
1.1	Explosives (with mass explosion hazard)	4.1	Flammable solid
1.2	Explosives (with a projection hazard)	4.2	Spontaneously combustible material
1.3	Explosives (with predominately a fire hazard)	4.3	Dangerous when wet material
1.4	Explosives (with no significant blast hazard)	5.1	Oxidizer
1.5	Very insensitive explosives; blasting agents	5.2	Organic peroxide
1.6	Extremely insensitive detonating substances	6.1	Poisonous (toxic) material
2.1	Flammable gas	6.2	Infectious substances (etiologic agents)
2.2	Nonflammable gas	7	Radioactive material
2.3	Poisonous gas	8	Corrosive material
3	Flammable liquid	9	Miscellaneous hazardous material

Figure 4. Hazardous Cargo Classes (AFJMAM 24-204, 2012)

The subclasses are then compared further for compatibility. Table 2 explains all of the possible compatible combinations. The letter "X" at the intersection of two classes shows that these hazards must not be loaded, transported, or stored together. The letter "O" at the intersection of two classes shows that these hazards must be separated by at least 88 inches. An "*" indicates that it is a Class 1 material and the Class 1 segregation chart must be utilized for compatibility determination. For this study, the compatibility chart will be utilized as constraints.

All 621st CRW missions will be considered a "Chapter 3" movement. A Chapter 3 movement is approved by USTRANSCOM Deployment Distribution Operations Center (DDOC), for tactical, contingency, or emergency airlift (AFJMAN 24-204, 2012). This

movement type is given the authority to deviate from most compatibility requirements as long as the hazards are separated by the maximum extent possible.

Table 2. Segregation Table for Hazardous Materials AFMAN 24-204, (2012)

Class or Division Note 7 Note 10	Notes	1.1 1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3 Gas Zone A	2.3 Gas Other than Zone A	3	4.1	4.2	4.3	5.1	5.2	6.1 Liquid PG I Zone A	7	8 Liquid Only
		16					9								1		4	23	4, 5 6, 8
1.1 and 1.2	16	*	*	*	*	*	X		X	X	X	X	X	X	X	X	X	X	X
1.3		*	*	*	*	*	X		X	X	X	X	X	X	X	X	X	0	X
1.4		*	*	*	*	*	0		0	0	0		0				0		0
1.5		*	*	*	*	*	X	X	X	X	X	X	X	X	X	X	X	X	X
1.6		*	*	*	*	*													
2.1	9	X	X	0	X				X	0			0	0	0	0	0	0	0
2.2					X														
2.3 Zone A		X	X	0	X		X				X	X	X	X	X	X			X
2.3 Other than Zone A		X	X	0	X		0				0	0	0	0	0	0			0
3		X	X	0	X				X	0		0	0	0	0	0	X		
4.1		X	X		X				X	0	0						X		0
4.2		X	X	0	X		0		X	0	0						X		X
4.3		X	X		X		0		X	0	0						X		0
5.1	1	X	X		X		0		X	0	0						X		0
5.2		X	X		X		0		X	0	0						X		0
6.1 Liquid PG I Zone A	4	X	X	0	X		0				X	X	X	X	X	X			X
7	23	X	0		X		0												
8 Liquid Only	4 5 6 8	X	X	0	X		0		X	0		0	X	0	0	0	X		

NOTES:

1. Ammonium nitrate fertilizer may be loaded, transported, or stored with Class 1.1 or 1.5 materials.

2. Do not load, transport, or store fissile class III radioactive material (Class 7) on the same aircraft with any other hazardous material.

3. Normal uranium, depleted uranium, and thorium metal in solid form radioactive materials (Class 7) may be loaded and transported with Class 1.1, 1.2, and 1.5 (explosives).

4. Do not load, transport, or store cyanides or cyanide mixtures (Class 6.1) with any Class 8 materials.

5. Separate nitric acid (Class 8) in carboys by 2.2 m (88 inches) in all directions from other corrosives materials in carboys when loaded on the same aircraft.

6. Do not load, transport, or store charged electric storage batteries (Class 8) on the same aircraft with any Class 1.1 or 1.2.

7. Ship the following materials with each other and with all other hazardous materials without compatibility restrictions (ensure compliance with notes 4, 5, and 6):

7.1. Class 6.1 toxic solids and liquids (other than PG I, zone A) See Note 4 concerning restrictions for cyanides or cyanide mixtures.

7.2. Class 8 solids

7.3. Class 9 (including ORM-D)

7.4. Excepted Quantities

7.5. Containers or articles drained but not purged containing 500 ml (17 ounces) or less of Class 3

8. Class 8 corrosive liquids must not be loaded above or adjacent to Class 4 (flammable solid) material or Class 5 (oxidizing) material.

9. Class 2.1 aerosol cans may be shipped with other incompatible items when separated in all directions by a minimum of 88 inches.

10. Items classified by a predominate hazard other than Class 1 but contain small amounts of explosive materials and assigned an explosive compatibility letter for storage may be shipped with Class 1 material according to Table A18.2. For example Class 4.2G may be shipped with Class 1.3G.

III. METHODOLOGY

3.1 Introduction

This section creates a methodology of a reproducible set of business rules for users to utilize for aggregating and consolidating UTCs during contingency deployment operations. Next, these business rules are placed against the specific requirements of the 621st Contingency Response Wings JTF-PO package UTCs. Finally, an analysis of load planning, aggregation/consolidation, and proper use of the BALS is utilized to reduce the airlift requirement for the 621st JTF-PO package.

3.2 Method

The scope of this study is limited to the 52 UTCs assigned to the 621st CRW units for the JTF-PO alert package. This scope ensures a set standard package that is utilized (for alert purposes) on a bi-annual basis by multiple units within the CRW. Furthermore, this shows the reproducibility of this research. The methods used are broken down into two segments; first is a qualitative approach using a working group, and second is a quantitative approach utilizing the Integrated Computerized Deployment System (ICODES) load planning software to optimize each deployment chalk.

A qualitative approach is utilized to create a methodology with subject matter experts (SMEs) at 618th AOC/XOPM as well as logistics planners at the 621st (CRW). This working group constructs and states all current limiting factors that are inherent to the unique mission of the CRW.

Currently the consolidation of contingency mission cargo is handled on a case by case basis through email and phone traffic and doesn't have a set standard which allows

for consistency in a reproducible method to ensure max mission utilization as a whole.

This research creates a working group of subject matter experts in the Aerial Port, Loadmaster, and Logistics Planners career fields. This group creates business rules that are effective, efficient and reproducible. For this thesis, the primary focus is the development of this methodology, specifically for the 621st CRW JTF-PO support package UTCs, which are bound with a short notice mission deployment of as little of 12 hours after notification.

The Quantitative approach for this research uses the Integrated Computerized Deployment System (ICODES) to complete load plans that will utilize the above mentioned constraints set by the working group. With these constraints and new guidelines, the new load plans will be compared to the original load plans created for planning purposes by the CRW.

3.3 Methodology Implementation

Many of the steps below are completed simultaneously, but have been broken down to allow for any or all steps to be completed while leaving others out if they aren't beneficial to reducing an additional sortie generation.

3.3.1 Step 1

This step requires a pre-load plan to take account of all empty pallet positions on an Aircraft. Empty pallet positions can be seen circled below in Figure 5.

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	00006
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 6 AF3
Departure date & time:	20150925 15:11 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK

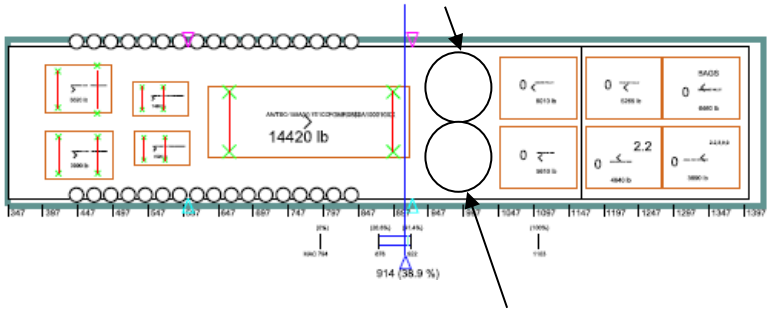


Figure 5. Identifying Empty Pallet Positions

3.3.2 Step 2

Identify all cargo items that are under the height of 64 inches and under 6000 pounds. The typical item could look like the pallet in Figure 8. These items can now be utilized with the BALS system. Once you have identified these items you are able to determine empty pallet positions by dividing the current pallet positions used by these items by 2 which gives you your new available pallet positions.

Figure 6. Low Profile Pallet

3.3.3 Step 3

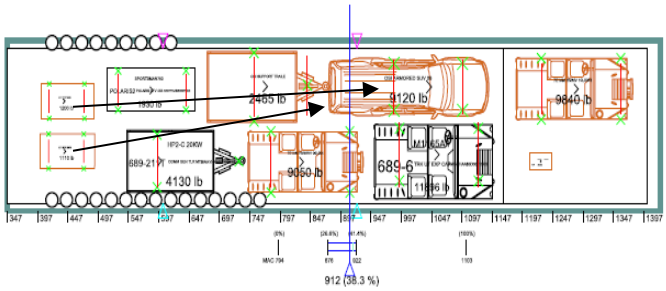
Take all water and food ration pallets and aggregate these pallets with the open space available on each tent pallet (see figure 9). This will allow PPs to be freed up on the load plans as well as allow for expedient delivery once at location.

Figure 7. Tent Pallets

3.3.4 Step 4

Place all ATVs on available trucks with tonneau covers as seen in Figure 4. This properly utilizes available vertical space, while freeing up pallet positions on the sortie.

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	-		-/ATV 07X13978	90	48	48	1110	401	491	443	Y		N	A	R	
2/M	-		-/ATV 11X13986	88	48	50	1200	402	490	442	Y		N	A	R	
3/M	AWAYHAA$0D00270XX	POLARIS2	SPORTSMAN700/POLARIS ATV 4X4	145	60	76	1930	512	657	587	Y		N	A		R3B
4/M	AWAYHAA$0D00230XX	689-211T	HP2-C 20KW/COMM GEN TLR MTD	195	86	79	4130	544	739	602	Y		N	A		R2D
5/M	-		-/OSI SUPPORT TRAILE	200	98	98	2465	677	877	776	Y		N	A		
6/M	-		-/7E1AM HMMWV 06L004	190	85	103	9050	744	934	836	Y		N	A		
7/M	-		-/OSI ARMORED SUV 08	264	89	72	9120	877	1141	1047	Y		N	A	P	
8/M	AWAYHAA$0D00010XX	689-6	M1165A1/TRK UT EXP CAP	198	105	97	11896	952	1150	1059	Y		N	A		R2D
9/M	-		-/7E1AM HMMV 10L0051	193	86	93	9840	1186	1379	1289	Y		N	A	R	

Figure 8. Load Plan Identifying Tonneau Cover/ATVs

3.3.5 Step 5

If needed consolidate and or aggregate all baggage pallets onto available cargo as a secondary load. This frees up additional PPs, but needs to be secured once at destination. This step could be left off if it will not reduce the required sorties for a required mission since it could be difficult to track each passenger's baggage with the location within each cargo item.

3.3.6 Step 6

Once all newly available/empty pallet positions are identified, a determination is needed to see if you are able to reduce at least one sortie generation. For example, if the mission is given 10 C17 aircraft sorties then the above steps would need to account for at least 18 empty pallet positions to reduce one sortie. If the mission was utilizing a mixture of aircraft then you would use the number of pallet positions of the smallest aircraft as the limiting factor.

3.3.7 Step 7

Once a determination has been made that enough pallet positions are available to reduce a sortie, a load plan can be developed utilizing the empty pallet positions on each sortie. For the CRW it is important to maintain fidelity of priority or chalk order of all cargo. This cargo has been determined by the Contingency Response (CR) Commander as important to complete their required mission. It is also important to maintain ease of download operations of all sorties, but Chalk 1/JAT is the most critical since many missions are conducted with little to no intelligence of the destination location which could result in the expedient departure of all cargo and personnel from the airfield. For this reason, only rolling stock (RS) will be placed on the JAT sortie. This research has determined that the largest drivable RS should be placed on the JAT mission. An All-Terrain (AT) forklift is the most beneficial if it is able to fit. This would allow for 463L pallets to be load planned on all subsequent missions as well as provide for the drivability to exit the airfield if needed.

Once the JAT is complete, all subsequent sortie load plans can be filled utilizing a leapfrog type method. This would bring cargo from later prioritized chalks up to higher priority chalks. For example, you can move a piece of cargo from chalk 3 to chalk 2 but you cannot move a piece of cargo from chalk 2 to chalk 3. This maintains chalk order and allows for the reduction of pallet positions on each sortie with the end goal of reducing entire chalks. This step will require load planners to maintain proper distance for accommodating the proper amount of passengers that the CR Commander has identified for each chalk. This method will allow more flexibility in aircraft selection and reduce sortie generation while maximizing sortie utilization.

IV. ANALYSIS AND RESULTS

4.1 Comparison of New vs. Old load planning

This chapter provides a comparison of the current business rules utilized by the 621st CRW with the new deployment planning and load planning methodology. A step by step analysis for each load plan is given and compared to the current method utilized. The results are clear that there are many opportunities to utilize critical underutilized vertical space on each sortie while maintaining ease of offload as well as integrity of chalk order. When comparing each load plan it can be difficult to compare since the naming of the load plans are different. Table 2 will help ensure that the proper System Chalk #: is matched up with the correct comparable load plans.

Table 3. Chalk Naming Comparisons

New Load Plan System chalk #:	Old Load Plan System chalk #:
CHALK 1 JAT	CHALK 1 JAT
CHALK 2 AF1	CHALK 2 AF1
CHALK 3 AF2	CHALK 3 AF2
CHALK 4 AF3	CHALK 6 AF3
CHALK 5 AF4	CHALK 7 AF4
CHALK 6 AF5	CHALK 10 AF5

4.1.1 Load Plan Layout explanation

Load plans are provided for each chalk starting with the Air Force Chalk 1 which is the JAT sortie. The first load plan is displayed in its entirety for the purpose of understanding what each part of a load plan is, but subsequent load plans will only display the load plan main deck as

well as cargo description, therefore leaving out associated hazards and signature pages. Old load plans will be placed in their entirety in Appendix A, while new load plans can be seen in Appendix B. The associated hazards are not relevant in this study since all hazards are compatible under the chapter 3 movement. All "New" load plans will have each piece of cargo labeled as to which chalk it was originally assigned.

Due to ICODES software issues, the new load plans "Total Cargo Wt:," is not correct since ICODES is not computing the cargo that was placed utilizing the "onto", "into", or "stacked on" features within the software. All weights that are displayed on the actual load plan for individual pieces are correct. Table 3 can be utilized for proper efficiency comparisons between chalks.

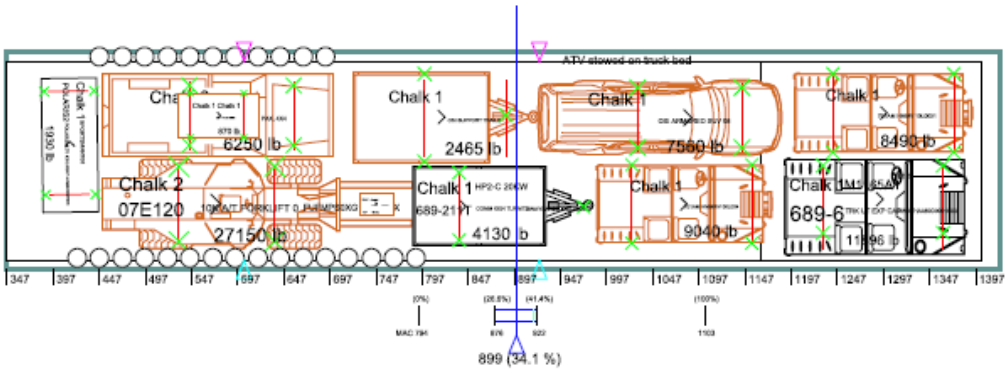
4.2.1 Chalk 1 JAT

4.2.1.1 New Load Plan

Aircraft type/Config: C-17/STD-AL
Delivery method: AL
Unit Being Airlifted: 321 CRS
Type movement plan: TURBO DISTRO
Departure date & time: 20150929 13:31 UTC
Departure airfield : WRI
Destination airfield: WRI
Load Description:

Mission type: Mobility
Mission #: TURBO DISTRO
Aircraft Tail #:
System chalk #: CHALK1 JAT
AFMAN 24-204 Chapter 3 Move

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	AWAYHAA$0D00270XX	POLARIS2	SPORTSMAN700/POLARIS ATV 4X4	145	60	76	1930	384	446	416	Y		N	A		R3B
2/M	FUFMPS0XG100010XX	07E120	-/10K A/T FORKLIFT 0	336	97	127	27150	450	786	579	Y		N	A	PS	
3/M	-		-/NON/TRUCK, 6 PAX, 4X4	250	89	87	6250	451	701	604	Y		N	A	P	

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4/M	-		-/OSI SUPPORT TRAILE	200	98	98	2465	723	923	822	Y	N	A			
5/M	FXFFKT0XB100010XX		Chalk1/CONTRACTING KIT	36	24	14	40	730	766	748	N	N	A			
6/M	AWAYHAA$0D00230XX	689-211T	HP2-C 20KW/COMM GEN TLR MTD	195	86	79	4130	787	982	845	Y	N	A			R2D
7/M	-		-/OSI ARMORED SUV 08	264	89	122	7560	923	1187	1089	Y	N	A	P		
8/M	-		-/7E1AM HMMWV 06L004	190	85	103	9040	986	1176	1084	Y	N	A			
9/M	-		Chalk 1/ATV 07X13978	90	48	48	910	1010	1100	1055	Y	N	A	R		
10/M	-		Chalk 1/ATV 11X13986	88	48	50	870	1011	1099	1057	Y	N	A	R		
11/M	AWAYHAA$0D00010XX	689-6	M1165A1/TRK UT EXP CAP	198	105	97	11896	1190	1388	1297	Y	N	A			R2D
12/M	-		-/7E1AM HMMV 10L0051	193	86	93	8490	1200	1393	1301	Y	N	A	R		

Total # of Pax:	27	Weight/Pax:	210	Total PAX Weight:	5670
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	78951	%ACL:	65	ACL:	130000
Cargo/Mail Weight:	78951	Cargo/Mail Moment:	7558		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	371346	Zero Fuel Moment:	33449		
CG Station:	901	%MAC:	34.6		

SQ/D **Flags/Warnings**

SQ/D	Class/Zone
1/M	8
1/M	9
1/M	9
2/M	2.2
2/M	3
2/M	8
2/M	9
3/M	9
4/M	3
4/M	8
4/M	9

6/M	8
6/M	9
6/M	9
6/M	9
7/M	9
8/M	2.2
8/M	3
8/M	8
8/M	9
9/M	3
9/M	8
9/M	9
10/M	3
10/M	8
10/M	9
11/M	2.2
11/M	3
11/M	8
11/M	9
12/M	2.2
12/M	3
12/M	8
12/M	9

ALL HAZARDOUS MATERIALS COVERED BY THIS LOAD PLAN HAVE BEEN INSPECTED AND FOUND TO BE PACKAGED IN THE PROPER OUTSIDE CONTAINER FREE OF VISIBLE DAMAGE AND LEAKS AND IS PROPERLY CERTIFIED

Air Terminal Representative Signature

I HAVE BEEN BRIEFED ACCORDING TO AFMAN 24-204(I), PARAGRAPH 1.2.9, ON HAZARDOUS CARGO COVERED BY THIS LOAD PLAN

Aircraft Crewmember Signature

Load planned by: _____ **Date:** _____

Load approved by: _____ **Date:** _____

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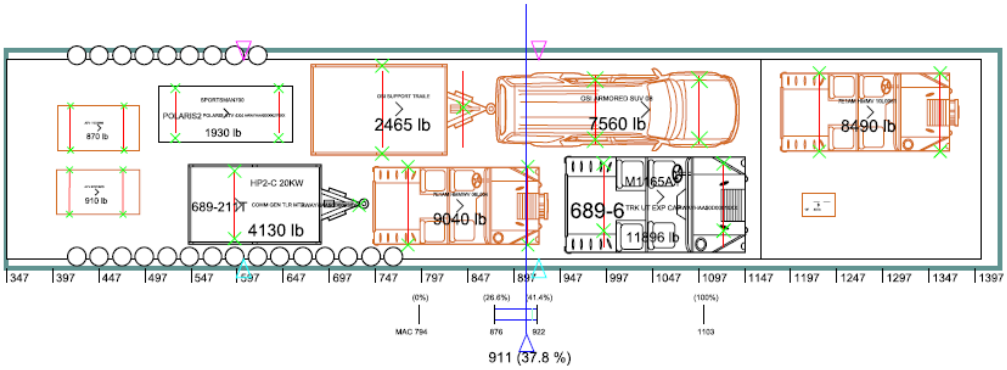
4.2.1.2 Old Load Plan

JTF-PO TD 16-1
20160125 18:34 UTC

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK1 JAT
Departure date & time:	20150929 13:31 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	-		-/ATV 07X13978	90	48	48	910	401	491	446	Y		N	A	R	
2/M	-		-/ATV 11X13986	88	48	50	870	402	490	449	Y		N	A	R	
3/M	AWAYHAA$0D00270XX	POLARIS2	SPORTSMAN700/POLARIS ATV 4X4	145	60	76	1930	512	657	587	Y		N	A		R3B

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4/M	AWAYHAA$0D00230XX	689-211T	HP2-C 20KW/COMM GEN TLR MTD	195	86	79	4130	544	739	602	Y		N	A		R2D
5/M	-		-/OSI SUPPORT TRAILE	200	98	98	2465	677	877	776	Y		N	A		
6/M	-		-/7E1AM HMMWV 06L004	190	85	103	9040	744	934	842	Y		N	A		
7/M	-		-/OSI ARMORED SUV 08	264	89	72	7560	877	1141	1044	Y		N	A	P	
8/M	AWAYHAA$0D00010XX	689-6	M1165A1/TRK UT EXP CAP	198	105	97	11896	952	1150	1059	Y		N	A		R2D
9/M	-		-/7E1AM HMMV 10L0051	193	86	93	8490	1186	1379	1287	Y		N	A	R	
10/M	FXFFKT0XB100010XX		-/CONTRACTING KIT	36	24	14	40	1210	1246	1228	N		N	A		

Total # of Pax:	24	Weight/Pax:	210	Total PAX Weight:	5040
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	47331	%ACL:	40	ACL:	130000
Cargo/Mail Weight:	47331	Cargo/Mail Moment:	4828		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	337316	Zero Fuel Moment:	30719		
CG Station:	911	%MAC:	37.8		

4.2.1.3 Chalk 1 JAT Comparision

The methodology utilized for the JAT mission consisted of bringing large rolling stock from later chalks and placing them on to the JAT mission. This action requires additional space to be created to place the required ATVs. A 6 passenger truck is taken from chalk 6 and utilizing

a tonneau cover and placing 2 ATVs as seen in figure 4 above. By moving all other assets to the rear, additional PPs were available to also move up a 10K A/T forklift from chalk 2. By placing a forklift on chalk one allows the availability of 463L pallets to be placed on chalk 2 without issue. The addition of three passengers is also included to assist with the driving of additional vehicles.

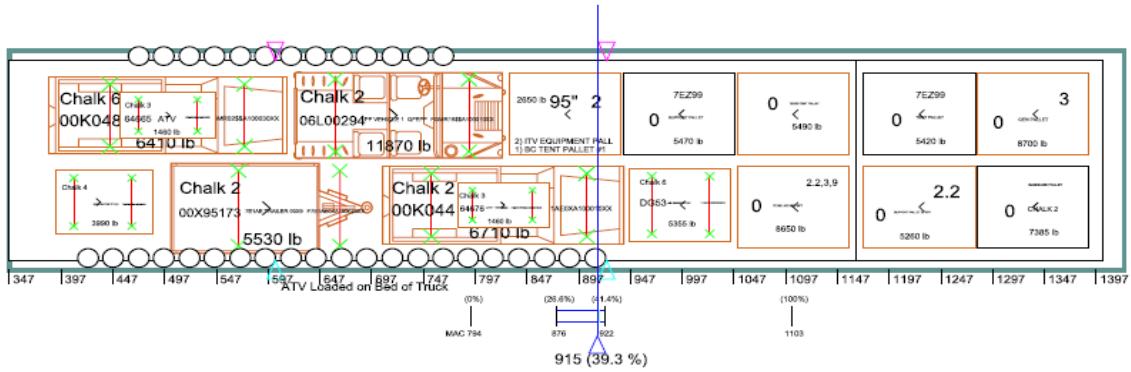
4.2.2 Chalk 2

4.2.2.1 New Load Plan

JTF-PO TD 16-1
20160107 16:10 UTC

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	00003
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 2 AF1
Departure date & time:	20150924 19:40 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	FGMR02$$A100030XX	00K048	-/TRUCK 7E1AE	230	83	130	6410	385	615	517	Y		N	A		
2/M	FGMR08$$A100020XX		-/GENERATOR 7E1CC	95	68	82	3990	391	486	435	Y		N	A	R	
3/M	FGMR15$$A100040XX	64665	-/ATV	93	50	50	1460	454	547	502	Y	50%	N	A		
4/M	F7E1AE0XA100020XX	00X95173	-/7E1AE TRAILER 00X9	194	97	97	5530	503	697	599	Y		N	A		

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5/M	FGMR15$$A100010XX	06L00294	-/PF VEHICLE 1 QFEPF	204	94	92	11870	622	826	722	Y		N	A		
6/M	F7E1AE0XA100010XX	00K044	-/M1008 (Truck, Loaded)	233	84	119	6710	708	941	830	Y		N	A		
7/M	FQFEPF0XA100070XX	64676	-/ATV 11X13984	88	48	46	1460	780	868	825	Y		N	A	R	
8/M	F7E1BC1XA100020XX		BALS 3/BC TENT PALLET #1	108	88	95	2650	830	938	884	N		N	A		
8/M	FUFBVE0XG100010XX		-/ITV EQUIPMENT PALL	108	88	31	1320	830	938	884	N		N	A		
9/M	-		7EZ99/SUPPORT PALLET	108	88	70	5470	940	1048	994	N		N	A		J3D
10/M	FHMHC10XS200050XX	DG53	-/-86 GENERATOR	98	78	71	5355	946	1044	995	Y		N	A		
11/M	F7E1BD0XA100060XX		-/7E1BD TENT PALLET	108	88	96	5490	1050	1158	1104	N		N	A		
12/M	F7E1BC1XA100010XX		-/7E1BC JOC GEN SPT	108	88	59	8650	1050	1158	1104	Y		N	A		
13/M	-		7EZ99/TENT PALLET	108	88	96	5420	1172	1280	1226	N		N	A		J3D
14/M	FGMR15$$A100030XX		-/SUPPORT PALLET QFEPF	108	88	90	5260	1172	1280	1226	Y		N	A		
15/M	F7E1BD1XA100130XX		-/GEN PALLET	108	88	55	8700	1282	1390	1336	Y		N	A	P	
16/M	-		BAGGAGE PALLET/CHALK 2	108	88	62	7385	1282	1390	1336	N		N	A		J3D

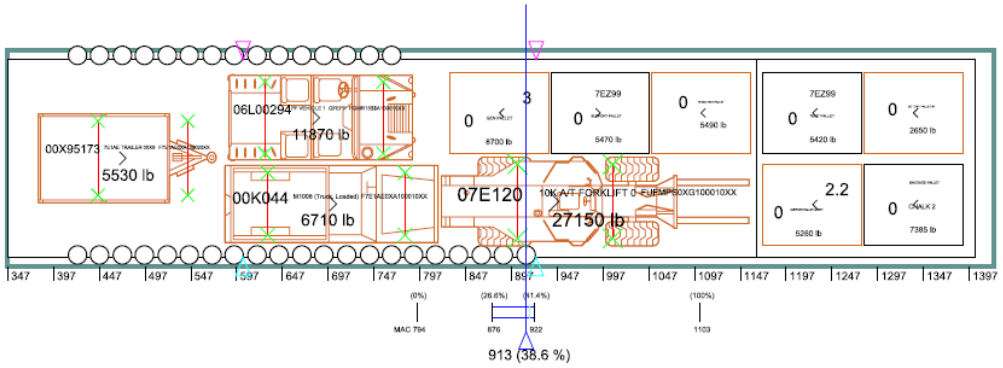
Total # of Pax:	34	Weight/Pax:	210	Total PAX Weight:	7140
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	88890	%ACL:	74	ACL:	130000
Cargo/Mail Weight:	88890	Cargo/Mail Moment:	9240		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	383895	Zero Fuel Moment:	35131		
CG Station:	915	%MAC:	39.3		

4.2.2.2 Old Load Plan

JTF-PO TD 16-1
20160125 18:33 UTC

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	00003
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 2 AF1
Departure date & time:	20150924 19:40 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	F7E1AE0XA100020XX	00X95173	-/7E1AE TRAILER 00X9	194	97	97	5530	381	575	476	Y		N	A		
2/M	F7E1AE0XA100010XX	00K044	-/M1008 (Truck, Loaded)	233	84	73	6710	584	817	706	Y		N	A		
3/M	FGMR15$$A100010XX	06L00294	-/PF VEHICLE 1 QFEPF	204	94	92	11870	588	792	687	Y		N	A		
4/M	FUFMPS0XG100010XX	07E120	-/10K A/T FORKLIFT 0	336	97	127	27150	821	1157	949	Y		N	A	PS	

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5/M	F7E1BD1XA100130XX	-/GEN PALLET	108	88	55	8700	830	938	884	Y	N	A	P		
6/M	-	7EZ99/SUPPORT PALLET	108	88	70	5470	940	1048	994	N	N	A			J3D
7/M	F7E1BD0XA100060XX	-/7E1BD TENT PALLET	108	88	96	5490	1050	1158	1104	N	N	A			
8/M	-	7EZ99/TENT PALLET	108	88	96	5420	1172	1280	1226	N	N	A			J3D
9/M	FGMR15$$A100030XX	-/SUPPORT PALLET QFEPF	108	88	90	5260	1172	1280	1226	Y	N	A			
10/M	F7E1BC1XA100020XX	-/BC TENT PALLET #1	108	88	60	2650	1282	1390	1336	N	N	A			
11/M	-	BAGGAGE PALLET/CHALK 2	108	88	62	7385	1282	1390	1336	N	N	A			J3D

Total # of Pax:	36	Weight/Pax:	210	Total PAX Weight:	7560
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	91635	%ACL:	76	ACL:	130000
Cargo/Mail Weight:	91635	Cargo/Mail Moment:	9183		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	384140	Zero Fuel Moment:	35074		
CG Station:	913	%MAC:	38.6		

4.2.2.3 Chalk 2 Comparision

With the additional space from moving the 10K AT forklift in from chalk 2, this sortie is able to include an additional 7 pieces of cargo, while reducing 2 passengers by placing them onto chalk 1. Multiple methods are used in creating the new chalk 2 load plan. Additional PPs are now available for two generators, two ATVs, a truck, a 463L pallet. Another method utilized was to consolidate the ITV equipment pallet with a tent pallet. By consolidating this equipment, an additional PP is availble from chalk 3.

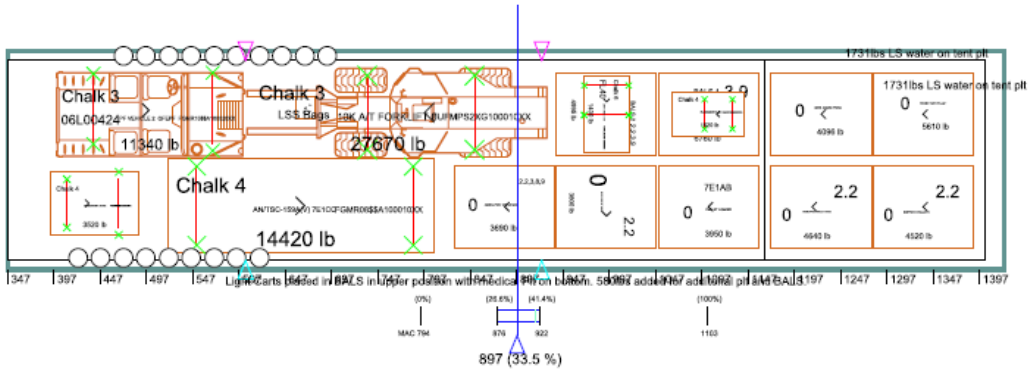
4.2.3 Chalk 3

4.2.3.1 New Load Plan

JTF-PO TD 16-1
20160126 16:41 UTC

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	00005
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 3 AF2
Departure date & time:	20150925 14:29 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	FGMR08$$A100030XX		-/GENERATOR 7E1CC	95	68	92	3520	393	488	435	Y		N	A	R	
2/M	FGMR15$$A100020XX	06L00424	-/PF VEHICLE 2 QFEPF	204	92	92	11340	400	604	500	Y		N	A		
3/M	FGMR08$$A100010XX		-/AN/TSC-159A(V) 7E1CC	287	101	105	14420	520	807	668	N		N	A		
4/M	FUFMPS2XG100010XX		-/10K A/T FORKLIFT 0	324	96	128	27670	605	929	797	Y		N	A	PS	

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5/M	-		-/LSS Bags	20	24	45	3610	658	678	668	N		N	A		
6/M	FGMR29$G100010XXX		-/AERIAL PORT OPS UFBAD	108	88	90	3690	830	938	884	Y	0%	N	A		
6/M	FGMR30$$G100010XX		-/BGAN TRANSIT CASE UFBL1	17	8	23	30	830	938	884	N		N	A		
6/M	FGMR31$$G106770XX		-/BOX WOOD UFBLJ	40	24	27	208	830	938	884	N		N	A		
7/M	FFFGR10XB100020XX		BALS 2/MEDICAL PALLET	88	108	105	4995	940	1048	994	Y		Y	A		
8/M	FGMR09$$S200040XX		-/MX FLY AWAY KIT HMHC1	88	108	90	3800	940	1048	994	Y		N	A		
9/M	FUFBLK1XG106560XX	FL40	-/LIGHT CART LT 05	82	48	65	1400	970	1018	994	Y		N	A	P	
10/M	FUFBLK2XG106560XX	FL13	-/LIGHT CART LT 05	82	48	65	1425	970	1018	994	Y		N	A	P	
11/M	-		BALS 1/-	108	88	125	6760	1050	1158	1104	N		N	A		
11/M	FHFHC10XS200060XX	LT01	-/FLOODLIGHT FL-1D	78	48	61	1430	1050	1158	1104	Y		N	A		
11/M	FHMHC10XS200020XX	LTO4	-/FLOODLIGHT FL-1D	78	48	61	1430	1050	1158	1104	Y		N	A		
12/M	-		7E1AB/PALLET LOADED	108	88	72	3950	1050	1158	1104	N		N	A		J3D
13/M	FHMHC10XS200030XX		-/FLOODLIGHT FL-1D	78	48	61	1520	1065	1143	1113	Y		N	A		
14/M	FHFHC10XS200070XX		-/FLOODLIGHT FL-1D	78	48	61	1480	1065	1143	1113	Y		N	A		
15/M	FGMR14$$T100010XX		-/INTEL CONEX PFCRG	108	88	60	4096	1172	1280	1226	N		N	A		
15/M	FGMR28$$T100010XX	Hand	-/AN/PSC-15 GRRIP PFMAK	16	13	7	1	1172	1280	1226	N		N	A		
15/M	FGMR37$$B100010XX		-/LOADED CONTRACTING XFFKT	21	14	10	1	1172	1280	1226	N		N	A		
16/M	FGMR08$$A100050XX		-/HAZ/SUPPORT PALLET 7E1CC	108	88	90	4640	1172	1280	1216	Y		N	A		
17/M	-		-/Loose Water	104	24	36	1731	1282	1390	1336	N		N	A		
17/M	F7E1BD1XA100060XX		-/7E1BD TENT PALLET	108	88	96	5610	1282	1390	1336	N		N	A		
18/M	FGMR15$$A100050XX		-/SUPPORT PALLET 2	108	88	90	4520	1282	1390	1336	Y		N	A		

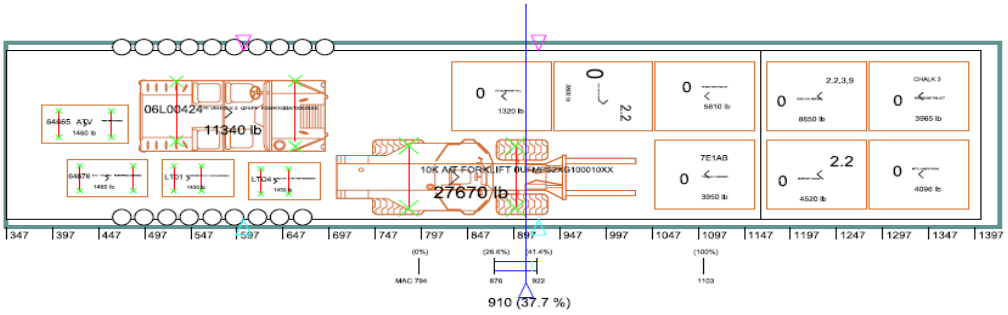
Total # of Pax:	19	Weight/Pax:	210	Total PAX Weight:	3990
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	102621	%ACL:	82	ACL:	130000
Cargo/Mail Weight:	102621	Cargo/Mail Moment:	9769		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	397381	Zero Fuel Moment:	35660		
CG Station:	897	%MAC:	33.5		

4.2.3.2 Old Load Plan

JTF-PO TD 16-1
20160125 18:33 UTC

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	00005
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 3 AF2
Departure date & time:	20150925 14:29 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	FGMR15$$A100040XX	64665	-/ATV	93	50	50	1460	386	479	434	Y	50%	N	A		
2/M	FQFEPF0XA100070XX	64676	-/ATV 11X13984	88	48	46	1460	413	501	458	Y		N	A	R	
3/M	FGMR15$$A100020XX	06L00424	-/PF VEHICLE 2 QFEPF	204	92	92	11340	491	695	591	Y		N	A		
4/M	FHFHC10XS200060XX	LT01	-/FLOODLIGHT FL-1D	78	48	61	1430	515	593	546	Y		N	A		

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5/M	FHMHC10XS200020XX	LTO4	-/FLOODLIGHT FL-1D	78	48	61	1430	610	688	640	Y	N	A		
6/M	FUFMPS2XG100010XX		-/10K A/T FORKLIFT 0	324	96	128	27670	705	1029	837	Y	N	A	PS	
7/M	FUFBVE0XG100010XX		-/ITV EQUIPMENT PALL	108	88	31	1320	830	938	884	N	N	A		
8/M	FGMR09$$S200040XX		-/MX FLY AWAY KIT HMHC1	88	108	90	3800	940	1048	994	Y	N	A		
9/M	F7E1BD1XA100060XX		-/7E1BD TENT PALLET	108	88	96	5610	1050	1158	1104	N	N	A		
10/M	-		7E1AB/PALLET LOADED	108	88	72	3950	1050	1158	1104	N	N	A		J3D
11/M	F7E1BC1XA100010XX		-/7E1BC JOC GEN SPT	108	88	59	8650	1172	1280	1226	Y	N	A		
12/M	FGMR15$$A100050XX		-/SUPPORT PALLET 2	108	88	90	4520	1172	1280	1226	Y	N	A		
13/M	-	CHALK4	CHALK 3/BAGGAGE PALLET	108	88	58	3965	1282	1390	1336	N	N	A		J3D
14/M	FGMR14$$T100010XX		-/INTEL CONEX PFCRG	108	88	60	4096	1282	1390	1336	N	N	A		

Total # of Pax:	19	Weight/Pax:	210	Total PAX Weight:	3990
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	80701	%ACL:	65	ACL:	130000
Cargo/Mail Weight:	80701	Cargo/Mail Moment:	7760		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	369636	Zero Fuel Moment:	33651		
CG Station:	910	%MAC:	37.7		

4.2.3.3 Chalk3 Comparision

Chalk 3 includes two new methods from this research. The first method is to break down every water pallet and distribute it onto each tent pallet. Additionally, two large pieces of rolling stock are moved from the last chalk to ensure the proper amount of passengers could be accommodated on this chalk since passengers cannot be placed next to palletized cargo. Furthermore, the baggage pallet is broken down and loose loaded or stowed on available rolling stock. A reduction of 355lbs each was annotated for the loss of this 463L pallet and nets for the water pallet and baggage pallet. Finally, the Bi-Level Airlift Loading System (BALS) is utilized to stack multiple pieces of cargo. This system allows four light carts to be placed in one PP while making two additional PP available. Additional weight is added to the load plan to account for the additional pallet and structure of each BALS.

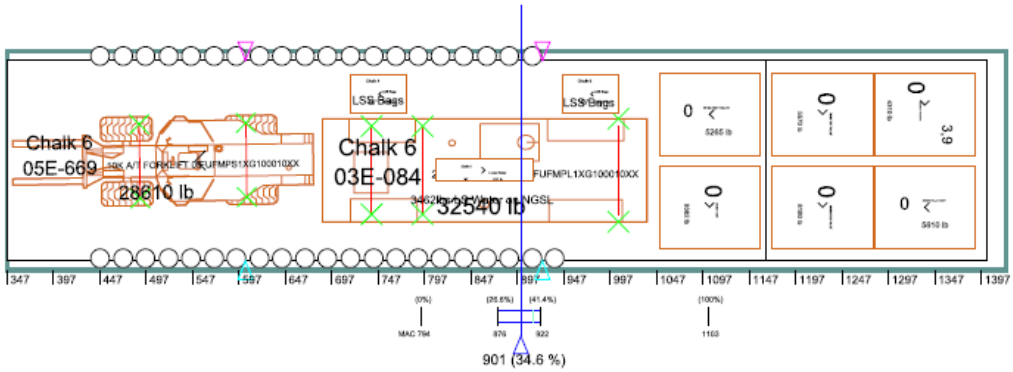
4.2.4 Chalk 4

4.2.4.1 New Load Plan

JTF-PO TD 16-1
20160126 16:42 UTC

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	00006
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 4 AF3
Departure date & time:	20150925 15:11 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	FUFMPS1XG100010XX	05E-669	-/10K A/T FORKLIFT 05	324	96	128	28610	353	677	550	Y		N	A	PS	
2/M	FUFMPL1XG100010XX	03E-084	-/25K NGSL 04E362	350	111	130	32540	687	1037	858	Y		N	A		
3/M	-		-/LSS Bags	60	40	45	6105	718	778	748	N		N	A		
4/M	-		-/Loose Water	104	24	36	1731	810	914	862	N		N	A		
			FOR OFFICIAL USE ONLY													
5/M	-		-/Loose Water	104	24	36	1731	810	914	862	N		N	A		
6/M	-		-/LSS Bags	60	40	45	3610	946	1006	976	N		N	A		
7/M	-		-/Loose Water	104	24	36	1731	1050	1158	1104	N		N	A		
7/M	F7E1BD1A100060XXX		-/7E1BD TENT PALLET	108	88	96	5265	1050	1158	1104	N		N	A		
8/M	-		-/Loose Water	104	24	36	1731	1050	1158	1104	N		N	A		
8/M	F7E1BD1A100070XXX		-/7E1BD TENT	88	108	96	9382	1050	1158	1104	N		N	A		
9/M	F7E1BD0XA100070XX		-/7E1BD TENT PALLET	88	108	96	5570	1172	1280	1226	N		N	A		
10/M	-		-/GENERATOR PALLET	88	108	75	8180	1172	1280	1226	Y		N	A		
11/M	F7E1BD0XA100020XX		-/CONEX 4-WAY/HAZ	88	108	66	4310	1282	1390	1336	Y		N	A		
12/M	FGMR15$$A100090XX		-/ARMORY PALLET QFEPF	108	88	96	5610	1282	1390	1336	N		N	A		

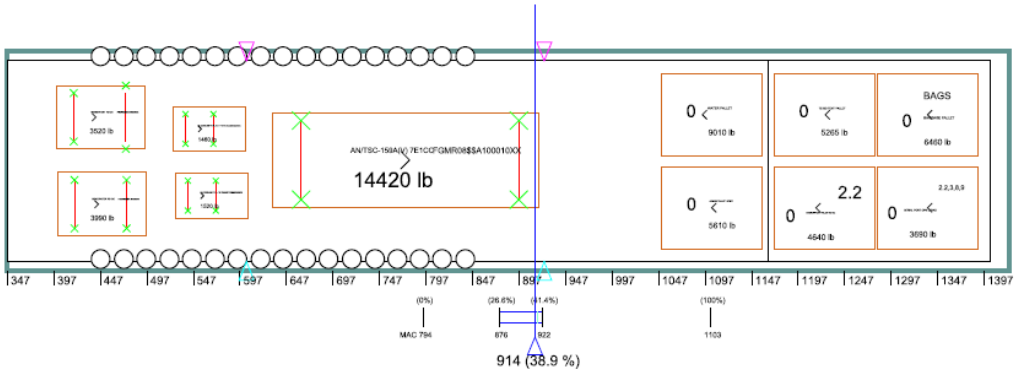
Total # of Pax:	41	Weight/Pax:	210	Total PAX Weight:	8610
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	109182	%ACL:	91	ACL:	130000
Cargo/Mail Weight:	109182	Cargo/Mail Moment:	10696		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	406199	Zero Fuel Moment:	36587		
CG Station:	901	%MAC:	34.6		

4.2.4.2 Old Load Plan

JTF-PO TD 16-1
20160125 18:33 UTC

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	00006
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 6 AF3
Departure date & time:	20150925 15:11 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	FGMR08$$A100030XX		-/GENERATOR 7E1CC	95	68	92	3520	400	495	442	Y		N	A	R	
2/M	FGMR08$$A100020XX		-/GENERATOR 7E1CC	95	68	82	3990	401	496	445	Y		N	A	R	
3/M	FHFHC10XS200070XX		-/FLOODLIGHT FL-1D	78	48	61	1480	525	603	555	Y		N	A		
4/M	FHMHC10XS200030XX		-/FLOODLIGHT FL-1D	78	48	61	1520	528	606	558	Y		N	A		
			FOR OFFICIAL USE ONLY													
5/M	FGMR08$$A100010XX		-/AN/TSC-159A(V) 7E1CC	287	101	105	14420	632	919	779	N		N	A		
6/M	F7E1BD1XA100030XX		-/WATER PALLET	108	88	57	9010	1050	1158	1094	N		N	A		
7/M	FGMR15$$A100090XX		-/ARMORY PALLET QFEPF	108	88	96	5610	1050	1158	1104	N		N	A		
8/M	F7E1BD1A100060XXX		-/7E1BD TENT PALLET	108	88	96	5265	1172	1280	1226	N		N	A		
9/M	FGMR08$$A100050XX		-/HAZ/SUPPORT PALLET 7E1CC	108	88	90	4640	1172	1280	1216	Y		N	A		
10/M	-	CHALK2	BAGS/BAGGAGE PALLET	108	88	66	6460	1282	1390	1336	N		N	A		J3D
11/M	FGMR29$G100010XXX		-/AERIAL PORT OPS UFBAD	108	88	90	3690	1282	1390	1336	Y	0%	N	A		

Total # of Pax:	34	Weight/Pax:	210	Total PAX Weight:	7140
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	59605	%ACL:	51	ACL:	130000
Cargo/Mail Weight:	59605	Cargo/Mail Moment:	6257		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	351690	Zero Fuel Moment:	32148		
CG Station:	914	%MAC:	38.9		

4.2.4.3 Chalk 4 Comparision

Chalk 4 consists of all left over cargo and passengers. Loose water was placed onto the 25K Next Generations Small Loader (NGSL) which replaced a PP. Additionally, loose baggage is floor-loaded on this chalk, but could also be placed on the NGSL, or the tent pallets. The

placement of this cargo is to show the different methods that can be utilized without utilizing a PP, and not necessarily the best or most efficient way to move each particular item.

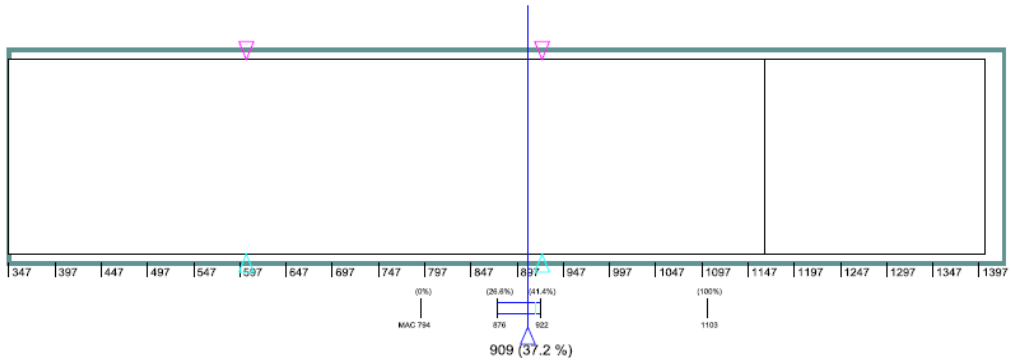
4.2.5 Chalk 5

4.2.5.1 New Load Plan

JTF-PO TD 16-1
20160107 16:10 UTC

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	00001
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 5 AF4
Departure date & time:	20150925 16:00 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



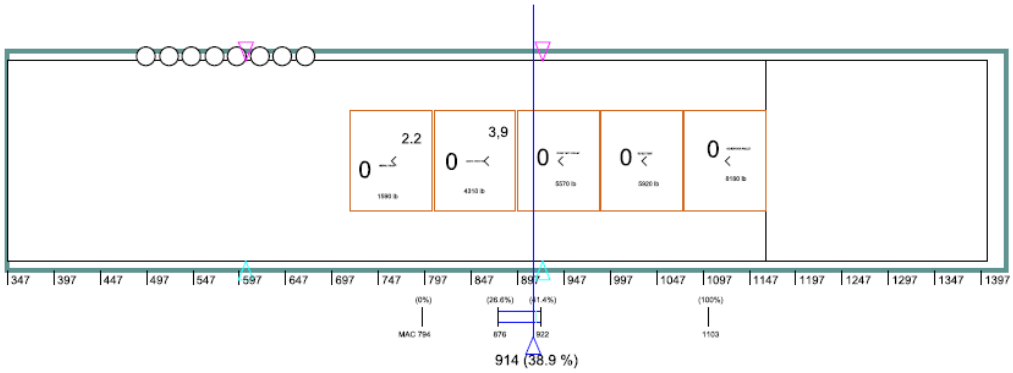
SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC

4.2.5.2 Old Load Plan

JTF-PO TD 16-1
20160125 18:33 UTC

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	00001
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 7 AF4
Departure date & time:	20150925 16:00 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	FFFGR10XB100020XX		-/MEDICAL PALLET	88	108	40	1590	717	805	761	Y		Y	A		
2/M	F7E1BD0XA100020XX		-/CONEX 4-WAY/HAZ	88	108	66	4310	807	895	861	Y		N	A		
3/M	F7E1BD0XA100070XX		-/7E1BD TENT PALLET	88	108	96	5570	897	985	941	N		N	A		
4/M	F7E1BD1A100070XXX		-/7E1BD TENT	88	108	96	5920	987	1075	1031	N		N	A		

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5/M	-		-/GENERATOR PALLET	88	108	75	8180	1077	1165	1121	Y		N	A		

Total # of Pax:	8	Weight/Pax:	210	Total PAX Weight:	1680
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	25570	%ACL:	21	ACL:	130000
Cargo/Mail Weight:	25570	Cargo/Mail Moment:	2642		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	312195	Zero Fuel Moment:	28533		
CG Station:	914	%MAC:	38.9		

4.2.5.3 Chalk 5 Comparision

All Cargo on Chalk 5 has been moved to earlier chalks and is no longer needed. A reduction of one C17 Sortie is achieved.

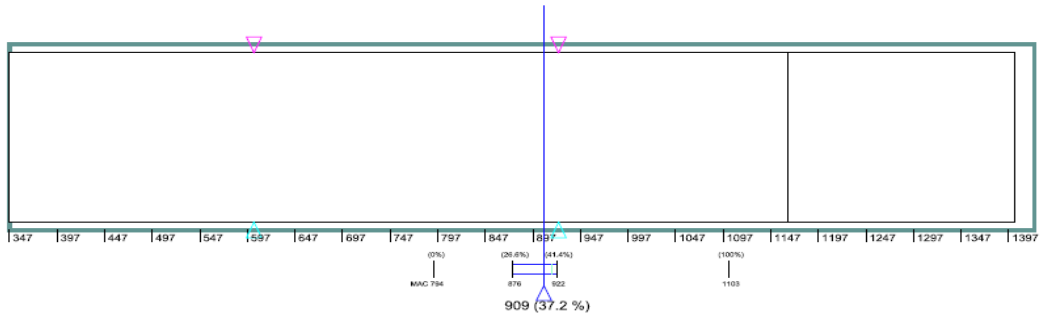
4.2.6 Chalk 6

4.2.6.1 New Load Plan

JTF-PO TD 16-1
20160107 16:10 UTC

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 6 AF5
Departure date & time:	20150925 16:45 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



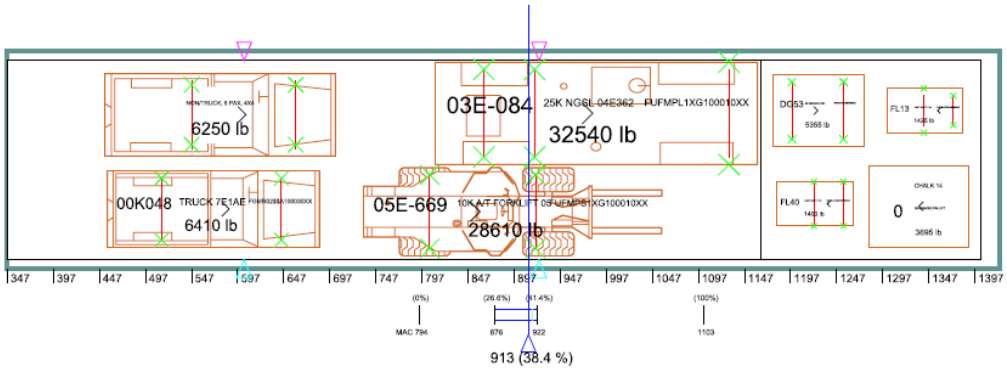
SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC

4.2.6.2 Old Load Plan

JTF-PO TD 16-1
20160125 18:33 UTC

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 10 AF5
Departure date & time:	20150925 16:45 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	-		-/NON/TRUCK, 6 PAX, 4X4	250	89	87	6250	453	703	606	Y		N	A	P	
2/M	FGMR02$$A100030XX	00K048	-/TRUCK 7E1AE	230	83	80	6410	455	685	588	Y		N	A		
3/M	FUFMPS1XG100010XX	05E-669	-/10K A/T FORKLIFT 05	324	96	128	28610	733	1057	860	Y		N	A	PS	
4/M	FUFMPL1XG100010XX	03E-084	-/25K NGSL 04E362	350	111	94	32540	811	1161	982	Y		N	A		
			FOR OFFICIAL USE ONLY													
5/M	FHMHC10XS200050XX	DG53	-/-86 GENERATOR	98	78	71	5355	1178	1276	1227	Y		N	A		
6/M	FUFBLK1XG106560XX	FL40	-/LIGHT CART LT 05	82	48	65	1400	1182	1264	1237	Y		N	A	P	
7/M	-	CHALK3	CHALK 14/BAGGAGE PALLET	108	88	45	3695	1282	1390	1336	N		N	A		J3D
8/M	FUFBLK2XG106560XX	FL13	-/LIGHT CART LT 05	82	48	65	1425	1302	1384	1356	Y		N	A	P	

Total # of Pax:	0	Weight/Pax:	0	Total PAX Weight:	0
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	85685	%ACL:	66	ACL:	130000
Cargo/Mail Weight:	85685	Cargo/Mail Moment:	7929		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	370630	Zero Fuel Moment:	33820		
CG Station:	913	%MAC:	38.4		

4.2.6.3 Chalk 6 Comparision

All Cargo on Chalk 6 has been moved to earlier chalks and is no longer needed. A reduction of one C17 Sortie is achieved.

4.3 Chalk Efficiency Comparison

Table 4. Chalk Efficiency

CHALK #	OLD LP WT:	% ACL UTILIZED	OLD LP PPE UTILIZED	OLD LP % PPE UTILIZED	NEW LP WT	% ACL UTILIZED	NEW LP PPE UTILIZED	NEW LP % PPE UTILIZED
1/JAT	47331	36%	16	89%	80731	62%	18	100%
2	91635	70%	18	100%	93130	72%	18	100%
3	80701	62%	17	94%	113277	87%	18	100%
4	59605	46%	16	89%	116106	89%	18	100%
5	25570	20%	8	44%	0		0	0%
6	85685	66%	16	89%	0		0	0%
TOTAL	390527	50%	91	84%	403244	78%	72	100%

4.3.1 Chalk Efficiency Comparison Explanation

Table 4 clearly shows the increased efficiency from a sortie perspective. A chalk by chalk comparison shows that the old load plans use only 84% of pallet position equivalents (PPEs). Counting the unused pallet positions, it would appear that only 17 pallet positions are not being utilized and therefore wouldn't equate to even a single sortie reduction. As shown in Table 4, the new load plans show a 28% increase in ACL utilization while utilizing all available PPE. The new load plans were able to reduce the number of PPEs by an additional 19. Proper vertical space utilization coupled with aggregation and consolidation methods allows for a total reduction of 36 PPE from this mission and the overall reduction of 2 C17 aircraft sorties. An addition of 12,667lbs on the new load plans is accounted for in the addition of the BALS.

4.4 Summary

The results of this research are very clear. There is merit to utilizing an aggregation and consolidation methodology to load planning of UTCs on contingency missions. Although this method might not be able to save multiple sorties on every contingency deployment, it will allow more UTCs to arrive to the fight faster and more efficiently.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides answers to the investigative questions from the first chapter. Furthermore, this chapter establishes recommendations for action and finally it discusses recommendations for future research.

5.2 Investigative Questions

5.2.1 Question 1

Does the current deployment process allow for full utilization of both pallets and aircraft capabilities? I conclude that the current process doesn't allow for full utilization for pallets. Since all cargo is tasked by a UTC that a single unit maintains and is responsible for palletizing (if it is required to be palletized), then it has to arrive ready for palletization at the Joint Inspection line ready for air shipment. Many times this pallet is not maxed out in weight, height, or cube.

5.2.2 Question 2

Can aggregation and consolidation of UTCs reduce required airlift for the Air Force JTF-PO heavy alert package? From this research it is obvious that aggregation and consolidation of cargo could play an enormous role in increasing airlift capability and therefore reducing the required airlift for many CRW taskings, including the Air Force JTF-PO heavy alert package.

5.2.3 Question 3

Will aggregation and consolidation of UTCs reduce or mitigate any current CRW capabilities? Consolidation of UTCs are already done on a small scale within the CRW

squadrons, but with the new methods of tonneau covers and the BALS, it is unlikely that this will diminish any CRW capabilities and in many ways could enhance the mobility of their forces. Aggregation of cargo could possibly have diminished returns if proper tracking of cargo is not maintained. Any time you are forced to break up a UTC and place it on different pieces of cargo or even different sorties, it could have adverse consequences in the event of a delay or diverted sortie.

5.2.4 Question 4

What other types of deployment movements can benefit from aggregation and consolidation of UTCs or requirements? Consolidation of UTCs is valuable technique that should be looked at by all units that own large amounts of small UTCs, such as Aerospace Ground Equipment (AGE) or airlift units that move their own equipment. Units that have a similar mission of rapidly deploying such as the 621st CRW would benefit. Units such as Red Horse and Prime Beef would be perfect candidates for this method.

5.2.5 Question 5

What are the current limitations that prevent full utilization of pallets and full utilization of Aircraft on UTC movements? Current limitations that are preventing full utilization of UTC movements rest in the current regulations and IT systems. For example; if a 621st CRW unit wants to aggregate a water pallet and distribute it throughout four sorties, it has to create four different UTC requirements and then pair them down. This might be easy for a water pallet, but many times a unit doesn't have four UTC's in the system to pull from. There needs to be an option to be able to split a UTC or split a Transportation Control Number (TCN) in Logistics Module (LOGMOD).

5.3 Conclusions of Research

This research shows that the current way of deploying the CRW forces is not the most efficient way to complete this movement. This research also gives multiple examples of how to complete various new methodologies to complete this task.

By utilizing the consolidation method of using tonneau covers and/or the BALS; or aggregation of cargo by splitting up water and baggage pallets, it was proven in this research that it can create more efficient load plans and reduce the required sorties. Although consolidation efforts are relatively easy when it comes to load planning and deployment preparation, aggregation is not easy to plan for until a tasking is sent down.

5.4 Significance of Research

This research has the ability to open new ways of viewing the deployment process not only for the CRW, but possibly all deployments. This research can have an immediate impact on the future of all CRW taskings as well as like-minded units that have a deployment only mission.

5.5 Recommendations for Action

The recommended action of this research is to create an investigation into the employment of the BALS technology. This piece of equipment could single handedly reduce required PP on many sorties within the 621st and other like-minded units. The recommendation that this system be purchased by individual units rather than mirroring the 463L asset program managed by Air Mobility Command. This will limit this resource to only units that will benefit heavily from its use and not become a mandated requirement for all units. Although the tonneau cover will require substantial future research and ATTLA certification, it is highly recommended that this be utilized for efficiency and sortie reduction in the future. The focus of utilizing the

excess height in cargo aircraft is not going away, and with the limitations on 463L pallets, utilizing available rolling stock will greatly benefit sortie utilization and possibly benefit ground logistics at downline destinations.

The above recommendations are great, but will still take time to develop and roll out. This research recommends that all future CR deployments that utilize water and food pallets, distribute the water evenly with other cargo pallets. This will immediately reduce required PPs while allowing space for other cargo or to move cargo forward to earlier sorties.

5.6 Recommendations for Future Research

This research is purposely limited to forming a methodology and examining the possibilities of consolidation and aggregation within and throughout UTCs. There are many available directions that future research can explore further. The following are a few examples:

1. Examine a cost benefit analysis of utilizing this methodology.

   This research has shown that it is possible to reduce 6 sorties down to 4 sorties, but will this increase in weight may require more fuel stops, different routings or require additional air refueling, therefore negating the presumed fuel savings of the 2 lost sorties.

2. Conduct a case study on multiple contingency response units to include CRWs, Redhorse or Prime Beef or other like-minded units to align the benefits of the BALS with their individual missions.

   This would allow the individual units to see first-hand the capability of this asset and possibly reveal other uses such as increase ground transportation capabilities.

3. Creation of an IT system that will systematically produce the most efficient way to consolidate/aggregate UTCs utilizing this methodology.

   This would allow logistics planners to definitively tell exactly how many sorties would be required without losing having to drop possible capabilities. This would also provide the lead time required by the users to know where and how their UTCs would need to be prepared.

5.7 Summary

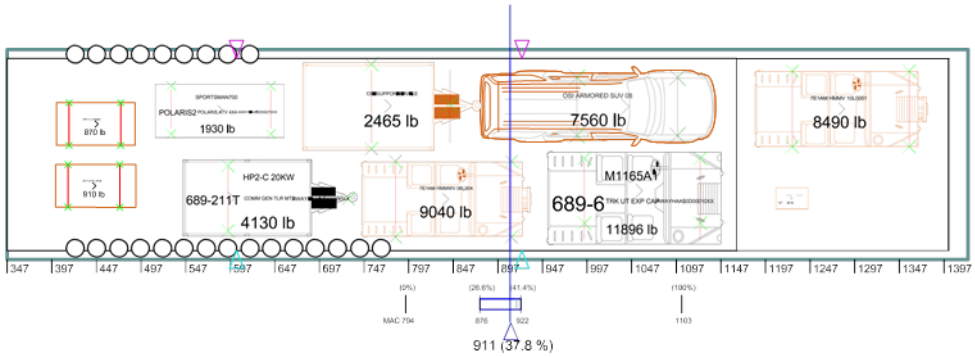
As the Department of Defense's budget is shrinking each year, it is vital that we are able to find smarter ways of conducting business in every area possible. Contingency deployments are extremely important to the national security of our country, but this research has shown an example of how efficiency can be gained concurrently on the battlefield as well as in the budget. The current mindset of deploying a UTC individually and in its entirety has noble reasoning, but is not efficient and without efficiency it is not 100% effective. It is the hope of this research that in the future, logistics planning will focus on not just UTC efficiency, but the entire mission efficiency. This research has shown that both can be achieved without compromising the other.

APPENDIX A

JTF-PO TD 16-1
20160125 18:34 UTC

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	
Type movement plan:	TURBO DISTRO	**System chalk#:**	CHALK1 JAT
Departure date & time:	20150929 13:31 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	-		-/ATV 07X13978	90	48	48	910	401	491	446	Y		N	A	R	
2/M	-		-/ATV 11X13986	88	48	50	870	402	490	449	Y		N	A	R	
3/M	AWAYHAA$0D00270XX	POLARIS2	SPORTSMAN700/POLARIS ATV 4X4	145	60	76	1930	512	657	587	Y		N	A		R3B

4/M	AWAYHAA$0D00230XX	689-211T	HP2-C 20KW/COMM GEN TLR MTD	195	86	79	4130	544	739	602	Y		N	A			R2D
5/M	-		-/OSI SUPPORT TRAILE	200	98	98	2465	677	877	776	Y		N	A			
6/M	-		-/7E1AM HMMWV 06L004	190	85	103	9040	744	934	842	Y		N	A			
7/M	-		-/OSI ARMORED SUV 08	264	89	72	7560	877	1141	1044	Y		N	A		P	
8/M	AWAYHAA$0D00010XX	689-6	M1165A1/TRK UT EXP CAP	198	105	97	11896	952	1150	1059	Y		N	A			R2D
9/M	-		-/7E1AM HMMV 10L0051	193	86	93	8490	1186	1379	1287	Y		N	A		R	
10/M	FXFFKT0XB100010XX		-/CONTRACTING KIT	36	24	14	40	1210	1246	1228	N		N	A			

Total # of Pax:	24	Weight/Pax:	210	Total PAX Weight:	5040
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	47331	%ACL:	40	ACL:	130000
Cargo/Mail Weight:	47331	Cargo/Mail Moment:	4828		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	337316	Zero Fuel Moment:	30719		
CG Station:	911	%MAC:	37.8		

SQ/D	Flags/Warnings

SQ/D	Class/Zone
1/M	3
1/M	8
1/M	9
2/M	3
2/M	8
2/M	9
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6/M	2.2
6/M	3
6/M	8
6/M	9
7/M	9
8/M	2.2
8/M	3
8/M	8
8/M	9
9/M	2.2
9/M	3
9/M	8
9/M	9

Item by TCN/Pallet ID	ULN	Weight	Short Tons
FXFFKT0XB100010XX	XFFKT0	40	0.02

ALL HAZARDOUS MATERIALS COVERED BY THIS LOAD PLAN HAVE BEEN INSPECTED AND FOUND TO BE PACKAGED IN THE PROPER OUTSIDE CONTAINER FREE OF VISIBLE DAMAGE AND LEAKS AND IS PROPERLY CERTIFIED

I HAVE BEEN BRIEFED ACCORDING TO AFMAN 24-204(I), PARAGRAPH 1.2.9, ON HAZARDOUS CARGO COVERED BY THIS LOAD PLAN

Air Terminal Representative Signature

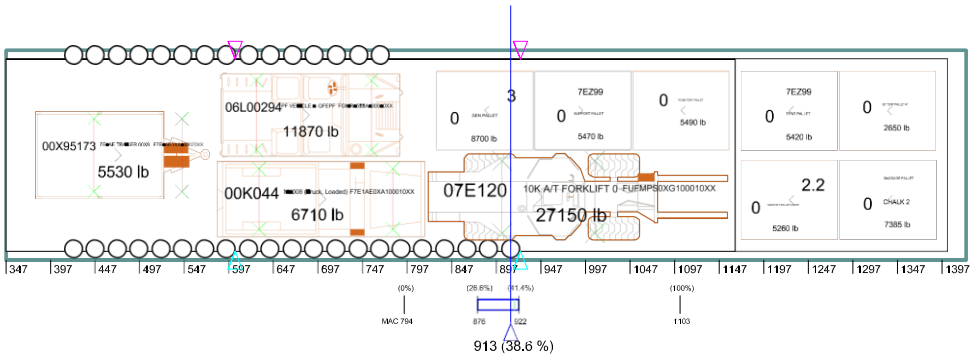
Aircraft Crewmember Signature

Load planned by: _____ **Date:** _____

Aircraft type/Config: C-17/STD-AL
Delivery method: AL
Unit Being Airlifted: 321 CRS
Type movement plan: TURBO DISTRO
Departure date & time: 20150924 19:40 UTC
Departure airfield : WRI
Destination airfield: WRI
Load Description:

Mission type: Mobility
Mission #: TURBO DISTRO
Aircraft Tail #: 00003
System chalk #: CHALK 2 AF1
AFMAN 24-204 Chapter 3 Move

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	F7E1AE0XA100020XX	00X95173	-/7E1AE TRAILER 00X9	194	97	97	5530	381	575	476	Y		N	A		
2/M	F7E1AE0XA100010XX	00K044	-/M1008 (Truck, Loaded)	233	84	73	6710	584	817	706	Y		N	A		
3/M	FGMR15$$A100010XX	06L00294	-/PF VEHICLE 1 QFEPF	204	94	92	11870	588	792	687	Y		N	A		
4/M	FUFMPS0XG100010XX	07E120	-/10K A/T FORKLIFT 0	336	97	127	27150	821	1157	949	Y		N	A	PS	
5/M	F7E1BD1XA100130XX		-/GEN PALLET	108	88	55	8700	830	938	884	Y		N	A	P	
6/M	-		7EZ99/SUPPORT PALLET	108	88	70	5470	940	1048	994	N		N	A		J3D
7/M	F7E1BD0XA100060XX		-/7E1BD TENT PALLET	108	88	96	5490	1050	1158	1104	N		N	A		
8/M	-		7EZ99/TENT PALLET	108	88	96	5420	1172	1280	1226	N		N	A		J3D
9/M	FGMR15$$A100030XX		-/SUPPORT PALLET QFEPF	108	88	90	5260	1172	1280	1226	Y		N	A		
10/M	F7E1BC1XA100020XX		-/BC TENT PALLET #1	108	88	60	2650	1282	1390	1336	N		N	A		
11/M	-		BAGGAGE PALLET/CHALK 2	108	88	62	7385	1282	1390	1336	N		N	A		J3D

Total # of Pax:	36	Weight/Pax:	210	Total PAX Weight:	7560
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	91635	%ACL:	76	ACL:	130000
Cargo/Mail Weight:	91635	Cargo/Mail Moment:	9183		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	384140	Zero Fuel Moment:	35074		
CG Station:	913	%MAC:	38.6		

SQ/D	Flags/Warnings

SQ/D	Class/Zone
1/M	2.2
1/M	8
1/M	9
2/M	2.2
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3/M	3
3/M	8
3/M	9
4/M	2.2
4/M	3
4/M	8

4/M	9
5/M	3
9/M	2.2

Item by TCN/Pallet ID	ULN	Weight	Short Tons
F7E1AE0XA100010XX	7E1AE0	6710	3.35
F7E1AE0XA100020XX	7E1AE0	5530	2.76
F7E1BC1XA100020XX	7E1BC1	2650	1.32
F7E1BD0XA100060XX	7E1BD0	5490	2.74
F7E1BD1XA100130XX	7E1BD	8700	4.35
FGMR15$$A100010XX	GMR15	11870	5.93
FGMR15$$A100030XX	GMR15	5260	2.63
FUFMPS0XG100010XX	UFMPS0	27150	13.57

ALL HAZARDOUS MATERIALS COVERED BY THIS LOAD PLAN HAVE BEEN INSPECTED AND FOUND TO BE PACKAGED IN THE PROPER OUTSIDE CONTAINER FREE OF VISIBLE DAMAGE AND LEAKS AND IS PROPERLY CERTIFIED

I HAVE BEEN BRIEFED ACCORDING TO AFMAN 24-204(I), PARAGRAPH 1.2.9, ON HAZARDOUS CARGO COVERED BY THIS LOAD PLAN

Air Terminal Representative Signature

Aircraft Crewmember Signature

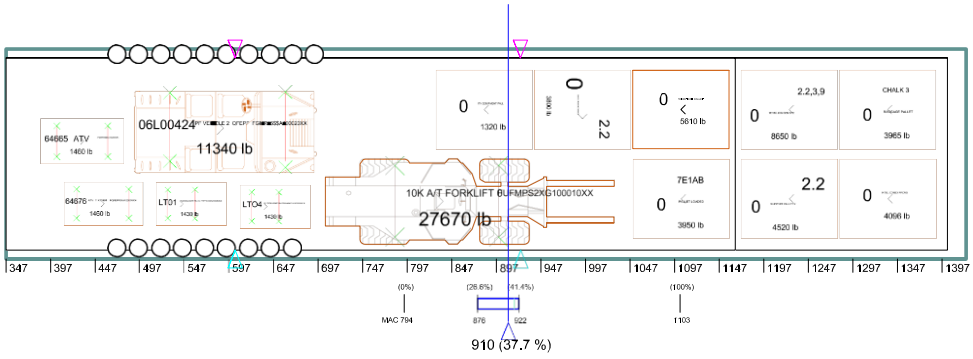
Load planned by: _____ **Date:** _____

JTF-PO TD 16-1
20160125 18:33 UTC

Aircraft type/Config: C-17/STD-AL
Delivery method: AL
Unit Being Airlifted: 321 CRS
Type movement plan: TURBO DISTRO
Departure date & time: 20150925 14:29 UTC
Departure airfield : WRI
Destination airfield: WRI
Load Description:

Mission type: Mobility
Mission #: TURBO DISTRO
Aircraft Tail #: 00005
System chalk #: CHALK 3 AF2
AFMAN 24-204 Chapter 3 Move

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	FGMR15$$A100040XX	64665	-/ATV	93	50	50	1460	386	479	434	Y	50%	N	A		
2/M	FQFEPF0XA100070XX	64676	-/ATV 11X13984	88	48	46	1460	413	501	458	Y		N	A	R	
3/M	FGMR15$$A100020XX	06L00424	-/PF VEHICLE 2 QFEPF	204	92	92	11340	491	695	591	Y		N	A		
4/M	FHFHC10XS200060XX	LT01	-/FLOODLIGHT FL-1D	78	48	61	1430	515	593	546	Y		N	A		

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5/M	FHMHC10XS200020XX	LTO4	-/FLOODLIGHT FL-1D	78	48	61	1430	610	688	640	Y	N	A		
6/M	FUFMPS2XG100010XX		-/10K A/T FORKLIFT 0	324	96	128	27670	705	1029	837	Y	N	A	PS	
7/M	FUFBVE0XG100010XX		-/ITV EQUIPMENT PALL	108	88	31	1320	830	938	884	N	N	A		
8/M	FGMR09$$S200040XX		-/MX FLY AWAY KIT HMHC1	88	108	90	3800	940	1048	994	Y	N	A		
9/M	F7E1BD1XA100060XX		-/7E1BD TENT PALLET	108	88	96	5610	1050	1158	1104	N	N	A		
10/M	-		7E1AB/PALLET LOADED	108	88	72	3950	1050	1158	1104	N	N	A		J3D
11/M	F7E1BC1XA100010XX		-/7E1BC JOC GEN SPT	108	88	59	8650	1172	1280	1226	Y	N	A		
12/M	FGMR15$$A100050XX		-/SUPPORT PALLET 2	108	88	90	4520	1172	1280	1226	Y	N	A		
13/M	-	CHALK4	CHALK 3/BAGGAGE PALLET	108	88	58	3965	1282	1390	1336	N	N	A		J3D
14/M	FGMR14$$T100010XX		-/INTEL CONEX PFCRG	108	88	60	4096	1282	1390	1336	N	N	A		

Total # of Pax:	19	Weight/Pax:	210	Total PAX Weight:	3990
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Total Cargo Wt:	80701	%ACL:	65	ACL:	130000
Cargo/Mail Weight:	80701	Cargo/Mail Moment:	7760		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	369636	Zero Fuel Moment:	33651		
CG Station:	910	%MAC:	37.7		

SQ/D	Flags/Warnings

SQ/D	Class/Zone
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1/M	8
1/M	9
2/M	3
2/M	8
2/M	9
3/M	2.2
3/M	3
3/M	8
3/M	9
4/M	9

5/M	3
5/M	9
6/M	2.2
6/M	3
6/M	9
8/M	2.2
11/M	2.2
11/M	3
11/M	9
12/M	2.2

Item by TCN/Pallet ID	ULN	Weight	Short Tons
F7E1BC1XA100010XX	7E1BC1	8650	4.32
F7E1BD1XA100060XX	7E1BD1	5610	2.80
FGMR09$$S200040XX	GMR09	3800	1.90
FGMR14$$T100010XX	GMR14	4096	2.05
FGMR15$$A100020XX	GMR15	11340	5.67
FGMR15$$A100040XX	GMR15	1460	0.73
FGMR15$$A100050XX	GMR15	4520	2.26
FHFHC10XS200060XX	HFHC10	1430	0.71
FHMHC10XS200020XX	HMHC10	1430	0.71
FQFEPF0XA100070XX	QFEPF0	1460	0.73
FUFBVE0XG100010XX	UFBVE0	1320	0.66
FUFMPS2XG100010XX	UFMPS2	27670	13.83

ALL HAZARDOUS MATERIALS COVERED BY THIS LOAD PLAN HAVE BEEN INSPECTED AND FOUND TO BE PACKAGED IN THE PROPER OUTSIDE CONTAINER FREE OF VISIBLE DAMAGE AND LEAKS AND IS PROPERLY CERTIFIED

I HAVE BEEN BRIEFED ACCORDING TO AFMAN 24-204(I), PARAGRAPH 1.2.9, ON HAZARDOUS CARGO COVERED BY THIS LOAD PLAN

Air Terminal Representative Signature

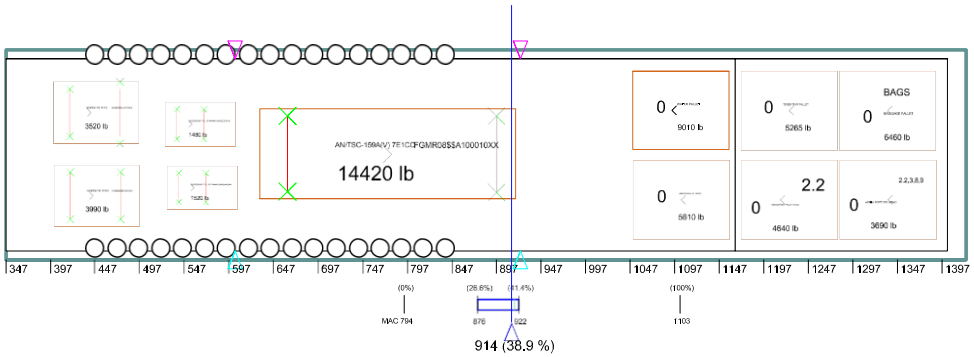
Aircraft Crewmember Signature

Load planned by: _____ **Date:** _____

JTF-PO TD 16-1
20160125 18:33 UTC

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	00006
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 6 AF3
Departure date & time:	20150925 15:11 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
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2/M	FGMR08$$A100020XX		-/GENERATOR 7E1CC	95	68	82	3990	401	496	445	Y		N	A	R	
3/M	FHFHC10XS200070XX		-/FLOODLIGHT FL-1D	78	48	61	1480	525	603	555	Y		N	A		
4/M	FHMHC10XS200030XX		-/FLOODLIGHT FL-1D	78	48	61	1520	528	606	558	Y		N	A		

5/M	FGMR08$$A100010XX		-/AN/TSC-159A(V) 7E1CC	287	101	105	14420	632	919	779	N		N	A		
6/M	F7E1BD1XA100030XX		-/WATER PALLET	108	88	57	9010	1050	1158	1094	N		N	A		
7/M	FGMR15$$A100090XX		-/ARMORY PALLET QFEPF	108	88	96	5610	1050	1158	1104	N		N	A		
8/M	F7E1BD1A100060XXX		-/7E1BD TENT PALLET	108	88	96	5265	1172	1280	1226	N		N	A		
9/M	FGMR08$$A100050XX		-/HAZ/SUPPORT PALLET 7E1CC	108	88	90	4640	1172	1280	1216	Y		N	A		
10/M	-	CHALK2	BAGS/BAGGAGE PALLET	108	88	66	6460	1282	1390	1336	N		N	A		J3D
11/M	FGMR29$G100010XXX		-/AERIAL PORT OPS UFBAD	108	88	90	3690	1282	1390	1336	Y	0%	N	A		

Total # of Pax:	34	Weight/Pax:	210	Total PAX Weight:	7140
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	59605	%ACL:	51	ACL:	130000
Cargo/Mail Weight:	59605	Cargo/Mail Moment:	6257		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	351690	Zero Fuel Moment:	32148		
CG Station:	914	%MAC:	38.9		

SQ/D	Flags/Warnings

SQ/D	Class/Zone
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1/M	8
1/M	9
2/M	3
2/M	8
2/M	9
3/M	9
4/M	3
4/M	9
9/M	2.2
11/M	2.2
11/M	3
11/M	8
11/M	9

FOR OFFICIAL USE ONLY

Item by TCN/Pallet ID	ULN	Weight	Short Tons
F7E1BD1A100060XXX	7E1BD1	5265	2.63
F7E1BD1XA100030XX	7E1BD1	9010	4.50
FGMR08$$A100010XX	GMR08	14420	7.21
FGMR08$$A100020XX	GMR08	3990	1.99
FGMR08$$A100030XX	GMR08	3520	1.76
FGMR08$$A100050XX	GMR08	4640	2.32
FGMR15$$A100090XX	GMR15	5610	2.80
FGMR29$G100010XXX	GMR29	3690	1.84
FHFHC10XS200070XX	HFHC10	1480	0.74
FHMHC10XS200030XX	HMHC10	1520	0.76

ALL HAZARDOUS MATERIALS COVERED BY THIS LOAD PLAN HAVE BEEN INSPECTED AND FOUND TO BE PACKAGED IN THE PROPER OUTSIDE CONTAINER FREE OF VISIBLE DAMAGE AND LEAKS AND IS PROPERLY CERTIFIED

I HAVE BEEN BRIEFED ACCORDING TO AFMAN 24-204(I), PARAGRAPH 1.2.9, ON HAZARDOUS CARGO COVERED BY THIS LOAD PLAN

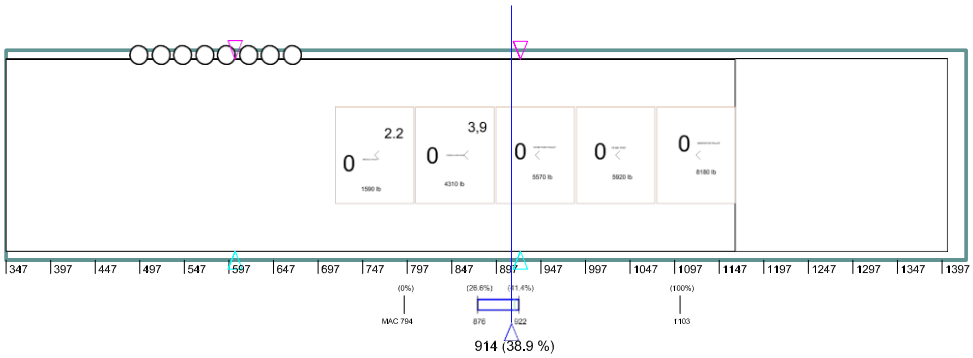
Air Terminal Representative Signature

Aircraft Crewmember Signature

Load planned by: _____ **Date:** _____

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	00001
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 7 AF4
Departure date & time:	20150925 16:00 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	FFFGR10XB100020XX		-/MEDICAL PALLET	88	108	40	1590	717	805	761	Y		Y	A		
2/M	F7E1BD0XA100020XX		-/CONEX 4-WAY/HAZ	88	108	66	4310	807	895	861	Y		N	A		
3/M	F7E1BD0XA100070XX		-/7E1BD TENT PALLET	88	108	96	5570	897	985	941	N		N	A		
4/M	F7E1BD1A100070XXX		-/7E1BD TENT	88	108	96	5920	987	1075	1031	N		N	A		
5/M	-		-/GENERATOR PALLET	88	108	75	8180	1077	1165	1121	Y		N	A		

Total # of Pax:	8	Weight/Pax:	210	Total PAX Weight:	1680
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	25570	%ACL:	21	ACL:	130000
Cargo/Mail Weight:	25570	Cargo/Mail Moment:	2642		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	312195	Zero Fuel Moment:	28533		
CG Station:	914	%MAC:	38.9		

SQ/D	Flags/Warnings

SQ/D	Class/Zone
1/M	2.2
2/M	3
2/M	9
5/M	Invalid IMO Code

Item by TCN/Pallet ID	ULN	Weight	Short Tons
F7E1BD0XA100020XX	7E1BD0	4310	2.15
F7E1BD0XA100070XX	7E1BD0	5570	2.78
F7E1BD1A100070XXX	7E1BD1	5920	2.96
FFFGR10XB100020XX	FFGR10	1590	0.79

ALL HAZARDOUS MATERIALS COVERED BY THIS LOAD PLAN HAVE BEEN INSPECTED AND FOUND TO BE PACKAGED IN THE PROPER OUTSIDE CONTAINER FREE OF VISIBLE DAMAGE AND LEAKS AND IS PROPERLY CERTIFIED

I HAVE BEEN BRIEFED ACCORDING TO AFMAN 24-204(I), PARAGRAPH 1.2.9, ON HAZARDOUS CARGO COVERED BY THIS LOAD PLAN

Air Terminal Representative Signature

Aircraft Crewmember Signature

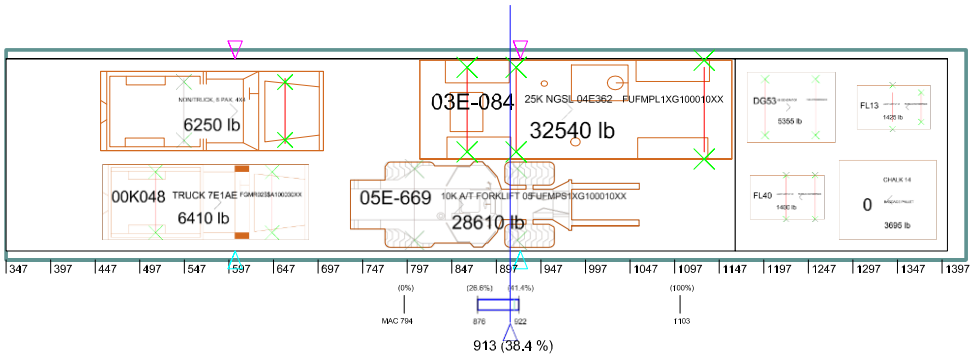
Load planned by: _____ **Date:** _____

20160125 18:33 UTC

Aircraft type/Config: C-17/STD-AL
Delivery method: AL
Unit Being Airlifted: 321 CRS
Type movement plan: TURBO DISTRO
Departure date & time: 20150925 16:45 UTC
Departure airfield : WRI
Destination airfield: WRI
Load Description:

Mission type: Mobility
Mission #: TURBO DISTRO
Aircraft Tail #:
System chalk #: CHALK 10 AF5
AFMAN 24-204 Chapter 3 Move

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	-		-/NON/TRUCK, 6 PAX, 4X4	250	89	87	6250	453	703	606	Y		N	A	P	
2/M	FGMR02$$A100030XX	00K048	-/TRUCK 7E1AE	230	83	80	6410	455	685	588	Y		N	A		
3/M	FUFMPS1XG100010XX	05E-669	-/10K A/T FORKLIFT 05	324	96	128	28610	733	1057	860	Y		N	A	PS	
4/M	FUFMPL1XG100010XX	03E-084	-/25K NGSL 04E362	350	111	94	32540	811	1161	982	Y		N	A		

FOR OFFICIAL USE ONLY

5/M	FHMHC10XS200050XX	DG53	-/-86 GENERATOR	98	78	71	5355	1178	1276	1227	Y	N	A		
6/M	FUFBLK1XG106560XX	FL40	-/LIGHT CART LT 05	82	48	65	1400	1182	1264	1237	Y	N	A	P	
7/M	-	CHALK3	CHALK 14/BAGGAGE PALLET	108	88	45	3695	1282	1390	1336	N	N	A		J3D
8/M	FUFBLK2XG106560XX	FL13	-/LIGHT CART LT 05	82	48	65	1425	1302	1384	1356	Y	N	A	P	

Total # of Pax:	0	Weight/Pax:	0	Total PAX Weight:	0
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	85685	%ACL:	66	ACL:	130000
Cargo/Mail Weight:	85685	Cargo/Mail Moment:	7929		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	370630	Zero Fuel Moment:	33820		
CG Station:	913	%MAC:	38.4		

SQ/D	Flags/Warnings

SQ/D	Class/Zone
1/M	9
2/M	2.2
2/M	3
2/M	9
3/M	2.2
3/M	3
3/M	9
4/M	2.2
4/M	3
4/M	9
5/M	3
5/M	9
6/M	3
6/M	9
8/M	3
8/M	9

Item by TCN/Pallet ID	ULN	Weight	Short Tons
FGMR02$$A100030XX	GMR02	6410	3.20
FHMHC10XS200050XX	HMHC10	5355	2.68
FUFBLK1XG106560XX	UFBLK1	1400	0.70
FUFBLK2XG106560XX	UFBLK2	1425	0.71
FUFMPL1XG100010XX	UFMPL1	32540	16.27
FUFMPS1XG100010XX	UFMPS1	28610	14.30

ALL HAZARDOUS MATERIALS COVERED BY THIS LOAD PLAN HAVE BEEN INSPECTED AND FOUND TO BE PACKAGED IN THE PROPER OUTSIDE CONTAINER FREE OF VISIBLE DAMAGE AND LEAKS AND IS PROPERLY CERTIFIED

Air Terminal Representative Signature

I HAVE BEEN BRIEFED ACCORDING TO AFMAN 24-204(I), PARAGRAPH 1.2.9, ON HAZARDOUS CARGO COVERED BY THIS LOAD PLAN

Aircraft Crewmember Signature

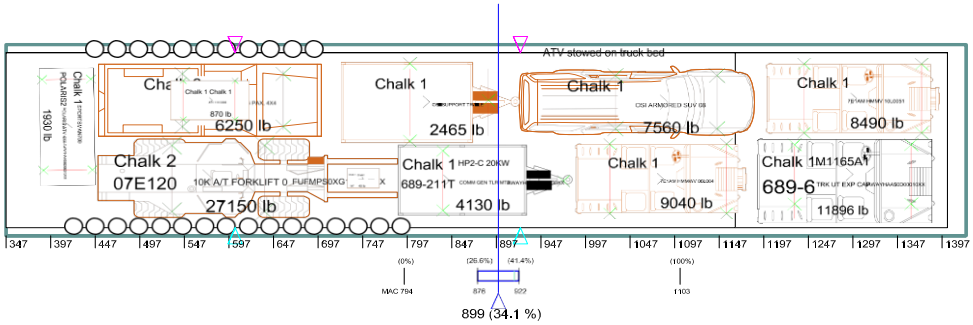
APPENDIX B

JTF-PO TD 16-1
20160212 16:47 UTC

Aircraft type/Config: C-17/STD-AL
Delivery method: AL
Unit Being Airlifted: 321 CRS
Type movement plan: TURBO DISTRO
Departure date & time: 20150929 13:31 UTC
Departure airfield : WRI
Destination airfield: WRI
Load Description:

Mission type: Mobility
Mission #: TURBO DISTRO
Aircraft Tail #:
System chalk #: CHALK1 JAT
AFMAN 24-204 Chapter 3 Move

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	AWAYHAA$0D00270XX	POLARIS2	SPORTSMAN700/POLARIS ATV 4X4	145	60	76	1930	384	446	416	Y		N	A		R3B
2/M	FUFMPS0XG100010XX	07E120	-/10K A/T FORKLIFT 0	336	97	127	27150	450	786	579	Y		N	A	PS	
3/M	-		-/NON/TRUCK, 6 PAX, 4X4	250	89	87	6250	451	701	604	Y		N	A	P	

3/M	-		Chalk 1/ATV 07X13979	90	48	48	910	451	701	604	Y	N	A	R		
4/M	-		Chalk 1/ATV 11X13986	88	48	50	870	532	620	578	Y	N	A	R		
5/M	-		-/OSI SUPPORT TRAILE	200	98	98	2465	723	923	822	Y	N	A			
6/M	FXFFKT0XB100010XX		Chalk1/CONTRACTING KIT	36	24	14	40	730	766	748	N	N	A			
7/M	AWAYHAA$0D00230XX	689-211T	HP2-C 20KW/COMM GEN TLR MTD	195	86	79	4130	787	982	845	Y	N	A			R2D
8/M	-		-/OSI ARMORED SUV 08	264	89	72	7560	923	1187	1089	Y	N	A	P		
9/M	-		-/7E1AM HMMWV 06L004	190	85	103	9040	986	1176	1084	Y	N	A			
10/M	AWAYHAA$0D00010XX	689-6	M1165A1/TRK UT EXP CAP	198	105	97	11896	1190	1388	1297	Y	N	A			R2D
11/M	-		-/7E1AM HMMV 10L0051	193	86	93	8490	1200	1393	1301	Y	N	A	R		

Total # of Pax:	27	Weight/Pax:	210	Total PAX Weight:	5670
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	79821	%ACL:	66	ACL:	130000
Cargo/Mail Weight:	79821	Cargo/Mail Moment:	7421		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	370436	Zero Fuel Moment:	33312		
CG Station:	899	%MAC:	34.1		

SQ/D /Warnings	Flags

SQ/D	Class/Zone
1/M	8
1/M	9
1/M	9
2/M	2.2
2/M	3
2/M	8
2/M	9
3/M	3
3/M	8
3/M	9
4/M	3
4/M	8
4/M	9
5/M	3
5/M	8
5/M	9
7/M	8
7/M	9
7/M	9
7/M	9
8/M	9
9/M	2.2
9/M	3
9/M	8
9/M	9
10/M	2.2
10/M	3
10/M	8
10/M	9
11/M	2.2
11/M	3
11/M	8
11/M	9

ALL HAZARDOUS MATERIALS COVERED BY THIS LOAD PLAN HAVE BEEN INSPECTED AND FOUND TO BE PACKAGED IN THE PROPER OUTSIDE CONTAINER FREE OF VISIBLE DAMAGE AND LEAKS AND IS PROPERLY CERTIFIED

I HAVE BEEN BRIEFED ACCORDING TO AFMAN 24-204(I), PARAGRAPH 1.2.9, ON HAZARDOUS CARGO COVERED BY THIS LOAD PLAN

Air Terminal Representative Signature

Aircraft Crewmember Signature

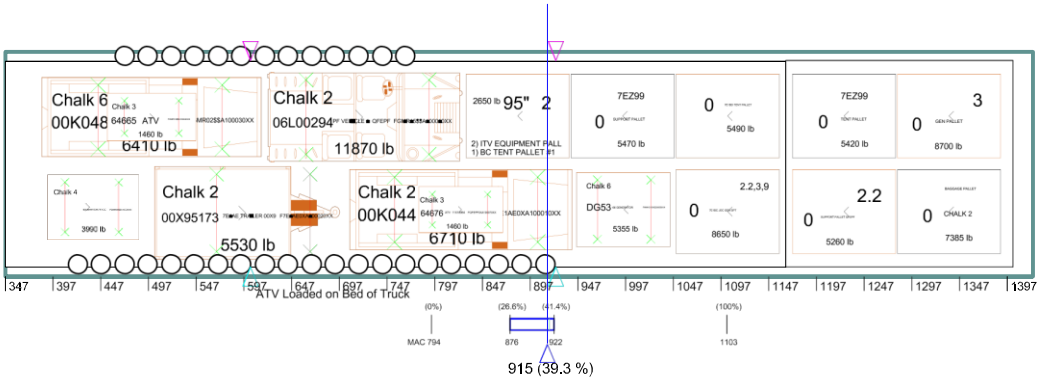
Load planned by: _____ **Date:** _____

Load approved by: _____ **Date:** _____

Aircraft type/Config: C-17/STD-AL
Delivery method: AL
Unit Being Airlifted: 321 CRS
Type movement plan: TURBO DISTRO
Departure date & time: 20150924 19:40 UTC
Departure airfield : WRI
Destination airfield: WRI
Load Description:

Mission type: Mobility
Mission #: TURBO DISTRO
Aircraft Tail #: 00003
System chalk #: CHALK 2 AF1
AFMAN 24-204 Chapter 3 Move

MAIN DECK



SQ/D	TCN/Pallet_ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	FGMR02$$A100030XX	00K048	-/TRUCK 7E1AE	230	83	130	6410	385	615	517	Y		N	A		
2/M	FGMR08$$A100020XX		-/GENERATOR 7E1CC	95	68	82	3990	391	486	435	Y		N	A	R	
3/M	FGMR15$$A100040XX	64665	-/ATV	93	50	50	1460	454	547	502	Y	50%	N	A		
4/M	F7E1AE0XA100020XX	00X95173	-/7E1AE TRAILER 00X9	194	97	97	5530	503	697	599	Y		N	A		

5/M	FGMR15$$A100010XX	06L00294	-/PF VEHICLE 1 QFEPF	204	94	92	11870	622	826	722	Y	N	A		
6/M	F7E1AE0XA100010XX	00K044	-/M1008 (Truck, Loaded)	233	84	119	6710	708	941	830	Y	N	A		
7/M	FQFEPF0XA100070XX	64676	-/ATV 11X13984	88	48	46	1460	780	868	825	Y	N	A	R	
8/M	F7E1BC1XA100020XX		BALS 3/BC TENT PALLET #1	108	88	95	2650	830	938	884	N	N	A		
8/M	FUFBVE0XG100010XX		-/ITV EQUIPMENT PALL	108	88	31	1320	830	938	884	N	N	A		
9/M	-		7EZ99/SUPPORT PALLET	108	88	70	5470	940	1048	994	N	N	A		J3D
10/M	FHMHC10XS200050XX	DG53	-/-86 GENERATOR	98	78	71	5355	946	1044	995	Y	N	A		
11/M	F7E1BD0XA100060XX		-/7E1BD TENT PALLET	108	88	96	5490	1050	1158	1104	N	N	A		
12/M	F7E1BC1XA100010XX		-/7E1BC JOC GEN SPT	108	88	59	8650	1050	1158	1104	Y	N	A		
13/M	-		7EZ99/TENT PALLET	108	88	96	5420	1172	1280	1226	N	N	A		J3D
14/M	FGMR15$$A100030XX		-/SUPPORT PALLET QFEPF	108	88	90	5260	1172	1280	1226	Y	N	A		
15/M	F7E1BD1XA100130XX		-/GEN PALLET	108	88	55	8700	1282	1390	1336	Y	N	A	P	
16/M	-		BAGGAGE PALLET/CHALK 2	108	88	62	7385	1282	1390	1336	N	N	A		J3D

Total # of Pax:	34	Weight/Pax:	210	Total PAX Weight:	7140
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	88890	%ACL:	74	ACL:	130000
Cargo/Mail Weight:	88890	Cargo/Mail Moment:	9240		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	383895	Zero Fuel Moment:	35131		
CG Station:	915	%MAC:	39.3		

SQ/D	Flags/Warnings

SQ/D	Class/Zone
1/M	2.2
1/M	3
1/M	9
2/M	3
2/M	8
2/M	9
3/M	3
3/M	8

3/M	9
4/M	2.2
4/M	8
4/M	9
5/M	2.2
5/M	3
5/M	8
5/M	9
6/M	2.2
6/M	3
6/M	8
6/M	9
7/M	3
7/M	8
7/M	9
10/M	3
10/M	9
12/M	2.2
12/M	3
12/M	9
14/M	2.2
15/M	3

ALL HAZARDOUS MATERIALS COVERED BY THIS LOAD PLAN HAVE BEEN INSPECTED AND FOUND TO BE PACKAGED IN THE PROPER OUTSIDE CONTAINER FREE OF VISIBLE DAMAGE AND LEAKS AND IS PROPERLY CERTIFIED

I HAVE BEEN BRIEFED ACCORDING TO AFMAN 24-204(I), PARAGRAPH 1.2.9, ON HAZARDOUS CARGO COVERED BY THIS LOAD PLAN

Air Terminal Representative Signature

Aircraft Crewmember Signature

Load planned by: _____ **Date:** _____

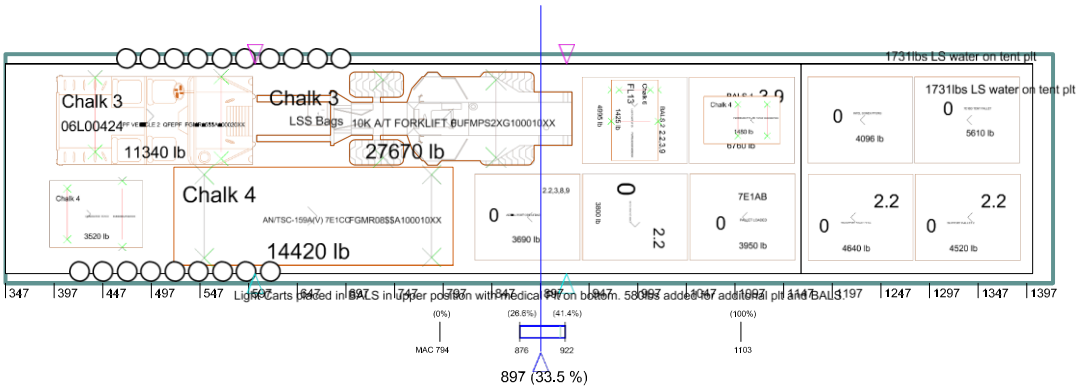
Load approved by: _____ **Date:** _____

JTF-PO TD 16-1
20160212 16:46 UTC

Aircraft type/Config: C-17/STD-AL
Delivery method: AL
Unit Being Airlifted: 321 CRS
Type movement plan: TURBO DISTRO
Departure date & time: 20150925 14:29 UTC
Departure airfield : WRI
Destination airfield: WRI
Load Description:

Mission type: Mobility
Mission #: TURBO DISTRO
Aircraft Tail #: 00005
System chalk #: CHALK 3 AF2
AFMAN 24-204 Chapter 3 Move

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	FGMR08$$A100030XX		-/GENERATOR 7E1CC	95	68	92	3520	393	488	435	Y		N	A	R	
2/M	FGMR15$$A100020XX	06L00424	-/PF VEHICLE 2 QFEPF	204	92	92	11340	400	604	500	Y		N	A		
3/M	FGMR08$$A100010XX		-/AN/TSC-159A(V) 7E1CC	287	101	105	14420	520	807	668	N		N	A		
4/M	FUFMPS2XG100010XX		-/10K A/T FORKLIFT 0	324	96	128	27670	605	929	797	Y		N	A	PS	

5/M	-		-/LSS Bags	20	24	45	3610	658	678	668	N		N	A		
6/M	FGMR29$G100010XXX		-/AERIAL PORT OPS UFBAD	108	88	90	3690	830	938	884	Y	0%	N	A		
6/M	FGMR30$$G100010XX		-/BGAN TRANSIT CASE UFBL1	17	8	23	30	830	938	884	N		N	A		
6/M	FGMR31$$G106770XX		-/BOX WOOD UFBLJ	40	24	27	208	830	938	884	N		N	A		
7/M	FFFGR10XB100020XX		BALS 2/MEDICAL PALLET	88	108	105	4995	940	1048	994	Y		Y	A		
8/M	FGMR09$$S200040XX		-/MX FLY AWAY KIT HMHC1	88	108	90	3800	940	1048	994	Y		N	A		
9/M	FUFBLK1XG106560XX	FL40	-/LIGHT CART LT 05	82	48	65	1400	970	1018	994	Y		N	A	P	
10/M	FUFBLK2XG106560XX	FL13	-/LIGHT CART LT 05	82	48	65	1425	970	1018	994	Y		N	A	P	
11/M	-		BALS 1/-	108	88	125	6760	1050	1158	1104	N		N	A		
11/M	FHFHC10XS200060XX	LT01	-/FLOODLIGHT FL-1D	78	48	61	1430	1050	1158	1104	Y		N	A		
11/M	FHMHC10XS200020XX	LTO4	-/FLOODLIGHT FL-1D	78	48	61	1430	1050	1158	1104	Y		N	A		
12/M	-		7E1AB/PALLET LOADED	108	88	72	3950	1050	1158	1104	N		N	A		J3D
13/M	FHFHC10XS200070XX		-/FLOODLIGHT FL-1D	78	48	61	1480	1065	1143	1113	Y		N	A		
14/M	FHMHC10XS200030XX		-/FLOODLIGHT FL-1D	78	48	61	1520	1065	1143	1113	Y		N	A		
15/M	FGMR14$$T100010XX		-/INTEL CONEX PFCRG	108	88	60	4096	1172	1280	1226	N		N	A		
15/M	FGMR28$$T100010XX	Hand	-/AN/PSC-15 GRRIP PFMAK	16	13	7	1	1172	1280	1226	N		N	A		
15/M	FGMR37$$B100010XX		-/LOADED CONTRACTING XFFKT	21	14	10	1	1172	1280	1226	N		N	A		
16/M	FGMR08$$A100050XX		-/HAZ/SUPPORT PALLET 7E1CC	108	88	90	4640	1172	1280	1216	Y		N	A		
17/M	-		-/Loose Water	104	24	36	1731	1282	1390	1336	N		N	A		
17/M	F7E1BD1XA100060XX		-/7E1BD TENT PALLET	108	88	96	5610	1282	1390	1336	N		N	A		
18/M	FGMR15$$A100050XX		-/SUPPORT PALLET 2	108	88	90	4520	1282	1390	1336	Y		N	A		

Total # of Pax:	19	Weight/Pax:	210	Total PAX Weight:	3990
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	102621	%ACL:	82	ACL:	130000
Cargo/Mail Weight:	102621	Cargo/Mail Moment:	9769		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	397381	Zero Fuel Moment:	35660		
CG Station:	897	%MAC:	33.5		

SQ/D	Class/Zone
1/M	3
1/M	8
1/M	9
2/M	2.2
2/M	3
2/M	8
2/M	9
4/M	2.2
4/M	3
4/M	9
6/M	2.2
6/M	3
6/M	8
6/M	9
7/M	2.2
8/M	2.2
9/M	3
9/M	9
10/M	3
10/M	9
11/M	3
11/M	9
11/M	9
13/M	9
14/M	3
14/M	9
16/M	2.2
18/M	2.2

ALL HAZARDOUS MATERIALS COVERED BY THIS LOAD PLAN HAVE BEEN INSPECTED AND FOUND TO BE PACKAGED IN THE PROPER OUTSIDE CONTAINER FREE OF VISIBLE DAMAGE AND LEAKS AND IS PROPERLY CERTIFIED

I HAVE BEEN BRIEFED ACCORDING TO AFMAN 24-204(I), PARAGRAPH 1.2.9, ON HAZARDOUS CARGO COVERED BY THIS LOAD PLAN

_____ _____

Air Terminal Representative Signature **Aircraft Crewmember Signature**

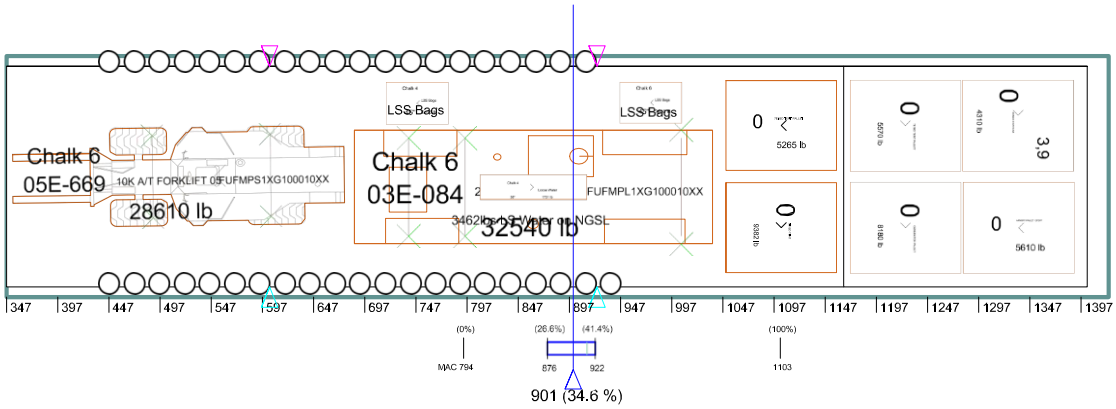
Load planned by: _____ **Date:** _____

Load approved by: _____ **Date:** _____

Aircraft type/Config: C-17/STD-AL
Delivery method: AL
Unit Being Airlifted: 321 CRS
Type movement plan: TURBO DISTRO
Departure date & time: 20150925 15:11 UTC
Departure airfield : WRI
Destination airfield: WRI
Load Description:

Mission type: Mobility
Mission #: TURBO DISTRO
Aircraft Tail #: 00006
System chalk #: CHALK 4 AF3
AFMAN 24-204 Chapter 3 Move

MAIN DECK



SQ/D	TCN/Pallet_ID	Bumper	Model/Nomenclature	LEN	WDT	HT	WT	FSN	TSN	CB	HZ	FL	V	D	SH	CCC
1/M	FUFMPS1XG100010XX	05E-669	-/10K A/T FORKLIFT 05	324	96	128	28610	353	677	550	Y		N	A	PS	
2/M	FUFMPL1XG100010XX	03E-084	-/25K NGSL 04E362	350	111	130	32540	687	1037	858	Y		N	A		
3/M	-		-/LSS Bags	60	40	45	6105	718	778	748	N		N	A		
4/M	-		-/Loose Water	104	24	36	1731	810	914	862	N		N	A		

5/M	-	-/Loose Water	104	24	36	1731	810	914	862	N	N A
6/M	-	-/LSS Bags	60	40	45	3610	946	1006	976	N	N A
7/M	-	-/Loose Water	104	24	36	1731	1050	1158	1104	N	N A
7/M	F7E1BD1A100060XXX	-/7E1BD TENT PALLET	108	88	96	5265	1050	1158	1104	N	N A
8/M	-	-/Loose Water	104	24	36	1731	1050	1158	1104	N	N A
8/M	F7E1BD1A100070XXX	-/7E1BD TENT	88	108	96	9382	1050	1158	1104	N	N A
9/M	F7E1BD0XA100070XX	-/7E1BD TENT PALLET	88	108	96	5570	1172	1280	1226	N	N A
10/M	-	-/GENERATOR PALLET	88	108	75	8180	1172	1280	1226	Y	N A
11/M	F7E1BD0XA100020XX	-/CONEX 4-WAY/HAZ	88	108	66	4310	1282	1390	1336	Y	N A
12/M	FGMR15$$A100090XX	-/ARMORY PALLET QFEPF	108	88	96	5610	1282	1390	1336	N	N A

Total # of Pax:	41	Weight/Pax:	210	Total PAX Weight:	8610
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	109182	%ACL:	91	ACL:	130000
Cargo/Mail Weight:	109182	Cargo/Mail Moment:	10696		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	406199	Zero Fuel Moment:	36587		
CG Station:	901	%MAC:	34.6		

SQ/D	Flags/Warnings

SQ/D	Class/Zone
1/M	2.2
1/M	3
1/M	9
2/M	2.2
2/M	3
2/M	9
10/M	Invalid IMO Code
11/M	3
11/M	9

ALL HAZARDOUS MATERIALS COVERED BY THIS LOAD PLAN HAVE BEEN INSPECTED AND FOUND TO BE PACKAGED IN THE PROPER OUTSIDE CONTAINER FREE OF VISIBLE DAMAGE AND LEAKS AND IS PROPERLY CERTIFIED

I HAVE BEEN BRIEFED ACCORDING TO AFMAN 24-204(I), PARAGRAPH 1.2.9, ON HAZARDOUS CARGO COVERED BY THIS LOAD PLAN

Air Terminal Representative Signature

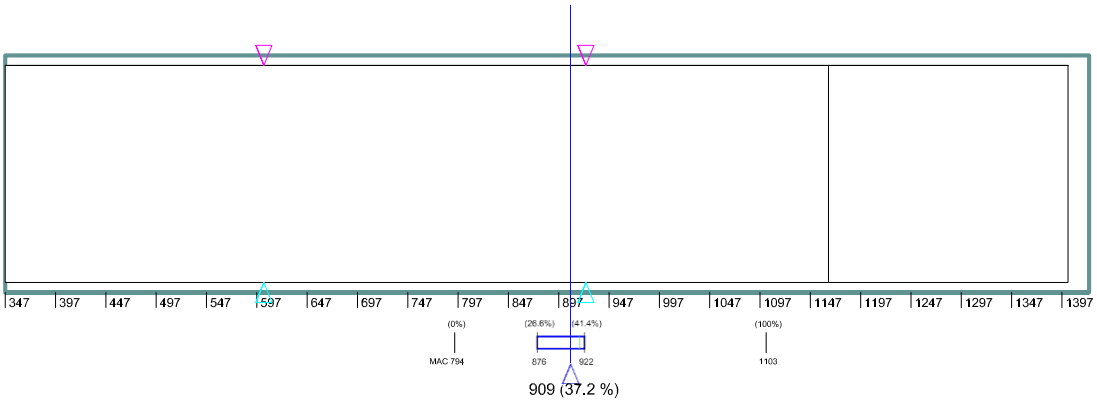
Aircraft Crewmember Signature

Load planned by: _____ **Date:** _____

Load approved by: _____ **Date:** _____

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	00001
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 5 AF4
Departure date & time:	20150925 16:00 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Model	WT	Nomenclature	FSN	LEN	WDT	HT

Total # of Pax:	0	Weight/Pax:	0	Total PAX Weight:	0
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	0	%ACL:	0	ACL:	130000
Cargo/Mail Weight:	0	Cargo/Mail Moment:	0		
Operating Weight:	284945	Operating Moment:	25891		
Zero Fuel Weight:	284945	Zero Fuel Moment:	25891		
CG Station:	909	%MAC:	37.2		

SQ/D **Flags/Warnings**

SQ/D **Class/Zone**

ALL HAZARDOUS MATERIALS COVERED BY THIS LOAD PLAN HAVE BEEN INSPECTED AND FOUND TO BE PACKAGED IN THE PROPER OUTSIDE CONTAINER FREE OF VISIBLE DAMAGE AND LEAKS AND IS PROPERLY CERTIFIED

I HAVE BEEN BRIEFED ACCORDING TO AFMAN 24-204(I), PARAGRAPH 1.2.9, ON HAZARDOUS CARGO COVERED BY THIS LOAD PLAN

Air Terminal Representative Signature

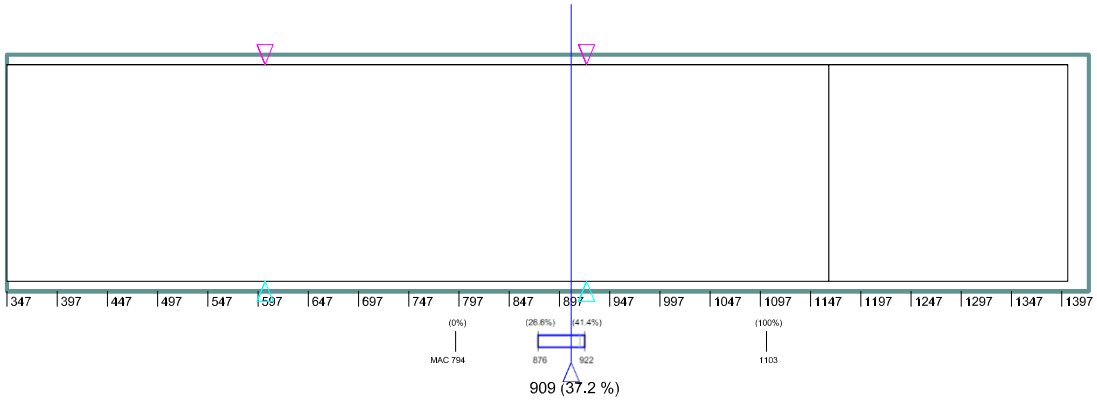
Aircraft Crewmember Signature

Load planned by: _____ **Date:** _____

Load approved by: _____ **Date:** _____

Aircraft type/Config:	C-17/STD-AL	**Mission type:**	Mobility
Delivery method:	AL	**Mission #:**	TURBO DISTRO
Unit Being Airlifted:	321 CRS	**Aircraft Tail #:**	
Type movement plan:	TURBO DISTRO	**System chalk #:**	CHALK 6 AF5
Departure date & time:	20150925 16:45 UTC	**AFMAN 24-204 Chapter 3 Move**	
Departure airfield :	WRI		
Destination airfield:	WRI		
Load Description:			

MAIN DECK



SQ/D	TCN/Pallet ID	Bumper	Mode	WT	Nomenclature	RSN	LEN	WDT	HT

Total # of Pax:	0	Weight/Pax:	0	Total PAX Weight:	0
Total # of Subfloors:	0	Weight/Subfloor:	0	Total Subfloor Weight:	0
Total Cargo Wt:	0	%ACL:	0	ACL:	130000
Cargo/Mail Weight:	0	Cargo/Mail Moment:	0		
Operating Weight:	284945	Operating Moment:	25891		
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CG Station:	909	%MAC:	37.2		

SQ/D	Flags/Warnings

SQ/D	Class/Zone

ALL HAZARDOUS MATERIALS COVERED BY THIS LOAD PLAN HAVE BEEN INSPECTED AND FOUND TO BE PACKAGED IN THE PROPER OUTSIDE CONTAINER FREE OF VISIBLE DAMAGE AND LEAKS AND IS PROPERLY CERTIFIED

I HAVE BEEN BRIEFED ACCORDING TO AFMAN 24-204(I), PARAGRAPH 1.2.9, ON HAZARDOUS CARGO COVERED BY THIS LOAD PLAN

Air Terminal Representative Signature

Aircraft Crewmember Signature

Load planned by: _____ **Date:** _____

Load approved by: _____ **Date:** _____

Increased Capacity Utilizing Aggregation and Consolidation of Contingency Cargo

MSgt Cassidy L. Wilson
Advisor: Jeffery D. Weir, PhD
Reader: Capt Michael P. Kretser, PhD
Department of Operational Sciences (ENS)
Air Force Institute of Technology

Problem Statement

Capture possible savings on real-world contingency missions by seeking all aggregation/consolidation opportunities.

Consolidation Opportunities

- Tonneau Covers
  - ATVs
- Bi-Level Airlift Loading System
  - Small/light weight UTCs

Aggregation Opportunities

- Water Pallets
- Baggage Pallets

Question 1: Does the current deployment process allow for full utilization of both pallets and aircraft capabilities?
Question 2: Can aggregation and consolidation of UTCs reduce required airlift for the Air Force JTF-PO heavy alert package?
Question 3: Will aggregation and consolidation of UTCs reduce or mitigate any current CRW capabilities?
Question 4: What other types of deployment movements can benefit from aggregation and consolidation of UTCs or requirements?
Question 5: What are the current limitations that prevent full utilization of pallets and full utilization of Aircraft?

CHALK #	OLD LP WT:	% ACL UTILIZED	OLD LP PPE UTILIZED	OLD LP % PPE UTILIZED	NEW LP WT	% ACL UTILIZED	NEW LP PPE UTILIZED	NEW LP % PPE UTILIZED
1/JAT	47331	36%	16	89%	80731	62%	18	100%
2	91635	70%	18	100%	93130	72%	18	100%
3	80701	62%	17	94%	113277	87%	18	100%
4	59605	46%	16	89%	116106	89%	18	100%
5	25570	20%	8	44%	0		0	0%
6	85685	66%	16	89%	0		0	0%
TOTAL	390527	50%	91	84%	403244	78%	72	100%

Results

- Achieved a 33% sortie reduction with consolidation and aggregation efforts.
- Increased Allowable Cabin Load (ACL) utilization by 28%.
- Increased Pallet Position Equivalent utilization by 16%

Significance of Research

This research has the ability to open new ways of viewing the deployment process not only for the CRW, but possibly all deployments. This research can have an immediate impact on the future of all CRW taskings as well as like-minded units that have a deployment only mission.

Conclusion

As the Department of Defense's budget is shrinking each year, it is vital that we are able to find smarter ways of conducting business in every area possible. Contingency deployments are extremely important to the national security of our country, but this research has shown an example of how efficiency can be gained concurrently on the battlefield as well as in the budget. The current mindset of deploying a UTC individually and in its entirety has noble reasoning, but is not efficient and without efficiency it is not 100% effective. It is the hope of this research that in the future, logistics planning will focus on not just UTC efficiency, but the entire mission efficiency. This research has shown that both can be achieved without compromising the other.

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14. ABSTRACT
Maximizing use of limited airlift assets is a common problem during large contingency operations. Requirements often exceed airlift capacity and fiscal constraints driving the need to aggregate conveyance loads both within and across business lines (ULN, SAAM, and sustainment). Current methods of consolidation are completed by planners at the 618th Air Operations Center. This process is completed by piecing email correspondence and making individual localized decisions which are not always consistent with big picture efficiency. United States Transportation Command requested a study to create standard business rules or a methodology that can benefit both manual and automated airlift aggregation decisions. Therefore, this research focuses on the opportunities for reducing the required sorties for the 621st Contingency Response Wing's Joint Task Force through aggregation and/or consolidation of unit type codes. A working group was created from various subject matter experts to create a methodology that would best work for contingency movements. A literature review was conducted to determine multiple aggregation and consolidation methods that subsequently utilize available vertical cargo space on the aircraft. The methods identified and prescribed by this research reduced the number of sorties required from six to four, resulting in a 33% reduction in required airlift.

15. SUBJECT TERMS
Contingency Mission UTC Aggregation/Consolidation

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