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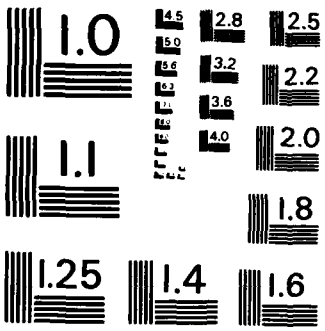

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QUANTIFYING WARTIME MANPOWER FOR
MILITARY AIRLIFT COMMAND (MAC) STRATEGIC
AERIAL PORT-CARGO SERVICES FUNCTION

THESIS

JOHN A. STARKEY
CAPTAIN, USAF

AFIT/GLM/LSM/85S-73

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THESIS

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Logistics Management

John A. Starkey

Captain, USAF

September 1985

Approved for public release: distribution unlimited

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My deepest appreciation to my wife Maureen, and son Taylor for their patience, understanding, and love. And finally, a special thanks to my advisor, Lt Col Richard L. Clarke, and my reader, Lt Col Carlos M. Talbott for their guidance and advice.

John A. Starkey

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Abstract

Military Airlift Command (MAC) strategic aerial port cargo services assumed wartime manpower data requirements are identified in nine separate Unit Type Codes (UTCs), UFBB1 through UFBB9. These UTCs were originally developed 10 to 15 years ago, however,the source data for their development is no long available. This study developed, with guidance from the HQ MAC Transportation Plans Staff, a revised set of UTCs manpower data requirements based on systematic modifications to current peacetime manpower standards.

The results of these revised UTCs manpower data requirements were then compared to the current MAC UTCs. In comparing the aggregate manpower requirements necessary to support the tasking of the UFBB series UTCs in the most stringent wartime scenario no discernible difference existed. When comparing manpower requirements for each individual UTC (UFBB1 through UFBB9) distinct differences began to emerge. The revised UTCs suggest that current MAC UTCs underestimate the manpower requirements in UTCs UFBB1 and UFBB2, while they overestimate the manpower requirements in UFBB4 through UFBB9. Finally, when comparing manpower by job classifications evidence form this study casts serious

doubts as to the proper employment of the freight traffic skill level in the current MAC UTCs. It also calls into question the proportion of supervisory personnel relative to the total UTC manpower.

This thesis concludes that differences do exist between the revised UTCs when compared to the current UTCs. This study has developed a systematic and justifiable procedure for developing aerial port cargo services UTCs. The specific determination of manpower requirements for individual UTCs (UFBB1 through UFBB9) are readily available for review and can be analyzed by individual work centers.

QUANTIFYING WARTIME MANPOWER FOR MILITARY AIRLIFT COMMAND (MAC) STRATEGIC AERIAL PORT-CARGO SERVICES FUNCTION

I. Introduction

Purpose of the Study

The purpose of this study is to develop a quantitative basis for determining the wartime manpower requirements of the Military Airlift Command (MAC) strategic aerial port cargo services function. Properly quantified wartime manpower requirements will provide a defensible basis for resource requirements determination and a systematic basis for effective decision making.

Background of the Problem

Currently, MAC strategic aerial port cargo services wartime manpower requirements are identified in nine separate Unit Type Codes (UTCs). MAC transportation war planners believe that these UTCs "...were developed based upon some modification of peacetime standards ten to fifteen years ago" (30). Unfortunately, the background data on their development is no longer available (Ref. Appendix A).

The following background discussion provides a general overview of Unit Type Codes (UTCs), a cursory review on the development of strategic aerial port peacetime manpower

standards, and a brief introduction to the structure and function of MAC aerial ports. A more detailed treatment of these subjects is deferred until Chapter II.

Unit Type Codes (UTCs). UTCs are a planning tool used in the Joint Operation Planning System (JOPS). They are used by all the services to identify the characteristics of a specific unit type to perform a prescribed military mission. In JOPS, a UTC is defined as:

> The five-character, alphanumeric code which is associated with each type unit and allows the organization to be categorized into a kind or class having common distinguishing characteristics (1, Appendix 2, 19).

UTC data are divided into two categories, manpower and equipment. Corresponding manpower and equipment UTCs are linked together by a cross reference which appears in the mission capability statement of the respective UTCs. This study concerns itself only with manpower data on several UTCs, specifically MAC strategic aerial port cargo services UTC's UFBB1 through UFBB9.

Figure 1 is a listing of MAC UTC UFBB1 manpower data. This UTC's manpower data contains a wealth of information. Three items of particular interest to this study are the UTC title code, the Mission Capabilities Statement (MISCAP), and the manpower detail (manpower table).

Referring to Figure 1, the title code appears on the second line in the upper left hand corner. This title code lists the unique UTC label, a title description, and the

PREPARED 84 OCT 26 MANPOWER FORCE ELEMENT LISTING AS OF 84 OCT 26 PCN SA200-1[illegible]

UTC - UFBB10 TITLE - APO STRAT CGO SVCS 050 TNS-DAY STRENGTH - OFF 003 AMN 043 CIV 000 TOTAL 0046 CHANGE DATE - 830117

SEQ NR MISSION CAPABILITIES STATEMENT

1 PROVIDES PERSONNEL TO PERFORM ALL CARGO SERVICES
2 ASSOCIATED WITH A MAJOR APOE/D TO INCLUDE AIRCRAFT
3 LOADING/OFF-LOADING, SHIPPER EQUIPMENT LOADING/OFF-
4 LOADING, PALLETIZATION, PALLET BREAKDOWN, WAREHOUSING,
5 LOAD MARSHALLING AND STAGING. WILL ALSO SUPPORT UNIT
6 DEPLOYMENT OPERATIONS UP TO A MOG OF 3 WITH A REDUCED
7 CAPABILITY IN BREAKBULK OPERATIONS. INCLUDES COMMAND
8 AND ADMINISTRATION SUPPORTS ALL AIRCRAFT TYPES
9 EXCEPT WIDE-BODY CARGO AIRCRAFT. TONNAGE CAPABILITY
10 INCLUDES STRATEGIC, INTRATHEATER AND RETROGRADE. USE
11 IN ASSOCIATION WITH EQUIPMENT UTC UFBL1. SEE ALSO
12 PERSONNEL UTCS FOR PASSENGER SERCICE, FLEET SERVICE,
13 RECOUPMENT, VEHICLE DISPATCH, 463L EQUIPMENT MAIN-
14 TENANCE. REQUIRES BASE OPERATING SUPPORT. MB, LB,
15 SB.

MANPOWER DETAIL

FAC CODE	FAC CODE TITLE / POSITION TITLE	AFSC	SEI	GRADE	QUANTITY	SEQ NBR	DUTY CODE	CRM	TLK	LINE NUMBER
4230	AERIAL PORT OPS									
	TRANSPORT STAFF OFF	06016		04	2	1				001
	TRANSPORTATION OFF	06054		03	1	2				002
	FREIGHT TRAFF SPEC	60251			1	3				003
	APR AIR CARGO SPEC	60531			9	4				004
	AIR CARGO SPEC	60551			18	5				005
	AIR TRANSPORT SUPV	60572			8	6				006
	APR ADMIN SPEC-STAFF	70230B			1	7				008
	ADMIN SPEC-STAFF SPT	70250B			4	8				009
	AIR TRANSPORT SUPT	60599			2	9				007

FUNCTION TOTAL 046

(4:7)

Figure 1. MAC UTC UFBB1

planned capability factor. According to Figure 1, the UTC label is "UFBB1". Throughout the entire Joint Operations Planning System, all MAC air transportation UTCs are uniquely identified as starting with the letters "UFB" (7:7). The last two characters indicate the specific functions the unit is designed to perform and the planned capability of that unit. In this UTC, the planning capability factor is "050 TNS-DAY" (tons per day). "050 TNS-DAY" is a logistics term which indicates to all Department of Defense (DoD) war planners that this particular strategic aerial port cargo services UTC is designed to provide the necessary aerial port services required to process a maximum of 50 short tons of cargo per day. Each of the nine UTCs addressed in this study have separate planning capabilities factors ranging from 50 to 800 short tons per day. The individual capability factors are based on the mission needs of the supported theater Commands as identified in the various war plans.

The next item of interest is the mission capability statement (MISCAP). The MISCAP states the employment mission capabilities of the type unit/element. According to MAC Regulation 28-1, War Planning, UNIT TYPE CODE MANAGEMENT, the MISCAPs should include the following information:

a. A brief explanation of what the unit type (force element) can do.

b. Type bases to which the unit/element can be deployed:

MB - Main Operating Base
LB - Limited Operating Base

SB - Standby Deployment Base
BB - Bare Base

c. A list of the major functional areas that are included in the force elements.

d. A description of the significant workload considerations used to determine how the element will be used.

e. The source of the manpower detail.

f. Other information of value to a planner who may consider the use of the force in a plan (7:1).

The MISCAP in Figure 1 adheres to all the requirements listed above with the exception of the requirement to identify the source of the manpower detail which contains the manpower table. The source of the manpower detail identifies to war planners how the manpower tables listed in the particular UTC were developed.

The final item of interest is the manpower detail which contains the manpower table. This table lists the estimated manpower necessary to support the requirements defined in the Mission Capability Statement (MISCAP) and the workload identified in the title code. It is the determination of this manpower table that is the focus of this study. In the manpower detail, manpower positions are described by job title, Air Force Speciality Code (AFSC), rank for officers only, quantities required, and a functional total. Figure 1 indicates that 46 personnel are required to perform the strategic aerial port cargo services functions identified in UFBB1.

Development of Peacetime Standards. Development of MAC strategic aerial port peacetime standards is the responsibility of the MAC Management Engineering Team (MACMET). Air Force Regulation (AFR) 25-5, Volume I and II, Management Engineering, AIR FORCE MANAGEMENT ENGINEERING PROGRAM (MEP), Policy, Responsibilities and Requirements, provides the guidance and procedures used by MACMET in developing peacetime standards. Requests for development of peacetime workload standards are initiated at the squadron level or above (18:1).

In this study, ten peacetime manpower standards are examined. Each standard was developed using an operational audit. An operational audit is a rigorous time study analysis performed by a MET in the effected work center. AFR 25-5, Volume I, defines an operational audit as a:

> ...work measurement method consisting of one or a combination of the following techniques: Good Operator Timing, Historical Records, Technical Estimate, Standard Time, and/or Directed Requirements (14:Atch 1, 9).

The objective of an operation audit is to collect manhour data on the workload activity of a preselected group of experienced workers in predesignated work categories. The combination of these predesignated work categories constitutes the total workload of that work center. In an operational audit, MACMET team members record, at randomly assigned times, the activities of the preselected group of experienced workers. In MACMET terminology, this is the

good operator technique. To determine the manhours required for activities which are not readily measured by the good operator technique, interviews are conducted with individuals from the effected work center and estimates are established to predict the manhours needed to perform the work measured. These estimates are referred to as technical estimates. This manhour data collection process typically takes 15 to 30 days to complete (3).

The manhour data obtained during the operational audit are analyzed using the Air Force Management Engineering Agency bivariate and multivariate regression analysis modes. Five such general models are used:

General Forms of Equations	Description
$Yc = a + bx$	Linear
$Yc = a + b1 * X1 + b2 * X2 + \ldots$	Multivariate Linear
$Yc = a*X^{b}$	Power Curve
$Yc = X/(a + bX)$	Ratio Curve
$Yc = a + bx + cx^{2}$	Paralinear (23:2)

Upon completion of the data analysis and choice of a general equation, operational parameters of the model are determined. Through statistical analysis, the upper and lower limits for the resulting manpower formulas are established and the MACMET study is complete.

The results of the completed study are channeled through both the squadron and operating command echelons and

the MACMET levels for final review and comment. Upon acceptance of the standards, they serve as a manpower measure for future peacetime manpower requirements.

Military Airlift Command (MAC) Aerial Ports. MAC has established two types of aerial port squadrons, strategic aerial port squadrons (APSs,) and mobile aerial port squadrons (MAPSs). This division is consistent with the MAC Airlift Concept of Operations. The MAC airlift concept divides airlift into two types of operations, intertheater airlift (primarily the domain of APSs) and intratheater airlift (primarily the domain of MAPSs).

> Intertheater airlift, usually deployment and resupply missions, are transoceanic in nature and normally operate between main operating bases (MOBs). Deployment missions operate from main bases near the deploying unit's home base or post to an overseas port of debarkation. Resupply missions generally operate through strategically located fixed aerial port facilities where cargo is assembled into aircraft loads to be shipped on scheduled flights. Intertheater airlift operations are normally conducted by C-5, C-141, and commercial airlift (33:Ch 2, 7-8).

> After troops and equipment arrive in the theater via airlift, sealift or prepositioning, intratheater airlift normally provides transportation within the theater between MOBs or seaports and forward operating locations (FOLs). Intratheater airlift forces are trained, manned, and equipped to deliver combat forces directly into an objective area, both during and subsequent to the assault phase of an operation; to perform those airborne operations which provide for the relocation of forces within and from a combat area; and to perform air logistics operations in support of all theater forces (33:Ch 2, 8).

Figure 2 is a pictorial representation of the Airlift Concept of Operations.

The mission of strategic aerial port squadrons (APSs) as described in MAC Regulation 23-25, Organization and Mission--Field, AERIAL PORT SQUADRONS:

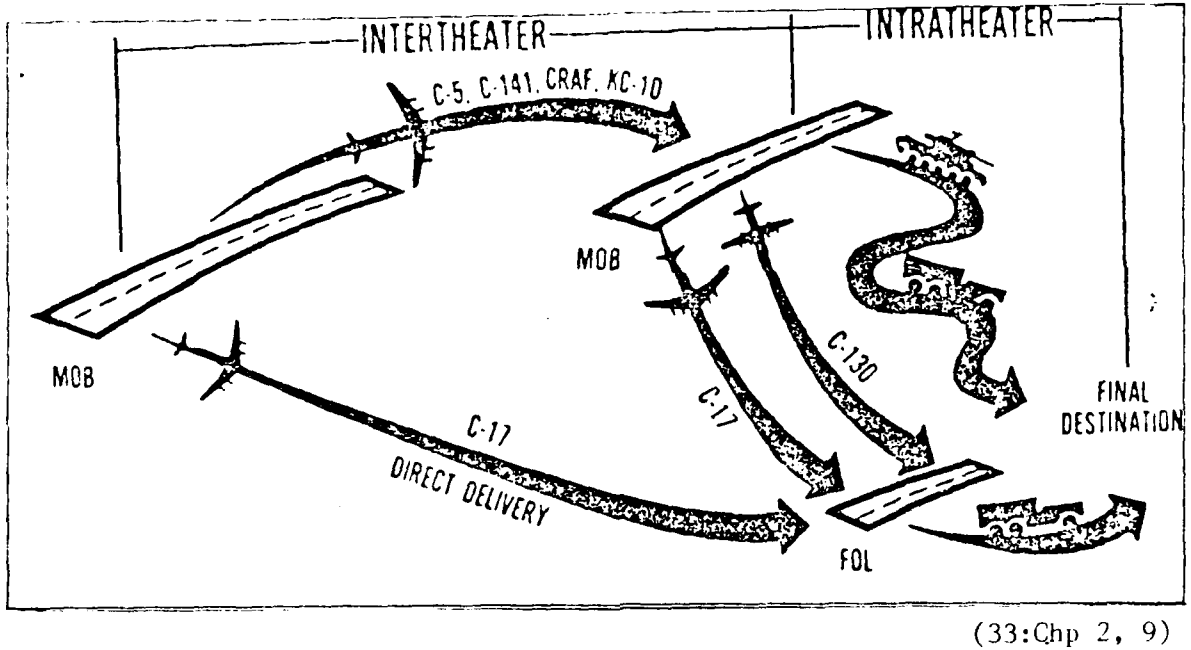
> The mission of aerial port squadrons is to operate fixed air terminal facilities as required to support MAC airlift operations, and to manage commercial transportation services. Fixed terminal facilities operations include all services required for effective movement of passengers, mail cargo by military or military contract aircraft. Mobile terminal operations include functions required to prepare cargo for aerial delivery modes and the terminal services associated with airland operations in an airhead (9:1).

The mission of mobile aerial port squadrons as described in MAC Regulation 23-21, Organization and Mission--Field, MOBILE AERIAL PORT SQUADRONS:

> The mission of mobile aerial port squadrons is to provide mobile terminal operations in support of airlift forces. Mobile terminal operations include functions necessary to support aerial port operations at a forward operating base (10:1).

This study addresses manpower requirements for strategic aerial ports. Wartime manning for mobile aerial ports is outside the scope of this study.

An organizational chart for strategic APSs is provided in Figure 3. Table 1.1 lists the strategic APS organizational chart required to initiate the UFBB1 through UFBB9 series UTCs. This chart was derived from information contained in the mission capability statement of the UTCs under



(33:Chp 2, 9)

Figure 2. Airlift Concept of Operations

ORGANIZATIONAL CHART FOR
AERIAL PORT SQUADRONS

```
Command
├─Unit Administration
├─Squadron Section
├─Vehicle Management
├─Traffic Management Office
│  └─Freight Service
│     ├─Inbound Freight Documentation
│     ├─Outbound Freight Documentation
│     ├─Loading and Offloading
│     ├─Preservation, Packing, and Packaging
│     └─Railroad Operations
├─Preservation, Packing, and Packaging
├─Surface Freight
│  ├─Passenger Movement
│  └─Personal Property
├─Combat Mobility
│  ├─Aerial Delivery
│  ├─Vehicle Operations and Maintenance
│  ├─Mobility Plans and Training
│  └─Supply
├─Aerial Delivery Support
│  ├─Aerial Delivery
│  └─Vehicle Operations and Maintenance
└─Squadron Operations
   ├─Passenger Service
   │  ├─Passenger Processing
   │  ├─Terminal Reservations
   │  └─Baggage Processing
   ├─Fleet Service
   ├─Air Freight Service
   │  ├─Cargo Processing
   │  ├─Ramp Services
   │  ├─Recooperage and Repackage
   │  ├─Special Handling Cargo
   │  └─Conveyor Systems Maintenance
   ├─Air Terminal Operations Center
   ├─Records Reports DCC Computor Operations
   ├─Terminal Reservations
   ├─Aircraft Services
   │  └─Vehicle Control
   ├─Vehicle Control
   └─Fleet Supply
```

(9:Atch 1)

Figure 3. Organizational Chart for Aerial Port Squadrons

consideration and reflects the wartime organization of that unit. A description of the specific functions performed by each section will be deferred until Chapter II.

TABLE 1.1

ORGANIZATIONAL CHART FOR STRATEGIC AERIAL PORT SQUADRONS UNDER UTC'S UFBB1 THROUGH UFBB9

Command

- Unit Administration
- Squadron Section
- Squadron Operation
  - Air Freight Services
    - Cargo Processing
    - Ramp Services
    - Special Handling Cargo
  - Air Terminal Operations Center
  - Records Reports DCC Computer Operations

Justification

Justification for this research is based on three factors. First, an earlier research effort by this author to forecast future wartime needs of aerial port manpower was abandoned, in part, when it was discovered that quantitative proof was unavailable to substantiate the UTCs reviewed in this study. The second factor, is a keen interest expressed by MAC transportation war planners to have a mathematically justified basis for their aerial port UTCs (25,27). The

sheer volume, some 66 active UTCs prohibit individual field testing. Additionally, MAC transportation planners are feeling the pressure to make the most with the people they have. The final factor is a requirement inherent in MAC Regulation 28-1, War Planning, UNIT TYPE CODE MANAGEMENT, to have as a part of the UTC mission capability statement "the source of the manpower detail (e.g., logistics composite modeling (LCOM), manpower standard, guide, etc.)" (7:1). No such source exists for the current APS UTCs making it difficult to justify estimates of wartime manning needs.

Problem Statement

HQ MAC transportation war planners are uncertain that the current cargo services aerial port unit type code (UTCs) manpower data accurately reflect wartime requirements (30). They need to know the UTC manpower composition which would result from an extrapolation of peacetime workload formulas modified with their guidance for a wartime environment.

Research Question

If the guidance of experienced MAC transportation war planners is used to develop new UTC manpower data from modified peacetime standards, how do the results of these revised UTC manpower requirements compare to the current MAC cargo services aerial port UTC manpower requirements?

Research Objectives

1. To determine what peacetime work center standards describe the functions required in the mission capability statement of the cargo services aerial port manpower UTCs.

2. To determine how the peacetime formulas operate and what input data are required to manipulate them.

3. To use guidance from MAC transportation war planners in modifying the peacetime formulas to reflect a wartime environment.

4. To calculate, from the modified standards, the manpower necessary to produce the capability of current UTCs.

5. To compare the revised UTC manpower requirements with those currently being used by MAC and identify points of similarity and difference.

Scope and Limitations of the Study

The United States Air Force operates aerial ports under the auspicious of the Military Airlift Command (MAC) and the Air Force Logistics Command (AFLC). The scope of this report is confined to only MAC aerial ports because the UTCs under review are MAC UTCs. More specifically, this thesis is further limited to the analysis of those work centers described in the mission capability statements of UTCs UFBB1 through UFBB9. These are strategic aerial port UTCs and therefore do not task MAC mobile aerial port squadrons (MAPS). This study limits its findings to the operational

characteristics of MAC's six major continental United States (CONUS) strategic aerial ports because they are the ports primarily tasked under the UFBB series of UTCs.

Methodology

In this section, a brief overview of the methodology used in this thesis is provided. Chapter III details a more descriptive account of this methodology.

In answering the research objectives, published sources were used to the maximum extent possible. Such was the case in determining which peacetime standards to use and how to use them. Verification of the work center choices was provided by MAC transportation war planners. The judgment of MAC transportation war planners was also instrumental in providing unclassified guidance on the conversion of the peacetime standards to a wartime environment when published data was not available or was otherwise classified. The comparison of the revised UTCs to the current UTCs was based solely on manpower.

II. Background

Chapter Overview

This chapter expands the background subjects treated in Chapter I and discusses the role of unit type codes (UTCs) in the planning process. MAC management of aerial port UTCs is discussed along with a detailed description of the work centers used in the strategic cargo services UTCs. An illustrative example of a peacetime work center formula is demonstrated. Finally, a literature review is presented.

The Role of UTCs in the War Planning Process

UTCs are a planning tool used in the Joint Operation Planning process. The role a UTC's manpower data plays in this planning process is to quantify the personnel required to support an Operation plan in complete format (OPLAN).

> An Operation Plan in Complete Format (OPLAN) can be used, with minor modification, to develop an OPORD (Operation Order) and execute an operation. An OPLAN...is supported by a computer-based Time-Phased Force and Deployment Data (TPFDD) file (1:Ch 9, 4).

Specific UTCs are identified in the TPFDD by a five character alphanumeric code. The nature of the joint planning system requires that UTCs represent an average or generic type of unit. This flexibility enhances the applicability of UTCs in supporting a variety of different wartime scenarios.

To insure the overall flexibility of the MAC air transportation UTCs, MAC war planners have divided their

UTCs into two categories - strategic and tactical. Strategic UTCs are designed to support the wartime aerial port operations at fixed aerial ports. In the planning process, fixed ports represent pre-established aerial port facilities or facilities which could quickly be converted for strategic aerial port operations. Tactical UTCs are designed to support the wartime aerial port operations at forward operating locations where aerial port facilities are minimal to non-existent. The following section discusses how MAC transportation war planners manage their UTCs.

MAC UTC Management

MAC Regulation (MACR) 28-1, War Planning, UNIT TYPE CODE MANAGEMENT:

> Identifies offices of primary responsibility (OPRs) for unit type codes (UTCs), and establishes procedures for UTC review, update, and management (7:1).

This regulation identifies HQ MAC Transportation Plans Division (HQ MAC/TRXP) as the functional OPR for Air Transportation UTCs.

The USAF system designed to manage UTCs is the Manpower and Equipment Force Packaging System (MEFPAK). The purpose of MEFPAK is to:

> ...provide predefined, standardized data and descriptions for units or elements used in contingency planning at all levels of command (16:238).

MEFPAK is composed of two subsystems; the Manpower Force Packing System (MANFOR), "a standardized means to

identify manpower requirements to OPLAN force lists" and the Logistics Force Packaging System (LOGFOR), "a system through which the material characteristics of the type unit are stated" (16:228). The data relationship between UTCs and MEEPAK is such that:

> The UTC is the key to collecting, reporting, and using MEFPAK data. This code transcends organizational structure and ties together all information about a given type unit (that is force description, mission capability, manpower, and logistics detail):
>
> 1. The UTC, as used in MEFPAK, represents a statement of requirement. It provides that data required for effective ADP support to Air Force Planning by establishing the 'address' within MEFPAK through which data can be retrieved from MANFOR and LOGFOR.
>
> 2. Service-wide distribution of MEFPAK data and the use of UTCs reduces the amount of detailed planning data which must be coordinated among the various MAJCOMS (Major Commands) during OPLAN generation or review (16:238).

HQ MAC/TRXP managed 66 active MANFOR UTCs as of 26 October 1984. All MAC aerial port UTCs are reviewed annually as required by MACR 28-1. Manning is based on an assumed wartime emergency work month of 244 hours per man (7:1). Two hundred forty-four manhours per month is a wartime emergency manpower availability factor (MAF) which is based on a 10 hour work day, six days a week. Shift lengths described in the MAC aerial port UTCs are based on a 12 hour work day. Personnel are therefore scheduled to work 12 hours per day for five days followed by two days off.

In reviewing the UTC operations performed by the aerial ports, the distinction between unit movement/deployment and strategic cargo services (breakbulk) must be emphasized. The function of unit moves is to deploy an entire unit from one place to another. This task normally involves chartering aircraft dedicated specifically for the movement of that unit. The function of the cargo services system is to provide a pre-established channel of airlift support to augment the individual needs of the deployed units. In this case, aircraft are dedicated to specific channels.

Unit moves for all Services using military organic or contract airlift are described in a joint service regulation entitled, Movement of Units in Air Force Aircraft, AF Regulation 76-6. This regulation defines the duties and responsibilities of the moving units. Cargo and passengers are prepared for air movement by the user before arriving at the airfield. Aerial port personnel double check the unit's cargo, paperwork, and passenger manifest prior to aircraft loading. When loading the aircraft, additional manpower support is provided by the unit being moved. Strategic cargo service operations are designed to process non-unit related supplies and equipment which:

> ...are shipped en masse to ports of support (POS) that serve the forces needing the support. Supplies are not identified for individual units thus the designation non-unit related supplies' (1:Ch 6, 29).

The support provided by aerial port personnel when operating under strategic cargo services UTCs is delineated in the mission capability statement of those UTCs. These services include:

> ...aircraft loading/off-loading, shipper equipment loading/off-loading, palletization, pallet breakdown, warehousing, load marshalling and staging (4:7-15).

Unlike unit moves, aerial port personnel are not provided with additional manpower from the shipper to help perform these functions. The following section addresses the specific aerial port duties and responsibilities required to achieve the mission capability described in the strategic cargo services UTCs UFBB1 through UFBB9.

Aerial Port Responsibilities

The responsibilities of MAC strategic aerial port squadrons (APSs) are defined in MAC Regulation (MACR) 23-25, Organization and Mission--Field, AERIAL PORT SQUADRONS. This regulation identifies the mission of the aerial squadrons. It also establishes the work centers needed to support that mission and defines the duties and responsibilities of those work centers.

In Chapter I, Table 1.1, the aerial port work centers needed to support the mission capability statement of UTCs UFBB1 through UFBB9 were identified. Listed below are the functional statements of those work centers as defined in MACR 23-25.

Commander (AA) - Exercises command jurisdiction over all activities of the squadron. Formulates plans and establishes procedures pertaining to the accomplishment of the assigned mission. Supervises the air terminal management system (ATMS), a computerized program for gathering and presenting aerial port workload, manhour accounting, and financial data. Administers to the general welfare and morale of assigned personnel.

Unit Administration/Squadron Section(s) (AU/AZ) - Publishes and distributes orders and directives. Maintains correspondence and publications files. Performs all unit administrative functions for airmen, such as TDY, OJT, security training, career development, reenlistment, promotion programs, etc.

Squadron Operations (MTY) - Responsible for overall management and control of the fixed terminal. Gives administrative services to all terminal operating functions. Conducts and monitors inspections and technical programs, and evaluates effectiveness of terminal operations.

Air Freight Service (MTYC) - Manages and supervises the air freight terminal operation. Prepares correspondence and reports relative to customs, irregularity reports, tracer actions on lost shipments, backlogs, and movement reports. Inspects and monitors all cargo loading and offloading, and processing activities in and around the terminal.

Cargo Processing (MTYCA) - Receives, processes, and warehouses all general cargo. Inspects cargo for proper packing and marking and prepares documents on damaged shipments. Makes cargo available to cosignee and maintains receipts and records of transactions. Matches incoming cargo with transportation data listings, palletizes cargo, selects and assembles into aircraft loads, and delivers to ramp services for loading.

Ramp Service (MTYCB) - Loads and offloads cargo from aircraft, trucks, dollies, etc. Operates material handling equipment during loading/offloading activities and prepares and positions equipment for loading/offloading.

Special Handling Cargo (MTYCF) - Receives, processes, and warehouses all special handling cargo,

including explosives, dangerous cargo, classified cargo, human remains, and other special interest cargo. Palletizes cargo for air shipment. Opens offload pallets at aircraft and withdraws special handling cargo.

Air Terminal Operations Center (MTYD) - Plans, coordinates, and controls aircraft requirements, programs, and utilization, for all activities of the terminal related to loading, offloading, and servicing of aircraft. Coordinates with the airlift operations center, aircraft maintenance, on/off base traffic and operations activities, and all other agencies concerned with aircraft scheduling, space allocation, on/offloading, and servicing. Monitors cargo on hand and backing information.

Records Report DDC Computer Operations (MTYE) - Audits shipping documents and supporting records to assure that data and actions are accurate. Prepares continuing reports and statistical information. Maintains records of shipping actions transiting the base, prepares special reports on transportation actions. Provides document processing capability. Mechanically prepares listings, accounting records, reports, inventories, and manifests (9:3-8).

For each of the above described work centers, a MAC Management Engineering Team (MACMET) has established a specific peacetime standard formula which is used to determine the manpower levels required to perform that function at a specific strategic aerial port. The following section describes the mechanics of a peacetime manpower formula.

The Mechanics of a Peacetime Manpower Formula

In Chapter I, an outline of the procedures used by the MAC Management Engineering Team (MACMET) for determining manpower standards was reviewed. Presented here is an example of how a peacetime standard works. Appendix B, contains a copy of the Work Center Description Report for

the Special Handling function. The work center description identifies both direct and indirect duties performed and contains Air Force (AF) Form 1113, Manpower Standard and Table. Direct duties are those unique tasks performed by a work center as required by governing regulations. Indirect duties are standard tasks performed by managers and supervisors. AF Form 1113, Manpower Standard and Table contains several items of particular interest to this study. These items include the work center title, applicability statement, extrapolation limits, application instructions, the standard equation and the manpower table. According to AF Form 1113, this standard applies to all six major CONUS strategic aerial ports. The standard has been determined by MACMET to be statistically valid within the range of a minimum of 67.38 manhours per month to a maximum of 4148.00 manhours per month. The application instructions require a 12 month average of the total special handling tonnage. This information is extracted from MAC Form 82, Monthly Station Traffic Handling Report, which will be discussed shortly. The standard equation for this work center is $Y = 825.038 * X^{.1817}$. The R^2 value for this regression model is .88847 (23:Atch 2,25). X, the independent variable, is the average monthly special handling cargo tonnage. The dependent variable Y is the total number of monthly manhours necessary to operate the work center. The conversion from monthly manhours to manpower is the result

of dividing Y by 145.2 hours, the CONUS peacetime work month manpower availability factor (MAF). Once the manpower is determined in aggregate, this number is used in choosing the appropriate manpower table. The manpower table in AF Form 1113 identifies personnel by job title, Air Force Speciality Code (AFSC) and rank.

Appendix C, contains MAC Form 82, Monthly Station Traffic Handling Report. This form is the workload source document for all the peacetime standard formulas used in this study. To apply the Special Handling formula, workload data from this form must be extracted. According to MAC Form 82, Section III, General Information, Subsection B, Special Handling (tons) the 62nd APS processed 1681 tons of special handling cargo in the month of April 1985. For illustrative purposes only, it is assumed that 1681 represents a 12 month average for this work station. Combining the workload data derived from MAC 82 and the standard formula from AF Form 1113, the peacetime manhours required to operate the Special Handling section is determined in the following manner:

$$Y = 825.038 * X^{.1817} \quad \text{(source AF Form 1113)} \qquad (2.1)$$

$$X = 1681 \text{ (source MAC Form 82)}$$

$$Y = 825.038 * 1681^{.1817}$$

$$Y = 825.038 * 3.856$$

$$Y = 3180.970 \text{ Monthly manhours}$$

Since 3180.70 is less than 4148.00, the upper limit of the formula, manpower equivalents can be determined. To determine manpower requirements, the monthly manhours are divided by the manhour availability factor (MAF) in the following manner:

3180.70 / 145.2 = 21.906

Rounding tables for peacetime standards are provided in AF Regulation 25-5, Volume II. This table is also available in Appendix D. 21.906 rounds to 22, so by this standard 22 people are required to process an average of 1681 tons of special handling cargo per month. Referring to the manpower table provided in AF Form 1113, the following people by AFSC and rank will be employed:

TABLE 2.1

ILLUSTRATIVE PEACETIME SPECIAL HANDLING MANPOWER TABLE

AFSC	RANK	QUANTITY
60571	MSG	1
60571	TSG	1
60571	SSG	2
60551	SSG	3
60551	SGT	6
60551	SRA	7
60531	AIC	2
TOTAL		22

This process is repeated for all aerial port squadron work centers to determine, on a yearly basis, the units

peacetime manning. This information becomes part of the squadron's unit manning document (UMD) and is officially recognized as the authorized strength of that unit for the year.

Literature Review

The Literature Review previews three separate efforts to establish wartime manpower requirements. The first effort summarizes the results of aerial port manning during the Vietnam Conflict, the second effort uses a simulation approach to develop tactical aerial port wartime manning, and the third effort outlines a procedure developed by the Air Force Logistic Command (AFLC) to modify peacetime standards for a wartime environment and briefly describes the approach being used by the MAC Management Engineering Team (MACMET).

Vietnam Effort. Wartime manning of aerial ports during the first half of the Vietnam Conflict proved to be particulary troublesome according to a study conducted by the USAF Tactical Airlift Center entitled Tactical Airlift, SEA: CORONA HARVEST, 1 January 1965-31 March 1968 (Volume III: Aerial Port Operations). This report stated that "...personnel shortages plagued the aerial port complex throughout the entire Vietnam buildup" (32:122).

In Vietnam, manpower authorizations were based on monthly tons handled per man. A February - March 1967 manpower study by a PACAF (Pacific Air Forces) Manpower

Survey Team established a standard of "...75 tons of cargo per man and 1100 passengers per Passenger Service clerk per month" (32:122). However, "Repeated efforts to obtain these spaces were useless due mainly to a low priority on the 7th Air Force priority listing of outstanding requirements" (32:123). Additionally, these standards had not received USAF sanction. Consequently, an USAF Management Engineering Survey Team visited Republic of Vietnam (RVN) aerial ports in November 1967 and conducted their own study to provide a validated Air Force Manpower standard. As a result of this study, the Seventh Air Force (7AF) increased the monthly manhour availability factor (MAF) from 170 manhours per month to 216 manhours per month. This change resulted in an increase from 75 tons of cargo per man per month to 90 tons of cargo per man per month. Passenger totals were similarly affected, changing from 1100 passengers per month to 1340 passengers per man per month (32:122-123). Unfortunately, during this time period, the lag time between authorization increased and the personnel pipeline was six months (32:124). As a result, by the time new personnel arrived, the authorizations were being increased again.

> Aerial port authorizations versus assignments were so critical that during the TET Offensive in early 1968, there were inadequate work hours or reserves in the theater to absorb the increased workload caused by increases of in-country C-130 aircraft. Approximately 400 TDY personnel from PACOM [Pacific Command], CONUS, and USAFE [United States Air Force Europe] were required to augment the in-country aerial ports until May 1968 (32:124).

Several other manpower problems were identified in this report, primary among them were:

1. Lack of wartime manning standards.
2. Application of peacetime operation standards based on stable base environments.
3. Variation in the aerial port organizational structures between MAC, TAC, USAFE and PACAF.
4. Wartime unique tasks.
5. Variation in the tasks performed by different in-country aerial ports (strategic functions versus tactical functions and combinations thereof) (32:124-125).

Many of the problems identified above have been rectified by the Air Force in the years since the Vietnam Conflict. Most importantly, there is no evidence to indicate that UTCs UFBB1 through UFBB9 were arbitrarily based on a 90 tons per month per man standard.

Simulation Effort. A more recent effort to quantify wartime aerial port manpower was published in a 1983 Air Force Institute of Technology (AFIT) thesis entitled, Simulation and Manpower Forecasting Models for Tactical Aerial Port Operations in a Contingency Environment. This thesis addressed the need to develop quantitative models to determine tactical aerial port manpower standards in a contingency environment. A computer simulation model was developed to establish mathematical equations for both terminal services operations and ramp services unit type codes (UTCs). Terminal service function was subdivided to include:

> ...marshalling operations [which] include the joint inspection of cargo loads with representatives of the unit to be transported, weight validation, limited palletization, load segregation, and cargo control. Ramp services include the set up of aircraft loads, the on and offload of aircraft, and the supervision of the deploying unit support forces in the aircraft parking area (28:7).

The resultant terminal services manpower model is:

$$ARU = 306.7304 + 3.3488 * MRCS - 265.3267 * IR + 4.0147 * (SR2) - 949.0579 * TR - 167.4501 * UR + 673.3414 * (UR) * (TR)$$

where

ARU = average personnel resources used

IR = inspection rate

SR = load setup rate

TR = transportation rate

UR = upload rate

And the ramp service manpower model is:

$$ARU = -3.5066 + 2.336 * (MRCS) + 2.392 * (DR)$$

where

ARU = average personnel resources used

MRCS = missions requiring concurrent servicing

DR = download rate

These formulas were developed using theoretical data applied to simulation models. Q-GERT (Graphical Evaluation and Review Technique) was the simulation language used.

The results of this thesis effort were mixed. In comparing the terminal services manpower model, for nine separate MRCS levels, to the unit type codes it was designed to replicate, the authors concluded that:

> It is apparent that at low levels of MRCS (1 to 3) the predictions are relatively close to the manning figures obtained from appropriate UTCs. However, it can be seen that at an MRCS greater than three, the terminal service manpower model generates predictions much lower than the UTCs (28:83).

The authors attributed this discrepancy to the building block concept inherent in the tactical UTCs. These UTCs are driven by the number of missions (airlift aircraft) on the ground (MOG) requiring concurrent aerial port servicing. The building concept works on the premise that manpower increases in direct proportion to the increase in the MOG. The results of this model are listed below:

Terminal Service Model Prediction Comparisons

MRCS	UTC Requirement per Shift	Manpower Model Prediction per Shift
1	12	14.3913 - 17.7321
2	20	17.7442 - 21.0768
3	28	21.3634 - 24.1551
4	36	24.7140 - 27.5021
5	48	28.0637 - 30.8498
6	56	31.4127 - 34.1985
7	64	34.7607 - 37.5479
8	72	38.1080 - 40.8982
9	81	41.4544 - 44.2493

(28:86)

In discussing the results of the ramp services manpower model, "The authors concluded that the predictive ability of the ramp services model was suspect" (28:85). In this case, the model did not replicate any of the manpower levels in the established UTCs. Once again, the authors concluded the building block concept was a prime factor in creating this discrepancy. The results of this model are listed below:

Ramp Operations Model Prediction Comparisons

MRCS	UTC Requirement per Shift	Manpower Model Prediction per Shift
1	5	3.015 +/- 0.254
2	10	5.351 +/- 0.254
3	15	7.689 +/- 0.254
4	20	8.665 +/- 0.254

(28:85)

Although the simulation model was able to capture the essence of the direct workload associated with the aerial port functions under review, it appears that the indirect workload factors elude the modeling effort. This calls attention to the fact that some effort to modify peacetime standards to a wartime environment may prove successful. There is no evidence which indicates that these models have been used to alter the tactical UTCs they were designed to address (31).

Peacetime Modification Effort. Efforts to use modified peacetime standards for a wartime environment are actively underway by the Air Force Logistics Command (AFLC). In December of 1984, the Directorate of Manpower and Organization published an operating instruction (OI) entitled, Management Engineering, WARTIME MANPOWER STANDARDS. This OI outlines the procedure used to convert from a peacetime mode into a wartime environment. The essential steps used in this process are delineated in Attachment 1 of this OI.

Attachment 1 describes the work center description review instructions. Three worksheet checklists are provided to guide the management engineer through the wartime

conversion process. The first worksheet requires an evaluation of each major work category. The following eight questions are asked to determine the wartime necessity of the work category:

A. Mission Essential--Entire category is required in war.

B. Delayed--Category is required in war, but can be put off for a number of days.

C. Time Permitting--Category is not wartime essential, but will enhance the work center if time is found for its accomplishment.

D. Non-Mission Essential--Not required in wartime.

E. Partially Mission Essential--Some tasks within the category are mission essential.

F. No Change--No tangible change in the work during wartime.

G. Process Change--Indicates that some tasks will be deleted, added, revised, or delayed.

H. Wartime Unique--Work accomplished only in a wartime scenario (20: Atch 1, 1).

The second worksheet checklist tasks the management engineer to identify for each category a "...programmed workload driver (e.g., flying hours, sorties, personnel required in subordinate work centers, or base population)" (20:Atch 1, 1). The third worksheet checklist requires a further evaluation of those job categories which are wartime unique or will require process changes. These job categories are to be evaluated on a task level. AFR 25-5, Volume

I, entitled Management Engineering, AIR FORCE MANAGEMENT PROGRAM (MEP), Policy, Responsibility, and Requirements, defines a task as "A major part of a category of work described in any work definition" (14, Atch 1, 12). Manhour adjustments identified in this procedure are then used to modify the peacetime formula for a wartime environment.

Two major obstacles prevent the application of the procedures described in this OI to the problem of converting MAC peacetime aerial port standards to a wartime environment. First, the review process described in this OI is designated to be conducted in conjunction with a functional review process (a review of peacetime standards) (20:3). Functional reviews normally take 15 to 30 days to complete and require extensive interaction with the personnel in the affected work center. Second, the conversion of peacetime formulas to a wartime environment is predicated on the fact that the "workload driver" is expressed in the same terms as described in the wartime scenarios. MAC wartime scenarios for the strategic cargo services function are based on tons per day while each peacetime formula has its own unique independent variable (workload driver).

A similar, though less sophisticated, effort is underway by MACMET. They are currently performing functional reviews on all the air transportation work centers. This process started in early 1985 and is expected to be completed by late 1988 (3). After each individual review is com-

plete MACMET members then interview the respective work center supervisors to determine, by category of work, what percentage change in manhours they feel will reflect a wartime environment for the previously measured work load. This percentage change is then multiplied by the manhours from the newly completed peacetime study for each work category. These categories are then added together and used to develop a wartime formula for the specific work center under review. It is surprising that MACMET is not in direct contact with the MAC transportation planning staff on this effort, nor does MACMET have any immediate plans to use the resultant wartime formulas to develop UTCs (3).

III. Methodology

Chapter Overview

This chapter describes the methodology employed to meet the research objectives of this thesis. Each objective is treated separately and the specific steps involved in meeting these objectives are delineated. Also discussed, in the data analysis section, are the decision rules to be applied in manipulating the data.

Research Objectives

The research objectives, as described in Chapter I are:

1. To determine what peacetime work center standards describe the functions required in the mission capability statement of the cargo services aerial port manpower UTCs.

2. To determine how the peacetime formulas operate and what input data are required to manipulate them.

3. To use guidance from MAC transportation war planners in modifying the peacetime formulas to reflect a wartime environment.

4. To calculate, from the modified standards, the manpower necessary to produce the capability of the current UTCs.

5. To compare the revised UTC manpower requirements with those currently being used by MAC and identify points of similarity and difference.

Investigative Procedures

In order to address the objectives listed in this study, the following procedures are applied:

1. Research Objective One. In determining which peacetime work center standards describe the functions required by the UTC mission capability statements, the functional statements provided in MAC Regulation 23-25, Organization and Mission--Field, AERIAL PORT SQUADRONS were compared to the mission capability statement contained in the UTC descriptions. These aerial port squadron functional statements were then compared to the CONUS work center description reports. These reports are designed to justify, on a peacetime basis, the manpower required to operate the work center in question. The work centers chosen were then reviewed separately by three different MAC transportation war planners to determine whether they accurately reflect the functions required in the mission capability statement. Once the chosen work centers were verified for correctness, their respective work center description reports were reviewed with a member of the MAC Management Engineering Team to determine their currency (2).

2. Research Objective Two. In determining how the peacetime formulas operate and what input data are required to manipulate them, information used to develop CONUS strategic aerial port peacetime manning strength was collected. The source document for inputs to the ten standard formulas

examined in this study is MAC Form 82, a monthly Station Workload Handling Report. Each standard formula requires a 12 month average of the previous year's workload. MAC Form 82 data were collected for each of the six CONUS strategic aerial ports for a 12 month period from May 1984 to April 1985. This time frame was established as a base year. Information needed to represent an average peacetime cargo service section was developed by extracting, from the base year data, information for each of the six aerial ports, and then dividing those figures by six. This procedure was initiated to provide the reader with an explanation of how the individual peacetime formulas operate and what input data is needed to manipulate the formulas.

3. Research Objective Three. In determining how to modify the peacetime formulas for a wartime environment, guidance was sought from MAC transportation war planners when the data for the variable in question could not be ascertained from published sources. Each independent variable from the standard formula was reviewed during a personal interview conducted with two senior MAC transportation war planners in which the ramification of the independent variables on a wartime environment were discussed. The personal interview technique was employed because it provided the greatest opportunity to achieve the detail and depth of the information needed to conduct this study. "It far exceeds, in volume and quality, the information we can usually secure

from telephone and mail surveys" (22:294). The following questions were addressed during this interview with the experts:

Question 1: In the strategic aerial port cargo services function, what percent of time, on a monthl basis, is currently being devoted to strictly peacetime duties which will not be performed in a wartime environment?

Question 2: In the strategic aerial port cargo services function, what percent of time, on a monthly basis will be devoted to strictly additional wartime duties which are not currently performed in a peacetime environment?

Question 3: In a 12 month period from May 1984 to April 1985, the average monthly amount of rehandled cargo and mail for the six major CONUS strategic aerial ports was 22.13% of the average monthly total of cargo and mail handled. What percent of the average monthly total of cargo and mail do you expect will require rehandling a wartime environment?

Question 4: In this same 12 month period, the average monthly amount of outbound cargo and mail for the six major CONUS was 59.5% of the average total monthly amount of cargo and mail handled. In a wartime environment, what percent of the total monthly amount of cargo and mail handled would you expect the six CONUS strategic aerial ports will handled as outbound cargo and mail?

Question 5: In this same 12 month period, the average monthly amount of terminating and originating mail at the six major CONUS strategic aerial ports was .97% of the average monthly amount of cargo and mail handled. In a wartime environment, what percent of the monthly amount of cargo and mail handled would you expect the six CONUS strategic aerial ports will handle as terminating and originating mail?

Question 6: In this same 12 month period, the average monthly amount of special handling cargo processed by the six major CONUS strategic was 18.17% of the total cargo and mail handled and rehandled. In the first 180 days of a conflict, what percent of the average monthly cargo and mail handled and rehandled would you expect the six CONUS strategic aerial ports will process as special handling cargo?

4. Research Objective Four. In calculating the manpower necessary to produce new UTCs based on modified standards, each standard was adjusted in accordance with the guidance provided by the MAC transportation war planners. The individual formulas were then recomputed to determine the total monthly manhours required to perform the specific work center duties. The total monthly manhours were then divided by 244 hours to calculate the manpower requirements. The total manpower required was used to choose the proper manpower table from the particular work center description

report. This entire procedure was repeated for all work centers reviewed in this study and new UTCs were developed.

5. Research Objective Five. The comparison of the suggested UTCs developed in this study with the UTCs currently being used by MAC, was performed in three stages. First, aggregate manpower requirements necessary to support the tasking of the UFBB series UTCs in the most stringent wartime scenario were compared. Second, manpower requirements for each individual UTC (UFBB1 through UFBB9) were analyzed. Finally, a comparison of five major job classifications was provided. The five job categories used in this study are:

1. Officers/Managers
2. Superintendents/Supervisors
3. Administrative Personnel
4. Air Cargo Specialist
5. Freight Traffic Specialist

Data Analysis

The data analysis performed in this study was guided by a series of decision rules. The following rules were applied consistently throughout the study:

Decision Rules

Rule 1, UTC Comparisons: A new set of suggested UTCs was developed based on the additive value of the manpower requirements derived from modifying the peacetime manpower standards for a wartime environment. However, the individu-

al UTC planning capability factor, tons per day, and the mission capability statement for UFBB1 through UFBB9 were not altered. The composition of the manpower tables did, of course, change. These changes were tracked by Air Force Speciality Code (AFSC) and aggregate quantities required for each of the nine UTCs under consideration.

Rule 2, Extrapolation Limits: As was previously stated, each peacetime work center formula has pre-established extrapolation limits. In situations where the formula yields a monthly manhour factor which exceeds those limits, further use of that formula becomes suspect. These situations as they occurred in this study are noted.

Rule 3, Constructing Manpower Tables: Manpower tables were constructed from the data provided in the individual work center description. Each work center description report contains a work center job description, manpower formula and manpower tables. In situations where the resultant calculations exceed the limits of the manpower formula and a manpower table is not available, one was constructed using data extrapolated from the existing tables.

Rule 4, Manhour Availability Factor: MAC Regulation 28-1, War Planning, UNIT TYPE CODE MANAGEMENT, paragraph 2a2(c) directs that UTC workload is determined based on a wartime emergency manning factor 244 manhours per month. Two hundred and forty-four hours was therefore used to convert the result of the manpower formulas (monthly manhours required) into the amount of manpower required.

Rule 5, Rounding: The manpower rounding rules as listed in AF Regulation 25-5 Volume II, entitled AIR FORCE MANAGEMENT ENGINEERING PROGRAM (MEP), Techniques and Procedures, were used in this study. This rounding table is available in Appendix D.

IV. Findings

Chapter Overview

This chapter presents the findings of the research objectives listed in Chapter I. Each objective is treated separately. Guidance provided by MAC transportation war planners is listed in a question and answer format. Revised UTSs are developed and compared to those currently used by MAC. An analysis of the UTCs is performed at both an aggregate level and by Air Force Speciality Code (AFSC).

Analysis and Discussion

Research Objective One: To determine what peacetime work center standards describe the wartime functions required in the mission capability statement of the cargo services aerial port manpower UTCs.

The approach used to achieve this objective involves linking the UTC mission capability statement (MISCAP) tasks to the equivalent strategic aerial port functions. Each aerial port function is then associated with its respective work center description report. Each work center description report contains a peacetime workload formula designed to support that particular aerial port function. These reports are identified by a unique six character alphanumeric functional account code (FAC). The culmination of this linking process is a match between each task described in the MISCAP and the peacetime workload formula which was

established to determine the manpower required to support that task.

Mission Capability Statement (MISCAP). The purpose of the MISCAP is to describe "...the employment mission capabilities of the type unit/element" (7:1). In the case of UTCs UFBB1 through UFBB9, the employment mission capabilities are the same, the difference between these UTCs is the degree of capability. The degree of capability is predicated on the number of tons handled per day which in turn directly affects the manpower required and the required amount of equipment needed. Listed below is the generic mission capability statement for UTCs UFBB1 through UFBB9:

> Mission Capabilities Statement - Provides personnel to perform all cargo services associated with a major APOE/D to include aircraft loading/off-loading, shipper equipment loading off-loading, palletization, pallet breakdown, warehousing, load marshalling and staging. Will also support unit deployment operations up to a MOG of [ ] with a reduced capability in breakbulk operations. Includes command and administration. Supports all aircraft types except widebody cargo aircraft. Tonnage capability includes strategic, intratheater and retrograde. Use in association with equipment UTC UFBB[ ]. See also personnel UTCs for passenger service, fleet service, recoupment, vehicle dispatch, 463L Equipment maintenance. Requires Base Operations support. MB, LB,SB. (4:7-15).

The above describes both the capabilities and limitations of the unit. The focus of this thesis is on determining wartime manpower for breakbulk operations; therefore, the subject of reducing breakbulk capability at the expense of deployment operations will not be addressed.

Table 4.1 below, summarizes both those tasks the unit is required to perform and those tasks for which the unit would need augmentation to perform.

TABLE 4.1

MISCAP TASKS

REQUIRED TASKS	AUGMENTED TASKS
Cargo Services (Major APOD/E)	Passenger Service
Aircraft Loading/Off-Loading	Fleet Service
Shipper Equipment Loading/Off Loading	Recoupment
Palletization	Vehicle Dispatch
Pallet Breakdown	463L Equipment Maintenance
Warehousing	Widebody cargo Aircraft servicing
Load Marshalling	
Staging	
Command	
Unit Administration	

Strategic Aerial Port Functions. In this section, the link between the required MISCAP tasks described above and the associated strategic aerial port functions is established. Table 4.2, taken from MAC Regulation (MACR) 23-25, Organization and Mission--Field, AERIAL PORT SQUADRONS, lists the organizational chart for the MAC Aerial Port Squadrons (APSs). The functions marked with an asterisk indicate those work centers which were described in detail in Chapter II. Extracted from this table are those work

Table 4.2

ORGANIZATIONAL CHART FOR
AERIAL PORT SQUADRONS

```
*   Command
*     Unit Administration
      Squadron Section
      Vehicle Management
      Traffic Management Office
        Freight Service
          Inbound Freight Documentation
          Outbound Freight Documentation
          Loading and Offloading
          Preservation, Packing, and Packaging
          Railroad Operations
      Preservation, Packing, and Packaging
      Surface Freight
        Passenger Movement
        Personal Property
      Combat Mobility
        Aerial Delivery
        Vehicle Operations and Maintenance
        Mobility Plans and Training
        Supply
      Aerial Delivery Support
        Aerial Delivery
        Vehicle Operations and Maintenance
*     Squadron Operations
        Passenger Service
          Passenger Processing
          Terminal Reservations
          Baggage Processing
        Fleet Service
*       Air Freight Service
*         Cargo Processing
*         Ramp Services
          Recooperage and Repackage
*         Special Handling Cargo
          Conveyor Systems Maintenance
*       Air Terminal Operations Center
*       Records Reports DCC Computer Operations
        Terminal Reservations
        Aircraft Services
          Vehicle Control
        Vehicle Control
        Fleet Supply
```

centers which perform the required tasks identified in the MISCAP. Table 4.3 lists the tasks required by the UTC mission capability statement and the associated aerial port work centers required to perform those tasks.

TABLE 4.3

ASSOCIATION OF REQUIRED UTC TASKS AND AERIAL PORT FUNCTIONS

REQUIRED UTC TASKS	AERIAL PORT FUNCTION
1. Cargo Services (Major APOE/D)	1. Cargo Processing 2. Ramp Services 3. Squadron Operations 4. Records Reports DCC Computer Operations 5. Special Handling Cargo Processing 6. Air Terminal Operations Center (ATOC)
2. Aircraft Loading/ Off-Loading	1. Ramp Services
3. Shipper Equipment Loading/ Off-Loading	1. Cargo Processing
4. Palletization	1. Cargo Processing
5. Pallet Breakdown	1. Cargo Processing
6. Warehousing	1. Cargo Processing
7. Load Marshalling	1. Ramp Services 2. Cargo Processing
8. Staging	1. Ramp Services 2. Cargo Processing
9. Command	1. Command
10. Unit Administration	1. Unit Administration

Table 4.3 was developed in collaboration with three MAC transportation war planners who validated the association of the UTC tasks to the aerial port functions(24,26,34).

Function Account Codes (FACs). The final link in this chain is the association of the work center description reports identified by individual functional account codes (FACs) with its respective aerial port function. Table 4.4 establishes this association and identifies the unique functional account code (FAC) for each work center.

TABLE 4.4

ASSOCIATION OF WORK CENTERS TO AERIAL PORT FUNCTIONS

WORK CENTER	FAC	AERIAL PORT FUNCTION
Air Freight Services Office	4233AA	Air Freight Services
Export Cargo Processing	4233DA	Cargo Processing
Special Handling	4233GA	Special Handling
Air Terminal Operations Center (ATOC)	4234AA	Air Terminal Operations Center (ATOC)
Records and Reports Document Control Center	4235AA 4235BA	Records Reports DCC Computer Operations
Ramp Services	4233EA	Ramp Services
Aerial Port Command	4230AA	Command
Unit Administration	4230CB	Unit Administration
Terminal Operations	4230LA	Squadron Operations

Summary Results of Objective One. The work center description reports contain the peacetime work center standards. Table 4.5 establishes the association of the required UTC tasks to its respective work center, identified by FAC and summarizes the results of objective one.

TABLE 4.5

ASSOCIATION OF REQUIRED UTC TASKS TO WORK CENTERS

UTC TASK	AERIAL PORT FUNCTION	FAC
Cargo Services (Major APOE/D)	Squadron Operations	4230LA
	Air Freight Services	4233AA
	Cargo Processing	4233DA
	Records Reports DCC	4235AA
	Computer Operations	4235BA
	Special Handling	4233GA
	Air Terminal Operations Center (ATOC)	4234AA
Aircraft Loading/ Off-Loading	Ramp Services	4233EA
Shipper Equipment Loading/Off-loading	Cargo Processing	4233DA
Palletization	Cargo Processing	4233DA
Pallet Breakdown	Cargo Processing	4233DA
Warehousing	Cargo Processing	4233DA
Load Marshalling	Ramp Services	4233EA
	Cargo Processing	4233DA
Staging	Ramp Services	4233EA
	Cargo Processing	4233DA
Command	Command	4230AA
Unit Administration	Unit Administration	4230CB

Research Objective Two: To determine how the peacetime formulas operate and what input data are required to manipulate them.

The work center description reports identified in Table 4.4 contain the standard peacetime manpower formulas which are used to establish the manning levels for that particular work center. Each peacetime manpower formula has its own independent variable. The source documentation for these

independent variables is MAC Form 82 , Monthly Station Traffic Handling Report. "This report is used to gather facts about transportation workloads which are needed to plan manpower, equipment, and facility levels" (8:Ch 6, 5). The values for the independent variables used in this analysis were provided by taking a 12 month average from the May 1984 through April 1985 MAC 7107 reports for all six CONUS strategic aerial ports. Substituting the proper value into the standard peacetime formula yields a manhour figure. This manhour figure indicates the number of manhours needed per month to operate that particular work center, given the activity level of the independent variable under consideration. Manpower requirements are calculated by dividing the manhour figure by 145.2, the CONUS peacetime manhour availability factor (MAF). Manpower is rounded in accordance with Figure 41.6, Fractional Manpower Ranges, of AFR 25-5, Vol. II.

The operation of each standard peacetime formula using inputs from the base year (May 84 through April 85) MAC 7107 reports is demonstrated below:

FAC 4233AA. The primary function of the Air Freight Services Office work center is to provide overall managerial and supervisory guidance needed to operate the cargo services sections on a daily basis. From this work center description report the following peacetime manpower standard is extracted:

$$Y = 394.2 + .0634 * X \quad (6:1) \qquad (4.1)$$

The independent variable X represents "total tons of cargo/mail originating, terminating, and rehandled" (6:1). Table 4.6 below summarizes this data for the six CONUS stations under consideration.

TABLE 4.6

MEAN TOTAL TONS OF CARGO/MAIL ORIGINATING, TERMINATING, AND REHANDLED

CONUS STATION	MEAN MONTHLY WORKLOAD
McChord	5013.083
McGuire	3852.083
Charleston	6176.750
Dover	10449.333
Norton	5352.750
Travis	12399.417
Average CONUS total	7207.236

Manhour Determination: Table 4.6 shows the average number of tons processed per month by all six CONUS aerial ports was 7,207.236. Substituting this number into the formula, the average monthly manhours are:

$$Y = 394.2 + .0634 * X \qquad (4.1)$$

$$= 851.1388 \text{ manhours per month}$$

where

$$X = 7,207.236$$

Manpower (MP) Determination:

$$MP = 851.1388/145.2$$

MP = 5.8618

Rounded MP = 6 personnel

FAC 4233DA. The primary function of the Export Cargo Processing work center is the physical outbound processing of cargo in preparation of aircraft upload. From this work center description report, the following peacetime manpower standard is extracted:

$$Y = -92.90 + 3.453 * Z \quad (12:1) \qquad (4.2)$$

where

$$Z = X(1) + .8627 * X(2) \qquad (4.3)$$

The dependent variable X(1) represents the "Average monthly tons of originating cargo/mail processed by the Aerial Port", and X(2) represents the "Average monthly tons of originating and terminating mail processed by the Aerial Port" (12:1). Table 4.7 summarizes the value for the variable X(1) and Table 4.8 summarizes the value for variable X(2).

TABLE 4.7

MEAN TOTAL TONS OF CARGO/MAIL ORIGINATING

CONUS STATION	MEAN MONTHLY WORKLOAD
McChord	2,448.583
McGuire	1,842.000
Charleston	3,681.333
Dover	5,151.333
Norton	2,306.833
Travis	5,846.417
Average CONUS Total	3,512.750

TABLE 4.8

MEAN TOTAL TONS OF ORIGINATING AND TERMINATING MAIL

CONUS STATION	MEAN MONTHLY WORKLOAD
McChord	1.167
McGuire	121.083
Charleston	46.417
Dover	141.167
Norton	12.417
Travis	20.500
Average CONUS Total	57.125

Manhour Determination. Table 4.7 shows that X(1) = 3,512.750 and from Table 4.8 X(2) = 57.125. Substituting these numbers into equation Z yields:

$$Z = X(1) + .8627 * X(2) \qquad (4.3)$$

$$= 3562.0317$$

where

$$X(1) = 3,512.750$$

$$X(2) = 57.125$$

Z is then substituted into the standard formula:

$$Y = -92.90 + 3.453 * Z \qquad (4.2)$$

$$= 12206.7956 \text{ manhours per month}$$

where

$$Z = 3562.0317$$

Manpower (MP) Determination:

MP = 12206.7956/145.2

MP = 84.0688

Rounded MP = 84 personnel

FAC 4233GA. The Special Handling work center processes all high priority and hazardous cargo shipments. From this work center description report, the following peacetime manpower standard is extracted:

$$Y = 825.038 * X^{.1817} \quad (19:Pt\ II,406) \qquad (2.1)$$

The dependent variable X represents "The total number of tons each month of CONUS inbound and outbound special handling cargo processed by the Special Handling work center for further shipment" (19:Pt II, 406). Table 4.9 summarizes the value for variable X.

TABLE 4.9

MEAN TOTAL TONS OF SPECIAL HANDLING CARGO

CONUS STATION	MEAN MONTHLY WORKLOAD
McChord	1299.667
McGuire	575.083
Charleston	576.250
Dover	2028.000
Norton	296.167
Travis	1660.250
Average CONUS Total	1072.570

Table 4.9 shows that X = 1072.570 tons per month. Substituting this number into the equation yields:

$$Y = 825.038 * X^{.1817} \qquad (2.1)$$

X = 2931.5837 manhours per month

where

X = 1072.570

<u>Manpower</u> (<u>MP</u>) <u>Determination</u>:

MP = 2931.5837/145.2

MP = 20.1899

Rounded MP = 20 personnel

<u>FAC</u> <u>4234AA</u>. Air Terminal Operations Center (ATOC) is the information center for the aerial port. This work center coordinates and monitors all cargo services activities. From this work center description report, the following peacetime manpower standard is extracted:

$$Y = 327.1 + .3836 * X(1) + 2.742 * X(2) \qquad (4.4)$$

(19:Pt II,81)

The dependent variable X(1) represents the total tons of cargo/mail originating, terminating and rehandled and X(2) represents number of aircraft handled and rehandled" (19:Pt II,82). Table 4.6 summarized the value for variable X(1), and Table 4.10 summarizes the value for variable X(2).

TABLE 4.10

MEAN AIRCRAFT HANDLED AND REHANDLED

CONUS STATION	MEAN MONTHLY WORKLOAD
McChord	1383.083
McGuire	1261.333
Charleston	2072.583
Dover	1016.667
Norton	1732.417
Travis	1759.500
Average CONUS Total	1537.597

Manhour Determination. Table 4.6, shows that X(1) = 7207.236 and Table 4.10 shows that X(2) = 1537.597. Substituting these numbers into the standard equation yields:

$$Y = 527.1 + .3826 * X(1) + 2.742 * X(2) \quad (4.4)$$

X = 7307.8867 manhours per month

where

X(1) = 7207.236

X(2) = 1537.597

Manpower (MP) Determination:

MP = 7307.8867/145.2

MP = 50.3297

Rounded MP = 50 personnel

FAC 4235AA. The primary function of the Records and Reports work center is to audit and report statistical

data on the aerial port workload. From this work center description report, the following peacetime manpower standard is extracted:

$$Y = X/(.9365 + .00004658 * X) \quad (13:1) \qquad (4.5)$$

The independent variable X represents the average monthly number of manifests processed by the unit (13:1). Table 4.11 below summarizes this data.

TABLE 4.11

MEAN NUMBER OF MANIFESTS PROCESSED

CONUS STATION	MEAN MONTHLY WORKLOAD
McChord	1095.25
McGuire	1379.75
Charleston	1255.66
Dover	1273.25
Norton	1517.25
Travis	2613.08
Average CONUS Total	1522.37

Manhour Determination. Table 4.11 shows that 1522.37 manifests are processed per month. Substituting this number into the standard equation yields:

$$Y = 1522.37/(.9365 + .00004658 * X) \qquad (4.5)$$

$$= 1511.1692 \text{ manhours per month}$$

where

$$X = 1522.37$$

Manpower (MP) Determination:

MP = 1511.1692/145.2

MP = 10.4075

Rounded MP = 11 personnel

FAC 4235BA. The primary function of the Document Control Center work center is to assign manifest numbers and produce via keypunch cards, source documents used to track the movement of the cargo. From this work center description report, the following peacetime manpower standard is extracted:

$$Y = 340.2 + 0.7301 * X \text{ (11:1)} \qquad (4.6)$$

The dependent variable X represents the average monthly number of manifests processed by the unit(11:1). Table 4.11 above summarized this data.

Manhour Determination. Table 4.11 shows that 1522.37 manifests are processed per month. Substituting this number into the standard equation yields:

$$Y = 340.2 + 0.7301 * X \qquad (4.6)$$

$$= 1451.7823 / 145.2$$

where

X = 1522.37

Manpower (MP) Determination:

MP = 1451.6823/145.2

MP = 9.9978

Rounded MP = 10 personnel

FAC 4233EA. The primary function of the Ramp Services work center is to load and unload aircraft. From this work center description report the following manpower standard is extracted:

$$Y = 615.4 * X^{.3019} \quad (19:Pt\ II,243) \qquad (4.7)$$

The dependent variable X represents the average monthly tons of cargo/mail originating, terminating and rehandled(19:Pt II, 243). Table 4.6 summarized this data.

Manhour Determination. Table 4.6 shows that 7207.236 tons of cargo are processed each month. Substituting this number into the standard equation yields:

$$Y = 615.4 * \qquad (4.7)$$

$$= 8991.2045 \text{ manhours per month}$$

where

$$X = 7207.236$$

Manpower (MP) Determination:

$$MP = 8991.2045/145.2$$

$$MP = 62.0083$$

Rounded MP = 62 personnel

FAC 4230AA. The primary function of the Command work center is to provide overall guidance and long term direction to all port activities. This work center description report, unlike the others discussed so far, is based on a constant manning of three personnel.

Manhour Determination. Not applicable to this work center description report.

Manpower Determination. A constant three personnel (17:1).

FAC 4230LA. The primary function of the Terminal Operations work center is to provide overall guidance and short term direction to all port activities. This work center description report, like the Command section above, is based on a constant manning.

Manhour Determination. Not applicable to this work center description report.

Manpower Determination. A constant four personnel (19:Pt II,391).

FAC 4230CB. The primary function of the Unit Administration work center is to provide administrative support to the Command for personnel matters. From this work center description report, the following peacetime manpower standard is extracted:

$$Y = X/(.3239 + .00009682 * X) \quad (5:1) \qquad (4.8)$$

The dependent variable X represents the total number of military personnel autnorized (5:1). Table 4.12 summarizes this data.

TABLE 4.12

AUTHORIZED MILITARY PERSONNEL

FAC	TITLE	TOTAL NO. OF PERSONNEL
4233A	Air Freight Services Office	6
4233DA	Export Cargo Processing	84
4233GA	Special Handling	20
4234A	Air Terminal Operations Center (ATOC)	50
4235BB	Records and Reports	11
4235CA	Document Control Center	10
4233EA	Ramp Services	62
4230AA	Command	3
4230NA	Squadron Operations	4
TOTAL		250

Manhour Determination. Table 4.12 shows that 250 personnel are authorized; substituting this number in the standard equation yields:

$$Y = 250/(.3239 + .00009682 * X) \qquad (4.8)$$

$$= 718.1741 \text{ manhours per month}$$

where

$$X = 250$$

Manpower (MP) Determination:

$$MP = 718.1741/145.2$$

$$MP = 4.9461$$

Rounded MP = 5 personnel

Summary of Findings on Research Objective Two. In this objective, the operation of the peacetime formulas identified in Objective One were explained and the input data necessary to manipulate them was provided. Using the MAC 7107 reports from May 1984 through April 1985 and the peacetime formulas extracted from the work center description reports identified in research Objective One, the average CONUS ports require 255 personnel to operate the cargo service functions of the aerial port. Table 4.13 lists the results of this exercise. Objective Three will now address modifying the independent variables for a wartime environment.

TABLE 4.13

AVERAGE CONUS AERIAL PORT

WORK CENTER	AVERAGE MANPOWER
Air Freight Services Off	6
Export Cargo Processing	84
Special Handling	20
ATOC	50
Records & Reports	11
Document Control Center	10
Ramp Services	62
Command	3
Squadron Operations	4
Unit Administration	5

Research Objective Three: To use guidance from MAC transportation war planners in modifying the peacetime formulas to reflect a wartime environment.

In the following section, each independent variable from the standard formulas identified in Objective Two were reviewed to determine their values in a wartime environment. Guidance was sought from senior MAC transportation war planners when data for the independent variable in question could not be ascertained from published sources (26,29). Following the discussion of each independent variable, a conversion factor is established to reflect the wartime environment of that variable.

MAC Guidance:

Question 1: In the strategic aerial port cargo services function, what percent of time, on a monthly basis, is currently being devoted to strictly peacetime duties which will not be performed in a wartime environment?

Reply: In the opinion of the interviewed officers, an overall 33% decrease in total monthly manhours could be expected. Several factors contributed to this estimate, key among them were:

a) Faster decision making; many decisions made at lower organizational levels.

b) Increase in direct manhours available resulting from less TDY (temporary duty) commitments, leaves, formalized training programs.

c) Overall improved working relationships, espirit de corps, and camaraderie.

d) Reduced slack time due to the increased pace of wartime activities.

e) Decrease in the number of peacetime additional duties (grass cutting, etc.).

f) Decrease in the amount of paperwork (performance reports, Wing unique reports, etc.).

Question 2: In the strategic aerial port cargo services function, what percent of time, on a monthly basis will be devoted to strictly additional wartime duties which are not currently performed in a peacetime environment?

Reply: This question generated much discussion concerning the additional duties performed in Vietnam. The general consensus on this issue was that there would be additional duties to be performed but over the long run their impact for the strategic cargo services function would be negligible.

Three classes of additional duties were discussed. The first class includes those tasks which would be performed concurrently with the present job. An example is an increased vigilance for terrorist activities and unauthorized personnel in the work area. The second class includes those tasks which must be performed to keep the entire airlift system working. Searching the host area units for missing or misused 463L pallets was an example mentioned.

However, personnel for these tasks would not come at the expense of decreasing the port's ability to handle the day to day workload. The third and final class includes those tasks which would be performed on a time permitting basis, building improvements projects were included in this class.

Conversion Factor: As a result of the discussion above, the product of each standard manpower formula will be multiplied by 67% in order to reflect a general 33% decrease in workload. In addition to the 67% level suggested, an 80% and 90% level will also be analyzed to determine how sensitive the resultant wartime manpower levels are to expected decreases over peacetime. These additional levels were chosen for two reasons; first, this adjustment factor has the pervasive effect on the entire study and second, of all the factors addressed by the MAC transportation planners, this factor is the most arbitrary.

Question 3: In a 12 month period from May 84 to April 85, the average monthly amount of rehandled cargo and mail for the six major CONUS strategic aerial ports was 22.13% of the average monthly total of cargo and mail handled. What percent of the average monthly total of cargo and mail do you expect will require rehandling in a wartime situation?

Reply: Rehandled work is generated primarily from aircraft which were serviced by aerial port personnel but which, for reasons beyond the control of the aerial

port, did not complete their original mission. This factor is expected to remain at the same level in a wartime environment.

Conversion Factor: Each UTC has, by definition, a tons per day capability associated with it. This figure represents the total number of tons the unit is expected to process; it does not consider rehandled cargo (24). To account for rehandled workload, the daily workload is converted into a monthly workload and then multiplied by 1.2213. Using the data from the previously established base year, the rehandled factor was calculated in the following manner:

7207.236	Average total tons of mail/cargo handled and rehandled
-5901.361	Average total tons of mail/cargo handled
1305.875	Average total tons of mail/cargo rehandled

1305.875/5901.361 = .2213 or 22.13%

Table 4.14 summarizes the amount of cargo/mail handled and rehandled for each UTC under consideration.

TABLE 4.14

MONTHLY AVERAGE CARGO/MAIL HANDLED AND REHANDLED

UTC	TONS PER DAY	TONS HANDLED PER MONTH {(2)*30.44 (days per month)}	HANDLED AND REHANDLED {(3)*1.2213}
UFBB1	50	1522	1858.8186
UFBB2	100	3044	3717.6372
UFBB3	200	6088	7435.2744
UFBB4	300	9132	11152.9116
UFBB5	400	12176	14870.5488
UFBB6	500	15220	18588.1860
UFBB7	600	18264	22305.8232
UFBB8	700	21308	26023.4604
UFBB9	800	24352	29741.0976

Question 4: In this same 12 month period, the average monthly amount of outbound cargo and mail for the six major CONUS was 59.5% of the average total monthly amount of cargo and mail handled. In a wartime environment, what percent of the total monthly amount of cargo and mail handled would you expect the six CONUS strategic aerial ports will handle as outbound cargo and mail?

Reply: The war planning estimate for returning cargo is 20%. This figure accounts for cargo entering both MAC and AFLC aerial ports, MAC will however receive the largest portion of this inbound traffic. It is estimated

that 30% of the MAC cargo handled by the strategic aerial ports will be inbound cargo, 70% outbound.

Conversion Factor: Outbound cargo does not consider the rehandled workload, therefore, 70% of the total tons handled is used to estimate the outbound share. Table 4.15 summarizes this data by UTC.

TABLE 4.15

MONTHLY AVERAGE OUTBOUND TONS HANDLED

UTC	TONS HANDLED PER MONTH	OUTBOUND TONS HANDLED {(2)*.70}
UFBB1	1522	1065.4
UFBB2	3044	2130.8
UFBB3	6088	4261.6
UFBB4	9132	6392.4
UFBB5	12176	8523.2
UFBB6	15220	10654.0
UFBB7	18264	12784.8
UFBB8	21308	14915.6
UFBB9	24352	17046.4

Question 5: In this same 12 month period, the average monthly amount of terminating and originating mail at the six major CONUS strategic aerial ports was .97% of the average monthly amount of cargo and mail handled. In a wartime environment, what percent of the monthly amount of cargo and mail handled would you expect the six CONUS strategic aerial ports will handle as terminating and originating mail?

Reply: This question has received much attention lately, however, no firm amount has been established. An estimate of five times the current amount was offered.

Conversion Factor: Table 4.16 summarizes the amount of mail handled using 4.85% as an estimating factor (5 * .0097).

TABLE 4.16

MONTHLY AVERAGE TONS OF MAIL ORIGINATING AND TERMINATING

UTC	TONS HANDLED PER MONTH	MAIL HANDLED {(2)*.0485}
UFBB1	1522	73.817
UFBB2	3044	147.634
UFBB3	6088	295.268
UFBB4	9132	442.902
UFBB5	12176	590.536
UFBB6	15220	738.17
UFBB7	18264	885.804
UFBB8	21308	1033.438
UFBB9	24352	1181.072

Question 6: In this same 12 month period, the average monthly amount of special handling cargo processed by the six major CONUS strategic aerial ports was 18.17% of the total cargo and mail handled and rehandled. In the first 180 days of a conflict, what percent of the average monthly cargo and mail handled and rehandled would you

expect the six CONUS strategic aerial ports will process as special handling cargo?

Reply: Double its current level over the long run (180 days). In this discussion, it was pointed out that in the first three weeks of a conflict, this figure could approach upwards of 60% of the total cargo, most of which will be ammunition. After approximately three weeks, ships are expected to haul the majority of the resupply ammunition.

Conversion Factor: The total of cargo/mail handled and rehandled is multiplied by 36.34% (2 * 18.17). Table 4.17 summarizes this data by UTC.

TABLE 4.17

MONTHLY AVERAGE TONS OF SPECIAL HANDLING CARGO

UTC	CARGO/MAIL HANDLED & REHANDLED	SPECIAL HANDLING CARGO {(2)*.3634}
UFBB1	1858.8186	675.4947
UFBB2	3717.6372	1350.9894
UFBB3	7435.2744	2701.9787
UFBB4	11152.9116	4052.9681
UFBB5	14870.5488	5403.9574
UFBB6	18588.186	6754.9468
UFBB7	22305.8232	8105.9362
UFBB8	26023.4604	9456.9255
UFBB9	29741.0976	10807.9149

Published Sources. To determine the number of aircraft handled and the number of manifests processed, estimates from published sources were employed. Also listed are the assumptions upon which those estimates were based.

Aircraft Handled: To estimate the number of cargo aircraft which would require aerial port servicing, standard planning factors from the U.S. Air Force Airlift Master Plan were used. The fiscal year (FY) 1983 aircraft available for planning purposes along with its long-range payload in tons (33:Atch 10) are listed in Table 4.18. Of the 39 narrow body (NB) Civil Reserve Fleet Aircraft available only 19 are capable of hauling cargo according to the July 1985 issue of MAC Form 312, Monthly Civil Reserve Air Fleet (CRAF) Capability Summary. Wide body cargo aircraft were not considered because their servicing is not a primary task identified in the UTC mission capability statements.

TABLE 4.18

FY 83 INTERTHEATER AIRLIFT CAPABILITY

AIRCRAFT	NO AVAILABLE	PAYLOAD	TOTAL CAPABILITY
C-141	215	27.5	5912.5
C-5A	64	68.9	4409.5
NB CRAF	19	41.4	786.6
TOTAL	298	137.8	11108.6

The average cargo aircraft can haul 37.277 tons of cargo (11108.06 / 298). This figure is used to determine the

monthly aircraft handled per month. To determine total number of aircraft handled and rehandled, the monthly aircraft handled per month is multiplied by 1.1066. The addition of .1066 reflects the average monthly percent by aircraft which were rehandled according to an analysis of the base year MAC 7107 reports.

Conversion Factor: Table 4.19 establishes the estimated number of aircraft handled and rehandled. The estimate is based on two assumptions. First, the average cargo aircraft can haul 37.277 tons; second, the percent of rehandled aircraft is the same in peacetime as it is in war.

TABLE 4.19

ESTIMATED NO. OF AIRCRAFT HANDLED AND REHANDLED

UTC	TONS HANDLED PER MONTH	AIRCRAFT PER MONTH {(2)/37.277}	AIRC. HANDLED & REHAND. PER MON. {(3) * 1.1066}
UFBB1	1522	40.829	45.182
UFBB2	3044	81.659	90.364
UFBB3	6088	163.318	180.728
UFBB4	9132	244.977	271.901
UFBB5	12176	326.636	361.455
UFBB6	15220	408.295	451.819
UFBB7	18264	489.945	542.183
UFBB8	21308	571.613	632.546
UFBB9	24352	653.271	722.910

Manifests Processed. According to MACR 76-1, Vol. I, Chapter 9, nine separate categories of manifest

exist. A separate manifest is prepared for each category. These nine categories are:

1) General Cargo
2) Ordinary Mail
3) MAC MICAP/VVIP
4) Registered Mail
5) Life or Death
6) Armed Forces Courier Material
7) Revenue Cargo
8) Each pallet or container moving via Category "A" airlift
9) Remains of Deceased Personnel (8:Ch 9,20).

To estimate the number of manifests processed, it is assumed that each aircraft will carry at minimum a general cargo, ordinary mail and registered mail manifest, in addition to a manifest for either MAC MICAP/VVIP, Life or Death supplies, Armed Forces Courier Material or Remains of Deceased Personnel.

Conversion Factor: Table 4.20 listed the estimated number of manifests. This estimation is based on two assumptions. First, each aircraft will carry four manifests; second, each aircraft is bound for only one destination.

TABLE 4.20

ESTIMATED NUMBER OF MANIFEST

UTC	AIRCRAFT PER MONTH	MONTHLY NO. OF MANIFEST {(2) * 4 }
UFBB1	40.829	163.316
UFBB2	81.659	326.636
UFBB3	163.318	653.272
UFBB4	244.977	979.908
UFBB5	326.636	1306.544
UFBB6	408.295	1633.180
UFBB7	489.945	1959.780
UFBB8	571.613	2286.452
UFBB9	653.271	2613.084

Results of Objective Three. From guidance provided by MAC Transportation war planners and estimates made from published sources, the following wartime adjustment rules were developed:

Rule 1: The results of each standard formula is reduced by 33%. For sensitivity analysis purposes, 20% and 10% levels will also be computed and analyzed.

Rule 2: The cargo/mail rehandled is calculated at 22.13% of the cargo/mail handled.

Rule 3: Outbound cargo represents 70% of the total cargo/mail handled.

Rule 4: Mail handled is calculated at 4.85% of the total cargo/mail handled.

Rule 5: Special handling cargo is calculated at 36.34% of the total cargo/mail handled and rehandled.

Rule 6: The number of aircraft handled is calculated by taking the monthly tons of cargo/mail handled divided by 37.277 tons.

Rule 7: The number of aircraft rehandled is 10.66% of the aircraft handled.

Rule 8: Each aircraft carries four manifests.

Rule 9: Work centers assigned constant manning levels will not be altered.

Research Objective Four: To calculate, from the modified standards, the manpower necessary to produce the capability of the current UTCs.

The approach used to achieve this objective involves two steps. In the first step, the aggregate manpower levels are determined for each peacetime standard formula by UTC, using the modification rules developed in Objective Three. A check was made to determine if the manhour activity levels were within the pre-established extrapolation limits for standard formula under consideration. In the second step, aggregate manpower levels suggested by MAC transportation war planners were converted to specific manpower tables. A check was made to determine if a manpower table already exists for the manpower standard under consideration. Exceptions were noted and new tables were developed based

on maintaining the established average ratio of Air Force Speciality Code (AFSC). The culmination of these steps resulted in a specific manpower table for each of the nine UTCs addressed in this study.

Step One: Aggregate Manpower. The tables listed below were developed separately by individual work centers. The peacetime manpower formulas identified in Objective Two were calculated using the modified independent variables established in Objective Three. The resultant manhours were then checked against the extrapolation limits of the peacetime formula under consideration and the results were noted. The manhour factor was then multiplied by 67% to reflect a 33% decrease in workload, 80% to reflect a 20% decrease, and 90% to reflect a 10% decrease in workload. Conversion from manhours to manpower was achieved by dividing the available manhours by 244 hours, the wartime emergency manhour availability factor (MAF). The manpower figure was then rounded in accordance with the fractional manpower ranges from AFR 25-5, Volume II, entitled Management Engineering, AIR FORCE MANAGEMENT ENGINEERING PROGRAM (MEP), Techniques and Procedures.

FAC 4233AA. The Air Freight Services Office standard formula is:

$$Y = 394.2 + .06234 * X \qquad (4.1)$$

X = Average tons of mail/cargo handled and rehandled (reference Table 4.14).

Extrapolation Limits: 312.91 - 1,251.04 manhours (6:Atch 2).

TABLE 4.21

AGGREGATE AIR FREIGHT SERVICES OFFICE MANPOWER

UTC	MANHOURS	WITHIN LIMITS	ROUNDED ADJ MP 33%	20%	10%
UFBB1	510.079	Y	2	2	2
UFBB2	625.958	Y	2	3	3
UFBB3	857.715	Y	3	3	4
UFBB4	1089.475	Y	3	4	4
UFBB5	1321.230	Y	4	5	5
UFBB6	1552.988	Y	5	6	6
UFBB7	1784.745	N	5	6	7
UFBB8	2016.503	N	6	7	8
UFBB9	2248.260	N	7	8	9

FAC 4233DA. The Export Cargo Processing standard formula is:

$$Y = -92.90 + 3.453Z \qquad (4.2)$$

$$Z = X(1) + .8627 * X(2) \qquad (4.3)$$

X(1) = Tons of originating cargo/mail (reference Table 4.15)

X(2) = Tons of originating and terminating mail (reference Table 4.16)

Extrapolation limits: Not available

TABLE 4.22

AGGREGATE EXPORT CARGO PROCESSING MANPOWER

UTC	MANHOURS	WITHIN LIMITS	ROUNDED ADJ MP 33%	20%	10%
UFBB1	3805.819	Unk.	11	13	14
UFBB2	7704.540	"	21	25	29
UFBB3	15501.979	"	43	51	57
UFBB4	23299.419	"	64	76	85
UFBB5	31096.860	"	85	101	114
UFBB6	38894.299	"	106	127	143
UFBB7	46691.739	"	128	153	172
UFBB8	54489.179	"	149	178	200
UFBB9	62286.618	"	171	204	229

FAC 4233GA. The Special Handling standard formula is:

$$Y = 825.038 * X^{.1817} \qquad (2.1)$$

X = Tons of Special Handling Cargo (Reference Table 4.17)

Extrapolation Limits: 67.38 - 4148.0 manhours (19:Pt II, 406)

TABLE 4.23

AGGREGATE SPECIAL HANDLING MANPOWER

UTC	MANHOURS	WITHIN LIMITS	ROUNDED ADJ MP 33%	20%	10%
UFBB1	2695.3568	Y	8	9	10
UFBB2	3057.1265	Y	9	10	12
UFBB3	3467.4528	Y	10	12	13
UFBB4	3732.5561	Y	11	13	14
UFBB5	3932.8529	Y	11	13	15
UFBB6	4095.5880	Y	12	14	15
UFBB7	4233.5383	N	12	15	16
UFBB8	4353.7924	N	12	15	16
UFBB9	4460.7189	N	13	15	17

FAC 4234AA. The Air Terminal Operations Center (ATOC) standard formula is:

$$Y = 327.1 + .3836 * X(1) + 2.742 * X(2) \quad (4.4)$$

X(1) = Tons of cargo/mail handled and rehandled (reference Table 4.14)

X(2) = Aircraft handled and rehandled (reference Table 4.19)

Extrapolation Limits: Not available

TABLE 4.24

AGGREGATE ATOC MANPOWER

UTC	MANHOURS	WITHIN LIMITS	ROUNDED ADJ MP 33%	20%	10%
UFBB1	1163.7178	Unk.	4	4	5
UFBB2	2000.9637	"	6	7	8
UFBB3	3674.8274	"	10	12	14
UFBB4	5348.6884	"	15	18	20
UFBB5	7022.5521	"	20	23	26
UFBB6	8696.4158	"	24	29	32
UFBB7	10370.2796	"	29	34	38
UFBB8	12044.1405	"	33	40	44
UFBB9	13718.0043	"	38	45	50

FAC 4235AA. The Records and Reports standard formula is:

$$Y = X/(.9365 + .00004658 * X) \qquad (4.5)$$

X = Number of manifests (reference Table 4.20)

Extrapolation Limits: 782.05 - 4210.65 manhours (13:Atch 2)

TABLE 4.25

AGGREGATE RECORDS AND REPORTS MANPOWER

UTC	MANHOURS	WITHIN LIMITS	ROUNDED ADJ MP 33%	20%	10%
UFBB1	172.985	N	1	1	1
UFBB2	343.207	N	1	1	1
UFBB3	675.6L5	N	2	3	3
UFBB4	997.724	Y	3	4	4
UFBB5	1310.004	Y	4	5	5
UFBB6	1612.900	Y	5	6	6
UFBB7	1906.797	Y	6	7	8
UFBB8	2191.182	Y	6	8	8
UFBB9	2469.327	Y	7	8	9

FAC 4235BA. The Document Control Center standard formula is:

$$Y = 340.2 + 0.7301 * X \qquad (4.6)$$

X = Number of Manifests (reference Table 4.20)

Extrapolation Limits = Not Available

TABLE 4.26

AGGREGATE DOCUMENT CONTROL CENTER MANPOWER

UTC	MANHOURS	WITHIN LIMITS	ROUNDED ADJ MP 33%	20%	10%
UFBB1	459.437	Unk.	2	2	2
UFBB2	578.678	"	2	2	3
UFBB3	817.154	"	3	3	3
UFBB4	1055.631	"	3	4	4
UFBB5	1294.107	"	4	5	5
UFBB6	1532.585	"	5	5	6
UFBB7	1771.036	"	5	6	7
UFBB8	2009.539	"	6	7	8
UFBB9	2248.012	"	7	8	9

FAC 4233EA. The Ramp Services standard formula is:

$$Y = 615.4 * X^{.3019} \qquad (4.7)$$

X = Cargo/mail handled and rehandled (reference Table 4.14)

Extrapolation Limits = 639 - 19325 manhours (19:Pt II, 243)

TABLE 4.27

AGGREGATE RAMP SERVICES MANPOWER

UTC	MANHOURS	WITHIN LIMITS	ROUNDED ADJ MP 33%	20%	10%
UFBB1	5972.2798	Y	17	20	22
UFBB2	7362.4287	Y	20	24	27
UFBB3	9076.1582	Y	25	30	34
UFBB4	10258.0310	Y	28	34	38
UFBB5	11188.7872	Y	31	37	41
UFBB6	11968.5116	Y	33	39	44
UFBB7	12645.7608	Y	35	41	47
UFBB8	13248.1794	Y	36	43	49
UFBB9	13793.1662	Y	38	45	51

FAC 4230AA. No Aerial Port Command standard formula exists, constant manning is used (17:1).

TABLE 4.28

AGGREGATE AERIAL PORT COMMAND MANPOWER

UTC	ROUNDED ADJUSTED MANPOWER 33%	20%	10%
UFBB1	3	3	3
UFBB2	3	3	3
UFBB3	3	3	3
UFBB4	3	3	3
UFBB5	3	3	3
UFBB6	3	3	3
UFBB7	3	3	3
UFBB8	3	3	3
UFBB9	3	3	3

AD-A161 688 QUANTIFYING WARTIME MANPOWER FOR MILITARY AIRLIFT COMMAND (MAC) STRATEGIC..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. J A STARKEY 2/2

UNCLASSIFIED SEP 85 AFIT/GLM/LSM/85S-73 F/G 1/5 NL

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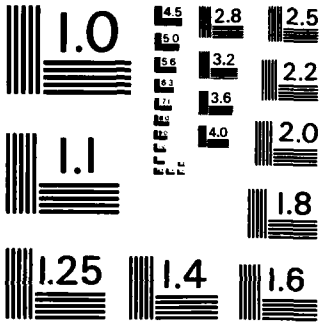

MICROCOPY RESOLUTION TEST CHART

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FAC 4230LA. No Terminal Operations standard formula exists, constant manning is used.

TABLE 4.29

AGGREGATE SQUADRON OPERATIONS MANPOWER

UTC	ROUNDED ADJUSTED MANPOWER 33%	20%	10%
UFBB1	4	4	4
UFBB2	4	4	4
UFBB3	4	4	4
UFBB4	4	4	4
UFBB5	4	4	4
UFBB6	4	4	4
UFBB7	4	4	4
UFBB8	4	4	4
UFBB9	4	4	4

FAC 4230CB. The Unit Administration standard formula is:

$$Y = X/(.3239 + .00009682 * X) \qquad (4.8)$$

X = Number of military personnel authorized (additive total of Tables 4.21 through 4.29)

Extrapolation Limits: 625.53 - 1700.04 manhours (5:Atch 2)

TABLE 4.30A

AGGREGATE UNIT ADMINISTRATION MANPOWER 33% LEVEL

UTC	ADDITIVE TOTAL	MANHOURS	WITHIN LIMITS	ROUNDED ADJUSTED MANPOWER
UFBB1	52	158.087	N	1
UFBB2	68	205.760	N	1
UFBB3	103	308.501	N	1
UFBB4	134	397.775	N	2
UFBB5	166	488.275	N	2
UFBB6	197	574.388	N	2
UFBB7	227	656.300	Y	2
UFBB8	255	731.521	Y	2
UFBB9	288	818.684	Y	3

TABLE 4.30B

AGGREGATE UNIT ADMINISTRATION MANPOWER (20% LEVEL)

UTC	ADDITIVE TOTAL	MANHOURS	WITHIN LIMITS	ROUNDED ADJUSTED MANPOWER
UFBB1	58	176.016	N	1
UFBB2	80	241.221	N	1
UFBB3	121	360.532	N	1
UFBB4	160	471.432	N	2
UFBB5	196	571.634	N	2
UFBB6	233	672.518	Y	2
UFBB7	268	766.047	Y	3
UFBB8	305	862.971	Y	3
UFBB9	340	952.865	Y	3

TABLE 4.30C

AGGREGATE UNIT ADMINISTRATION MANPOWER (10% LEVEL)

UTC	ADDITIVE TOTAL	MANHOURS	WITHIN LIMITS	ROUNDED ADJUSTED MANPOWER
UFBB1	45	137.088	N	1
UFBB2	60	181.979	N	1
UFBB3	102	305.595	N	2
UFBB4	154	454.532	N	2
UFBB5	196	571.634	N	2
UFBB6	240	691.370	Y	3
UFBB7	279	795.069	Y	3
UFBB8	318	896.561	Y	3
UFBB9	381	1056.021	Y	3

Results of Step One. Table 4.31 lists the results of the aggregate manpower developed in this step and the actual aggregate manpower using the current MAC UTC's.

TABLE 4.31

AGGREGATE MANPOWER UTC'S TOTALS

UTC	ADJUSTED UTCs (33%)	ADJUSTED UTCs (20%)	ADJUSTED UTCs (10%)	MAC UTCs
UFBB1	53	59	64	46
UFBB2	69	81	90	61
UFBB3	104	122	137	104
UFBB4	136	162	178	156
UFBB5	168	198	220	198
UFBB6	199	235	262	242
UFBB7	229	271	305	282
UFBB8	257	308	347	321
UFBB9	291	343	384	358

TABLE 4.32

SUMMARY OF EXTRAPOLATION LIMITS RESULTS

UTC	4233AA	4233DA	4233GA	4234AA	4235AA	4233EA	4230CB	4235BA
UFBB1	Y	Unk.	Y	Unk.	N	Y	N	Unk.
UFBB2	Y	"	Y	"	N	Y	N	"
UFBB3	Y	"	Y	"	N	Y	N	"
UFBB4	Y	"	Y	"	Y	Y	N	"
UFBB5	Y	"	Y	"	Y	Y	N	"
UFBB6	Y	"	Y	"	Y	Y	Y(1)	"
UFBB7	N	"	N	"	Y	Y	Y	"
UFBB8	N	"	N	"	Y	Y	Y	"
UFBB9	N	"	N	"	Y	Y	Y	"

(1) Not in Limits for 33% Level

Step Two: Manpower Tables. In step two, the aggregate manpower for the 33% level set of UTCs from step one were used to develop specific manpower tables for each individual work center. The manpower tables used came directly from the work center description report in most cases. In those situations where a manpower table did not exist for the level of personnel under consideration, a new table was developed based on maintaining the established ratio of AFSCs. These exceptions are noted at the end of each table. Table 4.33 provides an abbreviation index for the job titles used in the manpower tables.

TABLE 4.33

ABBREVIATION INDEX

FULL TITLE	ABBREVIATED TITLE
Transportation Staff Officer	Trans Staff Off
Transportation Officer	Trans Off
Air Transportation Superintendent	Air Trans Supt
Air Transportation Supervisor	Air Trans Supv
Air Cargo Specialist	Air Cargo Spec
Apprentice Air Cargo Specialist	Apr Air Cargo Spec
First Sergeant	First Sgt
Administrative Technician	Admin Tech
Administrative Specialist/ Orderly Room	Admin Spec/OR
Administrative Specialist/Staff	Admin Spec/Staff
Apprentice Administrative Specialist/Staff	Apr Admin Spec/Staff
Traffic Management Supervisor	Traffic Mgmt Supv
Freight Traffic Specialist	Frght Traff Spec
Apprentice Freight Traffic Specialist	Apr Frght Traff Spec

FAC 4233AA. The total Air Freight Services Office manpower quantities for Table 4.34A are taken from Table 4.21. The work center description report provided manpower tables in the range of three to eight personnel (6:Atch 2).

TABLE 4.34A

AIR FREIGHT SERVICES OFFICE MANPOWER TABLE

TITLE/(RANK)	AFSC	1	2	3	4	5	6	7	8	9
Trans Staff Off (04)	6016						1	1	1	1
Trans Off (03)	6054	1	1	1	1	1				
Air Trans Supt	60599			1	1	1	1	1	1	1
Air Trans Supv	60572					1	1	1	1	2
Air Cargo Spec	60551								1	1
Admin Spec/ Staff	70250B	1	1	1	1	1	2	2	2	2
TOTAL		2	2	3	3	4	5	5	6	7
Manpower Table Within Range		N	N	Y	Y	Y	Y	Y	Y	Y

FAC 4233DA. The total Export Cargo Processing manpower quantities for Table 4.34B are taken from Table 4.22. The work center description report provided manpower tables in the range of 14 to 121 personnel(12:Atch 1,1-9).

TABLE 4.34B

EXPORT CARGO PROCESSING MANPOWER TABLE

TITLE/(RANK)	AFSC	1	2	3	4	5	6	7	8	9
Air Trans Supt	60599				1	1	1	1	1	2
Air Trans Supv	60572	2	2	3	4	5	5	5	6	7
Air Cargo Spec	60551	5	7	16	24	32	39	47	54	62
Apr Air Cargo Spec	60531	2	7	15	22	30	35	43	51	58
Traffic Mgmt Supv	60273		1	1	1	2	3	3	4	4
Frght Traff Spec	60251	2	3	5	9	10	16	18	21	24
Apr Frght Traff Spec	60231		1	3	3	5	7	11	12	14
TOTAL		11	21	43	64	85	106	128	149	171
Manpower Table Within Range		N	Y	Y	Y	Y	Y	N	N	N

FAC 4233GA. The total Special Handling manpower quantities for Table 4.34C are taken from Table 4.23. This work center description report provided manpower tables in the range of 16 to 26 personnel (19:Pt II,407).

TABLE 4.34C

SPECIAL HANDLING MANPOWER TABLE

TITLE/(RANK)	AFSC	1	2	3	4	5	6	7	8	9
Air Trans Supv	60571	2	2	2	2	2	3	3	3	3
Air Cargo Spec	60551	6	7	8	9	9	9	9	9	10
TOTAL		8	9	10	11	11	12	12	12	13
Manpower Table Within Range		N	N	N	N	N	N	N	N	N

FAC 4234AA. The total Air Terminal Operation Center manpower quantities for Table 4.34D are taken from Table 24. This work center description report provided manpower tables in the range of 17 to 51 personnel (19:Pt II, 83-85).

TABLE 4.34D

ATOC MANPOWER TABLE

TITLE/(RANK)	AFSC	1	2	3	4	5	6	7	8	9
Trans Staff Off (04)	6016					1	1	1	1	1
Trans Off (03)	6054		1	1	2	3	4	4	4	5
Air Trans Supt	60591			1	1	1	1	1	1	1
Air Trans Supv	60571	1	1	2	4	4	3	4	5	5
Air Cargo Spec	60551	2	3	5	7	9	12	16	19	22
Apr Air Cargo Spec	60531					1	2	2	2	3
Admin Spec	70250B	1	1	1	1	1	1	1	1	1
TOTAL		4	6	10	15	20	24	29	33	38
Manpower Table Within Range		N	N	N	N	Y	Y	Y	Y	Y

FAC 4235AA. The total Records and Reports manpower quantities for Table 4.34E are taken from Table 4.25. This work center description report provided manpower tables in the range of six to 28 personnel (13:Atch 2).

TABLE 4.34E

RECORDS AND REPORTS MANPOWER TABLE

TITLE/(RANK)	AFSC	1	2	3	4	5	6	7	8	9
Trans Off (Ø3)	6Ø54									1
Air Trans Supv	6Ø572						1	1	1	1
Air Cargo Spec	6Ø551	1	1	2	3	3	3	3	3	3
Apr Air Cargo Spec	6Ø531							1	1	1
Admin Spec	7Ø25ØB					1	1	1	1	1
TOTAL		1	1	2	3	4	5	6	6	7
Manpower Table Within Range		N	N	N	N	N	N	Y	Y	Y

FAC 4235BA. The total Document Control Center manpower quantities for Table 4.34F are taken from Table 4.26. This work center description report provided manpower tables in the range of five to 24 personnel (11:Atch 2, 1-2).

TABLE 4.34F

DOCUMENT CONTROL CENTER MANPOWER TABLE

TITLE/(RANK)	AFSC	1	2	3	4	5	6	7	8	9
Air Trans Supv	6Ø572								1	1
Air Cargo Spec	6Ø551	2	2	2	2	3	3	3	3	4
Apr Air Cargo Spec	6Ø531						1	1	1	1
Apr Admin Spec	7Ø23ØB			1	1	1	1	1	1	1
TOTAL		2	2	3	3	4	5	5	6	7
Manpower Table Within Range		N	N	N	N	N	Y	Y	Y	Y

FAC 4233EA. The total Ramp Services manpower quantities for Table 4.34G are taken from Table 4.27. The work center description report provided manpower tables in the range of 36 to 84 personnel(19:Pt II, 245-249).

TABLE 4.34G

RAMP SERVICES MANPOWER TABLE

TITLE/(RANK)	AFSC	1	2	3	4	5	6	7	8	9
Air Trans Supt	60591	1	1	1	1	1	1	1	1	1
Air Trans Supv	60571	1	1	1	2	2	2	2	2	2
Air Cargo Spec	60551	12	14	11	20	22	24	25	26	28
Apr Air Cargo Spec	60531	3	4	5	5	6	6	7	7	7
TOTAL		17	20	25	28	31	33	35	36	38
Manpower Table Within Range		N	N	N	N	N	N	N	Y	Y

FAC 4230AA. The Command manpower quantities for Table 4.34H are taken from Table 4.28. This work center description report provided a constant manning of three personnel and is applicable to all levels in this analysis.

TABLE 4.34H

COMMAND MANPOWER TABLE

TITLE/(RANK)	AFSC	1	2	3	4	5	6	7	8	9
Trans Staff Off (06)	6016	1	1	1	1	1	1	1	1	1
Air Trans Supt	60591	1	1	1	1	1	1	1	1	1
Admin Spec	70250B	1	1	1	1	1	1	1	1	1
TOTAL		3	3	3	3	3	3	3	3	3

FAC 423LA. The Squadron Operations manpower quantities for Table 4.34I are taken from Table 4.29. This work center description report provided a constant manning of four personnel and is applicable to all three levels in this analysis (19:Pt II,392).

TABLE 4.34I

SQUADRON OPERATIONS MANPOWER TABLE

TITLE/(RANK)	AFSC	1	2	3	4	5	6	7	8	9
Trans Staff Off (Ø5)	6Ø16	1	1	1	1	1	1	1	1	1
Trans Off (Ø3)	6Ø54	1	1	1	1	1	1	1	1	1
Air Trans Supt	6Ø591	1	1	1	1	1	1	1	1	1
Admin Spec	7Ø25ØB	1	1	1	1	1	1	1	1	1
TOTAL		4	4	4	4	4	4	4	4	4

FAC 4230BA. The total Unit Administration manpower quantities for Table 4.34J are taken from Table 4.30A. This work center description report provided manpower tables in the range of five to 11 personnel (5:Atch 2).

TABLE 4.34J

UNIT ADMINISTRATION MANPOWER TABLE

TITLE/(RANK)	AFSC	1	2	3	4	5	6	7	8	9
First Sgt	1ØØ9Ø	1	1	1	1	1	1	1	1	1
Admin Spec	7Ø25JC				1	1	1	1	1	2
TOTAL		1	1	1	2	2	2	2	2	3
Manpower Table Within Range		N	N	N	N	N	N	N	N	N

Results of Step Two. The following table represents a new set of UTCs based on the modifications suggested by the MAC transportation war planners.

TABLE 4.35

REVISED UTC MANPOWER REQUIREMENTS (33% LEVEL)

TITLE/(RANK)	AFSC	1	2	3	4	5	6	7	8	9
Trans Staff Off (04) (05) (06)	6016	2	2	2	2	3	4	4	4	4
Trans Off (03)	6054	2	3	3	4	5	5	5	5	7
Air Trans Supt	6059-	3	3	5	6	6	6	6	6	7
Air Trans Supv	6057-	6	6	8	12	14	15	16	19	21
Air Cargo Spec	60551	28	34	51	65	78	90	103	115	130
Apr Air Cargo Spec	60531	5	11	20	27	37	44	54	62	70
First Sgt	10090	1	1	1	1	1	1	1	1	1
Admin Spec	70250C				1	1	1	1	1	2
Admin Spec	70250B	4	4	4	4	5	6	6	6	6
Apr Admin Spec	70230B			1	1	1	1	1	1	1
Traff Mgmt Supv	60273		1	1	1	2	3	3	4	4
Frght Traff Spec	60251	2	3	5	9	10	16	18	21	24
Apr Frght Traff Spec	60231		1	3	3	5	7	11	12	14
TOTAL		53	69	104	136	168	199	229	257	291

Research Objective Five. To compare the revised UTC manpower requirements with those currently being used by MAC and identify points of similarity and difference.

Analysis of this objective is performed in two steps. Step one examines aggregate manpower comparisons. Step two identities and compares five categories of manpower job classifications. These five categories are officers, superintendents/supervisors, administrative personnel, air cargo specialists and traffic management specialists.

Step One: Aggregate Manpower Comparisons. Table 4.35 identified three separate sets of suggested UFBB series UTCs. These tnree sets used the same modified independent variables for the specific UTC under consideration, they differed only in the manhour change from peacetime to the percentage decrease in manhours deducted to account for wartime workloads. MAC transportation war planners suggested a 33% decrease in total manhours. For comparative purposes, the effect of a 20% and 10% decrease in manhours was also examined.

In comparing the wartime manpower implications of these three sets of revised UTCs against the current MAC UTCs, Table 4.36 provides data on the usage frequency for UTC's UFBB1 through UFBB9. This data represents the aggregate number of times each specific UFBB UTC is employed to support the most stringent wartime scenario (21).

TABLE 4.36

WARTIME SCENARIO USAGE FREQUENCY FOR UFBB SERIES UTC'S

UTC	NUMBER OF TIMES USED
UFBB1	0
UFBB2	10
UFBB3	7
UFBB4	1
UFBB5	1
UFBB6	0
UFBB7	1
UFBB8	0
UFBB9	0
	20 (21)

Table 4.37 takes the usage rates from Table 4.36 and multiplies these numbers by the manpower requirements for the respective set of UTCs. This table represents the total manpower required to support the employment of the UFBB series UTCs in the most stringent wartime scenario. An analysis of this table indicates that the suggested set of UFBB series UTC at the 33%, level which were recommended by MAC transportation war planners, resulted in a total net savings of 23 personnel when compared to the current MAC UTCs (1974 personnel minus 1951 personnel). At the 20% level, 321 more personnel were required (2295 personnel minus 1974 personnel) and at the 10% level, 588 more personnel were required (2562 personnel minus 1974 personnel).

TABLE 4.37

WAR PLAN MANPOWER REQUIREMENTS

UTC	WAR PLAN USAGE	MAC UTC's UTC MP	MAC UTC's AGG MP	33% UTC MP	33% AGG MP	20% UTC MP	20% AGG MP	10% UTC MP	10% AGG MP
UFBB1	0	46	0	53	0	59	0	64	0
UFBB2	10	61	610	69	690	81	810	90	900
UFBB3	7	104	728	104	728	122	854	137	959
UFBB4	1	156	156	136	136	162	162	178	178
UFBB5	1	198	198	168	168	198	198	220	220
UFBB6	0	242	0	199	0	235	0	262	0
UFBB7	1	282	282	229	229	271	271	305	305
UFBB8	0	321	0	257	0	308	0	347	0
UFBB9	0	358	0	291	0	343	0	384	0
			1974		1951		2295		2562

Figure 4 provides a graphical comparison between the three sets of revised UTCs developed in Objective Four and the current MAC UTCs. This figure plots the number of personnel required against the daily tonnage capability of the UTCs. Tables 4.38A through 4.38C provide a comparison of the numerical and percentage differences in the total manpower for each of the three sets of revised UTCs against the current MAC UTCs. An analysis of this data indicates that for the UTCs developed by deducting 33% of the manhours required after adjusting for modification of the independent variables, slightly more personnel are required for UTC UFBB1 and UFBB2, 15.2% and 13.1% respectively. This set of

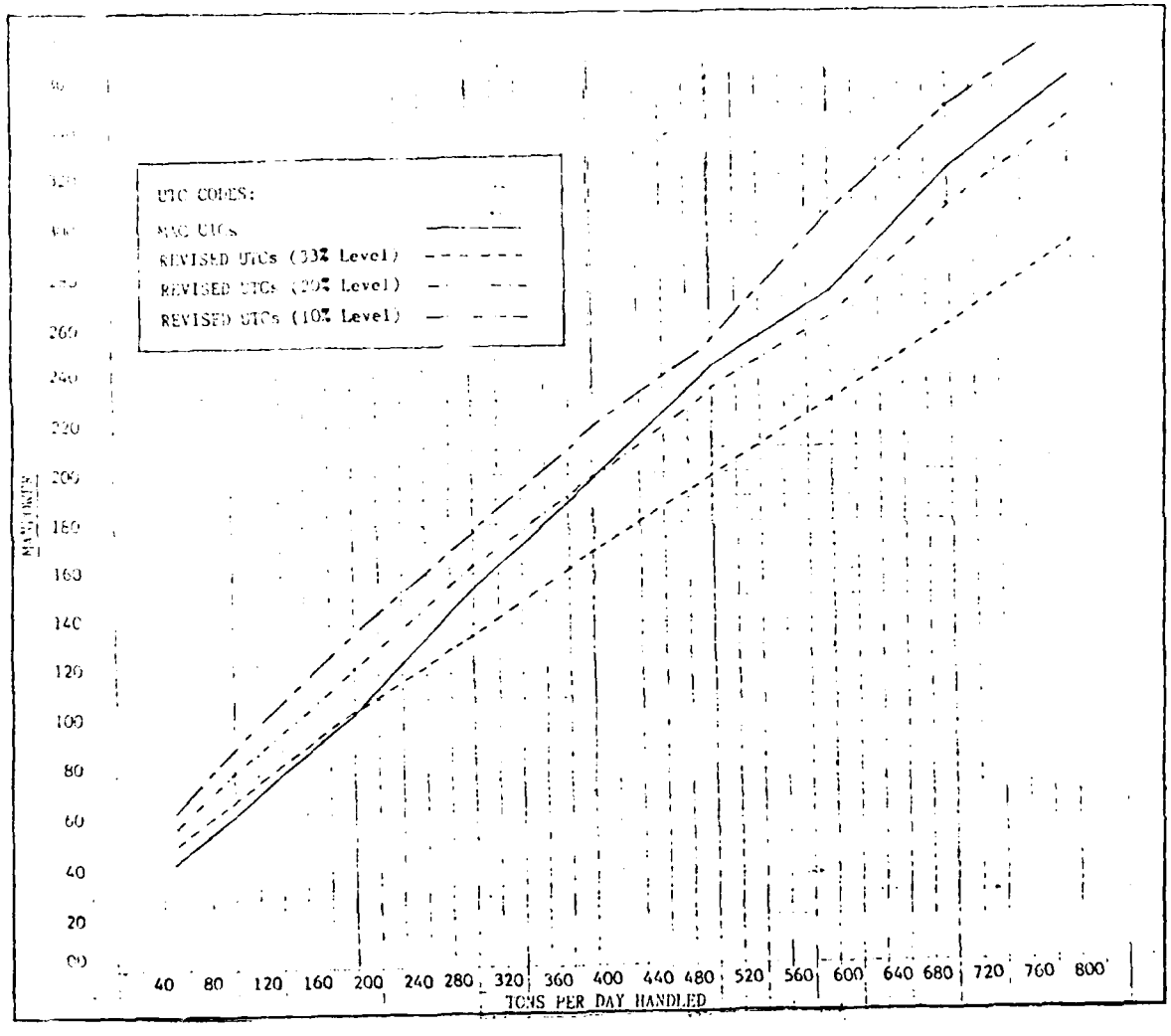

Figure 4. UTC Plot: Manpower versus Tons Handled Per Day

revised UTCs intersects with the current MAC UTC at UFBB3, thereafter, the suggested UTCs require increasingly less personnel.

The revised set of UTCs developed by deducting 20% of the manhours required after adjusting for the modification of the independent variables require a greater amount of personnel for UTC's UFBB1 and UFBB2, 28.3% and 32.8% respectively. This set of suggested UTCs intersects with the MAC UTCs at UFBB5 and thereafter requires slightly less personnel. The final set of suggested UTCs developed at the 10% level consistently require more personnel than its' respective MAC UTC.

TABLE 4.38A

AGGREGATE MANPOWER COMPARISONS (33% LEVEL)

UTC	SUGGESTED UTC'S	MAC UTC'S	MANPOWER DIFFERENCE	PERCENT DIFFERENCE
UFBB1	53	46	7	15.2%
UFBB2	69	61	8	13.1%
UFBB3	104	104	0	0.0%
UFBB4	136	156	-20	-12.8%
UFBB5	168	198	-30	-15.2%
UFBB6	199	242	-43	-17.8%
UFBB7	229	282	-53	-18.8%
UFBB8	257	321	-64	-19.9%
UFBB9	291	358	-67	-18.7%

TABLE 4.38B

AGGREGATE MANPOWER COMPARISONS (20% LEVEL)

UTC	SUGGESTED UTC'S	MAC UTC'S	MANPOWER DIFFERENCE	PERCENT DIFFERENCE
UFBB1	59	46	13	28.3%
UFBB2	81	61	20	32.8%
UFBB3	122	104	18	17.3%
UFBB4	162	156	6	3.8%
UFBB5	198	198	0	0.0%
UFBB6	235	242	-7	-2.9%
UFBB7	271	282	-11	-3.9%
UFBB8	308	321	-13	-4.0%
UFBB9	343	358	-15	-4.2%

TABLE 4.38C

AGGREGATE MANPOWER COMPARISONS (10% LEVEL)

UTC	SUGGESTED UTC'S	MAC UTC'S	MANPOWER DIFFERENCE	PERCENT DIFFERENCE
UFBB1	64	46	18	39.1%
UFBB2	90	61	29	47.5%
UFBB3	137	104	33	21.2%
UFBB4	178	156	22	14.1%
UFBB5	220	198	22	11.1%
UFBB6	262	242	20	8.3%
UFBB7	305	282	23	8.2%
UFBB8	347	321	26	8.1%
UFBB9	384	358	26	7.3%

Step Two: Job Classification Comparisons. MAC transportation war planners recommended an overall 33% decrease in the monthly manhours required for a wartime environment after modifications were made to the independent variables. In the following section, five job classifications are established to compare the differences in the type of skills recommended by the revised set of UTCs (33% level) versus those skills currently utilized in the MAC UTCs. The first category combines all the Transportation Officers irrespective of rank. The second category combines all the Air Transportation superintendents and supervisors along with the Traffic Management Supervisors. The third category combines the requirements for a first sergeant along with all administrative AFSCs. The fourth category combines both Air Cargo skill levels and the fifth category combines both Freight Traffic skill levels. Tables 4.39A through I provide this data.

Tables 4.39A through I shows several differences between the suggested UTCs and the MAC UTCs. First and foremost among these is the significant difference in the use of Freight Traffic Specialist. Throughout the range of UTC's UFBB3 to UFBB9, the suggested UTC utilized this skill category at an increasing rate relative to their use in the MAC UTC. A review of the work center description reports used in this study (published on 20 July 1982) indicates that Freight Traffic Specialists are employed only in FAC

4233DA, Export Cargo Processing. The fact that the Export Cargo Processing function was updated in 1982 could account for this difference, assuming the MAC UTCs predate this time period. A second major distinction between these two sets of UTCs is the difference in the utilization of superintendents/supervisors. The suggested UTCs consistently call for fewer supervisory personnel overall than are presently employed in the MAC UTCs. Along with this decrease in supervisory personnel, a decrease in the utilization of administrative personnel is also indicated in the tables, with the exception of UFBB1. The final notable point of difference involves the ratio of Transportation Staff Officers to Transportation Officers. The major part of this discrepancy is clearly attributable to the use of the constant manpower tables for both Aerial Port Command and Terminal Operations work centers.

TABLE 4.39A

UFBB1 JOB CLASSIFICATION COMPARISONS

CLASSIFICATION	SUGGESTED UTC'S	MAC UTC'S	MANPOWER DIFFERENCE	PERCENT DIFFERENCE
Trans Staff Off	2	2	0	
Trans Off	2	1	+1	
Off Subtotal	4	3	+1	+33.0%
Percent of Total	7.5	6.5		
Air Trans Supt	3	2	+1	
Air Trans Supv	6	8	-2	
Traffic Mgmt Supv	-	-	-	
Supv/Supt Subtotal	9	10	-1	-10.0%
Percent of Total	17.0	21.7		
First Sgt	1	-	+1	
Admin Tech	-	-	-	
Admin Spec/OR	-	-	-	
Admin Spec/Staff	4	5	-1	
Admin Subtotal	5	5	0	0.0%
Percent of Total	9.4	10.9		
Air Cargo Spec	33	27	+7	+25.9%
Percent of Total	62.0	59.0		
Fright Traff Spec	2	1	+1	+100.0%
Percent of Total	3.8	2.0		
TOTAL	53	46	+7	+15.2%

TABLE 4.39B

UFBB2 JOB CLASSIFICATION COMPARISONS

CLASSIFICATION	SUGGESTED UTC'S	MAC UTC'S	MANPOWER DIFFERENCE	PERCENT DIFFERENCE
Trans Staff Off	2	2	0	
Trans Off	3	2	+1	
Off Subtotal	5	4	+1	+25.0%
Percent of Total	7.2	6.5		
Air Trans Supt	3	2	+1	
Air Trans Supv	6	10	-4	
Traffic Mgmt Supv	1	-	+1	
Supv/Supt Subtotal	10	12	-2	-16.7%
Percent of Total	14.5	19.7		
First Sgt	1	-	+1	
Admin Tech	-	1	-1	
Admin Spec/OR	-	-	-	
Admin Spec/Staff	4	6	-2	
Admin Subtotal	5	7	-2	-28.6%
Percent of Total	7.2	11.4		
Air Cargo Spec	45	37	+8	+21.6%
Percent of Total	65.0	61.0		
Frght Traff Spec	4	1	+3	+300.0%
Percent of Total	6.0	2.0		
TOTAL	69	61	+8	+13.1%

TABLE 4.39C

UFBB3 JOB CLASSIFICATION COMPARISONS

CLASSIFICATION	SUGGESTED UTC'S	MAC UTC'S	MANPOWER DIFFERENCE	PERCENT DIFFERENCE
Trans Staff Off	2	2	0	
Trans Off	3	2	+1	
Off Subtotal	5	4	+1	+25.0%
Percent of Total	4.8	3.8		
Air Trans Supt	5	2	+3	
Air Trans Supv	8	15	-7	
Traffic Mgmt Supv	1	-	+1	
Supv/Supt Subtotal	14	17	-3	-17.6%
Percent of Total	13.5	16.3		
First Sgt	1	-	+1	
Admin Tech	-	1	-1	
Admin Spec/OR	-	1	-1	
Admin Spec/Staff	5	7	-2	
Admin Subtotal	6	9	-3	-33.3%
Percent of Total	5.8	8.6		
Air Cargo Spec	71	71	-	0.0%
Percent of Total	68.0	68.0		
Frght Traff Spec	8	3	+5	+166.7%
Percent of Total	8.0	3.0		
TOTAL	104	104	0	0.0%

TABLE 4.39D

UFBB4 JOB CLASSIFICATION COMPARISONS

CLASSIFICATION	SUGGESTED UTC'S	MAC UTC'S	MANPOWER DIFFERENCE	PERCENT DIFFERENCE
Trans Staff Off	2	2	0	
Trans Off	4	6	-2	
Off Subtotal	6	8	-2	-25.0%
Percent of Total	4.4	5.1		
Air Trans Supt	6	3	+3	
Air Trans Supv	12	22	-10	
Traffic Mgmt Supv	1	-	+1	
Supv/Supt Subtotal	19	25	-6	-24.0%
Percent of Total	14.0	16.0		
First Sgt	1	1	-	
Admin Tech	-	1	-1	
Admin Spec/OR	1	1	-	
Admin Spec/Staff	5	10	-5	
Admin Subtotal	7	13	-6	-26.1%
Percent of Total	5.1	8.3		
Air Cargo Spec	92	106	-14	-13.2%
Percent of Total	68.0	68.0		
Frgnt Traff Spec	12	4	+8	+200.0%
Percent of Total	9.0	3.0		
TOTAL	136	156	-20	-12.8%

TABLE 4.39E

UFBB5 JOB CLASSIFICATION COMPARISONS

CLASSIFICATION	SUGGESTED UTC'S	MAC UTC'S	MANPOWER DIFFERENCE	PERCENT DIFFERENCE
Trans Staff Off	3	3	0	
Trans Off	5	6	-1	
Off Subtotal	8	9	-1	-11.1%
Percent of Total	4.8	4.5		
Air Trans Supt	6	6	-	
Air Trans Supv	14	29	-15	
Traffic Mgmt Supv	2	-	+2	
Supv/Supt Subtotal	22	35	-13	-37.1%
Percent of Total	13.1	17.7		
First Sgt	1	1	-	
Admin Tech	-	1	-1	
Admin Spec/OR	1	1	-	
Admin Spec/Staff	6	10	-4	
Admin Subtotal	8	13	-5	-38.5%
Percent of Total	4.8	6.6		
Air Cargo Spec	115	136	-21	-15.4%
Percent of Total	68.0	68.0		
Frght Traff Spec	15	5	+10	+200.0%
Percent of Total	9.0	3.0		
TOTAL	168	198	-31	-15.7%

TABLE 4.39F

UFBB6 JOB CLASSIFICATION COMPARISONS

CLASSIFICATION	SUGGESTED UTC'S	MAC UTC'S	MANPOWER DIFFERENCE	PERCENT DIFFERENCE
Trans Staff Off	4	3	+1	
Trans Off	5	6	-1	
Off Subtotal	9	9	0	0.0%
Percent of Total	4.5	3.7		
Air Trans Supt	6	8	-2	
Air Trans Supv	15	38	-23	
Traffic Mgmt Supv	3	-	+3	
Supv/Supt Subtotal	24	46	-22	-47.8%
Percent of Total	12.1	19.0		
First Sgt	1	1	-	
Admin Tec	-	1	-1	
Admin Spec/OR	1	1	-	
Admin Spec/Staff	7	11	-4	
Admin Subtotal	9	14	-5	-35.7%
Percent of Total	4.5	5.7		
Air Cargo Spec	134	167	-33	-19.8%
Percent of Total	67.0	69.0		
Frght Traff Spec	23	6	+17	+283.3%
Percent of Total	12	2		
TOTAL	199	242	-43	-17.8%

TABLE 4.39G

UFBB7 JOB CLASSIFICATION COMPARISONS

CLASSIFICATION	SUGGESTED UTC'S	MAC UTC'S	MANPOWER DIFFERENCE	PERCENT DIFFERENCE
Trans Staff Off	4	3	+1	
Trans Off	5	8	-3	
Off Subtotal	9	11	-2	-18.2%
Percent of Total	3.9	3.9		
Air Trans Supt	6	9	-3	
Air Trans Supv	16	43	-27	
Traffic Mgmt Supv	3	-	+3	
Supv/Supt Subtotal	25	52	-27	-51.9%
Percent of Total	10.9	18.4		
First Sgt	1	1	-	
Admin Tech	-	1	-1	
Admin Spec/OR	1	1	-	
Admin Spec/Staff	7	12	-5	
Admin Subtotal	9	15	-6	-40.0%
Percent of Total	3.9	5.3		
Air Cargo Spec	157	197	-40	-20.3%
Percent of Total	69.0	70.0		
Frght Traff Spec	29	7	+22	+314.3%
Percent of Total	13.0	2.0		
TOTAL	229	282	-53	-18.8%

TABLE 4.39H

UFBB8 JOB CLASSIFICATION COMPARISONS

CLASSIFICATION	SUGGESTED UTC'S	MAC UTC'S	MANPOWER DIFFERENCE	PERCENT DIFFERENCE
Trans Staff Off	4	3	+1	
Trans Off	5	8	-3	
Off Subtotal	9	11	-2	-18.2%
Percent of Total	3.5	3.4		
Air Trans Supt	6	9	-3	
Air Trans Supv	19	48	-29	
Traffic Mgmt Supv	4	1	+3	
Supv/Supt Subtotal	29	58	-29	-50.0%
Percent of Total	11.3	18.1		
First Sgt	1	1	-	
Admin Tech	-	1	-1	
Admin Spec/OR	1	2	-1	
Admin Spec/Staff	7	14	-7	
Admin Subtotal	9	18	-9	-50.0%
Percent of Total	3.5	5.6		
Air Cargo Spec	177	227	-50	-22.0%
Percent of Total	69.0	71.0		
Frght Traff Spec	33	7	+26	+371.4%
Percent of Total	13.0	2.0		
TOTAL	257	321	-64	-19.9%

TABLE 4.39I

UFBB9 JOB CLASSIFICATION COMPARISONS

CLASSIFICATION	SUGGESTED UTC'S	MAC UTC'S	MANPOWER DIFFERENCE	PERCENT DIFFERENCE
Trans Staff Off	4	3	+1	
Trans Off	7	8	-1	
Off Subtotal	11	11	0	0.0%
Percent of Total	3.8	3.1		
Air Trans Supt	7	9	-2	
Air Trans Supv	21	51	-30	
Traffic Mgmt Supv	4	1	+3	
Supv/Supt Subtotal	32	61	-29	-47.5%
Percent of Total	11.0	17.0		
First Sgt	1	1	-	
Admin Tech	-	1	-1	
Admin Spec/OR	2	2	-	
Admin Spec/Staff	7	14	-7	
Admin Subtotal	10	18	-8	-44.4%
Percent of Total	3.4	5.0		
Air Cargo Spec	200	260	-60	-23.1%
Percent of Total	69.0	73.0		
Frght Traff Spec	38	8	+30	+375.0%
Percent of Total	13.0	2.0		
TOTAL	291	358	-67	-18.7%

V. Summary, Conclusions, and Recommendations

Chapter Overview

This chapter summarizes the significant findings of this study and offers several conclusions regarding the determination of wartime manpower standards for the cargo services aerial port function. Recommendations for incorporating the results of this effort to revise the current UTCs are also provided.

Study Summary

The major goal of this thesis was to develop a systematic method for establishing wartime manpower requirements for the MAC aerial port cargo services function. As stated in Chapter I, HQ MAC transportation war planners are uncertain that the current cargo services aerial port unit type codes (UTCs) manpower data accurately reflect wartime requirements. They are equally uncertain as to how these UTCs were originally developed (30). Following a suggestion by Lt Col Sledge, HQ MAC/TRXP, and a review of the literature on this subject, standard peacetime manpower formulas were modified to develop wartime manpower requirements for the cargo services function.

A five step procedure was developed to achieve the results reported in this study. The first step identified the peacetime formulas which reflect the wartime tasks required by the mission capability statements of the UFBB

series cargo services UTCs. The second step provided an explanation on how these peacetime formulas operate and what input data was needed to adopt them for specific workloads. The third step developed, with the guidance of MAC transportation planners, the wartime workload adjustments to the independent variables in the specific peacetime formulas. To reflect the change in the number of monthly manhours necessary to operate in a wartime environment, the product of each peacetime formula (manhours) was decreased by 33%, 20% and 10%. A 33% decrease represents, in the opinion of the MAC transportation planners interviewed, the percentage monthly manhours provided by the peacetime formulas for strictly peacetime duties that will not be performed in a wartime environment. The 20% and 10% were arbitrarily chosen by the author for comparative purposes. The fourth step applied these modified peacetime formulas to nine expected wartime workload levels identified in UTC's UFBB1 through UFBB9. The culmination of this step was the creation of three revised sets of UFBB series UTCs manpower tables. These revised sets of UTCs have been identified through this study as UTCs developed at the 33%, 20% and 10% levels. The fifth and final step then compared these revised UTCs against the current MAC UTCs. This comparison was made in three stages. First, aggregate manpower requirements necessary to support the tasking of the UFBB series of UTCs in the most stringent wartime scenario were

compared. Second, manpower requirements for each individual UTC (UFBB1 through UFBB9) were analyzed. Finally, for the revised set of UTCs, developed at the 33% level only, a comparison of five major job classifications was provided.

Main Conclusions

As stated in Chapter I, the research question addressed in this thesis was: If the guidance of experienced MAC transportation war planners is used to develop new UTC manpower data from modified peacetime standards, how do the results of these revised UTC manpower requirements compare to the current MAC cargo services aerial port UTC manpower requirements? The main conclusions reached from comparing the suggested UTCs against the current MAC UTCs are provided below.

Wartime Scenario Comparisons. Given the most stringent wartime scenario, no discernible difference existed between the aggregate manpower needed to support the employment of the revised UTCs developed in this study (at the 33% level) when compared to manpower needed to support the employment of the current MAC UTCs. The revised UFBB series UTCs required 1951 personnel versus 1974 personnel required by the current MAC UTCs, a difference of only 1.2%. The revised set of UTCs developed at the 20% level required 2295 personnel to support this scenario, or 16.3% more personnel than is required by the current MAC UTCs. Finally, the revised set of UTCs developed at the 10% level required 2562 personnel, or 30% more personnel.

Individual UTC Comparisons. When comparing the manpower data requirements for each individual UTC (UFBB1 through UFBB9) distinct differences between the revised sets of UTCs and the current MAC UTCs begin to emerge. The revised set of UTCs at the 33% level initially require an additional seven personnel for UFBB1, an increase of 15.2% over the current MAC UTCs, and for UFBB2 an additional eight personnel or 13.1% more. Manpower requirements for UFBB3 are equivalent. Thereafter, the revised UTCs (33% level) UFBB4 through UFBB8 require increasingly less personnel ranging from 12.8% to 19.9%. At UTC UFBB9, this trend starts to level off. The revised UTC (33% level) required 67 fewer personnel which represents an 18.7% decrease in manpower. The revised set of UTCs developed at the 20% level require significantly more personnel initially, 28.3% more for UFBB1 (13 people), 32.8% for UFBB2 (20 people), 17.3% more for UFBB3 (18 people) and 3.8% for UFBB4 (6 people). Manpower requirements are equivalent to the MAC UTC for UFBB5; therefore, the revised UTCs (20% level) require slightly fewer personnel, ranging from 2.9% to 4.2%, or 7 to 13 people less. Finally, the revised set of UTCs developed at the 10% level consistently required more personnel; although, with the exception of UFBB1, the rate continues to rapidly decline from 47.5% more personnel for UFBB2 to 7.3% more personnel for UFBB9.

Job Classification Comparisons

More salient differences surface between the revised UTCs at the 33% level and current MAC UTCs when a comparison is made by job classifications. The officer category as a percent of total manpower in the suggested UTCs are very similar to the MAC UTCs, never varying by more than a one percent difference. However, the superintendent/ supervisors, as a percentage of the total manpower, is consistently lower in the revised UTCs (33% level), normally representing 11 to 14 percent of the total. In the MAC UTCs, this category generally constitutes a healthy 17 to 18 percent of the total manpower. The percentage of administrative personnel is also consistently lower in the revised UTCs (33% level), declining from 9.4% in UFBB1 to only 3.9% in UFBB9. Although this category also declines in the MAC UTCs, the decline is not as swift nor as great. Administrative personnel comprise 10.9% of the total manpower in UFBB1 and 5% in UFBB9. Air Cargo Specialist, the mainstay speciality skill in this series of UTCs, typically composes 67% to 69% of the total manpower in the revised UTCs (33% level). While in the MAC UTCs this speciality skill slowly increases as a total percent of manpower from 59% in UFBB1 to 73% in UFBB9. As a percent of total manpower, the revised UTCs (33% level) increasingly se more Freight Traffic Specialists. This category represents 5% of the total manpower for UFBB1 and continues

to increase to the point where it represents 13% of the total manpower for UFBB7, where it then levels off. In the MAC UTCs, however, Freight Traffic Specialist never represent more than 3% of the total manpower or less than 2%.

Differences do exist between the suggested UTCs developed in this study when compared to the current MAC UTCs. When interpreting the results of this study, the following cautions should be exercised. First, this study represents a quantitative aid to be used by managers in supporting decisions concerning the manpower composition of the strategic aerial port cargo services UTCs. It does not claim, nor should it be interpreted as having claimed, to made that decision. Second, the reader should remain mindful of the fact that the findings are based on peacetime formulas developed for CONUS strategic aerial ports, although in comparing the results to the most stringent wartime scenario, strategic ports world wide were considered. Finally, the extrapolation limits of the peacetime standard formulas were exceeded in several cases (reference Table 4.32, Summary of Extrapolation Limits Results) and so must be considered when evaluating specific work centers.

Recommendations

The results of Tables 4.39A through 4.39I, Job Classification Comparisons, should be reviewed by both the

MAC Transportation Plans Staff and all strategic aerial port commanders and operations officers for a field level evaluation and validation. As a possible strategy for validating the revised UTCs developed at the 33% level, it is recommended that MAC transportation planners submit these UTCs to the field for their written evaluation. Input derived from this process should then be used to modify the revised manpower tables. MAC transportation planners should then re-evaluate the adjusted UTCs to determine if discernible differences still exist. If differences still exist, MAC transportation planners should then direct the deployment of the adjusted UTCs in the next operational readiness inspection (ORI). The results of the ORI field tests should then be analyzed and, if necessary, further adjustments should be made. Once the manpower tables are evaluated and validated and the current MAC UTCs changed, the phase "Technical adjustment to the peacetime formulas" should be added to the mission capability statement to reflect the source of the manpower tables.

As a second recommendation, MAC transportation planners should become actively involved in the efforts by the MAC Management Engineering Team (MACMET) in establishing wartime manning formulas. The results of these field studies should be cross validated with the opinions of expert MAC transportation war planners so that an integrated view of the wartime environment can be developed and

reflected in the wartime manning standards. The MAC transportation planning staff could then use these standards to review and update all their air transportation UTCs.

Differences do exist between the revised UTCs developed in the thesis when compared to the current MAC UTCs. Evidence from this study casts serious doubts as to the proper employment of the freight traffic skill level in the current MAC UTCs. It also calls into question the high proportion of superintendents/supervisors relative to the total UTC manpower and suggests that the current MAC UTCs underestimate the required manpower in UTCs UFBB1 and UFBB2, while they overestimate the manpower requirements in UFBB4 through UFBB9. Most importantly, this study has developed a systematic and justifiable procedure for developing aerial port cargo services UTCs where one did not previously exist. The specific determination of manpower requirements for individual UTCs (UFBB1 through UFBB9) are readily available for review and can be analyzed by individual work center. It is recommended that these UTCs be reviewed by the MAC transportation planning staff and aerial port field representative for initiating changes to the current MAC UTCs.

Appendix A: Background Letter

08 JUL 1985

FROM: HQ MAC/TRXP

SUBJECT: Aerial Port UTC Research

TO: Cpt Jac Starkey
AFIT/LSG
Wright-Patterson AFB, OH 45433

1. We've researched our files in an effort to locate the background data you requested on how UTCs UFBB1 through UFBB9 were developed. Unfortunately, we were unable to locate any historical data along these lines. However, I believe, but cannot confirm, that they were developed based upon some modification of peacetime standards ten to fifteen years ago ago. As I recall, this series of aerial port UTCs was in use when I was first assigned to HQ MAC in the summer of 1975.

2. I think it would be worthwhile to evaluate these UTCs to see if there is a logic still resident within them and if they can be related to some modification of the current peacetime standards. This would be an especially useful exercise if it could be related directly to our six CONUS aerial ports as they are the ports primarily tasked under the UFBB- series of UTCs.

3. The results of such an effort would be extremely useful in refining our overall wartime aerial port manpower requirements via they FORSIZE process. If, for example, you detect a disconnect in logic that would equate to 10 percent overall reduction or increase in CONUS ports alone, that would roughly equate to 1.5 million dollars savings or expense annually. Please keep me informed on your progress.

James H. Sleigh

JAMES H. SLEIGH, LtCol, USAF
Chief, Plans & Programs Div
Dir of Plans, Reg & Mobility
DCS/Air Transportation

Appendix B: Work Center Description Report

[illegible] 26-1
[illegible] 29, Pt Two

Special Handling

[illegible]

[illegible] HANDLING [illegible] explosive cargo [illegible] NM [illegible] registered [illegible] processes refrigerated/frozen cargo; palletizes [illegible] travels to and from aircraft; loads [illegible] cargo.

[illegible] INVENTORY [illegible] HANDLING CARGO: [illegible] explosives [illegible] explosive cargo (danger area); inventories security [illegible] cargo; inventories NM [illegible] cargo; inventories registered [illegible] inventories refrigerated/frozen cargo.

[illegible] TRACER ACTION: Initiates tracer action [illegible] and registered mail; answers inquiries on special handling [illegible] status; refers inquiry to other agencies when tracer information is not available.

[illegible] SHIPMENTS: Identifies frustrated shipments; prepares [illegible] as required; completes frustrated cargo report; [illegible] transports frustrated cargo to and from [illegible].

[illegible]

[illegible] personnel; supervises [illegible] reviews incoming distribution; reviews [illegible] reviews report and statistical data; develops budget estimate; inspects [illegible] investigates accident or incident; receives and assists visiting [illegible].

[illegible]: Maintains unclassified correspondence files; maintains [illegible] publication files; maintains stock of blank forms; maintains [illegible] or bulletin board; maintains [illegible] roster; maintains [illegible] maintains daily work schedule; [illegible] and receives telephone calls.

[illegible] conducts or attends [illegible].

[illegible]: Administers training; develops training materials; conducts [illegible] receives training.

[illegible] equipment request; conducts inventory; maintains [illegible] expendable supplies; monitors expenditures; [illegible] stock.

[illegible] EQUIPMENT MAINTENANCE: Maintains shop equipment; and maintains assigned [illegible].

[illegible]: Prepares work area; puts work away; and cleans work area.

MANPOWER STANDARD AND TABLE

I. MANPOWER STANDARD	WORK CENTER TITLE/CODE: Special Handling / 4230 X

CLASS OF STANDARD		SCOPE		TYPE	
	ENGINEERED		AIR FORCE	X	MILITARY
	STATISTICAL, TYPE I	X	COMMAND		CIVILIAN
X	STATISTICAL, TYPE II		BASE PECULIAR	H	DATA CODE

APPLICABILITY STATEMENT

1. This standard applies to: 436 APS, Dover; 438 APS, McGuire; 437 APS, Charleston; 60 APS, Travis; 62 APS, McChord; 63 APS, Norton

2. Extrapolation limits: $67.38 \leq Y_c \leq 4148.00$

APPLICATION INSTRUCTIONS

Extract tonnage figure for 12 month period to insure a representative average.

NORMAL HOURS OF OPERATION	WORK WEEK	MANHOUR AVAILABILITY FACTOR
24 hours / day	7 days / week	145.2

MANHOUR DATA SOURCE

	WORK SAMPLING	X	OPERATIONAL AUDIT		MANHOUR REPORTING
	MANPOWER FILES		TIME STUDY		OTHER (Specify)

STANDARD EQUATION (Manhours)	DATES: APPROVAL	DATES: CURRENCY REVIEW
$Y = 825.08X^{.1917}$	HQ USAF / 12 JAN 79	

WORKLOAD FACTOR IDENTIFICATION

TITLE

Tons of Special Handling Cargo Manifested

DEFINITION

The total number of tons each month of CONUS inbound and outbound special handling cargo processed by the Special Handling work center for further shipment. This type of cargo encompasses all Hazardous, Explosive, Security Cage MAC NMCS/VVIP/PSS, Registered Mail and Refrigerated Frozen Food and Nonfood Shipments.

SOURCE

RCS: MAC-TRP(M)7107, Monthly Station Traffic Handling Report, Section IV, Tons row, Total column

AF FORM MAR 77 1113 (REVISED)

II. MANPOWER TABLE		WORK CENTER TITLE/CODE Special Handling / 4230X						
AIR FORCE SPECIALTY TITLE	AFSC	MNHR AVL	WORKLOAD OR FRACTIONAL MANHOUR VALUES					
		L						
		U						
		L						
		U						
		L						
		U						
		GRADE	MANPOWER REQUIREMENT					
Air Transportation Supv	60571	MSG	1	1	1	1	1	1
Air Transportation Supv	60571	TSG	-	-	-	-	-	1
Air Transportation Supv	60571	SSG	3	3	3	3	3	2
Air Cargo Spec	60551	SSG	1	1	1	2	3	3
Air Cargo Spec	60551	SGT	5	5	5	5	5	5
Air Cargo Spec	60551	SRA	6	7	7	7	7	7
Apr Air Cargo Spec	60531	AIC	-	-	1	1	1	2
TOTAL			16	17	18	19	20	21

AIR FORCE SPECIALTY TITLE	AFSC	MNHR AVL	WORKLOAD OR FRACTIONAL MANHOUR VALUES					
		L						
		U						
		L						
		U						
		L						
		U						
		GRADE	MANPOWER REQUIREMENT					
Air Transportation Supv	60571	MSG	1	1	1	1	1	
Air Transportation Supv	60571	TSG	1	1	1	1	1	
Air Transportation Supv	60571	SSG	2	2	3	3	3	
Air Cargo Spec	60551	SSG	3	3	3	3	3	
Air Cargo Spec	60551	SGT	6	6	6	6	7	
Air Cargo Spec	60551	SRA	7	7	7	8	8	
Apr Air Cargo Spec	60531	AIC	2	3	3	3	3	
TOTAL			22	23	24	25	26	

Appendix C: Monthly Station Traffic Handling Report

MONTHLY STATION TRAFFIC HANDLING REPORT

REPORT CONTROL SYMBOL: MAC-TRX(M&Q)7107

MONTH AND YEAR: Apr 85

STATION: 62 APS McChord AFB WA 98438-5000

I. PASSENGERS

AIRCRAFT		ORIGINATING S/R	ORIGINATING S/A	TERMINATING S/R	TERMINATING S/A	THROUGH S/R	THROUGH S/A	REHANDLED/REPROCESSED S/R	REHANDLED/REPROCESSED S/A	TOTAL PASSENGERS S/R	TOTAL PASSENGERS S/A
ASIF	MILITARY	1740	605	4913	498	33	35	23	325	6709	1463
	COMMERCIAL	2	5	301		260				563	5
NON ASIF	MILITARY	595	1224	1826	846	83	39			2504	2109
	COMMERCIAL	3		2	4	9				14	4
TOTAL		2340	1834	7042	1348	385	74	23	325	9790	3581 13,371

II. CARGO AND MAIL (TON)

AIRCRAFT		ORIGINATING CARGO	ORIGINATING MAIL	TERMINATING CARGO	TERMINATING MAIL	REHANDLED/REPROCESSED CARGO	REHANDLED/REPROCESSED MAIL	TOTAL CARGO	TOTAL MAIL
ASIF	MILITARY	1246		1671		489		3406	
	COMMERCIAL	327		298		121		746	
NON ASIF	MILITARY	142		169		6		317	
	COMMERCIAL	466		719		96		1281	
TOTAL		2181		2857		712		5750	

III. GENERAL INFORMATION

A. SPECIAL CATEGORY PASSENGER SPACE REQUIRED	SPACE AVAILABLE	B. SPECIAL HANDLING PIECES	TONS	C. CODE J BAGGAGE TONS	D. COCP/RTOPC LINE ITEMS	E. TRUCK HANDLINGS NO	TONS
55	41	6111	1681	355	NA	1270	1665

IV. AIRCRAFT HANDLED BY TYPE

TYPE	A. ASIF AIRCRAFT ARRIVAL	DEPART	SUB TOTAL	B. NON ASIF AIRCRAFT ARRIVAL	DEPART	SUB TOTAL	C. REHANDLED AIRCRAFT ASIF	NON ASIF	D. TOTAL HANDLED	V. AIRCRAFT FLEET SERVICED ASIF	NON ASIF	TOTAL
C-5	16	15	31				3		34	28		28
C-9	12	12	24	39	39	78			102		1	1
C-141	178	186	364	35	34	69	38	3	474	254	66	320
CARGO	322	310	632	1	1	2	71		705	636		636
AERO MED	12	11	23						23	6		6
PAX CONFIG	24	42	66						66	81		81
NARROW BODY CGO	9	8	17	52	52	104			121	16		16
NARROW BODY PAX												
WIDE BODY CGO	8	7	15				1		16	3		3
WIDE BODY PAX	2	1	3						3			
OTHER				28	21	49			49		10	10
TOTAL	583	592	1175	155	147	302	113	3	1593	1024	77	1101

VI. REMARKS

TYPE	INBND	OUTBND	THRU	RERUN	CANX	TOTAL
PAX	210	374	23		10	617
Cargo	307	327	177		2	813
Mail						
TOTAL	517	701	200		12	1430

Border Star (Exercise)

PAX 2,885

Cargo 363 Tons

Ballast included in Rehandled: 311 tons

Civilian mandays expended: 45 on base; 31 off base

Aerial Delivery: Heavy Equipment - 30

Container delivery-systems load on hand - 59

USO Lounge staffed as required.

VII. AUTHENTICATION

PROGRAMMER (Name, Grade and Signature): DIXIE L. PETERS, GS-5, DAF, Supervisor, Records & Reports

REVIEWING OFFICIAL (Name, Grade and Signature): Jack A. Glatz, JACK A. GLATZ, Major, USAF, Squadron Operations Officer

DATE: 14 May 85

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Appendix D: Rounding Tables

MANPOWER RANGE FOR EACH AVAILABILITY FACTOR				MANPOWER
143.5/145.2 (NORMAL WORKWEEK)	180.0 (EXTENDED NORMAL WORKWEEK)	183.1 (EXTENDED REMOTE WORKWEEK)	244.0 (WARTIME EMERGENCY WORKWEEK)	
.001 - 1.077	.001 - 1.043	.001 - 1.040	.001 - 1.012	1
1.078 - 2.154	1.044 - 2.086	1.041 - 2.080	1.013 - 2.024	2
2.155 - 3.231	2.087 - 3.129	2.081 - 3.120	2.025 - 3.036	3
3.232 - 4.308	3.130 - 4.172	3.121 - 4.160	3.037 - 4.048	4
4.309 - 5.385	4.173 - 5.215	4.161 - 5.200	4.049 - 5.060	5
5.386 - 6.462	5.216 - 6.258	5.201 - 6.240	5.061 - 6.072	6
6.463 - 7.539	6.259 - 7.301	6.241 - 7.280	6.073 - 7.084	7
7.540 - 8.616	7.302 - 8.344	7.281 - 8.320	7.085 - 8.096	8
8.617 - 9.693	8.345 - 9.387	8.321 - 9.360	8.097 - 9.108	9
9.694 - 10.770	9.388 - 10.430	9.361 - 10.400	9.109 - 10.120	10
10.771 - 11.847	10.431 - 11.473	10.401 - 11.440	10.121 - 11.132	11
11.848 - 12.924	11.474 - 12.516	11.441 - 12.480	11.133 - 12.144	12
12.925 - 13.999	12.517 - 13.559	12.481 - 13.520	12.145 - 13.156	13
14.000 - 14.999	13.560 - 14.602	13.521 - 14.560	13.157 - 14.168	14
15.000 - 15.999	14.603 - 15.645	14.561 - 15.600	14.169 - 15.180	15
ETC.	15.646 - 16.688	15.601 - 16.640	15.181 - 16.192	16
	16.689 - 17.731	16.641 - 17.680	16.193 - 17.204	17
	17.732 - 18.774	17.681 - 18.720	17.205 - 18.216	18
	18.775 - 19.817	18.721 - 19.760	18.217 - 19.228	19
	19.818 - 20.860	19.761 - 20.800	19.229 - 20.240	20
	20.861 - 21.903	20.801 - 21.840	20.241 - 21.252	21
	21.904 - 22.946	21.841 - 22.880	21.253 - 22.264	22
	22.947 - 23.989	22.881 - 23.920	22.265 - 23.276	23
	23.990 - 24.999	23.921 - 24.960	23.277 - 24.288	24
	25.000 - 25.999	24.961 - 25.999	24.289 - 25.300	25
	26.000 - 26.999	26.000 - 26.999	25.301 - 26.312	26
	ETC.	27.000 - 27.999	.	27
		ETC.	.	28
			.	29
			.	.
			.	.
			.	.
			.	.
			.	.
			.	.
			.	.
			80.961 - 81.972	81
			81.973 - 82.984	82
			82.985 - 83.996	83
			83.997 - 84.999	84
			85.000 - 85.999	85
			86.000 - 86.999	86
			ETC.	

(15:Chp 41, 17)

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VITA

Captain John A. Starkey was born on 5 April 1951 in Brooklyn, New York. He enlisted in the Air Force in May 1969 and served as an administrative specialist. He attended Michigan State University and received the degree of Bachelor of Arts in Marketing in August 1975. He received his commission in the USAF through the OTS program in November 1980. He served as duty officer and Chief of the Mobility Plans Branch, 3 MAPS, Pope AFB, North Carolina, from January 1981 until entering the School of Systems and Logistics, Air Institute of Technology in June 1984.

Permanent Address: 81 Elba Avenue
Hopatcong, New Jersey 07843

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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

TITLE: QUANTIFYING WARTIME MANPOWER FOR MILITARY AIRLIFT COMMAND (MAC) STRATEGIC AERIAL PORT-CARGO SERVICES FUNCTION

THESIS CHAIRMAN: RICHARD L. CLARKE, Lt Col, USAF
Instructor in Logistics Management

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Military Airlift Command (MAC) strategic aerial port cargo services assumed wartime manpower data requirements are identified in nine separate Unit Type Codes (UTCs), UFBB1 through UFBB9. These UTCs were originally developed 10 to 15 years ago, however, the source data for their development is no longer available. This study developed, with guidance from the HQ MAC Transportation Plans Staff, a revised set of UTCs manpower data requirements based on systematic modifications to current peacetime manpower standards.

The results of these revised UTCs manpower data requirements were then compared to the current MAC UTCs. In comparing the aggregate manpower requirements necessary to support the tasking of the UFBB series UTCs in the most stringent wartime scenario no discernible difference existed. When comparing manpower requirements for each individual UTC (UFBB1 through UFBB9) distinct differences began to emerge. The revised UTCs suggest that current MAC UTCs underestimate the manpower requirements in UTCs UFBB1 and UFBB2, while they overestimate the manpower requirements in UFBB4 through UFBB9. Finally, when comparing manpower by job classifications evidence form this study casts serious doubts as to the proper employment of the freight traffic skill level in the current MAC UTCs. It also calls into question the proportion of supervisory personnel relative to the total UTC manpower.

This thesis concludes that differences do exist between the revised UTCs when compared to the current UTCs. This study has developed a systematic and justifiable procedure for developing aerial port cargo services UTCs. The specific determination of manpower requirements for individual UTCs (UFBB1 through UFBB9) are readily available for review and can be analyzed by individual work centers.

END

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