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**PICK-UP AND DELIVERY: A COMPARISON OF FUNCTIONAL  
ALIGNMENTS AND THE IMPACT ON CUSTOMER SERVICE AND VEHICLE  
OPERATOR UTILIZATION**

THESIS

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AFIT/GLM/ENS/05-03

**DEPARTMENT OF THE AIR FORCE**

**AIR UNIVERSITY**

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AFIT/GLM/ENS/05-03

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UTILIZATION

THESIS

Presented to the Faculty

Department of Operational Sciences

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the  
Degree of Master of Science in Logistics Management

Shawn K. Booher, BS

Captain, USAF

March 2005

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UTILIZATION

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### **Abstract**

The Chief of Staff Logistics Review of 1999 examined a multitude of process issues and their resulting impact on organizational structure. A resulting initiative was to transition the pick-up and delivery function from the Material Management flight (LGRM) to the Vehicle Operations section (LGRVO). The motivation of this initiative, more specifically referred to as Supply/Transportation Reengineering, was to streamline similar processes, and to effectively and efficiently utilize resources. The goal of this transition was to use fewer people and resources to provide pick-up and delivery service to wing customers with minimal adverse impact to customer service and to improve overall mission support.

Concerned about actual or perceived degradation in pick-up and delivery service, some Logistics Readiness Squadron (LRS) commanders have chose to co-locate vehicle operators with LGRM to perform pick-up and delivery service, despite Air Force guidance that forbids it.

This research is an analysis of actual or perceived impacts caused by the two different functional alignments in terms of pick-up and delivery service and vehicle operator utilization.

## **Acknowledgements**

I would like to thank my wife and children for enduring the many nights and weekends with me absent working on my studies.

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In addition, I would like to thank all of the extraordinary individuals who took the time out of their busy schedules to provide the data necessary for this research. Those who stand out the most are SSgt Allison Korzun, TSgt Jeffery Crochet, MSgt Douglas Gaines, and MSgt Lester Lee.

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Shawn K. Booher

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PICK-UP AND DELIVERY: A COMPARISON OF FUNCTIONAL ALIGNMENTS  
AND THE IMPACT ON CUSTOMER SERVICE AND VEHICLE OPERATOR  
UTILIZATION

**I. Introduction**

Research has shown that adopting a system's approach when structuring an organization and aligning accountability and authority with processes greatly improves the productivity of the organization (Jacque, 1989). Essentially every process in an organization must have a process owner. The process owner must be held accountable for the process but is given the authority to make changes as necessary to ensure its success (Jacques, 1989).

**Background**

The Air Force Chief of Staff (CSAF) ordered a review of logistics processes in 1999. This review, known as the Chief of Staff Logistics Review (CLR), considered alternative organization structures that clearly assign process owners, giving the process owners the authority to make changes as needed, and holding the process owners accountable for the performance of the processes in which they are responsible for (USAF, June 2002). CLR examined a multitude of process issues in the Air Force and considered alternative organizational structures to optimize manpower, resources, and ultimately to enhance mission effectiveness. The benefits achieved through re-

organization of the Air Force's combat wings were to be achieved by aligning core competencies by squadron and/or group, giving commanders the authority and experience necessary to make decisions to ensure the success of their squadron or group, and then holding those commanders accountable for the processes which they are responsible (USAF, June 2002).

A resulting initiative of the CLR considered shifting the responsibility of the pick-up and delivery function from the Material Storage and Distribution flight (LGSD) to the Vehicle Operations flight (LGTO), flights of the Supply (LGS) and Transportation (LGT) squadrons. The motivation of this initiative, more specifically referred to as *Reengineering of Supply Pick-Up and Delivery Responsibilities and Processes to Transportation*, was to streamline similar processes and to effectively and most efficiently utilize limited assigned personnel and equipment. The goals of the transition was to use fewer people and resources to provide pick-up and delivery service to wing customers with minimal adverse impact to customer service and to improve overall mission support.

The transition of the pick-up and delivery function from LGSD to LGTO was institutionalized in the Air Force in 2002 with Program Action Directive (PAD) 02-05 that established a new combat wing organization structure. PAD 02-05 directed wing commanders to stand down the Supply and Transportation squadrons and establish the Logistics Readiness Squadron (LRS). PAD 02-05 and Air Force Instruction (AFI) 24-301 instructs commanders of the new LRS to consolidate all vehicle operation functions, including pick-up and delivery, under the Vehicle Operations section (LGRVO) (USAF, June 2002 & USAF, November 2001). Under this alignment all pick-up and delivery

requests are handled through the vehicle dispatch section in LGRVO and performed by vehicle operators (Air Force Specialty Code (AFSC) 2T1X1) rather than supply (AFSC 2S0X1) personnel in the Material Management flight (LGRM) who had traditionally been responsible for pick-up and delivery service.

Although the CLR initiative aligned processes and assigned process owners, the new combat wing organization structure split the responsibility of pick-up and delivery between the material management flight and the vehicle operations section. LGRM is responsible for pulling property from inventory, placing the property in a staging area, and notifying LGRVO of priority deliveries. LGRVO is responsible for all pick-up and delivery service, with exception of Due-In from Maintenance (DIFM) assets. Concerned about degradation of pick-up and delivery service associated with the new organization structure, some LRS commanders segregated pick-up and delivery from traditional vehicle operation functions and created a sub-motor pool of vehicle operators in LGRM to perform pick-up and delivery.

### **Problem Statement**

Some LRS commanders are concerned that pick-up and delivery service has been compromised as a result of the Air Force directed alignment of the pick-up and delivery function. Some LRS commanders have addressed their concerns by applying for waivers to allow them to co-locate vehicle operators with LGRM to perform pick-up and delivery. Since Air Force direction was given to implement the transition of the pick-up and delivery function from LGRM to LGRVO, there has not been an analysis of the impact

that various alignments have on pick-up and delivery service and vehicle operator utilization.

### **Research Question**

The question this thesis seeks to answer concerns the impact on customer service of the two functional alignment strategies of the pick-up and delivery function under the recently formed LRS and the impact on vehicle operator manpower utilization. The research question that will guide this study is: Comparing two pick-up and delivery functional alignment strategies, which alignment provides the best pick-up and delivery service while ensuring the greatest utilization of vehicle operator manpower?

To clarify what is meant by alignment in this context, one alignment retains all vehicle operation functions, including pick-up and delivery, in LGRVO. The alternate alignment creates a sub-motor pool in LGRM. Although these vehicle operators are still actually assigned to LGRVO and supervised by vehicle operators, they are located in LGRM and only perform duties associated with pick-up and delivery.

### **Investigative Questions**

Four investigative questions will be used to answer portions of the research question. The answers to all four questions will be used to evaluate the overall issue. The following is a list of all four questions with a brief description of how the question will be answered.

1. Which functional alignment strategy provides the best pick up and delivery service? A quantitative analysis of priority 02 delivery times over a term of one

year will be conducted using two separate locations that are aligned differently. Data obtained from the 509<sup>th</sup> LRS at Whiteman AFB, MO will be used as the example installation that is aligned as the Air Force guidance directs, vehicle operators performing pick-up and delivery dispatched from LGRVO. Data obtained from the 2<sup>nd</sup> LRS at Barksdale AFB, LA will be used as the example installation that has created a sub-motor pool co-located with LGRM to perform pick-up and delivery and applied for a waiver to authorize them to do so.

2. What efficiencies/inefficiencies are associated with pick-up and delivery procedures under each alignment and what changes could be made to improve the process? This question will be answered by interviewing personnel assigned to LGRM and LGRVO at both locations. This question seeks to compare the two functional alignment strategies and identify what benefits are gained or lost by creating a sub-motor pool and co-locating them LGRM compared to the Air Force directed alignment of the pick-up and delivery function. This question also seeks to identify characteristics that make each functional alignment strategy better or worse than the other.
3. Which alignment produces the most efficient utilization of vehicle operator manpower? Actual and theoretical utilization rates of airmen performing pick-up and delivery and airmen performing all other tasks will be calculated for both locations and compared.
4. What is the impact of co-locating vehicle operators with LGRM on meeting vehicle operator training requirements? There is concern within the 2T1X1 community that the potential loss of training opportunities of those airmen only

performing pick-up and delivery will compromise their ability to perform vehicle operation responsibilities other than pick-up and delivery. This question will be answered by interviewing vehicle operators of various ranks and by considering the amount of time working and training on tasks associated with pick-up and delivery relative to all other vehicle operation tasks.

### **Research Objectives**

This thesis seeks to determine, through quantitative and qualitative analysis, which of two functional alignment strategies provide the best pick-up and delivery service while ensuring the greatest utilization of scarce 2T1X1 manpower without compromising 2T1X1 training requirements.

### **Research Significance**

The two most significant issues involved in this research are pick-up and delivery service and vehicle operator utilization.

The Air Force has established a 30-minute Time-Definite Delivery (TDD) time for priority 02 deliveries because of the impact the property may have on force/activity mission capability. If the TDD times of priority 02 deliveries are compromised, then LRS leadership is charged with ensuring the problem is resolved. Priority designators are assigned to prioritize requisition and issue transactions. The priority designator entry can be determined by base supply/depot supply management through the use of the combination of the Air Force assigned Force/Activity Designator (FAD) and Urgency of Need Designator (UND) criteria (USAF, January 2005). The priority 02 designator can

be used when the requisition is “Required for immediate end-use and without which the force/activity is unable to perform assigned operational mission or meet contract commitment” (USAF, January 2005).

There is concern in the LRS community that their ability to provide 30-minute time-definite delivery times has been compromised by the Air Force directed procedures associated with pick-up and delivery.

In addition, the vehicle operator career field is stressed. Vehicle operators are currently supporting logistical support operations all over the world. Manning at the base level has been adversely impacted as a result. Whiteman AFB, in particular, is authorized 36 vehicle operators. At the time of this research, they had 34 vehicle operators assigned, 12 of which were deployed (interview with 509<sup>th</sup> LRS/LGRVO leadership).

Because of the potential impact to force/activity mission capability caused by the timeliness of priority O2 deliveries and the demand on the limited vehicle operator manpower, every effort should be made to optimize vehicle operator utilization while ensuring the greatest possible pick-up and delivery service.

### **Scope and Limitations**

There are variations of how the pick-up and delivery function is performed in the Air Force (i.e. frequency of delivery sweeps, introduction of a “load coordinator” in LGRM, dedicated pick-up and delivery drivers). However, the way the airmen performing the pick-up and delivery function are aligned in the LRS squadron (all vehicle operators dispatched through LGRVO versus sub-motor pool co-located with LGRM)

was selected as the most noteworthy difference. These research findings will be limited to consideration only of the alignment of the vehicle operators.

The squadrons selected, the 2<sup>nd</sup> LRS at Barksdale AFB, LA and the 509<sup>th</sup> LRS at Whiteman AFB, MO, were selected based on their similar weapon systems, similar missions, and how the airmen performing pick-up and delivery are aligned in the squadron. Then, another limitation is that only two bases are being considered in this research. They are both in the same numbered Air Force (8<sup>th</sup> Air Force) and Major Command (ACC). Mission, installation, major command uniqueness, geographical differences, and/or a variety of other characteristics associated with individual installations across the Air Force may limit the applicability of these research findings.

To evaluate pick-up and delivery service, only priority 02 deliveries are considered. Priority 02 deliveries have short time-definite delivery times, are fairly easily extracted from standard asset tracking systems operated in the units, and have the most substantial potential to positively or negatively impact the force/activity mission. Therefore, it is assumed that the faster priority 02 deliveries are made the higher the customer service. However, there may be other important characteristics of customer service that are not being considered in this research.

## **Outline of Thesis**

This thesis is divided into the following five chapters: Introduction, Literature Review, Methodology, Findings and Analysis, and Conclusions. The following is a brief description of each chapter.

*Chapter 1: Introduction* – This chapter describes the background, problem and focus, objectives, significance, and scope and limitations of this research.

*Chapter 2: Literature Review* – This chapter is a review of material associated with organizational structure and Air Force combat wing structure.

*Chapter 3: Methodology* - This chapter will discuss the data collection and data analysis procedures used to evaluate the data obtained from SATS, OLVIMS, and personal interviews.

*Chapter 4: Findings and Analysis* – This chapter focuses on answering the four investigative questions.

*Chapter 5: Conclusions and recommendations* – The research results are reviewed and recommendations made. The relevance of the research is presented and recommendations for future research are provided.

## **II. Literature Review**

### **Introduction**

Gaining and sustaining an effective organization is not an easy matter. Unlike machines, which will in some way reveal inefficiency, studying human behavior is much more complex and difficult to produce definitive results associated with impacts on productivity caused by the absence or introduction of particular factors. Many individuals who seek to optimize the productivity of organizations believe effective leadership and organizational structure to be the two most powerful indicators of productivity (Drucker, 1974).

Being most interested in the impact of organizational structure on productivity rather than leadership, the purpose of this chapter is to provide a review of literature associated with organizational structure and the United States Air Force combat wing structure.

### **Organizational Structure**

This section focuses on literature that addresses organizational structure and the impacts on productivity. It will begin with classic organizational theory. Next, the organizational and span of control theories of Elliot Jaques and the findings of the Hawthorne experiment and how they relate to organizational structure and productivity will be discussed. Finally, Human Performance Technology, an organizational structure theory adopted by the International Society for Performance Improvement (ISPI), will be reviewed.

### *Classic Organizational Theory.*

In the past, the most commonly used ideas about structural design were those developed by a group of organization theorists labeled the “classicists”, Fayol, Gulick, Urwick, and Mooney (Dalton, 1970). These theorists developed their ideas from the industrial engineering ideas of Frederick J. Taylor. A review of all of their ideas concerning the principles of organization is beyond the scope of this research. However, a summary of their ideas on structural design, particularly with regard to the division of work, is well within the confines of this research.

With exception of Gulick, who suggested that work of an organization could be divided on several bases (by function, by product, by territory, by time), the authors collectively recommend dividing the work of an organization by function. They advocated that each individual of an organization should be assigned a narrow task which, “...given his limited capacity, he could accomplish in the most technically efficient manner” (Dalton, 1970). These ideas rely on the notion that individuals are motivated only by money and will perform as directed by those in authority over them.

According to these theorists, coordination and communication between individuals performing the processes of the organization was not a problem. Work was to be divided so that “...the sub goals of various units would add up to the overall organizational goals. Any remaining coordinating issues would be handled through the management hierarchy” (Dalton, 1970). Again relying on the notion that individuals will always do as they are directed, the only coordinating device necessary was the management hierarchy.

Identifying the limitations of this approach to structural design and division of work, theorists in the 1960's and 1970's expanded on the ideas of their predecessors. Particularly when attempting to apply this method to complex organizations with multiple levels of work necessary to complete a single process, these theorists realized that the management hierarchy was not a sufficient mechanism of coordinating the sub goals of the organization.

These theorists had education and experience in the fields of psychology and social psychology, rather than engineering as the classicists did. The work of Rensis Likert, and others during this time, considered the motivational and collaborative issues left unattended by the classicists (Dalton, 1970). They suggested that work should be divided in a way that individuals are given "...meaningful work over which he can have some feeling of control and influence [and the organization should be structured so that] each individual belongs to a cohesive work group in which participation in decision making is the accepted norm" (Dalton, 1970). The work groups coordinate through the efforts of a "linking pin" (Likert, 1967), which hold membership in two or more groups and is a key figure in the organization.

***Elliot Jacques's Accountability Hierarchy (AcH), Stratified Systems Theory (SST), and Span of Control.***

Dr. Elliot Jacques, a renowned expert in the field of organization and human resourcing, recognizes "...a highly creative leader may give a competitive edge in the short- and mid-term, despite serious shortcomings in organization. [In the long term, however, he argues that] sustained success and even survival depend upon effective

organization” (Jacques, 1989). Jacques’s Accountability Hierarchy, Stratified System Theory, and theory on Span of Control are discussed.

### ***Accountability Hierarchy (AcH).***

Jacques defines the Accountability Hierarchy (AcH) as “the organizations we use for employing people in order to get work done – employment systems – organized in hierarchies of managers and subordinates” (Jacques, 1989). Accountability Hierarchies are systems of vertical organization for getting work done and should be aligned in a way that “managers hold immediate subordinates accountable for their own personal effectiveness in getting work done and for the output of their subordinates” (Jacques, 1989).

Accountability Hierarchies are created whenever an association in pursuit of some common goal has been created. This association may be a church, company, partnership, or military organization. All organizations have a governing body that decides to get its work done by employing people. The association is comprised of those individuals who make-up the governing body of the organization and the Accountability Hierarchies are comprised of the people employed to perform the work. Together they form the organization (Jacques, 1989).

In order for an organization to be successful, the roles of each group, association and AcH, must be clearly defined and delineated. Furthermore, the accountability of each group, individual, and manger-subordinate relationship must be clearly understood and enforced.

There are traits associated with organizations as they grow in size and responsibility that compromise the effectiveness of the organization as a whole. Specifically, "...constriction of initiative, bureaucratic red-tapism, weak or autocratic leadership, [and] unclear accountability and authority" are traits that have the potential of greatly degrading the organization and its ability to perform work effectively (Jacques, 1989).

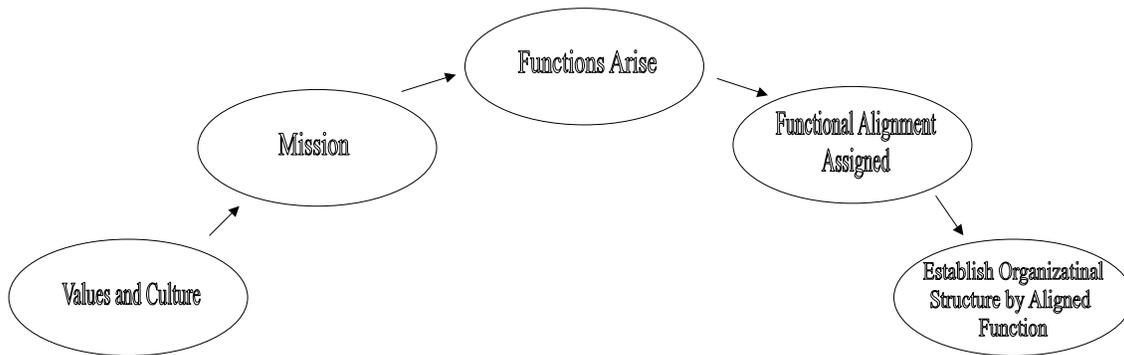
The Accountability Hierarchies should be established in a way that enables employees to do their work with outstanding effectiveness and produces valued goods and services to satisfy the needs of their customers. The work should be done in a way that makes it possible for people to "...work with full exercise of their capabilities, and [enables them] to work together under conditions which strengthen bonds of mutual trust" (Jacques, 1989). Every individual in the organization should have a clear understanding of the work they are responsible to perform as well as the subordinates they are responsible for and managers they are responsible to.

### ***Stratified Systems Theory (SST).***

The Stratified System Theory addresses the importance of aligning Accountability Hierarchies by process and assigning a process owner. The process owner is held accountable for the process and is given the authority to make changes as needed to ensure its success (Jacques, 1989).

Organizations should be structured using a comprehensive system that Dr. Jacques chose to call Stratified Systems Theory (SST). It is a system's approach to

organization. According to Jacques's theory, every organization should be established using a sequential process (see Figure 1 below).



**Figure 1. Stratified System Theory Process**

First, the values and culture of the proposed organization are determined. From this process flows the mission of the organization. Once the mission of the organization has been determined, functions arise. Functional alignments must be developed according to the various functions to be performed by the organization. Finally, the organization must be organized by functional alignment.

Once the organizational structure has been established, managers are given the authority to ensure the success of the processes they own and are held accountable for the outcomes.

### ***Span of Control.***

To determine the appropriate number of subordinates assigned to each manager, span of control must be considered. Determining the appropriate span of control is the process of finding the appropriate number of subordinates assigned to a manager that

enables the manager the ability to manage the subordinates effectively for getting work done.

Organizing into levels for pay and status rather than for getting work done has been argued by several academics and practitioners in the field of management to compromise the effectiveness of organizations (Jacque and Clement, 1991). Another factor of organization that greatly diminishes the effectiveness of organizations is a "...incorrect view of what an appropriate span of control ought to be" (Jacque and Clement, 1991).

Jacque argues, "There is more nonsense centering on the topic of span of control than around nearly any other subject in the whole field of organization and management" (Jacque and Clement, 1991). There is a universally accepted notion that managing three to six subordinates is about right for effective management (Jacque and Clement, 1991). A management expert named Graicunas first introduced this idea in the 1920's. This idea was absent of theory or fact (Jacque and Clement, 1991). Nonetheless, it was universally accepted and applied.

Rather than applying a simple rule of thumb when developing manager-subordinate relationships in an organization, senior leaders should consider the complexities of the operations being performed in their organization. They should also consider the number of processes/component processes in the organization, as well as how close the subordinates must be managed to be effective. Jacque argues, "Span of control decreases as the variability of the conditions and the absences of the manager increases" (Jacque and Clement, 1991). Therefore, in a large organization that performs several complex processes with many component processes that require the workers to

routinely be away from their work center, managers should have fewer subordinates, possibly 10-20 (Jacque and Clement, 1991). On the other hand, in a routinized organization like a production line, managers should be expected to effectively handle many more subordinates, as many as 50 or more (Jacque and Clement, 1991).

### ***The Hawthorne Experiment.***

The Hawthorne experiment was a series of research efforts, first led by Harvard Business School professor Elton Mayo along with associates F.J. Roethlisberger and William J. Dickson (Mayo, 1960). The research began by examining the physical and environmental influences of the workplace in terms of characteristics such as brightness of lights, and humidity. Later, the research evolved into psychological aspects and considered the impacts of breaks, group pressure, working hours, and managerial leadership.

The major finding of the study was that almost regardless of the experimental manipulation employed, the production of the workers seemed to improve (Mayo, 1960). One reasonable conclusion is that the workers were pleased to receive attention from the researchers who expressed an interest in them. Four general conclusions were drawn from the Hawthorne studies:

- **The aptitudes of individuals are imperfect predictors of job performance.**

Although they give some indication of the physical and mental potential of the individual, the amount produced is strongly influenced by social factors.

- **Informal organization affects productivity. The Hawthorne researchers discovered a group life among the workers.** The studies also showed that the relations that supervisors develop with workers tend to influence the manner in which the workers carry out directives.
- **Work-group norms affect productivity.** The Hawthorne researchers were not the first to recognize that work groups tend to arrive at norms of what is "a fair day's work," however; they provided the best systematic description and interpretation of this phenomenon.
- **The workplace is a social system.** The Hawthorne researchers came to view the workplace as a social system made up of interdependent parts (Mayo, 1960).

The Hawthorne experiment was monumental in the field of human relations. The effects of environmental conditions, once thought by factory managers and experts in the field of manufacturing to be highly correlated with productivity, were compromised. Instead, it was determined that simply showing interest in subordinates and grouping them in a way that the social factors of the group align with the goals of the organization has a much more dramatic effect on productivity than environmental conditions.

For purposes of this research, the important findings of the Hawthorne experiment were those associated with the social system and other social factors created in the workplace. Despite individual abilities, individuals will only perform to the "work-group norm" level. The individuals who were studied in the Hawthorne experiment were six women who made telephone relays. The women were segregated from the main assembly room. Under the structure of the experiment they performed as a team rather

than working autonomously in the main assembly area. Working in the main assembly area, they likely would have not known each other and even less likely to develop a social system and be impacted by other social factors. However, working together in a small area as a group for five years they developed very close professional and social relationships (Mayo, 1960).

The social system and other social factors created in this study helped to raise production from the group from a weekly average of 2400 relays to 3000 (Mayo, 1960). There was a “work-group norm” that was accepted by the group. There was a professional and social obligation created in the group that ensured the accepted norm was consistently produced. The production of the group appeared to be most influenced by the social factors informally established by the social system and the accepted work-group norm. Ultimately, the social factors created in the research group were a much more powerful predictor of productivity than any other environmental condition considered.

### ***Human Performance Technology (HPT).***

The International Society for Performance Improvement (ISPI), a business professional organization, has adopted Human Performance Technology (HPT) as the preferred method to improve the performance of any organization. HPT “focuses on the goals of the organizational structure and the accomplishments produced by workers’ behavior, not the behavior itself” (Schneider, 2003).

This method of optimizing human behavior begins with recognizing that most organizations require many workers and processes functioning harmoniously to operate.

Performance systems should be established in a way that treats component processes as individual “cottages” that work together to complete a process (Schneider, 2003). The accomplishment output from one cottage becomes the raw material input to another cottage. Organizations could have potentially several internal supplier-to-customer relationships or “cottages”.

Mapping supplier-to-customer relationships in the organization can reveal problems with organizational structure. For example, the sales department of many organizations is tasked to manage customer relationships not the entire sales process. Generally, they only have customers and no suppliers. As a result, the sales department receives feedback from customers and shipping, but it has no control over them (Schneider, 2003). Ideally the sales department would either be given more control over the entire sales process or an internal supplier-to-customer relationship developed and nurtured with those “cottages” who contribute to the sales process, like shipping.

Performance metrics and criteria must be established for each internal supplier’s output. For each metric, “...an acceptable range and a standard performance must be defined” (Schneider, 2003). The sum of the standard performance at the component process level should equal the standard performance at the process level.

Communication is essential to ensure the success of any organization. It must be decided who needs the information, what information is needed, who is going to provide it, and how it will be shared. Information must be delivered through established “feedback loops” (Schneider, 2003). Feedback loops should be directed to the appropriate internal supplier/customer, consistent, and as a general rule, there should be

“...one loop for every type of variation that we want the organization to respond to automatically, without intervention by senior management” (Schneider, 2003).

If a performance problem is identified, senior leaders in the organization should resist the temptation to solve it at that policy level by “...writing a memo and circulating it to all concerned” (Schneider, 2003). The best cure to solve a performance problem is to identify the root of the problem, as well as the contributing factors. The answers to a few well-chosen questions will reveal the appropriate starting point:

- Is there a simpler way? Because simplification usually reduces the time required to complete the task, it is the first option to consider.
- Is there a skill deficit? If workers lack the skills that the process requires, it could be that they have forgotten some seldom-used aspects, or it could be that they never learned them. The solution is to provide highly focused training, practice, or just more feedback, depending on the situation.
- Does good performance produce positive consequences? Consider the consequences that workers experience when they perform the task correctly. Are they punished, rewarded, or ignored? If reporting a safety hazard is considered to be “making trouble” for management, reporting them will happen less and less often because most workers will avoid being labeled as “troublemakers”.
- Are other tasks or methods more rewarding? Few jobs these days involve only one task. When some of their tasks are unpleasant or boring, workers will find reasons to leave them undone, especially when there are no consequences.

(Schneider, 2003)

## **Air Force Combat Wing Structure**

The combat wing structure was recently changed in the Air Force as a result of the Air Force Chief of Staff Logistics Review (CLR) that began in the fall of 1999. A multitude of process issues and their corresponding impacts on organizational structure were examined. This extensive review, and the changes made as a result, has been argued by senior Air Force leaders to posture us to "...further enhance the way we produce and deliver air and space power in the future" (USAF, June 2002).

CLR considered alternative organizational structures to optimize manpower, resources, and ultimately to enhance mission effectiveness. A new combat wing organization structure was established in the Air Force as result of findings from CLR. The initial guidance on how to implement the changes was given the wings in the form of a program action directive. Functional Air Force instructions and Career Field Education and Training Plans (CFETP) have slowly been evolving to give more specific direction and to guide training.

Air Force Instruction (AFI) 38-101 Air Force Organization, Program Action Directive (PAD) 02-05: *New Combat Wing Organization Structure*, Air Force Instruction (AFI) 24-301 *Vehicle Operations*, and 2T1X1 Career Field Education and Training Plan (CFETP) will be reviewed to determine what changes have been made that impact the pick-up and delivery function.

***Air Force Instruction (AFI) 38-101 Air Force Organization.***

At the time of this research, AFI 38-101 *Air Force Organization* was under revision. AFI 38-101 still reflects the combat wing structure as it was prior to the changes adopted as a result of CLR. However, direction from the OPR is to refer to HQ USAF PAD 02-05, *New Combat Wing Organization Structure*, until the revision is completed. This PAD "...changes the standard structure for the wing and a number of subordinate organizations. It takes precedence over affected structures in AFI 38-101, pending revision of the AFI" (<https://www.dp.hq.af.mil/dpm/dpmo.cfm>, accessed 06 Jan 05).

***Program Action Directive (PAD) 02-05: New Combat Wing Organization***

***Structure.***

On 25 Mar 02, the CSAF and Major Command (MAJCOM) commanders reached decisions on the CLR initiatives. As a result, "...a new standard wing organizational structure that standardize[d] operations across the AF and enhance[d] expeditionary capabilities" (USAF, June 2002) was developed. The following five CLR initiatives were approved and outlined in PAD 02-05:

- 1) The Logistics Readiness Officer (LRO) career field initiative
- 2) Assignment of all aircraft and space maintenance personnel currently assigned to Operations and Logistics Groups to Maintenance Groups (MXG)
- 3) The merger of Supply and Transportation Squadrons into Logistics Readiness Squadrons (LRS)
- 4) Placement of Logistics Plans into the LRS

- 5) Placement of the LRS, Contracting Squadron, and Aerial Port Squadron into the existing Support Group to form a new group aptly named the “Mission Support Group” (USAF, June 2002).

The vision of the CSAF and MAJCOM commanders was to enable the four standardized groups in our wings to focus on the essential core capabilities extracted from PAD 02-05 and paraphrased below:

- 1) Operations Group. “Operations Group activities will focus on planning and executing air and space power” (USAF, June 2002).
- 2) Maintenance Group.

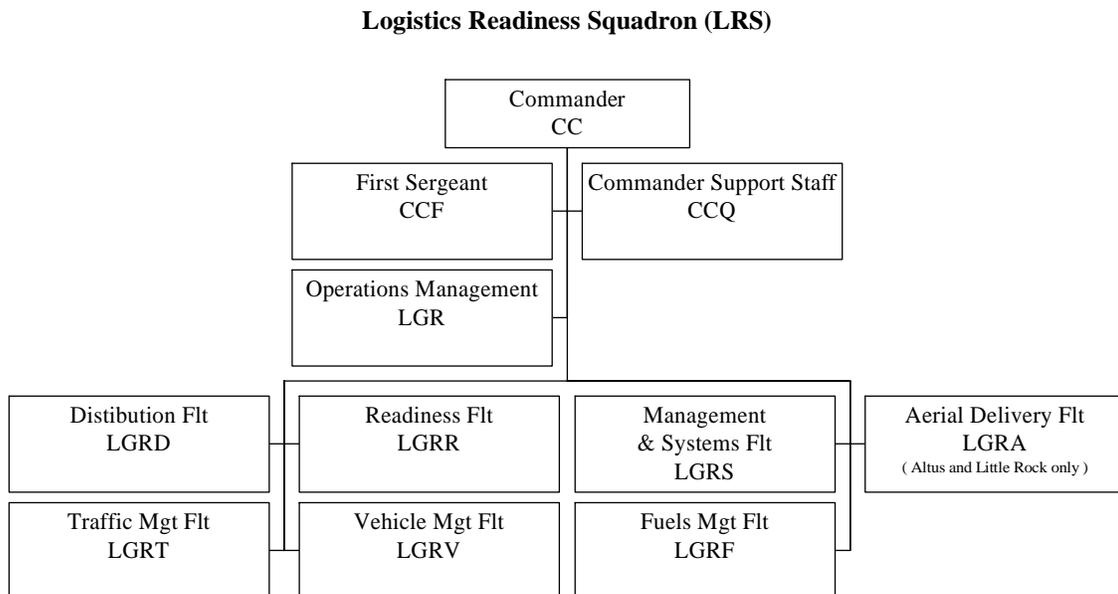
Maintenance of air and space weapons systems is a core competency of the United States Air Force. [The demands of maintaining our aging fleets] requires career maintenance professionals able to develop the same level of skill and proficiency demanded of our operations, mission support and medical professionals (USAF, June 2002).

- 3) Mission Support Group.

Mission support, in the expeditionary, rapid reaction, contingency-based Air Force of today, is a core competency. The Air Force will develop a career path for commanders who understand the full scope of home station employment/sustainment and deployment, beddown, and sustainment at contingency locations: Crisis Actions, UTC preparation, load planning, communications and information, enroute visibility, reception, bare base/tent city preparation, munitions site planning, expeditionary combat support, etc. (USAF, June 2002).

- 4) Medical Group. “The Medical Group organization structure will not change” (USAF, June 2002).

The newly formed LRS, a consolidation of the Transportation and Supply squadrons and logistics plans section, is a product of the established changes. Aligned under the Mission Support group, the LRS is responsible for “...base logistics processes related to vehicles, cargo movement, passenger movement, personal property, supplies, equipment, deployment planning and operations, fuels, and when appropriate, logistics plans” (USAF, June 2002). This consolidation and streamlining of processes was done in an effort to “...improve [logistical] support to our expeditionary forces” (USAF, June 2002). The organizational chart (see Figure 2 below) depicts the organization of the new LRS.



**Figure 2. LRS Organizational Chart (USAF, June 2002).**

Since the approval of PAD 02-05 an amendment was approved that impacted the LRS by re-designating the Distribution flight (LGRD) to the Material Management flight (LGRM).

Other than HQ/USAF approved amendments, deviations from PAD 02-05 are only permitted when authorized by the MAJCOM and HQ USAF POC.

***Air Force Instruction (AFI) 24-301 Vehicle Operations.***

Air Force Instruction (AFI) 24-301 *Vehicle Operations* clearly defines all responsibilities of vehicle operations. The only responsibilities discussed in this literature review, however, are those responsibilities and guidance specifically associated with pick-up and delivery. AFI 24-301 states,

Vehicle operations is responsible for all pick-up and delivery services (except Due-in for Maintenance (DIFM) turn-ins) within the confines of the installation 24 hours per day and 7 days per week. Provide pick and delivery of supplies and equipment, except base service store items, to base units by using a time definite delivery concept of operations.” [Furthermore,] “Pick-up and delivery transportation services will be supported out of Dispatch Operations and managed/controlled in the same manner as all other requests for dispatch/service. Do not establish alternative locations (sub-motor pools) to support pick-up and delivery services (USAF, November 2001).

The Pick-up and Delivery function can be explained as the distribution of material on an installation. Pick-up and delivery can be segregated into three broad categories;

routine deliveries from the point of supply to the point of consumption, priority deliveries from the point of supply to the point of consumption, and Due-In For Maintenance (DIFM) turn-ins. Although the movements of DIFM assets are considered part of pick-up and delivery service, under the new alignment "...the movement of DIFM turn-in items will be supported and managed by the Flight Service Center (FSC)" (USAF, June 2002). Only pick-up and delivery service performed by vehicle operations is considered in this research.

Residual workload of the pick-up and delivery function, defined as "sorting and staging of cargo, facilitation of customer requirements, etc. will remain Supply responsibilities. Supply (LGRM) will presort cargo to accommodate established sweep/route schedules" (USAF, November 2001). IAW with 24-301, vehicle operations is directed to "Ensure sufficient resources are available to support Time Definite Delivery and Priority delivery of supplies, equipment, and cargo to installation units" (USAF, June 2002). Time definite deliveries will be accomplished through scheduled sweeps. The frequency of the sweeps will be determined locally to support the mission of the installation.

Due-out Releases (DORs) are property that is essentially backordered. As soon as the property is received on the installation through LGRM, a document is automatically created to deliver it. Issues (ISUs) are property that was ordered and was in inventory. With exception of priority DORs, all priority 01, 02, and MICAP parts must be delivered in 30 minutes. Unless notified by the unit who ordered the property, priority DORs can be delivered during scheduled sweeps. Issue (ISU) priority deliveries can be delivered during the scheduled sweep as well as long as they are delivered in the allotted 30-minute

time frame. However, Supply is responsible to notify vehicle operations of priority deliveries that cannot wait for the scheduled sweep (Air Force, 2002).

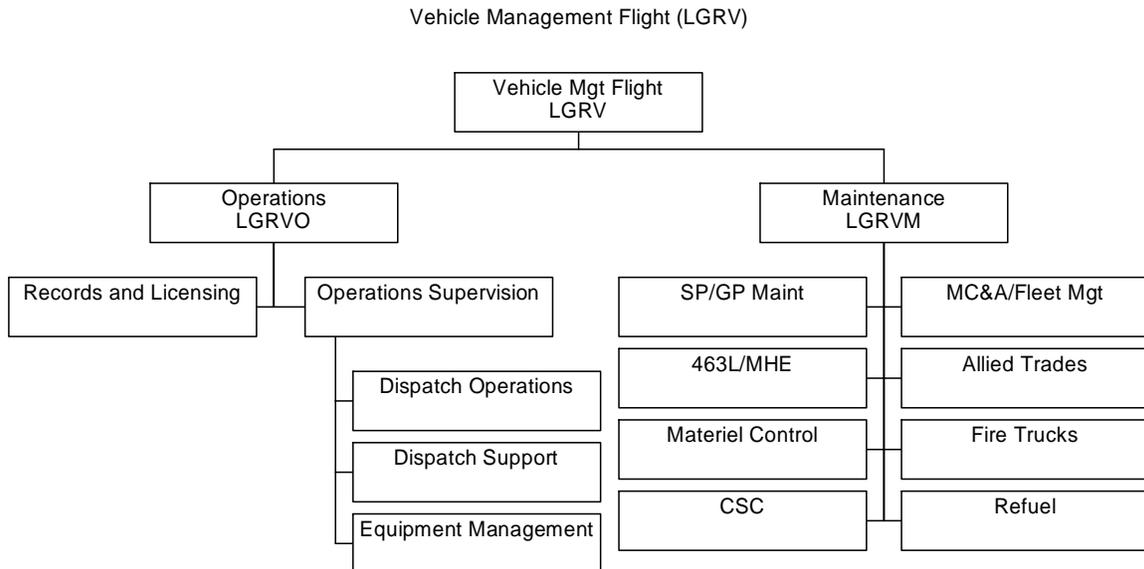
***Whiteman AFB.***

Whiteman AFB aligns the pick-up and delivery function under the vehicle operations section of the vehicle management flight (LGRV). This alignment is in accordance with PAD 02-05 and AFI 24-301. All vehicle operators assigned to LRS are assigned to LGRVO. All pick-up and delivery services, routine and non-routine deliveries, are handled through dispatch operations.

Routine sweeps (performed every two hours) and non-routine deliveries (performed as needed) at Whiteman AFB were previously handled by any available vehicle operator assigned to the LGRVO section. In a given day, there may have been as many as four different vehicle operators performing the four routine deliveries throughout the day and different operators handling the non-routine deliveries. This lack of continuity created problems. There are procedures associated with pick-up and delivery that are unique and therefore a learning curve associated with performing pick-up and delivery. There are organizational codes that may or may not be obviously associated with their location. There may be unique entry procedures and/or issue procedures associated with an organization. If the vehicle operator dispatched to make a delivery is unfamiliar with the unique procedures associated with pick-up and delivery and/or the organization, then the asset may not be delivered during that sweep or at the very least, be delivered late.

Squadron and flight leadership addressed this problem by assigning two vehicle operators on a one-week rotation to perform only pick-up and delivery. These airmen remain located with LGRVO. The goal of having dedicated vehicle operators to perform pick-up and delivery was to provide some continuity to the vehicle operators performing pick-up and delivery. The responsibility is rotated every week to another two airmen to ensure all vehicle operators assigned to the section are given the opportunity to train and perform vehicle operation responsibilities other than pick-up and delivery.

The following organizational chart depicts how the Vehicle Operations section is aligned under the vehicle management flight (see Figure 3 below). IAW PAD 02-05, all pick-up and delivery at Whiteman AFB is handled through dispatch operations.



**Figure 3. LGRV Organizational Chart (USAF, June 2002).**

***Barksdale AFB.***

Although all vehicle operators are administratively assigned to LGRVO at Barksdale AFB, there are six to seven vehicle operators co-located with LGRM to perform the pick-up and delivery function during normal business hours. Although this alignment is not standard organizational structure as directed in PAD 02-05, creating a sub-motor pool in LGRM is not specifically prohibited in PAD 02-05. However, AFI 24-301 specifically states, “Do not establish alternative locations (sub-motor pools) to support pick-up and delivery services” (USAF, November 2001). Although LRS commanders are given some discretion on the organization of their squadrons, this particular alignment of the pick-up and delivery function directly contradicts Air Force guidance that specifically prohibits it. The 2<sup>nd</sup> LRS at Barksdale AFB has applied for a waiver to enable them to perform pick-up and delivery under this alignment. At the time of this research, the waiver was under review by Headquarters Air Force/Installation and Logistics (HQ USAF/IL) (interview with 2<sup>nd</sup> LRS/LGRVO leadership).

At Barksdale AFB, generally, there are six vehicle operators co-located with LGRM, five airmen and one NCO. The NCO is the pick-up and delivery lead dispatch and immediate supervisor of vehicle operators co-located with LGRM. There is one airman who handles only priority deliveries. The remaining four airmen are assigned one routine sweep per duty day. Routine sweeps are accomplished every four hours, starting at 0400. The sub-motor-pool in LGRM is responsible for the four sweeps between 0800 and 1600 as well as any non-routine deliveries during those times. Between 1600 and 0800, all pick-up and delivery services, routine and non-routine deliveries, are handled through dispatch operations in LGRVO.

Due to the intricacies associated with pick-up and delivery, continuity of the vehicle operators performing pick-up and delivery is paramount. Although LRS leadership at Barksdale AFB recognizes the importance of continuity, they also recognize the importance of ensuring vehicle operators receive the training necessary as outlined in the *Vehicle Operator Career Field Education and Training Plan (CFETP)*. Therefore, the airmen co-located with LGRM are rotated with airmen working in LGRVO as necessary to meet their training needs, generally every six months. The NCO co-located with LGRM has generally been trained on most tasks in the CFETP and is less affected by loss of training opportunities. Non-Commissioned Officers will spend approximately one year in LGRM before they are rotated.

The following is the *Concept of Operations* for pick-up and delivery at Barksdale AFB.

1. The primary responsibility of Documented Cargo is to deliver property to base organizations. A common misconception is that only aircraft parts are delivered, however, all sorts of property are delivered to wing customers using our services.
2. Property arrives to the documented cargo delivery area from several different sections of LRS. The Receiving section provides property that arrives via commercial carriers such as FedEx, UPS, and/or commercial trucks. Storage and Issue provides property that is stored locally in the main supply warehouse. WRSK provides property that is being pulled from the war readiness kits. The aircraft parts store (APS) requests property movement for non-flightline organizations and items being shipped.

3. Documented cargo uses primarily a fleet of five vehicles to accomplish its day-to-day deliveries. This usually consists of three ½ ton pickup trucks and two stake and platform trucks. However, frequently 10k forklifts, tractor-trailers, and other heavy equipment are sourced to complete the mission. Usually the forklifts are borrowed from TMO, WRSK, or Vehicle Dispatch. Vehicle Dispatch provides all other additional vehicle requirements.

4. Under normal circumstances routine property is delivered within 24 hours, Priority 03 property within 4 hours, and Priority 02 and Red-balls delivered within 30 minutes. Delivery times are tracked from the time the property is scanned into our area [delivery holding area] until the time the customer signs for the property.

5. There are three main concerns for delivering property.

1. Ensure 100% accountability of property
2. Ensure property/people do not get damaged/injured
3. Ensure property is delivered on time (2<sup>nd</sup> LRS/LGRVO, 2004)

***2T1X1 Career Field Education and Training Plan (CFETP).***

Career Field Education and Training Plans (CFETP) are Air Force approved guidance that focuses the training of airmen in each particular career field. The 2T1X1 CFETP is currently under revision. Whenever a CFETP is under revision in the Air

Force the functional managers of the career field convene to discuss and approve necessary changes. This meeting of the career field functional managers is called a Utilization and Training Workshop (U&TW). There was a U&TW 8- 13 November 2004 at Fort Leonard Wood, Missouri. The Air Force Personnel Center listed the following reasons for the U&TW.

HQ USAF/ILGD 2T1X1 Air Force career field manager has received the results of the Occupational Survey Report (OSR). The OSR data and recent current events require the career field identify and/or adjust training as required. Purpose of the U&TW is to review the current 2T1X1 specialty description, AFMAN 36-2108; Career Field Education and Training Plan (CFETP); and initial skills, web-based advanced skills, and 5- and 7- LEVEL Career Development Courses (CDC) (<http://www.afpc.randolph.af.mil/aftrain/OJT/AIG%209689/2004/04-86.htm>, accessed 19 Dec 04).

The U&TW point of contact developed recommended changes and made them available to the voting members of the U&TW (Air Force and MAJCOM functionals). The voting members were asked to review the proposed changes before the U&TW and come prepared to discuss them. The voting members of the U&TW approved the Specialty Training Standard (STS) portion of the CFETP that was proposed, which included pick-up and delivery action functions. During the U&TW, the title of this section was changed to Documented Cargo (correspondence with Mr. Anthony Merritt, 2T1X1 U&TW POC). The Documented Cargo section of the STS is found in section 16.11 of the STS (see Figure 4 below).

<b>16.11. Documented Cargo TR: AFMAN 23-110, AFI 24-301, Local Directives</b>
<b>16.11.1. Issue/Control Property Using</b>
16.11.1.1. DD Form 1348-1A
16.11.1.2. DD Form 1348-6
16.11.1.3. AF Form 2005
16.11.2. Proper Turn-in of Accountable Documents
16.11.3. Monitor Delinquent Document Lists
<b>16.11.4. Delivery Procedures</b>
16.11.4.1. Priorities
16.11.4.2. Mission Capability (MICAP)
16.11.4.3. Item Refusal
16.11.4.4. Classified Material Handling
16.11.4.5. Material Safety Data Sheet (MSDS)
16.11.4.6. Health Hazards
16.11.4.7. Electrostatic Discharge Sensitive Items
16.11.4.8. Utilize Automated/Non-Automated Cargo Tracking Methods
16.11.4.9. Scheduled/Unscheduled Deliveries (Sweeps)

**Figure 4. Documented Cargo Section of 2T1X1 CFETP**

According to Mr. Merritt, the 2T1X1 U&TW point of contact, “the U&TW minutes do not address pick-up and delivery in any way other than changes to proficiencies and task statements. There was no major discussion on the topic other than, yes, they are doing this new job and these are the tasks associated with the job that we need to train either in formal training or OJT”.

## **Summary**

Literature concerning theory of organization structure and how it impacts productivity is important in framing a comparison of commercial industry and Air Force combat wing structure. The comparison is used to evaluate the effectiveness of the Air

Force pick and delivery functional alignment and to consider commercial organization structure practices to find potential improvements to Air Force organization structure.

### **III. Methodology**

#### **Introduction**

There are several information management tools available to LRS leadership to evaluate the performance of the processes performed within the squadron. These information management tools can be used to detect inefficiencies in the processes being performed. The two information management tools important to this research are Supply Asset Tracking System (SATS) and On-line Vehicle Interactive Management System (OLVIMS).

Data needed for this analysis was obtained from two Logistics Readiness Squadrons (LRS), the 509<sup>th</sup> Bomb Wing located at Whiteman AFB, Missouri and the 2<sup>nd</sup> Bomb Wing located at Barksdale AFB, Louisiana. Both squadrons provided reports from SATS and OLVIMS. The data obtained from SATS enabled a quantitative analysis of pick-up and delivery customer service. The data obtained from OLVIMS enabled a quantitative analysis of vehicle operator manpower utilization and a method of evaluating the impact of sub-motor pools on meeting vehicle operator training requirements. In an effort to identify efficiencies, inefficiencies, and suggestions for improvement associated with pick-up and delivery procedures at each location, personal interviews were conducted at both locations as well.

The methodology used for this research, followed by the data collection and data analysis procedures used to evaluate the data obtained from SATS, OLVIMS, and personal interviews are discussed.

## **Methodology**

The methodology for this study is based on both quantitative and qualitative research methods.

Quantitative research methods were used in this research analysis for purposes of comparing the two locations on their ability to deliver priority deliveries, their ability to maximize the use of their personnel resources, and to consider the potential impact of sub-motor pools on meeting vehicle operator training requirements.

Unable to capture all necessary data needed to answer the investigative questions, a qualitative research method was also used. The goal of using qualitative research methods was to gather information to reveal characteristics unique to the way pick-up and delivery is being performed at each location and to identify characteristics that enable one alignment to perform more or less efficiently than the other.

## **Supply Asset Tracking System (SATS)**

Identifying inefficiencies associated with a paper-based system, the Air Force's goal during the mid-1990's was to develop a system to "...eliminate manual entry of information into Standard Base Supply System (SBSS), reduce the amount of paperwork and provide the Air Force with complete accountability and tracking of all base supply assets as they move through the supply system" (Intermec, 2001). Using Intermec to develop the hardware and Logicon to develop the software, Supply Asset Tracking System (SATS) was created.

SATS provides the electronic front-end link to SBSS through use of a bar code system and wireless technology. Each asset, location, issuer, and receiver is given a unique bar code identifiable to SATS. The bar codes are affixed to assets and locations with bar code labels. The issuers (vehicle operators performing pick-up and delivery, Flight Service (FSC) and/or Aircraft Parts Store (APS) personnel) and receivers (customer receiving the asset) are identified with SATS identification cards. Every time the asset is moved or issued to a customer, the bar code is swiped with a handheld scanner. This not only provides asset visibility, but, provides a detailed history of who, what, when, and where the asset has gone. It provides real-time total asset tracking capability of assets from the time the asset is unloaded at the receiving dock of an installation and scanned into SATS until the asset reaches its final destination in the customer's hands and who handled the asset along the way (Intermec, 2001).

SATS has made measurable efficiencies in the Air Force supply system. The Air Force Identification Technology (AIT) program management office claims that since implementing SATS, "asset stocking time has been reduced by 77 percent. Asset issuing time has dropped 81 percent. The number of auditable documents to be filed at document control has dropped 79 percent [and] among 35 bases worldwide, SATS has slashed supply-related paperwork processing by 96 percent" (Intermec, 2001).

Besides the benefits of added asset visibility capabilities and saving time and resources, SATS is a very powerful management tool. Historical data can be extracted from SATS either by selecting a generic report and setting the parameters or by writing script using Standard Query Language (SQL) to extract data not obtainable using the standard reports.

To compare the pick-up and delivery customer service provided at Whiteman AFB and Barksdale AFB, performance measurements using SATS reports were established. The performance measurements to evaluate the pick-up and delivery customer service are:

1. Percentage of on-time priority 02 deliveries.
2. Average delivery times of priority 02 deliveries.

Systems management personnel at Barksdale AFB wrote a SQL script that enabled the extraction of priority 02 deliveries and calculated the pick-up and delivery time for each delivery. The customer is only concerned with the time it takes to get the asset after they have established the demand. Therefore, for purposes of this research, the pick-up and delivery time is defined as the time the demand was created in the Standard Base Supply System (SBSS) by the customer until the asset was delivered to the point of consumption.

Time-definite delivery standards are established Air Force wide. Every Air Force Logistics Readiness Squadron is held to the same time standard established for priority 02 deliveries. Therefore, despite any potential differences caused by geography, weather, etc. between Barksdale AFB and Whiteman AFB, both LRSs are still responsible for meeting the 30 minutes allotted for priority 02 deliveries. Priority 02 deliveries were not only chosen for their Air Force wide time-definite delivery standard, putting both locations on the same standard despite any potential differences. Meeting the requirements of a priority delivery suggests that these particular deliveries have the overwhelming potential to impact the wing's mission capability, more so than a lower

priority delivery. The data obtained for this analysis encompasses all priority 02 deliveries for Calendar Year (CY) 2004.

The data was taken from SATS and imported into Microsoft Excel to enable data manipulation. The 2326 data points from Whiteman AFB and 9740 from Barksdale AFB were first sorted by delivery time. There were deliveries that indicated a negative delivery time. This would indicate that SBSS, SATS, or both were down and manual post-post procedures were used to issue the property. The transactions were later input into SBSS and SATS when access was restored but the delivery was already made, indicating a negative delivery time. These particular deliveries were extracted.

Additionally, there were deliveries that indicated as much as 1.5 million minutes to deliver after document creation. Individuals at both locations were contacted to discuss this matter. The consensus between the two locations was that there are several circumstances that cause unrealistic delivery times and/or the inability to make a delivery within the required 30-minutes.

1. DOR is received at LRS late in the afternoon and the organization that ordered the property is closed. Time is accumulating in SATS. But, the delivery cannot be made until the following duty day.
2. SATS is “down” for a variety of reasons and manual issue procedures are used. The driver must return at a later time to clear the transaction in SATS. SATS will only identify the delivery time as the time when the transaction was cleared, even though the delivery has already been made.

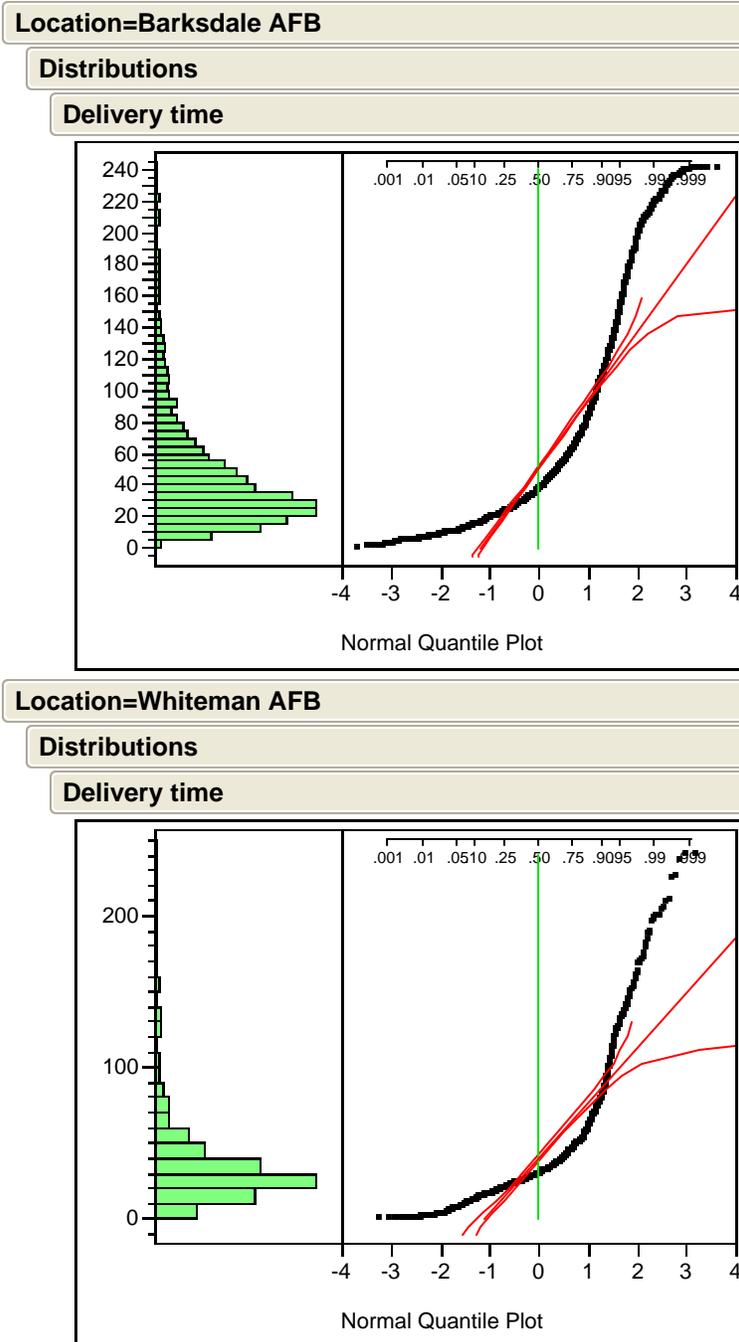
3. The customer does not have their SATS identification card. Manual issue procedures are used. The driver must return at a later time to clear the transaction in SATS.

Both locations agreed that any priority 02 delivery not made within four hours would indicate the delivery had been impacted by at least one of the three circumstances above. Therefore, deliveries that took more than four hours were also excluded from this analysis. After excluding this data, 79% of the raw data from Barksdale AFB and 68% of the raw data from Whiteman AFB was used for statistical analysis.

The percentage of on-time deliveries was calculated by identifying the number of deliveries that were made in 30-minutes or less, relative to the total number of priority 02 deliveries made at each location.

To evaluate average delivery times, means and standard deviations were calculated. Considering the difference in average delivery times alone, as evidence that the functional alignments in fact are different is not as meaningful or accurate as performing a statistical test of significance. If the effects are found to be significant when performing a statistical test of significance, it is implied that the delivery time distributions differ more than would be expected by chance alone.

Statistical tests of significance are either parametric or nonparametric. Parametric tests require that certain assumptions be met. One of the assumptions is that “The dependent variable is normally distributed in the population” (Hinkle et al, 1998). The normality assumption necessary for parametric testing is violated using the raw delivery times (see Figure 5 below).



**Figure 5. Normal Quantile Plots by Location (JMP 5.1, 2005)**

The distribution of the data by location is located on the left side of each JMP 5.1 output (see Figure 5 above), appearing to fit a lognormal distribution rather than a normal distribution. The normal quantile plot (located on the right side) is useful for visualizing

the extent to which the variable is normally distributed. If a variable is normal, the normal quantile plot approximates a diagonal straight line (JMP 5.1 help guide, 2003). In this case, the variable does not approximate a diagonal straight line, emphasizing the variable is not normally distributed.

The results of a parametric test when a nonparametric test is more appropriate are unreliable. Nonparametric techniques are available for analyzing data that do not follow a normal distribution and require fewer assumptions than parametric tests. Nonparametric tests do not depend on the distribution of the sampled distribution. They are distribution-free tests. They are more powerful than their corresponding parametric counterparts in situations where either the data are nonnormal or the data are ranked, as is the delivery time data sets of each location (McClave et.al., 2001).

Therefore, the Kruskal-Wallis test was chose. The Kruskal-Wallis test is used “...for comparing the populations that requires no assumptions concerning the population probability distributions” (McClave et al, 2001). It is a distribution-free, nonparametric test. The Kruskal-Wallis test compares distributions by the rank sums for the sets of sampled data. The ranks are computed for each observation “...according to the relative magnitude of the measurements when the data for all the samples are combined” (McClave et al, 2001). The test statistic, then, is a measure of the “...extent to which the  $p$  samples differ with respect to their relative ranks” (McClave, 2001). The Prob>Chisq value is the probability of obtaining by chance alone a Chi-square value larger than the one calculated if, in reality, the distributions across factor levels are centered at the same location. Observed significance probabilities of 0.05 or less are considered evidence that

the distributions across factor levels are not centered at the same location (JMP help guide, 2003).

The Kruskal-Wallis test used in this analysis is a single factor observational experiment that investigates the affect of co-locating vehicle operators in LGRM on priority 02 delivery times. The priority 02 delivery times were compared from Barksdale AFB and Whiteman AFB. Barksdale AFB has a sub-motor pool co-located with LGRM to perform pick-up and delivery and Whiteman AFB performs all pick-up and delivery functions from LGRVO. For purposes of this study, the delivery time is defined as the time the demand is created in SBSS until the property is delivered to the point of consumption.

The variable of interest, or response, is delivery time in minutes. The only factor being investigated in this experiment is the location of the vehicle operators performing pick-up and delivery. There are two levels of the single factor in this experiment, vehicle operators co-located in LGRM (Barksdale AFB) and all vehicle operators located in LGRVO (Whiteman AFB). Since only one factor is being considered in this experiment, the treatments are the two levels of this factor. The experimental unit is the priority 02 pieces of property being delivered.

The hypothesis in this test is that there is no difference in the delivery times caused by the functional alignment of each location. This hypothesis is tested against the alternative hypothesis that the delivery times are different.

## **On-line Vehicle Interactive Management System (OLVIMS)**

The Air Force needs information at many levels to “...manage vehicle authorizations, assignments, operations, and maintenance” (USAF, May 1994). On-line Vehicle Interactive Management System (OLVIMS) is the system the Air Forces uses to manage this information. The data is input and maintained at the installation level then consolidated at the major command level and forwarded to the Air Force level quarterly. Many decisions, in terms of vehicle authorizations, vehicle assignments, budget, and manpower, are made using information obtained from OLVIMS data (USAF, May 1994).

OLVIMS is an extremely important tool within the vehicle maintenance and vehicle operations communities. Although, OLVIMS has several vehicle maintenance specific capabilities, only the vehicle operations capabilities are discussed.

Because manpower determinations are made, in part, from information obtained from OLVIMS, it is essential that the data is not only accurate, but also thorough. Essentially all work performed in LGRVO is documented in OLVIMS by use of category codes.

Although there are standard category codes used by most vehicle operation sections, each vehicle operation section can establish category codes unique to their installation as well. The following table (see Table 1 below) is a list of 509<sup>th</sup> LRS/LGRVO category codes.

**Table 1. 509th LRS/LGRVO Category Codes (OLVIMS, 2004)**

Category Codes	
1	Taxi
2	Transient Aircrew
3	Aircrew
4	Pax Cargo
5	UDI
6	Bus Service
7	School Service
8	Shuttle Service
9	Wrecker
10	Mobile Maintenance
11	Tractor/Trailer
12	MHE Service
13	Priority Cargo
14	Protocol
15	Command Car
16	Base Tour
17	Operator Training
18	Servicing
19	Rental Pick-up/Delivery
20	Contingency
21	Scheduled Sweep
22	Unscheduled Sweep
23	CDC/Youth/Teen Center
24	KCI run
25	Deliver UDI
26	Vehicle Maintenance
27	DRMO
28	Vehicle Roll-By
29	Presidential Support
30	Scheduled/Unscheduled Maintenance

Similar to SATS, reports can be generated in OLVIMS by simply establishing parameters of the type and timeframe of the data needed. To perform the quantitative analysis of 2T1X1 manpower utilization, a report was generated that provided one year of historical data for the time spent by each operator on each one of the above category codes. The time spent on pick-up and delivery (13 *priority cargo*, 21 *scheduled sweep*, and 22 *unscheduled sweep*) were consolidated and segregated from the time spent on all other category codes. The remaining category codes were consolidated into one group

and simply labeled vehicle operation responsibilities other than pick-up and delivery. The time spent on these two groups of work at both locations are only one piece of the data needed to calculate utilization rates and make the comparison of 2T1X1 utilization by location.

To obtain utilization rates, both the work performed as well as the available manpower figures are needed. Vehicle operations reliably tracks the work performed in OLVIMS. However, the available manpower data is only kept in daily logs. The data kept in the daily logs is inconsistent and unreliable. Therefore, to make the utilization rate calculations it was assumed that the number of vehicle operators available in LGRVO is 80% of the number of vehicle operators assigned to the squadron and working during normal duty hours minus the vehicle operators actually or theoretically co-located with LGRM. This 20% is to account for time spent away from the work center (leave, deployments, training, temporary duty). The assumption is that both squadrons, on average, have been affected the same (20% on average) by deployments, leave, training, and other circumstances that decrease the available manpower pool.

The number of vehicle operators used to calculate utilizations rates of vehicle operators performing pick-up and delivery will be the number assigned to the sub-motor pool. Interviews with vehicle operators at Barksdale AFB revealed that the sub-motor pool is less affected by loss in manning due to leave, deployments, etc. because they are backfilled with vehicle operators from LGRVO when they are going to be without a vehicle operator for an extended amount of time.

Whiteman AFB performs all pick-up and delivery services through vehicle dispatch. However, a theoretical number of vehicle operators co-located with LGRM

was used to obtain a utilization rate of airmen performing pick-up and delivery as if they were aligned as Barksdale AFB. The theoretical sub-motor pool at Whiteman AFB was modeled as Barksdale AFB, assigning vehicle operators to perform pick-up and delivery based on the time spent performing pick-up and delivery relative to the total time vehicle operators in the squadron spend working. Barksdale AFB co-locates 6 vehicle operators with LGRM to perform pick-up and delivery, an average of 38% of the total time vehicle operators in the squadron spend working. Whiteman AFB spends 24% of the total time vehicle operators in the squadron spend working performing pick-up and delivery.

Assuming the logic used to assign 6 vehicle operators to the sub-motor pool at Barksdale AFB is appropriate, the theoretical number of vehicle operators assigned to the sub-motor

pool at Whiteman AFB will be  $4 \left( \frac{24}{38} = .64 \rightarrow .64 \times 6 = 3.78 \right)$ .

The functional alignment determined to produce the greatest utilization of 2T1X1 manpower will be the unit that consistently spreads the workload evenly. Spreading the workload evenly prevents the situation, for example, where 10% of the manpower performs 80% of the work. Ideally, 100% of the manpower is utilized, for example, 70% of the time.

Although the vehicle operations sections at both locations have similar staffing requirements on weekends and other than normal duty hours, pick-up and delivery is only performed during normal duty hours (0700-1600) at Whiteman AFB and by vehicle dispatch at Barksdale AFB from 1600-0700. Therefore, only duty days during normal duty hours (0700-1600) are considered.

Data obtained from OLVIMS does not easily import into Microsoft Excel or other software package to enable data manipulation. Each week of data must be printed from Adobe Acrobat, manually edited to filter the category codes and times not used for analysis, and manually input into Microsoft Excel. It is a tedious process considering the amount of data (each week is 12-20 pages of 8-font data). Therefore, 15 weeks from CY 2004 were randomly selected for analysis.

The time spent performing pick-up and delivery relative to all other vehicle operations responsibilities will also be used to evaluate the impact of sub-motor pools on meeting vehicle operator training requirements.

### **Personal Interviews.**

The personal interviews (AFRL/HEH Human Subject Exemption Approval Case Log Approval number F-WR-2005-0023-E. See Appendices A-D for interviews) were conducted face-to-face at Whiteman AFB and by telephone at Barksdale AFB. Notes were taken during the interviews and later transcribed. Three groups of Air Force personnel were identified as being involved in the pick-up and delivery function. Each group either has a unique perspective or has different pick-up and delivery tasks they are responsible for and can only answer questions that pertain to those tasks. Therefore, separate interviews were developed for each group.

The first group identified was LGRM and LGRV flight leadership. I interviewed the flight commanders and superintendents of each flight at both bases. The goal was to obtain information from a more macro level of the squadron. Flight leadership is involved in weekly staff meetings, monthly How-Goes-It briefings and other related

conversations/meetings where the overall productivity of the squadron is discussed. Their perspective is important to identify issues that may or may not be common knowledge or relevant at the airmen/junior NCO level.

The final two groups identified are vehicle operator airmen and vehicle operator Non-Commissioned Officers (NCOs). These are the individuals who ultimately have the biggest impact on pick-up and delivery customer service. I interviewed all available airmen and NCOs assigned to LGRVO and those co-located with LGRM. The nature of the information that I was seeking from personnel assigned to LGRVO and those co-located with LGRM, necessitated airman specific/NCO specific interviews. Some questions were closed-ended, looking for very specific information. However, most of the questions asked were open-ended. Open-ended questions facilitate communication between the interviewee and the researcher. The use of open-ended questions and interviewing a variety of people involved in the pick-up and delivery function provides the ability to identify what is really going on, what the true concerns from all facets and all levels of the process are.

The interviews were transcribed from notes taken during the interview and consolidated into their respective interview group. The responses from each interview group were analyzed to detect common responses from which explanations could be constructed.

## **Summary**

This chapter discussed the methodology and the data collection and data analysis procedures used to analyze the data obtained from SATS, OLVIMS and personal interviews.

Data obtained SATS and OLVIMS was used to perform statistical analysis using Microsoft Excel and SAS JMP 5.1 (a statistical software package) to determine significant difference between delivery time distributions as well as consider the impact that functional alignment has on vehicle operator utilization and ability to meet vehicle operator training requirements.

A qualitative approach is used in the form of personal interviews. Notes were taken during the interview and later transcribed and consolidated into their respective interview group. The responses from each interview group were analyzed to detect common responses from which an explanation could be constructed. The goal of using qualitative research methods was to gather information to reveal characteristics unique to the way pick-up and delivery is being performed at each location and to identify characteristics that enable one alignment to perform more or less efficiently than the other.

## **IV. Findings and Analysis**

### **Introduction**

This thesis seeks to examine the potential impact on customer service levels created by the two functional alignment strategies of the pick-up and delivery function under the recently formed LRS. This thesis also considers the impact each alignment has on vehicle operator utilization and ability to meet vehicle operator training requirements as well as identify characteristics that make one alignment more or less efficient than the other. The results of this analysis will focus on suggesting an alignment with the ability to provide the best pick-up and delivery service possible while maximizing the limited vehicle operator manpower available.

To perform the analysis necessary, data was gathered from the 509<sup>th</sup> LRS located at Whiteman AFB, MO and 2<sup>nd</sup> LRS located at Barksdale AFB, LA. Data was collected from Supply Asset Tracking System (SATS), Online Vehicle Interactive Management System (OLVIMS), and personal interviews. The four investigative questions are used to outline the findings and analysis of this research.

### **Which functional alignment strategy provides the best pick up and delivery service?**

Only priority 02 deliveries made in calendar year 2004 were considered to answer this question. There were 2326 priority 02 deliveries made at Whiteman AFB and 9740 made at Barksdale AFB. The delivery times were sorted by delivery time. Because negative delivery times and times that exceeded 240 minutes were determined to indicate equipment, connectivity, and/or procedure problems that complicate reporting, they were

excluded from consideration. Ultimately, 1584 deliveries made at Whiteman AFB and 7650 deliveries made at Barksdale AFB were considered in this analysis. This captured 68% of the total number of deliveries made at Whiteman AFB and 79% of those made at Barksdale AFB.

The two pick-up and delivery performance measurements were identified as:

1. Percentage of on-time priority 02 deliveries.
2. Average delivery times of priority 02 deliveries.

***Percentage of On-Time Priority 02 Deliveries.***

The percentage of on-time priority 02 deliveries can be found in the table below (see Table 2 below).

**Table 2. Percentage of On-Time Priority Deliveries**

	<b>Priority 02 Deliveries</b>	
	<b>On-Time</b>	<b>Late</b>
<b>Whiteman AFB</b>	54%	46%
<b>Barksdale AFB</b>	42%	58%

The first performance measurement indicates that Whiteman AFB delivered 54% of priority 02 deliveries within 30 minutes outperforming Barksdale AFB's 42% on-time delivery rate by 8 percentage points. Although Whiteman AFB outperformed Barksdale AFB on the percentage of on-time deliveries, Whiteman AFB failed 46% of the time and Barksdale AFB failed 58% of the time to meet the Air Force directed Time-Definite Delivery (TDD) time of 30 minutes.

*Average Delivery Times of Priority 02 Deliveries.*

Whiteman AFB makes priority 02 deliveries in 39 minutes, on average, exceeding the Air Force established TDD time by nine minutes. Barksdale AFB makes priority 02 deliveries in 50 minutes, on average, exceeding the Air Force established TDD time by 20 minutes (see Figure 4 below). Although both locations routinely exceed the TDD time, Whiteman AFB outperforms Barksdale by 11 minutes, on average.

Whiteman AFB		Barksdale AFB	
<b>Moments</b>		<b>Moments</b>	
Mean	39.463384	Mean	49.802484
Std Dev	36.258494	Std Dev	43.251339
Std Err Mean	0.9110289	Std Err Mean	0.4945029
upper 95% Mean	41.250334	upper 95% Mean	50.771845
lower 95% Mean	37.676434	lower 95% Mean	48.833122
N	1584	N	7650

**Figure 6. Mean Delivery Times (JMP 5.1, 2003)**

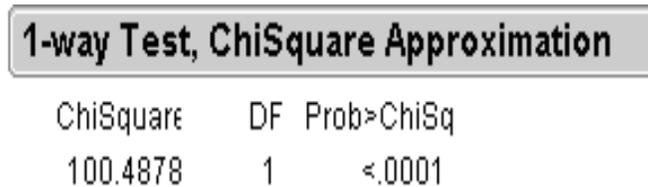
Considering the difference in average delivery times alone as evidence that the functional alignments in fact are different is not as meaningful or accurate as performing a statistical test of significance. If the effects are found to be significant when performing a statistical test of significance, it is implied that the delivery time distributions differ more than would be expected by chance alone.

To accurately perform a statistical test of significance the appropriate test must be used. It was determined that the dependent variable is not normally distributed (see Figure 7 below), which violates the assumptions necessary for parametric testing.

The Kruskal-Wallis test was chosen for its nonparametric distribution-free qualities. The Prob>Chisq value is the probability of obtaining by chance alone a Chi-square value larger than the one calculated if, in reality, the distributions across factor levels are centered at the same location. Observed significance probabilities of 0.05 or less are often considered evidence that the distributions across factor levels are not centered at the same location (JMP help guide, 2003).

The observed Prob>Chisq value of .0001 (see Figure 5 below) indicates that the distributions across factor levels are not centered at the same location. This would indicate that the delivery time distributions differ more than would be expected by chance alone. This would indicate that alignment might have an impact on delivery times. However, further analysis is necessary to exclude all other explanations.

**Figure 7. Observed Significance Probability (JMP 5.1, 2003)**



1-way Test, ChiSquare Approximation		
ChiSquare	DF	Prob>ChiSq
100.4878	1	<.0001

**What efficiencies/inefficiencies are associated with pick-up and delivery procedures under each alignment and what changes could be made to improve the process?**

Interviews with individuals from the three separate interview groups revealed several efficiencies and inefficiencies associated with the pick-up and delivery procedures at each location, as well as recommendations of what changes could be made to improve the process. These efficiencies and inefficiencies can be consolidated into

three categories: communication, ability to respond, and coordination of component processes. These three categories will be discussed for each location, as well as the recommended changes to improve the process.

***Communication.***

At Whiteman AFB many of the vehicle operators complained that vehicle dispatch is not immediately notified of priority deliveries once the demand for a priority delivery has been communicated to the material management flight by a supply activity. On the other hand, often when they are notified, the vehicle operator arrives at the warehouse in material management only to wait for the property to be pulled from inventory. Another problem identified by material management flight personnel is the time wasted when a vehicle operator arrives to the warehouse to make a routine or priority delivery only to determine that movement of the property requires special material handling equipment (i.e. forklift or tractor-trailer) or additional manpower that requires a trip back to LGRVO to retrieve.

Material management flight personnel complained that vehicle operators “cherry pick” loads. They explained that the vehicle operators often take easy loads and leave loads that require special delivery procedures (delivery to weapons storage area or require special material handling equipment to move). These loads that require special delivery procedures are often left undelivered for several days.

Many of the respondents, both vehicle operators and supply personnel, believe there would be some benefit to implementing a load coordinator. The load coordinator would be a vehicle operator that would be co-located with LGRM in the warehouse to

coordinate all deliveries. The load coordinator could notify vehicle dispatch of priority deliveries, any special material handling equipment or additional manpower necessary to make a delivery, and handle any other load coordination issues to ensure a more efficient operation.

Although Whiteman AFB (aligned as the Air Force directs) outperformed Barksdale AFB on priority 02 delivery times, communication at Barksdale AFB does not seem to be an issue. The pick-up and delivery Non-Commissioned Officer In-Charge (NCOIC) sits at a desk in the LGRM warehouse with the pick-up and delivery staging area in plain view. He is constantly aware of the size, shape, and priority of each piece of property that is placed on the shelves and is made available for delivery. Also, the communication between LGRVO and LGRM leadership seems to be effective. One senior NCO stated, “Any problems are identified and resolved immediately”.

***Ability to Respond.***

The time lost at Whiteman AFB when vehicle dispatch is not immediately notified of priority deliveries and/or special material handling equipment requirements greatly diminishes vehicle operations ability to quickly respond to priority deliveries. Also, the vehicle operators are geographically separated from the priority property to be delivered. The introduction of a load coordinator would improve their ability to respond.

At Barksdale AFB there is a vehicle operator on standby in the warehouse at all times to handle priority deliveries. When a priority delivery is placed in the pick-up and delivery staging area, the NCOIC immediately notifies the vehicle operator on standby,

and the part is delivered. Their ability to respond quickly to priority deliveries appears to be much more efficient.

### *Coordination of Component Processes*

In Accordance With (IAW) PAD 02-05, the new alignment of the pick-up and delivery function split the responsibility between the material management flight and the vehicle operations section. The material management flight is responsible for retrieving the asset from inventory once a demand has been created. Once the asset has been taken from inventory it is either moved to a holding area awaiting a routine delivery or moved to a priority delivery holding area and notifies vehicle operations of a priority delivery. Vehicle operations perform routine deliveries at designated intervals throughout the day and responds to priority deliveries as appropriate.

At Whiteman AFB LGRM and LGRVO leadership agreed to allow LGRM 15-minutes to pull the property from inventory and call LGRVO, allowing LGRVO 15-minutes to take the call, drive approximately 1-mile to the main warehouse, and deliver the property to its final destination. This initiative breaks the pick-up and delivery process into component processes, the sum of the time of the component process standards equal the time-definite delivery time of 30 minutes. However, often there are communication and/or coordination issues that prevent 30-minute deliveries. Also, the flights are currently considering reducing the time allowed by LGRM personnel to pull the property from inventory, effectively increasing the time allowed to LGRVO to deliver the property.

At Barksdale AFB the time LGRM takes to pull the property and place it in the pick-up and delivery holding area once a demand has been established is not tracked. Although SATS, and Air Force standards, identify late deliveries as any priority 02 delivery not delivered within 30-minutes from SBSS document creation, pick-up and delivery times are tracked at Barksdale AFB "...from the time the property is scanned to our area to the time the customer signs for the property" (2<sup>nd</sup> LRS/LGRVO Concept of Operations, 2004). The time spent from SBSS document creation until the property is scanned into the pick-up and delivery staging area is not considered. There is not an established standard that LGRM personnel must meet to ensure a 30-minute delivery time.

Elliot Jacques' Accountability Hierarchy, Stratified System Theory, and The International Society for Performance Improvement's Human Performance Technology would agree that each process in an organization must have established standards with allowable variation. When it is necessary to break processes into component processes, the component processes must have standards and variation that when summed equal the standards and allowable variation of the process. Although they are currently under revision, Whiteman AFB has assigned standards to the component processes of the pick-up and delivery process. Barksdale AFB, on the other hand, does not hold LGRM accountable to meet standard times of the component process they control (time spent from SBSS document creation until the property is scanned into the pick-up and delivery staging area).

One senior NCO at Barksdale AFB stated, "LGRVO is 100% accountable for pick-up and delivery service but only in control of 10% of the process". He explained

that customers control some of the process (SATS identification cards, keeping organization codes and supply accounts information current) and LGRM controls some of the process (receives the documents, pulls the property from inventory, and notifies vehicle operators of priority deliveries). The same senior NCO suggested that vehicle operations should either own the entire pick-up and delivery process (the individuals pulling the property assigned to LGRVO) or the entire process should go back to LGRM. He stated that pick-up and delivery could never be performed as efficiently as it could be if there was a single flight or section in-charge of the entire process.

Under the current Air Force combat wing structure, the entire process cannot be controlled under a single flight or section. However, effective communication between the component process owners, effective priority delivery response procedures, and clear and obtainable standards for the component processes, for which the component process owners are held accountable, should ensure an efficient pick-up and delivery service.

### **Which alignment produces the most efficient utilization of 2T1X1 manpower?**

To determine the alignment that produces the most efficient utilization of 2T1X1 manpower, a comparison of both utilization rates (time spent working on category codes 13, 21, and 22 and time spent working on all other category codes), operating under both scenarios (with sub-motor pool, without sub-motor pool), at both locations were considered. Fifteen weeks of CY 2004 were randomly selected to perform this analysis.

Based on how vehicle operators are assigned to the sub-motor pool in LGRM at Barksdale (time spent performing pick-up and delivery relative to total time vehicle operators spent working), a theoretical number of 4 (refer to chapter 3) vehicle operators

will be used to obtain a utilization rate of the theoretical sub-motor pool at Whiteman AFB.

It was assumed that the number of vehicle operators available in LGRVO at both locations is 80% of the number of vehicle operators assigned to the squadron and work during normal duty hours minus the vehicle operators co-located (or theoretically located) with LGRM. This 20% is to account for time spent away from the work center (leave, deployments, training, temporary duty). The assumption is that both squadrons, on average, have been affected the same (20% on average) by deployments, leave, training, and other circumstances that decrease the available manpower pool.

The number of vehicle operators used to calculate utilization rates of vehicle operators performing pick-up and delivery will be the constant number assigned to the sub-motor pool. Interviews with vehicle operators at Barksdale AFB revealed that the sub-motor pool is less affected by loss in manning due to leave, deployments, etc. because they are backfilled with vehicle operators from LGRVO when they are going to be without a vehicle operator for an extended amount of time.

The following table is a summary of the various average utilization rates for each location (see Table 3 below). The shaded cells on the summary table are the actual utilization rates for each location and the non-shaded cells are the theoretical utilization rates.

**Table 3. Utilization Rate Summary Table**

	Vehicle Operators assigned	Vehicle Operators working during (0700-1600)	Utilization Rate With Sub-Motor Pool		Utilization Rate Without Sub-Motor Pool
			P & D	All Other	(aligned as the Air Force directs)
Barksdale AFB	57	35	41.35%	22.67%	26.51%
Whiteman AFB	34	29	49.26%	51.18%	50.86%

The vehicle operators assigned to the sub-motor pool at Barksdale AFB spend nearly twice the time working (41.35% versus 22.67%), on average, than their counterparts in LGRVO (see Table 3 above). If Whiteman AFB performed pick-up and delivery with a sub-motor pool, the vehicle operators assigned to the sub-motor pool would spend relatively the same amount of time working as their LGRVO counterparts (49.26% versus 51.18%) (see Table 3 above). These findings indicate that vehicle operators assigned to the sub-motor pool at Barksdale AFB spend substantially more time working than their LGRVO counterparts. The alignment at Barksdale AFB is not the most efficient use of vehicle operator manpower.

With utilization rates relatively the same at Whiteman AFB between pick-up and delivery and all other tasks, allocating vehicle operators to LGRM to perform duties only associated with pick-up and delivery would appear to be a logical decision at Whiteman AFB. However, when asked if the vehicle operations section would consider the sub-motor pool alternative alignment to handle pick-up and delivery, the answer was a resounding “no” (interviews with 509<sup>th</sup> LRS/LGRVO leadership).

The main concern from vehicle operators at Whiteman AFB is that there are vehicle operation responsibilities other than pick-up and delivery that would suffer if there were airmen dedicated to perform only pick-up and delivery and taken out of the available manpower pool in LGRVO. Although the airmen estimate that 70% of their time spent working is associated with pick-up and delivery (interviews with 509<sup>th</sup> LRS/LGRVO vehicle operators), vehicle operators argue that the vehicle operations section simply does not have enough manpower to support dedicated vehicle operators to perform only pick-up and delivery. Activities like aircrew runs and bus routes are

scheduled. However, a majority of the work performed in vehicle operations (tractor-trailer support, priority deliveries, wrecker support, etc.) is un-scheduled. Therefore, the vehicle operators stated that there must be an available manpower pool to pull from to handle increases in activity throughout the day. By performing pick-up and delivery from the vehicle operations section, vehicle operators can be detailed from the pool of available operators and still be tasked to perform other details when there are not deliveries to be made.

It was determined that the alignment at Barksdale AFB over utilizes the vehicle operators assigned to the sub-motor pool and under utilizes the vehicle operators assigned to the vehicle operations section. The workload is not distributed evenly among all vehicle operators assigned. This alignment does not appear to produce the most efficient utilization of manpower.

The vehicle operators assigned to LGRVO spend 22.67% of their time working leaving 77.33% of their time not performing work captured by category codes (see Table 3 above). It appears as though additional vehicle operators could be allocated to the sub-motor pool without compromising their ability to provide services other than pick-up and delivery. Therefore, further analysis is necessary to consider the impact that additional manpower would have on the difference in vehicle operator utilization.

Although the sub-motor pool alignment appears to be an alignment to be considered at Whiteman AFB, based solely on a comparison of utilization rates, the vehicle operations section leadership claim that the sub-motor alignment is simply infeasible at their location due to the potential increase in unscheduled work routinely encountered. The loss of manpower suffered as a result of allocating vehicle operators to

a sub-motor pool may compromise their ability to provide services other than pick-up and delivery.

**What is the impact of co-locating vehicle operators with LGRM on meeting 2T1X1 training requirements?**

The loss of training opportunities suffered as result of separating vehicle operators from the functional experts located in LGRVO is a valid concern of those in the vehicle operations community. The 2T1X1 Career Field Education and Training Plan (CFETP) lists 14 training tasks associated with documented cargo (pick-up and delivery). There are a total of 240 training tasks in the 2T1X1 CFETP. Therefore, training tasks associated with pick-up and delivery only account for 6% of the total training tasks identified in the 2T1X1 CFETP.

Furthermore, the time spent performing pick-up and delivery at each location is on average relatively low compared to total time spent working. Time spent (in minutes) on pick-up and delivery and all other vehicle operation tasks during the 15 randomly selected weeks in CY 2004 is displayed in the following tables (see Tables 4 and 5).

**Table 4. Barksdale AFB Time Spent Working**

<b>Barksdale AFB</b>				
Week	P&D in minutes	% of Total Time	All Other	% of Total Time
1	2382	56.97%	1799	43.03%
2	7366	51.58%	6916	48.42%
3	5135	31.81%	11008	68.19%
4	4453	35.79%	7990	64.21%
5	5910	42.42%	8021	57.58%
6	5873	23.49%	19134	76.51%
7	4567	36.68%	7884	63.32%
8	6297	15.54%	34229	84.46%
9	7971	23.53%	25908	76.47%
10	12834	39.16%	19937	60.84%
11	4253	37.76%	7009	62.24%
12	7323	22.94%	24603	77.06%
13	3900	56.54%	2998	43.46%
14	5917	61.84%	3651	38.16%
15	5137	38.39%	8245	61.61%
Total	89318		189332	
Average	5954.533333	38.30%	12622.13	61.70%

**Table 5. Whiteman AFB Time Spent Working**

<b>Whiteman AFB</b>				
Week	P&D in minutes	% of Total Time	All Other	% of Total Time
1	3165	11.42%	24550	88.58%
2	5486	35.28%	10066	64.72%
3	4986	5.32%	88767	94.68%
4	4974	38.69%	7882	61.31%
5	5543	13.33%	36050	86.67%
6	5550	23.24%	18336	76.76%
7	3582	38.94%	5617	61.06%
8	4816	46.42%	5558	53.58%
9	3972	16.53%	20060	83.47%
10	3674	24.55%	11292	75.45%
11	4824	7.37%	60674	92.63%
12	6297	39.02%	9842	60.98%
13	3240	14.79%	18672	85.21%
14	4006	24.00%	12684	76.00%
15	6819	15.06%	38466	84.94%
Total	70934		368516	
Average	4728.933333	23.60%	24567.73	76.40%

Although pick-up and delivery is an important function of the vehicle operations section, it only accounts for 6% of total 2T1X1 training requirements and an average of 24% and 38% of total time spent working at Whiteman AFB and Barksdale AFB, respectively (see Tables 4 and 5 above).

The potential loss in training opportunities is not an issue at Whiteman AFB because they retain all vehicle operators in the vehicle operations section.

Barksdale AFB appropriately addresses the concerns of ensuring training requirements are met by rotating the vehicle operators between LGRM and LGRVO. One of five vehicle operators assigned to the sub-motor pool rotates with a vehicle operator in LGRVO every month. This ensures continuity in the sub-motor pool by only rotating one vehicle operator a month and enables vehicle operators meet training requirements other than those associated with pick-up and delivery by only allowing them to be separated from LGRVO for five months at a time.

There is a substantial amount of time spent providing vehicle operation services other than pick-up and delivery at both locations (61.7% at Barksdale AFB and 76.4% at Whiteman AFB) and a substantial number of training tasks (226 of 240) identified in the CFETP unrelated to pick-up and delivery (see Tables 4 and 5 above). Vehicle operators must be given the opportunity to develop proficiency in all tasks performed as well as those identified in the CFETP. It appears as though vehicle operators are given the opportunity to be trained on vehicle operator training tasks other than those associated with pick-up and delivery at under both alignments. However, only a review of the training records of the airmen assigned at each location could substantiate this finding.

## **Summary**

This thesis examined the impact on customer service created by the two functional alignment strategies of the pick-up and delivery function under the recently formed logistics readiness squadrons at Whiteman AFB and Barksdale AFB. The impact each alignment has on vehicle operator utilization and ability to meet vehicle operator training requirements was also considered. The results of this analysis will be used to suggest an alignment that provides the best pick-up and delivery service possible while efficiently utilizing the limited vehicle operator manpower available.

It was determined, through this analysis, that Whiteman AFB provides a better pick-up and delivery service than Barksdale AFB. Furthermore, it was determined by personal interviews that communication, ability to respond, and coordination of component processes are important components of the pick-up and delivery process.

Furthermore, this analysis revealed that the alignment at Barksdale AFB causes an inefficient utilization of vehicle operator manpower.

## V. Conclusion

The goal of this research is to suggest an alignment that provides the best pick-up and delivery service while providing the most efficient utilization of vehicle operator manpower. The research results are reviewed and followed by recommendations for improvement as well as ideas for future research provided.

### Review of Research Results

Early organizational theorists suggest that work should be divided in a way that individuals are given "...meaningful work over which he can have some feeling of control and influence [and the organization should be structured so that] each individual belongs to a cohesive work group in which participation in decision making is the accepted norm" (Dalton, 1970). Furthermore, the work groups should coordinate through the efforts of a "linking pin" that holds membership in both groups.

Although Barksdale AFB does not have a "linking pin" that holds membership both in the sub-motor pool and LGRM, by co-locating vehicle operators with LGRM to perform pick-up and delivery, they have created an atmosphere that encourages communication and a social and professional obligation to optimize the working groups' ability to provide pick-up and delivery service. Yet, Barksdale AFB was unable to provide a better service or more efficient utilization of vehicle operator manpower than Whiteman AFB.

Whiteman AFB has aligned the pick-up and delivery function as the Air Force directs. Pick-up and delivery, for the most part, is a vehicle operations function. Yet, at

Whiteman AFB vehicle operators are geographically separated from much of the process (document creation and inventory). This separation creates an “us” versus “them” attitude between LGRVO and LGRM personnel that hinders innovation, process improvement, and development of a cohesive working group. Nonetheless, despite the apparent shortcomings of the alignment, Whiteman AFB appears to provide a better service than Barksdale AFB and more efficient utilization of vehicle operator manpower.

However, there may be some explanation for the difference that was not considered in this research. Barksdale AFB made nearly four times more priority deliveries in CY 2004 than Whiteman AFB. Furthermore, follow-up interviews at both locations revealed that Barksdale AFB does not have the luxury of handling priority deliveries on an individual basis, as is the case at Whiteman AFB. Whiteman AFB, with one quarter the number of priority deliveries, has the time to give each priority delivery individual attention. Barksdale AFB handles priority deliveries in sweeps. For instance, they may have four priority deliveries in the truck ready to deliver and wait on two more to be pulled from inventory. They will risk exceeding the 30-minute TDD time of the first four deliveries to ensure that all six deliveries are made in a reasonable time.

Training vehicle operators on tasks other than those associated with pick-up and delivery does not appear to be sacrificed at either location. However, a review of vehicle operator training records would be necessary to substantiate this finding.

## **Recommendations**

Whiteman AFB could show some process improvement by the introduction of a load coordinator, a “linking pin” that holds membership in both groups (a vehicle

operator assigned to LGRM). This load coordinator can notify vehicle dispatch of priority deliveries, special handling equipment required for deliveries, and handle any other load coordination issues to ensure an efficient pick-up and delivery service. By retaining all but one vehicle operator (load coordinator in LGRM) in LGRVO, the vehicle operations section can continue to offer efficient pick-up and delivery service without jeopardizing the service of the scheduled and unscheduled vehicle operation tasks other than pick-up and delivery.

Further analysis is necessary to determine the impact of allocating additional vehicle operators to the sub-motor pool at Barksdale AFB on their ability to provide pick-up and delivery service and utilize vehicle operators efficiently. Barksdale spends much more of their total time working performing pick-up and delivery, 38% compared to Whiteman AFB's 24%. The additional manpower should enable them to reduce their delivery times and ensure a more efficient use of vehicle operator manpower than under their current LGRVO/sub-motor pool manning levels. Continued separation of the pick-up and delivery function from the LGRVO section enables the vehicle operators assigned to the sub-motor pool to focus their attention only on the pick-up and delivery process and strive for continual improvement.

Both locations are absent of a single individual at the flight or section level that is solely responsible, or held accountable, for the entire pick-up and delivery function. Also, the roles and responsibilities of the component processes are not clearly delineated or established to ensure TDD times are met at either location.

## **Recommendations for Future Research**

There are characteristics of customer service that are not considered in this research. Research could be broadened in three manners. First, examining the potential increased capabilities of vehicle operators to handle non-standard supply issues of vehicle operators co-located with LGRM versus those that are not could be of some benefit (Are the vehicle operators co-located with LGRM better trained in supply procedures than those assigned to LGRVO?). Second, evaluating the level of service from the customers in terms of their interaction with one of few vehicle operators, typical of the sub-motor pool alignment, versus interacting with one of several vehicle operators, typical of the Air Force directed alignment, would provide insight from the customer's perspective.

The next logical recommendation for future research is to consider the impact of slow or late priority deliveries. The Air Force Core Automated System (CAMS) tracks maintenance/repair procedures performed on the entire Air Force aircraft inventory. Data from CAMS can be used to track maintenance/repair procedures associated with priority deliveries being made. It would be interesting to determine how long after a priority delivery was made that the maintenance/repair procedure was accomplished. Priority deliveries that are made minutes late or maybe even hours late may have minimal impact to the force/activity's mission capability.

## Appendix A: Vehicle Operator Interview (E-1 thru E-4)

I. Interview Subject Information (kept confidential, will not be published, used only for contact information for any response clarification that may be needed and destroyed when data collection is done):

Name: \_\_\_\_\_ Rank: \_\_\_\_\_

Position: \_\_\_\_\_

### II. Interview Questions:

#### Question 1

Are you involved in the pick-up and delivery function?

#### Question 2

In what way are you involved in the pick-up and delivery function?

#### Question 3

For the purposes of this interview I will define your supervisor as the individual who assigns you tasks on a daily basis and your rater as the individual who writes your EPR.

Is your supervisor someone other than your rater?

If yes, proceed to Questions 4-11.

If no, skip to Question 12

#### Question 4

Does your rater also perform duties related to pick-up and delivery?

#### Question 5

How many individuals does your rater rate?

#### Question 6

Does your rater rate individuals other than those involved in pick-up and delivery?

#### Question 7

Is your rater in another career field than you?

#### Question 8

Does your supervisor also perform duties related to pick-up and delivery?

#### Question 9

How many individuals does your supervisor supervise?

Question 10

Does your supervisor supervise individuals other than those involved in pick-up and delivery?

Question 11

Is your supervisor in another career field than you?

Question 12

Does your supervisor perform duties related to pick-up and delivery?

Question 13

How many individuals does your supervisor rate/supervise?

Question 14

Does your supervisor rate/supervise individuals other than those involved in pick-up and delivery?

Question 15

Is your rater in another career field than you?

Question 16

Do you perceive any problems with the current organizational structure of the pick-up and delivery function? If so, what are the problems?

Question 17

Do you have any suggestions that may improve pick-up and delivery customer service and what would be the benefit?

Question 18

Do you perceive any cost or sacrifices that would be made to implement the changes you have suggested?

Question 19

Do you feel the current alignment of the pick-up and delivery function in your squadron ensures the best utilization of 2T1X1 manpower and the workload is distributed evenly? If no, why not?

Question 20

Do you have any suggestions that may improve manpower utilization and ensure an even workload distribution?

Question 21

Do you perceive any costs or sacrifices that would be made to implement the changes you have suggested?

Question 22

Do you feel personnel other than vehicle operators could better perform the pick-up and delivery function?

Question 23

Is there anything else you would like to add or explain pertaining to what we have discussed or is relevant to this topic?

## Appendix B: Supply Personnel Interview

I. Interview Subject Information (used only for contact information for any response clarification that may be needed and destroyed when research is done):

Name: \_\_\_\_\_ Rank: \_\_\_\_\_

Position: \_\_\_\_\_

### II. Interview Questions:

#### Question 1

Are you involved in the pick-up and delivery function?

#### Question 2

In what way are you involved in the pick-up and delivery function?

#### Question 3

Have you performed pick-up and delivery?

#### Question 4

Do you feel pick-up and delivery customer service has suffered as a result of the responsibility shifting from Supply personnel to Transportation personnel?

If yes, proceed to Question 5-6.

If no, skip to Question 7.

#### Question 5

How has the pick-up and delivery service suffered?

#### Question 6

What do think has caused the pick-up and delivery customer service to suffer?

#### Question 7

What changes could be made to provide better pick-up and delivery customer service?

#### Question 8

Do you perceive any costs or sacrifices that would be made to implement the changes you have suggested?

#### Question 9

Of the following three alignments, which alignment do you think would best enable the Logistics Readiness Squadron to provide the best pick-up and delivery service to wing customers:

Supply personnel assigned to LGRM

Transportation personnel assigned to LGRM

Transportation personnel assigned to LGRVO

Question 10

Is there an alternative alignment, not already mentioned in the previous question that would best enable the Logistics Readiness Squadron to provide pick-up and delivery service?

Question 11

Is there anything else you would like to add or explain pertaining to what we have discussed or is relevant to this topic?

## Appendix C: Vehicle Operator Interview (NCO)

I. Interview Subject Information (kept confidential, will not be published, used only for contact information for any response clarification that may be needed and destroyed when data collection is done):

Name: \_\_\_\_\_ Rank: \_\_\_\_\_

Position: \_\_\_\_\_

### II. Interview Questions:

#### Question 1

Are you involved in the pick-up and delivery function and are you a vehicle operator?

#### Question 2

In what way are you involved in the pick-up and delivery function?

#### Question 3

How many individuals do you supervise?

#### Question 4

Do you supervise individuals in a career field other than vehicle operations?

#### Question 5

Do you supervise individuals who perform functions other than pick-up and delivery?

#### Question 6

Do you perceive any problems with the current organizational structure of the pick-up and delivery function? If so, what are the problems?

#### Question 7

Do you have any suggestions that may improve pick-up and delivery customer service and what would be the benefit?

#### Question 8

Do you perceive any cost or sacrifices that would be made to implement the changes you have suggested?

#### Question 9

Do you feel the current alignment of the pick-up and delivery function in your squadron ensures the best utilization of 2T1X1 manpower and the workload is distributed evenly?  
If no, why not?

Question 10

Do you have any suggestions that may improve manpower utilization and ensure an even workload distribution?

Question 11

Do you perceive any costs or sacrifices that would be made to implement the changes you have suggested?

Question 12

Do you feel personnel other than vehicle operators could better perform the pick-up and delivery function?

Question 13

Is there anything else you would like to add or explain pertaining to what we have discussed or is relevant to this topic?

## Appendix D: LGRM/LGRVO Leadership

I. Interview Subject Information (kept confidential, will not be published, used only for contact information for any response clarification that may be needed and destroyed when data collection is done):

Name: \_\_\_\_\_ Rank: \_\_\_\_\_

Position: \_\_\_\_\_

### II. Interview Questions:

#### Question 1

Are you satisfied with the pick-up and delivery service?

#### Question 2

Are there changes that could be made to improve the service and or efficiency of how the service is provided?

#### Question 3

Do you perceive any cost or sacrifices that would be made to implement the changes you have suggested?

#### Question 4

Do you perceive any problems with the current organizational structure of the pick-up and delivery function? If so, what are the problems?

#### Question 5

Are there changes that could be made in the organizational structure that would improve the pick-up and delivery service and or efficiency of how the service is provided?

#### Question 6

Do you perceive any cost or sacrifices that would be made to implement the changes you have suggested?

#### Question 7

Do you feel the current alignment of the pick-up and delivery function in your squadron ensures the best utilization of 2T1X1 manpower and the workload is distributed evenly? If no, why not?

Question 8

Do you have any suggestions that may improve manpower utilization and ensure an even workload distribution?

Question 9

Do you perceive any cost or sacrifices that would be made to implement the changes you have suggested?

Question 10

Elliot Jaques, an expert in the field of personnel management, claims that “span of control decreases as the variability of the conditions and the absences of the manager increase (I will ask the interviewee to explain what this means to them. If they understand this quote the way it is intended to be understood, according to the writings of Elliot Jacques, I will move on. If they do not, I will explain it to them.).

Is span of control an issue with the airmen performing the pick-up and delivery function?

If yes, proceed to Questions 11-12.

If no, skip to question 13.

Question 11

How do you feel control of the pick-up and delivery function could be improved?

Question 12

Do you perceive any sacrifices that would be made to implement the changes you have suggested?

Question 13

Do you feel pick-up and delivery customer service has deteriorated as a result of the responsibility shift from supply personnel to transporters? If so, in what way has the service deteriorated?

Question 14

Are there changes that could be made that would improve the pick-up and delivery service and or efficiency of how the service is provided?

Question 15

Do you perceive any cost or sacrifices that would be made to implement the changes you have suggested?

Question 16

Is there anything else you would like to add or explain pertaining to what we have discussed or is relevant to this topic?

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<b>14. ABSTRACT</b> The Chief of Staff Logistics Review of 1999 examined a multitude of process issues and their resulting impact on organizational structure. A resulting initiative was to transition the pick-up and delivery function from the Material Management flight (LGRM) to the Vehicle Operations section (LGRVO). The motivation of this initiative, more specifically referred to as Supply/Transportation Reengineering, was to streamline similar processes, and to effectively and efficiently utilize resources. The goal of this transition was to use fewer people and resources to provide pick-up and delivery service to wing customers with minimal adverse impact to customer service and to improve overall mission support. Concerned about actual or perceived degradation in pick-up and delivery service, some Logistics Readiness Squadron (LRS) commanders have chose to co-locate vehicle operators with LGRM to perform pick-up and delivery service, despite Air Force guidance that forbids it. This research is an analysis of actual or perceived impacts caused by the two different functional alignments in terms of pick-up and delivery service and vehicle operator utilization.					
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