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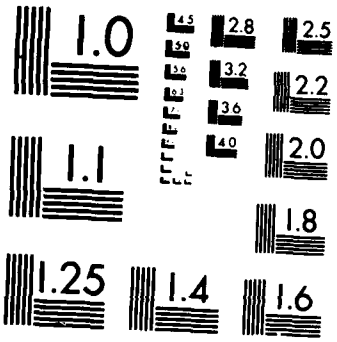

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THE SOURCE-TO-USER CONCEPT - AN ALTERNATIVE METHOD FOR DISTRIBUTING AIRCRAFT TIRES

THESIS

DAN E. KING
MAJOR, USAF

AFIT/GLM/LSM/86S-39

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THE SOURCE-TO-USER CONCEPT - AN ALTERNATIVE METHOD FOR DISTRIBUTING AIRCRAFT TIRES

THESIS

Presented to the Faculty of the School of Systems and Logistics of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Logistics Management

Dan E. King, M.A.

Major, USAF

September 1986

Approved for public release; distribution unlimited

Preface

The purpose of this research was to examine the Source-to-User concept as an alternative to the current central warehouse method of distribution for aircraft tires. The proposal was submitted by HQ Ogden ALC/MMI.

I would like to thank Major Kent Gourdin, my thesis advisor, for his patience and assistance. I also wish to thank Ms. Cecilia Ridgeway of the HQ AFLC Transportation Staff for her help in collecting current and historical information on the subject of Source-to-User. Finally, I want to thank my wife Sandy for her many hours at the word processor. Their contributions were many and I appreciate them deeply.

Dan E. King

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Abstract

In October 1985, the Air Force Institute of Technology (AFIT), School of Systems and Logistics, received a letter from the Directorate of Materiel Management (MMI), Headquarters Ogden Air Logistics Center (ALC), Hill AFB, Utah proposing that a thesis be accomplished on the validity of the Source-to-User concept. The Source-to-User concept would permit aircraft tires to be shipped directly from the source of procurement/repair to using bases rather than to centralized storage at Hill AFB and Wright-Patterson AFB with subsequent transhipment to users.

A Delphi Process was used to gather professional opinion regarding the potential of the Source-to-User concept to improve the distribution of aircraft tires. A review of historical documents and current policy and procedures permitted a discussion of nine investigative questions pertaining to the Source-to-User concept. Parallels were drawn between other Department of Defense initiatives/programs, the commercial Just-in-Time philosophy, and Source-to-User.

It was concluded that the Source-to-User concept addresses classic distribution goals and its implementation would improve the efficiency and effectiveness of the aircraft tire distribution system. The Source-to-User concept should shorten the extensive distribution pipeline currently

in-place. Improvements should include reduced inventory, less documentation, processing, and distribution of tires while permitting the use of less expensive modes of transportation.

It was recommended that the Air Force Logistics Management Center be tasked to conduct a thorough and complete field-test that would collect hard and definitive operational cost and time data. In the interim, the Air Force should use Amended Shipping Instructions to reduce pipeline time for aircraft tires. It was further recommended that current information systems associated with the purchase/repair and subsequent delivery of aircraft tires be reviewed and revised to provide a complete and accurate audit trail of cost and time.

THE SOURCE-TO-USER CONCEPT - AN ALTERNATIVE METHOD FOR DISTRIBUTING AIRCRAFT TIRES

I. Introduction

The Source-to-User concept is a method of distribution and material management that appears extremely straight forward at first glance. It means that items purchased or repaired are shipped directly to the ultimate user rather than to a central warehouse for later transhipment. An example within the Air Force could be the direct shipment of aircraft tires to an operational base from the manufacturer or recapping plant in lieu of shipment to an Air Logistics Center or alternate storage location for stockage and subsequent shipment to the operational base.

Potential Advantages

The Source-to-User concept, in the example above, would seem to offer clear cut advantages. First, there would be only one shipment versus two. The shipment from the contractor would encompass all documentation, all processing/handling, and all transportation enroute to the operational base.

Secondly, there would be no interim centralized storage with the attendent requirements for material handling equip-

ment, facilities, manpower, and inventory management documentation. (There would, however, still be a reduced requirement for these central storage resources for tires held in support of wartime or contingencies.)

For tires satisfying recurring or daily demands, there would be only one inventory reception point versus two. This reception by the operational base would encompass all in-checking, storage, and record keeping functions until the time of issue. The resources for these functions are already in-place along with historical demand level and base-level stockage rates. In addition, the time from procurement to arrival at the operational base would be compressed. Thus, vulnerability to damage and loss would be decreased since each time the tires are handled, the opportunity for mistakes is magnified.

Finally, non-premium transportation could be used since the total transit time will have been reduced. This would free-up space on LOGAIR, the government contract airlift service, resulting in cost savings for the aircraft tires being shipped by surface means. This advantage is important because it produces a ripple effect by releasing premium LOGAIR transportation capability to many other critical items. Since aircraft tires are often bulky and heavy, the effect could be significant.

Potential Drawbacks

There are some potential drawbacks to the Source-to-User concept as well. For example, the contractor must make multiple small shipments (if the aircraft tires are required at more than one operational base) rather than one large shipment to the supporting central storage point. In virtually all cases, new and recapped tires are purchased Free On Board (FOB) Origin, which means that the cost of the contract does not include the cost of transporting the tires to the Air Force. Therefore, any incremental costs, due to more frequent and smaller shipments, would be paid by the government.

Communication between the procurement activity and the contractor may increase if initial shipping instructions are amended. This could occur if stockage requirements at operational bases had to be changed or modified.

Actual stockage rates at operational bases may fluctuate over a greater range until production rates and usage rates are synchronized. These fluctuations should result in increased lateral support between bases rather than shipment between the central storage and the bases.

Finally, direct shipments to operational bases would delete the central warehouse's opportunity to check tires for flaws and damage. This inspection is not a technical inspection, but is accomplished by supply warehouse personnel when the tires are received and stored. Non-the-less, there would be a higher potential for flawed tires to reach base-level.

Assumptions

As with any concept of operations, certain assumptions must be made and it is useful to clarify these. The Source-to-User concept, as presented here, is based on common management principles. The physical resources (transport, facilities, manpower, etc.) required by Source-to-User are the same as those already in the central warehousing system. Based on the above, the first assumption is that the Air Force must know how many of the commodity are needed. This number could be for a specific contract or the total requirement for a given period.

Second, the future requirements for each operational base must be estimated. It is hard to understand why past demand and/or new mission requirements will not generate these numbers. If the Air Force cannot forecast their geographic needs with some degree of accuracy, the annual budget requirement for aircraft tires is suspect whether Source-to-User or centralized warehousing is used.

Third, reception and storage capability must exist at each operational base. Capabilities may have to be realigned to meet the needs of the Source-to-User concept, since reception and/or storage requirements may change depending on the frequency of the shipments and the geographic distance between the supplier and the operational base.

Fourth, there must be an adequate information feedback loop in the inventory management system that signifies the

completion of the procurement/repair and delivery system. This will provide the visibility of the total inventory for the Item Manager and the procurement/contracting agency.

Thesis Source

In early October 1985, the Air Force Institute of Technology (AFIT), School of Systems and Logistics, received a letter from the Directorate of Materiel Management (MMI), Headquarters, Ogden Air Logistics Center (ALC), Hill AFB, Utah. The letter proposed that an AFIT thesis be accomplished on the subject of "Source-to-User Concept" (14).

The concept, as outlined in the letter, would permit aircraft tires to be shipped directly from the source of procurement/repair to using bases rather than to centralized storage and subsequent transhipment to users. The Source-to-User concept was briefly tested in 1981, but the test was aborted when the test procedures became disruptive to inventory and distribution managers at the central warehouses and base-level. Total logistics savings were inconclusive due to the short duration of the test; however, proponents of the concept still believe implementation will result in transportation, storage, and handling savings and speed items to the users (14).

Problem Statement

The Air Force buys and recaps aircraft tires using vari-

ous commercial sources. The tires are all delivered to one of two central storage locations: Ogden Air Logistics Center (ALC) at Hill AFB, Utah or Wright-Patterson AFB, Ohio. The tires must be receipted for, processed, and stored while waiting for requisitions from using bases in the continental United States and several overseas locations. Once requisitions are received, the tires must be pulled from storage, processed, and shipped again. Often this second shipment is back to bases near the initial source of procurement. Supporters of the current centralized warehousing concept prefer the established method of asset management that results when vendors ship tires to the two central warehouses. This apparently leads to easier accountability of the tires and reduces the amount of communication and coordination between the Air Force and the vendor. The problem is that the existing system results in multiple processing, handling, storage, and shipping activities. This research will examine the contention that considerable savings in costs and time can be realized by having the vendor ship the tires directly to the bases that use them.

Scope

The scope of this thesis will permit the examination of only one commodity entering the Air Force supply system: aircraft tires. The primary reason for this focus is that the tasking letter from Ogden ALC/MMI specifically referred to

aircraft tires and the attempted test of the concept in 1981. Additionally, aircraft tires are centrally warehoused at only two locations, reducing the variability of procedures and costs that must be evaluated. There appears to be general agreement between the Source-to-User concept advocates and the centralized warehouse concept supporters that the central storage locations must maintain a stock of tires for wartime and emergency conditions. The difference of opinion centers around the tires needed for recurring operations at base-level.

Summary

The principle of Source-to-User is based on the idea that items should be shipped from the point of procurement or repair directly to the using bases rather than to an central storage location. This is especially true when the using bases' requirements are well established and the using bases have adquate reception and storage capability.

The Source-to-User concept would preclude in-processing, stockage, stock withdrawal, and shipment activities at the central storage location. Advocates believe that direct shipment to the point of consumption will minimize pipeline time and enhance overall capability at reduced logistics costs. Chapter II will look at the logistics disciplines and their role in the Source-to-User concept. It will also examine the history behind aircraft tires and Source-to-User. A

review of current literature will offer new insight into emerging logistics doctrine. Articles on the Just-in-Time philosophy show similiarities between it and the Source-to-User concept.

II. Historical Development

Who's Involved

Which of the logistics functions are involved in making the Source-to-User concept work? What are their related roles and how do these differ from their function under the centralized warehouse system commonly used today? These questions are answered in the short synopsis of each functional discipline below and displayed in Figure 1.

The Item Manager (IM) at the supporting Air Logistics Center will continue to be the focal point for origination, consolidating and overall management of the commodity. Using information at their disposal, they must identify requirements, quantify those requirements, and anticipate the needs of the users at the operational level. If this can be done efficiently and accurately, then the user will have ready access to the commodity. Under the Source-to-User concept the Item Managers would generate procurement requests or repair action requests (for reparables) for action by the Department of Defense (DOD) Procurement/Contracting agencies. They would include a description of the item to be procured/repaired, the total number needed, a time frame for requirements to be met, and a distribution plan that tells the manufacturer or repairing agencies where to ship new or serviceable commodities (5:10-11).

The Procurement/Contracting agency must match the re-

quirement request with a qualified supplier so that the needs of the Air Force can be met in a timely and efficient manner with a quality product. In awarding a contract to a qualified vendor, the Procurement/Contracting agencies must consider the impact that distribution and transportation costs will have on the commodity. Thus, a Transportation Evaluation is requested, based upon the distribution information received from the Item Manager (4:47-8).

The Transportation community provides an evaluation of transportation costs based on the proposed point of procurement and first destination of delivery within the Air Force. In some cases these transportation costs may help decide which bid (when multiple contractors are involved) is most appropriate for Air Force consideration. This evaluation is provided to Procurement/Contracting at their request (4:47-21).

When the decision to award a contract to a particular manufacturer or repair agency is made, the Air Force must be ready to receipt for, store, and provide further distribution of the new commodity. Under the Source-to-User concept, this responsibility would be transferred from the supply functions at the Air Logistics Center, or alternate storage locations, to those at each operational base. It has been proposed that this would more quickly place the commodity where it is needed and eliminate the interim processing, handling, storing, and transportation commonly associated with the centralized warehouse concept (12).

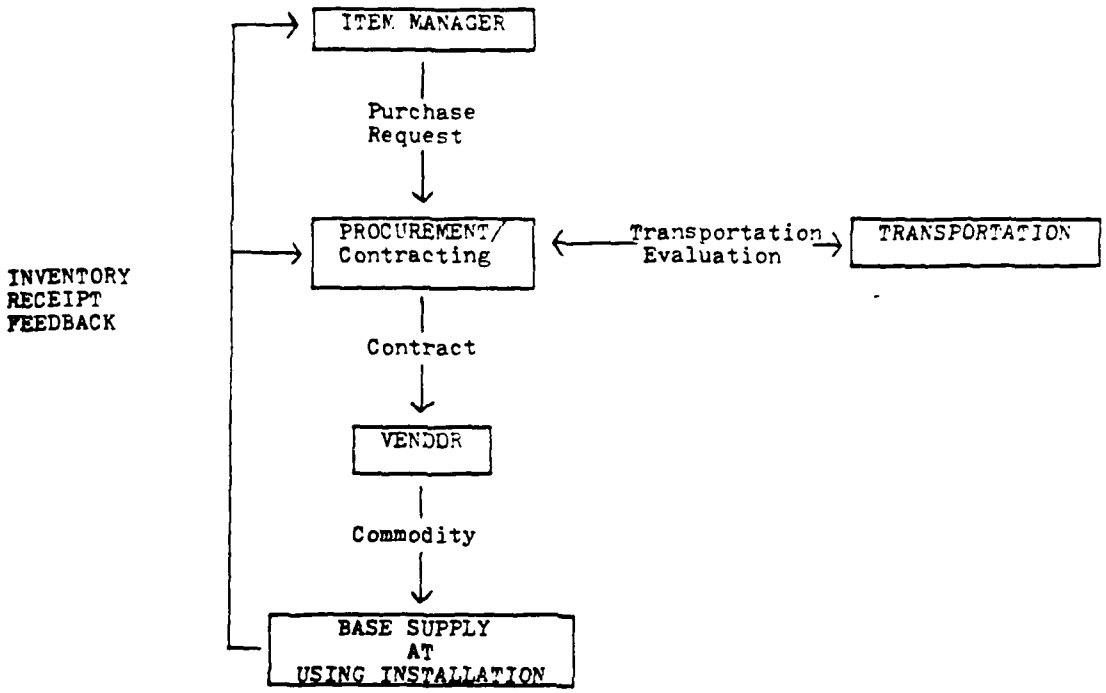

Figure 1. Source-to-User Structure

Once the Source-to-User concept has been implemented and enacted from the Item Manager to the Supply function at an operational base, the sequence is complete with the exception of feedback. The Item Manager and the procurement/contracting agency must, in some way, be made aware that the deliveries have been finalized in order that the Air Force inventory totals and commodity locations can be updated (5:10-12).

Background

The Air Force buys and recaps aircraft tires using a variety of vendors. The tires are then delivered to two central storage locations: Odgen Air Logistics Center, Utah or Wright-Patterson AFB, Ohio. They are receipted for, processed, and stored awaiting requisitions from using bases in the continental United States and several overseas locations. Once requisitions are received, the tires must be pulled from storage, processed, and shipped again. An alternative concept, Source-to-User, would permit the shipment of the tires directly to the using bases. This change in distribution policy could possibly offer cost and time savings. There are potental savings in transportation, manpower, material handling equipment, and facilities. Additionally, there are expected efficiencies in the administrative and processing areas.

In July 1981, the HQ Ogden Materiel Management Directorate and the Distribution Directorate began planning a field-test of the Source-to-User concept for KC-135 aircraft tires. The test was permitted to run between October and December 1981. Transportation savings over the 90 day test period were impressive. By shipping only 260 tires from a commercial recapper directly to five bases, a savings of $11,200 was realized (7). A recommendation by the Transportation Office (DST) to expand the test to other using locations was delayed by the Inventory Management Office (MMI) due to ad-

ministrative and contractual problems encountered during the first part of the field-test. For all practical purposes, the field-test was over at that time. Discussion continued about the Source-to-User concept and how it might be applied, but essentially there was no further testing of the program (15).

A number of problems surfaced as a result of this trial effort. First, the field-test required manual effort by central storage and base-level distribution personnel. The automated systems associated with the central warehouse system could not, at that time, be modified for the test. In addition, the Item Manager lost visibilty of some shipment and status data. This, too, was due to the lack of availability of a data system adapted to Source-to-User. Furthermore, the field-test proved disruptive to base-level supply operations. It is unclear if this problem stemmed from a lack of guidance or from a fundamental incompatibility between the old and new concepts. The test also created varied stock conditions at base-level, with shortages at some locations and excess assets at others. This, in-turn, created a need for more communication between the operational base and the Item Manager. When shortages occurred at base-level, off-line requisitions had to be initiated. Amending shipping instructions to the contractor required additional effort by the Item Manager, while follow-ups required even more effort (16).

Finally, on 17 August 1983, one year and eight months

after the aborted field-test, the Inventory Management Office announced that the Source-to-User working group had been dissolved and that all efforts to implement the Source-to-User concept for aircraft tires had been abandoned (18).

Literature Review

An initial literature review indicates that there is little published information having a direct bearing on the Source-to-User concept. Although the Source-to-User concept has implications for the entire Air Force distribution system, it was originated as and remains, an Air Force Logistics Command (AFLC) issue with little exposure outside the Ogden ALC staff. As noted previously, the earliest dated material specifically referring to the concept was generated in July 1981 (17). These documents were messages and letters organizing the ill-fated field-test later that year. Follow-on correspondence continued intermittently through August 1983, when Ogden ALC/MMI announced the dissolution of the Source-to-User working group and abandonment of all implementation efforts (18). The Director of Distribution (DS) made one last appeal to the Director of Materiel Mangagement (MM) in an effort to revive the issue on 15 February 1984 (12); however MM's reply, dated 28 February 1984 (13), indicated the concept was not considered to be in the best interest of the Air Force.

Only one other document speaks directly to the Source-to-

User concept. It is an Interim Message Change (IMC) 86-1 to AFLCR/AFSCR 57-5. It advises that the proper distribution decision is an important part of satisfying the requirement of urgent Purchase Requests (PRs). It recommends that strong considerations be given to consigning all or part of the purchase against outstanding requisitions for direct shipment to field activities. The final decision is left to the initiator of the Purchase Request (11).

Regardless of the limited literature that directly addresses the Source-to-User concept, there are other references that discuss distribution and logistics goals and objectives that parallel those of Source-to-User. These documents provide insight to considerations Air Force managers should make when comparing the Source-to-User concept to centralized warehousing.

In his article, "Air Force Logistics Doctrine", Major James D. Gorby reminds us that, as logisticians, our task is to determine resource requirements, procure those resources and then to transport, store, allocate and maintain them in order that our forces are efficient and effective (8:24). We must be efficient in holding the line on logistics costs so that maximum funding support can be directed to those critical resources that will make the ultimate difference in combat. We must be effective in that we ensure that adequate resources are located where they can be readily used by our combat forces to achieve mission objectives. Policy and procedures must be flexible enough to meet changes in the opera-

tional environment, thus the question of whether the Source-to-User concept can better permit us to reach the above goals is a viable one.

Lieutenant Colonel William T. McDaniel, Jr., in his article, "The Doctrinal Challenge: A Rebirth of Logistics Thought", recognizes that the formulation of a new doctrine for new times will force logisticians to address issues they have been unable or unwilling to deal with at the policy or procedure level (23:14). Therefore, challenging the merits of an existing distribution system like centralized warehousing is appropriate at a time when Defense appropriations are being scrutinized heavily and accomodations to logistics support spending are needed.

Two major functional areas of logistics, Supply and Transportation, have set their strategy toward a flexible system of procedures. Supply, with its Supply System Strategic Plan, has shown its intent to improve mission support and its response to mission requirements by emphasizing and exploiting new methodologies/technologies in improving procedures, communications, and interfaces with a total system approach (20:8). One of the keystone operational concepts is that inventory management will be accomplished by centrally integrated material management authorities and that there will be a continuing effort to relocate aggregate spares closest to points of use (20:5).

Transportation's objective of getting the right thing to the right place at the right time compliments the supply ef-

fort above. The Defense Transportation System: Giving Direction to Change, a technical report published by transportation officers at the Air Force Institute of Technology focuses on the need for flexibility (9:182). This is especially true, considering the Defense Transportation System's significant involvement with, and reliance on, the commercial transportation community.

The Acquisition portion of the Logistics community is under severe pressure to decrease costs. The requirement to establish Competition Advocacy programs in all the services is a perfect example of the attention being given to overall reductions in material and systems costs. Numerous articles have been written describing the impact of Acquisition program changes on the overall logistics effort. Two notable articles from the periodical Government Executive were selected for their currency and clarity in supporting and challenging the increased competitiveness and drive to reduce costs in defense contracting. The article, "Bullets, Boilers and Business Basics", by RAdm Stuart F. Platt, the first of the services competition advocates, defends competition as desirable by the military and industry alike. He contends that effective competition will "control costs and improve quality" (25:28). The counter argument to RAdm Platt's is entitled, "Competition and Weapons", by retired Vice Admiral John T. Hayward. He cautions against seeking low overall cost based on low-bid acquisition and advocates streamlining distribution and other elements of the logistics system as a

method to reach reduced costs overall (10:23).

Chapter 14 of the Air Force's Global Assessment document is titled "Logistics and Engineering". It calls for an "assured critical assets distribution system" and places a heavy reliance on prepositioned assets (27:14-6). It anticipates that future conflicts would create unpredictable distribution situations that could not be accomodated by the current centralized warehouse asset distribution system (27:14-6). Consequently, it recommends an evolving materiel management and distribution system that will meet wartime requirements while satisfying peacetime schedules as well.

While the above documents either refer to the Source-to-User concept or to military logistics/distribution issues with parallel objectives, the following commercially oriented articles focus on a distribution method that meets the goals of Source-to-User and then goes one step further. The subject is, of course, Just-in-Time (JIT). This logistics concept has received a lot of attention from the United States industrial sector since being acclaimed as one of the primary reasons for Japanese industrial success (26:3). While it is not considered a panacea for logistics/distribution needs within the Air Force, the Just-in-Time concept is similar in many ways to the Source-to-User concept being considered in this research. Portions of the Just-in-Time concept, especially as it relates to inventory levels, cost and customer/supplier relationships, should be understood. The Just-in-Time concept focuses on reducing the inventory transit time,

the amount of inventory, and the capital investment tied to inventory (26:18). It reduces handling, storage, processing, and develops supporting, rather than adversarial relationships between the suppliers and the users (34:48). With this in mind, five articles have been selected for inclusion here.

The first, by Richard C. Walleigh, looks at the most common excuses used by American industry to explain why they don't use the Just-in-Time concept for inventory and production scheduling. Many of the excuses are the same as those given by military managers in defending their large stocks of inventory. Certainly, the Just-in-Time concept will not meet all military requirements, yet some of the excuses listed in this article and echoed by our military managers defy logic (30:38-54).

The second article, by The Yankee Group, addresses the subject of direct labor costs as an element of the overall cost of manufacturing. The authors of this article suggest that no more than 10% of the typical total manufacturing cost is direct labor. Thus, in many cases American industry could not be competitive if their direct labor costs were zero. Savings should be looked for in the inventory and manufacturing flow process (32:3). Consider the example of the aircraft tire. What portion of the total cost is consumed by the direct labor of mounting the tire? Very little; most of the costs are tied up in acquisition and inventory handling.

The third, from Modern Materials Handling Magazine, makes the assertion that maintaining a stock of more material than

needed is just as bad as a shortage of material. This should be taken in the context that excess material often permits and encourages management to avoid identifying and solving problems in material quality, scheduling, and supplier/buyer relationships. As applied to the military, these problems, if overlooked, could be devastating during a crisis (34:47-49).

The fourth article, written by G. H. Manoochehri, is important because it addresses what Just-in-Time is and then puts it in the context of the supplier rather than the buyer. Understanding the nature of the supplier/buyer relationships allows practitioners to expand the benefits of Just-in-Time. With virtually no safety stock to off-set inefficiencies, the timing, quantity and quality of the material or services provided by the supplier must be dead on. For buyers and suppliers alike, the ones that are able to adapt may be the ones that survive (22:16-21).

The last article on Just-in-Time was written by Glenn T. Wilson. Rather than dwelling on the optimistic opportunities of applying Just-in-Time to American production, he takes a more pragmatic approach. The risks of Just-in-Time, especially during the initial application period and the potential costs of the ever-present Murphy's law can spell disaster. Additionally, he suggests that American managers may not be able to cope with the close and demanding management style of Just-in-Time, seeking relief through sickness, absence and early burnout (32:134-141).

The five articles above articulate the complexity and consequences of the Just-in-Time concept. Source-to-User and Just-in-Time share many of the same objectives and offer similar benefits. Just-in-Time is, indeed, a management philosophy, like Source-to-User, that will, if pushed to its extreme, tie all elements of the source and user chain together in a cooperative effort (22:17). Just-in-Time is about the continous flow of material where inventories have been reduced in size for better management visibility and control (32:3). These small lot sizes permit quick response to quality and delivery problems (22:17). In essence, Just-in-Time and Source-to-User are about time/place utility. In each case, the buyer must establish his requirements schedules (22:20). He must then contract with a vendor to provide the needed resources at exactly the time and place needed to meet that schedule (22:18). Buffer stocks are eliminated, so the vendor realizes immediately that his performance in supplying quality, on time, will mean success or failure for the customer (22:17). Should the vendor have any desire for repeat business (and most do), he will attend to this business of quality and timeliness in a serious manner (22:19). For his part, the buyer will select a supplier that can be relied upon (34:48). If the buyer is satisfied with the reliability of the vendor, there will be an incentive to reward the vendor with future contracts, thus establishing a longer term relationship (22:19). Management must understand that in the early stages after implementation of Just-in-Time or Source-

to-User there may be some interruptions to resolve conflicts or schedules (30:52). These conflicts will diminish as the supplier and user schedules are synchronized.

Summary

This chapter examined the roles that would be played by the various logistics disciplines if the Source-to-User concept were applied. Then the background material of Source-to-User was reviewed to better understand the philosophies both for and against the issue. The literature review highlighted key documents from HQ Ogden ALC during their Source-to-User field-test and subsequent decision to abandon Source-to-User as a viable approach to distribution. Also reviewed were doctrinal and procedural documents which impacted the decision to conduct this research. Finally, commercial articles describing the pros and cons of Just-in-Time, a concept that, in many respects parallels the Source-to-User concept, were presented. The next chapter looks at the methods that will be used to gather data and make comparisons between Source-to-User and the centralized warehouse system.

III. Methodology

HQ AFLC Support

When the research request was received from Ogden ALC, HQ AFLC/DS/MM were questioned to insure that this effort would not duplicate or interfere with any initiative currently underway. Points of contact were assigned in the Directorate of Transportation, the Directorate of Materiel Management, and the Directorate of Supply. Later, a point of contact in the Directorate of Contracting was established to advise on matters in that functional area.

These directorate representatives initially advised on the historical perspectives of Source-to-User and assisted in interpreting the regulations and procedures governing the current system. They also provided information about programs and issues that had goals and concerns which paralleled those of Source-to-User. These helped when comparing the objectives of central warehousing and the Source-to-User concept. Finally, these points of contact participated in a Delphi Process that recorded their professional opinion regarding the potential impact of implementing a Source-to-User concept for distributing aircraft tires. The Delphi Process is described in a subsequent subsection of this chapter with the results outlined in Chapter IV, Analysis and Findings.

Field Visit

After Headquarters AFLC agreed to assist in the project, the author went on Temporary Duty (TDY) to Ogden Air Logistics Center and discussed the thesis topic with representatives of the Directorates of Materiel Management, Transportation, and Procurement.

The circumstances surrounding the 1981 field-test were examined to the extent possible. Most of the key participants were not available, but some representatives within the Directorates of Materiel Management and Transportation were able to recall elements of the test with varying degrees of detail. The Materiel Management personnel remembered the test as an exercise which offered recognized savings in transportation dollars. However, it was also remembered as being fraught with communication shortfalls and requiring constant manual input/monitoring between the Item Manager, procurement, vendor, and base-level supply (at the using installation). The difference in inventory information-flow, resulting from the aircraft tires being shipped directly to the using installation created a need for closer management by Materiel Management and drove them to abort the test after only ninety days.

Transportation officials, on the other hand, remembered the test for the $11,200 saved in transportation funds, and the perceived savings in depot resources and reduced transit times. They felt the test should have been expanded to other

bases and additional time allowed for procedures to either smooth out or be modified as necessary.

Both Materiel Management and Transportation personnel agreed that it was difficult to forecast which bases would have back-orders for tires when the new or recapped aircraft tires became available for shipment from the source to the using installations. These back-orders should, theoretically, establish priority of shipment for the new/recapped tires to the using bases. Transportation maintains, however, that established procedures for Amended Shipping Instructions (ASIs), as defined in AFM 67-1, Vol III, Part One, permit, and encourage, direct shipment of goods for which known requirements exist. As the goods become available for shipment from the source, the Item Manager makes distribution decisions so that the commodities are shipped to the operational bases rather than to central storage for transhipment.

The Materiel Management community found Amended Shipping Instructions to be labor intensive, costly, and disruptive to the distibution process. They objected to the administrative tasks associated with the forms, the additional communication required with contracting and the vendor and the general changing of plans made earlier. Transportation personnel saw Amended Shipping Instructions as a necessary management tool to streamline the delivery of aircraft tires to the using installation.

Other Agency Support

Hoping to find some reference, either pro or con, with regard to the Source-to-User concept, the local Audit Agency and Management Engineering Team were contacted. The Audit Agency had not addressed Source-to-User directly, but were involved in a preliminary look at aircraft tire management practices. They showed an interest in this research and, as a result, a joint visit to the Wright-Patterson Aircraft Tire Storage and Distribution warehouse was arranged. A tour of the facility with the warehouse foreman and discussions with the section supervisor provided insight into the distribution philosophy currently in use.

The Management Engineering Team had performed a Functional Review Study on the Aircraft Storage and Distribution Point and had, as a side issue, noted that the Navy uses a hybrid version of the Source-to-User distribution system (6). Subsequent contact with the Naval Supply Center at Philadelphia, Pennsylvania and the Goodyear Tire and Rubber Company at Akron, Ohio permitted some indirect comparisons of the Navy distribution program and the Air Force central warehouse system. Findings from these contacts with the Audit Agency, Wright-Patterson Aircraft Tire Warehouse, Management Engineering, Naval Supply Center, and Goodyear are discussed in The Investigative Questions section of chapter IV.

Delphi Process

Some logistics concepts appear to have obvious merit. Logisticians tend to readily agree with the implementation of these concepts and then observe the success, or the lack thereof, that the concept encounters when applied to the management area. Some concepts, however, generate enough questions that considerable thought and discussion takes place before implementation is attempted. One such concept is Source-to-User. It would permit aircraft tires purchased or recapped for the Air Force to be delivered directly to the using installations rather than to Air Logistics Centers for later transhipment. On the surface, the Source-to-User concept appears to have considerable merit. It would seem to be quicker, cheaper, and a more efficient method of distribution of aircraft tires, yet it has not been fully adopted. In fact, the vast majority of aircraft tires are still distributed using the centralized warehouse concept of the Ogden Air Logistics Center and its alternate storage location, Wright-Patterson AFB. Only on rare occasions are shipping instructions amended for direct shipment. The Source-to-User concept does not question the fact that the central storage locations should remain the repository for wartime and emergency stocks of aircraft tires. It does question, however, if daily or recurring needs for aircraft tires could not be better met by a direct distribution flow from the source of procurement to the installation of use.

Evaluating a concept like Source-to-User without a full field-test is a difficult task. One method often used in cases such as this is to gather opinions from knowledgeable sources that would be involved in the implementation of such a concept. These professional opinions can be gathered as a result of panels, committees or other group efforts, but sometimes these methods result in the consensus being driven by either an outspoken advocate or opponent of the concept. An alternative to a group generated consensus is the Delphi process. This process permits the individual to offer an opinion without pressure from others in the group. Each person is then permitted to review the anonymous input of the other participants and record changes, if necessary, to his original input. This provides a controlled and honest opinion from knowledgeable participants (3:3).

In gathering data on the Source-to-User concept, a Delphi process was conducted. Participants in the process were representatives of the HQ AFLC staff: the Directorates of Materiel Management, Transportation, Supply, and Procurement. Their professional opinions are analyzed in Chapter IV, Analysis and Findings.

Investigative Questions

A look at the management objectives of a distribution system reveals a distinct functional goal. A distribution system should offer time-place utility (9:157). That is, it

should place the commodity at its point of use when it is needed at the lowest possible cost. This overall goal can be broken down into the specifics of the environment of a particular commodity and the purpose it serves. Aircraft tires, in this case, are a unique commodity with a highly restricted use. They serve a limited segment of the Air Force mission and are valued most when installed on an aircraft. Prior to that, the tires actually constitute a liability requiring processing, storage, and handling as they are moved to the aircraft. Thus, the Air Force should strive to reduce that portion of the aircraft tire's life when it is a liability, yet still have the tire ready for immediate use.

If the Source-to-User concept is to reduce the overall costs and pipeline time associated with shipping aircraft tires the following investigative questions must be addressed:

1. Can a less expensive mode of transportation be used when routinely moving aircraft tires directly to the base of use? Pushing the tires to the using installation may be better than having to respond to urgent requests.

2. Will the Source-to-User concept permit a consolidated shipment of tires to the users rather than multiple shipments in response to requistions? Since some bases are located in the same geographic region, this may be a possibility.

3. Can processing times and costs be decreased with the Source-to-User concept? Administrative costs and the associated resources needed for receipting and storing stock are often overlooked.

4. Will direct shipments permit better use of central storage facilities? These are scarce resources at best.

5. Would the Source-to-User concept result in less dependence on LOGAIR (a contract air delivery system servicing many bases in the United States)? This premium mode of transportation should not be considered as a sunk cost, nor should it be used to ship commodities which can be effectively moved by other modes.

6. Can distribution manpower resources at the central storage location be better utilized under the Source-to-User concept? If manpower is a sensitive issue then correct assignment of existing manpower resources is critical.

7. Will the Source-to-User concept save transportation dollars? Efficient use of both initial and follow-on shipment funds is essential.

8. Can delivery times be enhanced? Readiness and customer service should still be our prime goal.

9. What trade-offs would be necessary to achieve the gains above and what new problems, if any, would be generated with a Source-to-User concept.

The investigative questions above comprise the heart of the issue in considering the Source-to-User concept versus centralized warehousing. Discussion and analysis of these questions can be found in Chapter IV, Analysis and Findings.

Summary

Points of contact were established in the HQ AFLC Directorates of Materiel Management, Transportation, Supply, and

Procurement. Their primary purpose was to assist in interpretation of policy/procedures and to advise of other command initiatives that paralleled Source-to-User objectives. A visit to HQ Ogden ALC and it's Directorates of Materiel Management and Transportation provided a review of the 1981 field-test and current attitudes toward Source-to-User. An explanation of the Delphi Process showed why it could assist in collecting the professional opinion input so critical to this research. In the absence of a complete field-test, this opinion assumes increasing importance. Based on the input from HQ AFLC and HQ Ogden ALC, a list of investigative questions was created. These are key comparisons between the Source-to-User and centralized warehousing concepts and vital to forecasting the Source-to-User concept's potential to provide better time/place utility for aircraft tires. In the next chapter, Analysis and Findings, the results of the Delphi Process are reviewed and the investigative questions are considered and discussed.

IV. Analysis and Findings

The Delphi Process (33)

The use of the Delphi Process to solicit professional opinion from experienced logistics staff members served as a time efficient and productive method of data collection. It was efficient in that it was completed in a short period of time without serious interruption to the participant's daily schedule. It was productive because it provided useful and unexpected insights into the potential benefits and drawbacks of the Source-to-User concept. The opinion of each participant was sought on the merits of the Source-to-User concept and a Delphi worksheet assisted in recording their input (See Appendix).

As noted before, complete anonymity was assured and each participant was given the opportunity to revise their initial input, if necessary, after they had reviewed the inputs of the other participants. The final iteration by all participants then constituted the observed opinion. The responses ranged from negative to positive, while some were non-committal. Comments in support of their agreement or disagreement were solicited. Two short scenarios were offered for comparision: one described the centralized warehouse concept while the other described the Source-to-User concept. Participants were asked to read them and offer their opinions to the statements that followed. There were twelve responses

and the process was not designed to be a lengthy or difficult one. The analysis below reviews the Source-to-User reference statements to which the participants were asked to agree or disagree. Then the amount of agreement/disagreement shown by the respondents is discussed. The comments of the participants are referred to for emphasis or in support of a unique perception of Source-to-User.

In their first response, the participants were asked if they agreed or disagreed that a push system from the contractor would be more efficient than a pull system based on requisitions. Responses showed agreement on this point. Comments emphasized that with a push system, pipeline times would be shortened thus reducing overall inventory quantities over time. Pushing the tires from the source to the using installation should minimize handling, potential loss or damage, and save on transhipment costs. It was anticipated that service to the user would improve. Other comments, however, warned of the need for adequate warehousing at the using installation and the need for overall inventory visibility and control by the Item Manager.

The second response recorded the participants agreement/-disagreement on whether the Source-to-User concept would reduce requisition documentation at the central storage location and base-level. Respondents offered no clear consensus on this issue. Advocates noted that the central storage locations would not have to initiate a shipment to using installations and that requisitions would only be required to

supplement the push system; however, there was concern that generation of data requirements at the using bases might keep base-level documentation tasks from being reduced.

When asked to agree or disagree on the possibility of a reduction of in-checking and stock withdrawal at central storage locations, the respondents readily agreed. Although some stock would still have to come to central storage to fullfill wartime and contingency requirements, the remaining would be checked-in at the user installation. The only stock withdrawal for receiving requirements would be by base-level personnel at the time of issue. Essentially, less inventory in central storage would mean less processing time.

In their fourth response, the participants acknowledged that the Source-to-User concept would entail fewer requirements for material handling equipment and operators at central storage locations. They could not, however, agree on whether this would provide any significant increase in the level of support afforded other commodities. There appeared to be some concern that reducing the central storage inventory would automatically result in lost equipment and operator authorizations.

Agreement was more consistent on the fifth response. Participants showed no disagreement that the Source-to-User concept would permit better and more flexible use of the central warehouse space. As the respondents noted, aircraft tires are a bulky item, thus reducing the centralized inventory would lead to an significant increase in available

storage. Certainly, the need for space at base-level may increase to some degree, but eventually the Air Force would try to syncronyze the flow of tires from the source to better match base needs.

The sixth response showed the participant's agreement with the concept's potential to save overall transportation dollars. There was the caution that individual shipments from the source to the using installations may actually increase the cost to deliver the tires to the Air Force; however, since the initial shipment will actually be to the ultimate user, there will be a total saving of transhipment costs. Administrative costs associated with the normal transhipment costs would also be avoided, while on-base transportation, at the central storage site, could be reduced as well.

There was less agreement regarding the potential of Source-to-User to permit the use of less expensive modes of transportation. It was felt, however, that priority motor transportation would replace shipment by LOGAIR. Still, the actual pipeline time from the source to the user would be reduced. The option of using government owned vehicles and government operators was recommended in those instances where the source of procurement/repair is near the user installation.

The eighth response by the participants reflected no disagreement with the idea that any LOGAIR service relinquished by virtue of the Source-to-User concept would be readily con-

sumed by other priority cargo. This would reduce pipeline times for those commodities still controlled through the centralized warehouse concept. These reduced pipelines and improved Item Manager response time are directly related to other readiness goals.

In their ninth response, there was no disagreement among the participants that using the Source-to-User concept to by-pass the central warehouse would permit movement of the tires with fewer transportation forms. There would only be one Government Bill of Lading (GBL) per shipment and it would be generated at the source of procurement or repair. Only one shipment label and associated documentation would have to be originated to move the tires to each using installation.

It then follows, and the participants agreed, that reducing the number of tires being processed through the centralized shipping department would likely enhance the service offered to other commodities still centrally managed. The degree of improved service would have to be measured, but the extra availability of processing time would be undeniable. This type of streamlining can be extremely important in work areas already stressed by high volumes of activity.

Savings in inventory forms documentation were not readily acknowledged by the participants. While noting that the Source-to-User concept would reduce the centralized inventory of aircraft tires, the participants concluded that since some inventory would remain for wartime and contingency requirements, there would have to be a complete set of inventory

forms on file. Comments from the participants indicated that time savings might accrue in the maintenance of these forms due to the reduced tire inventory. This could have a positive impact on the completeness and acccuracy of inventory information.

For their twelfth and last response, the participants were in full and complete agreement that the Source-to-User concept offered enough potential savings that a well orchestrated field-test should be conducted. Comments suggested that, although less manpower, paperwork, time, and transportation requirements were expected from a Source-to-User concept, the extent of actual savings would have to be carefully evaluated. Some respondents recommended expanding the test to commodities other than tires since it was felt that some benefits might be masked by limiting the sample size to just one commodity. Benefits should be recognized in light of communications, data processing, and information system improvements. Also, the test could reflect needed changes in the associated logistics agencies and functions of the distribution system. The inputs included a warning that the Source-to-User concept and the field-test would likely face a stiff challenge from supporters of the status quo.

The Investigative Questions

After reviewing the documentation still available from the 1981 field-test of Source-to-User, the regulations and

procedures applicable to materiel management and distribution of Air Force commodities, and the military/commercial issues that paralleled the objectives of the Source-to-User concept, the investigative questions were addressed. The findings here echo those of the Delphi Process presented earlier. Cautious reasoning and an urgent need for logistics improvements indicates there are significant benefits to be had by adopting a Source-to-User concept for distributing aircraft tires. Each investigative question is listed below with analysis following:

> 1. Can a less expensive mode of transportation be used when routinely moving aircraft tires directly to the base of use? Pushing the tires to the using installation may be better than having to respond to urgent requests.

With the current central warehouse system, transportation of the tires from the source to the central storage location is accomplished by either truck or rail (1). The cost of the shipment depends on the quantity of tires shipped. A full truck load or railcar load is less expensive per tire than partially filled truck or railcar loads. Once received at the central warehouse, the tires are then transhipped, at some point in time, to the users at operational bases. Many shipments, perhaps as much as 80%, are shipped on LOGAIR, a premium mode of transportation (1). Under the Source-to-User concept, the source would have to make frequent and smaller shipments to users at operational bases rather than consoli-

dated shipments to the two Air Force central storage locations. Truck and rail would still be the selected mode; however, since the number of shipments would increase, the Air Force would face an incremental increase in cost. The tires would, however, now be at the point of use. No further shipments would be necessary, thus the LOGAIR shipment from central warehouse to the user would not be needed. It is likely that this savings would more than offset the incremental costs. Once tire production and shipment from the source is synchronized to the requirements of the users, there should be virtually no urgent, daily need requisitions to be filled from central storage or the source.

The Navy uses rail and motor carrier to deliver its aircraft tires directly to its using installations. The Goodyear Tire and Rubber Company ships tires to thirty-nine Navy and Marine locations while only shipping to two Air Force locations, Hill AFB and Wright-Patterson AFB (21). Although data was not available for direct cost comparison, it is probably safe to assume that Navy spends more per tire to ship to thirty-nine locations than Air Force does to two locations only. However, the Navy now has its new tires where they will be used while the Air Force must make yet another shipment, often on the premium mode of LOGAIR (1).

2. Will the Source-to-User concept permit consolidated shipments of tires to the users rather than multiple shipments in response to requisitions? Since some bases are located in the same geographic region, this may be a possibility.

If the Source-to-User concept was implemented, not all shipments from the source would have to be separate, single shipments to each user. If the using bases were located relatively close together, consolidation of two or more shipments on a truck could permit a full truck load to depart the source then make enroute deliveries to the users. This would permit the use of lower price truck-load shipments rather than the separate and more expensive less-than-truck-load shipments (19). Once again, the tires would be delivered to their final destination: the user. Consequently, there would be no requirement for a second shipment to get the tires from a central warehouse to the user.

3. Can processing times and costs be decreased with the Source-to-User concept? Administrative costs and the associated resources needed for receipting and storing stock are often overlooked.

The central warehousing system requires that aircraft tires be delivered from a supplier to one of two Air Force storage locations. There they are receipted for, inspected for shipping damage, and placed in stock. As user requirements at base-level are received and acknowledged, the tires are removed from stock and transhipped to the using installation. Here, the tires are again receipted for, inspected for shipping damage, and placed in stock until the time of issue. With the Source-to-User concept, most, if not all, of the tires would be shipped directly to the using base (a portion of the tires may be shipped to the central storage loca-

tion if required for wartime or contingency stock). This movement of the tires directly to the using installation would eliminate the receipt, inspection, and stockage process at the storage location for the majority of aircraft tires (19). All resource costs (manpower, facility, material handling equipment, and documentation) associated with the receipt and transhipment would be saved. Additionally, all processing and transhipment time for the above would be saved.

4. Will direct shipments permit better use of central storage facilities? These are scarce resources at best.

Currently there are approximately 180,000 tires on stock at Hill AFB and Wright-Patterson AFB (6). By reducing the number of tires at the storage locations, the facilities currently used for aircraft tire storage could be diverted to other uses. Some aircraft tires at the central storage locations would still be required for wartime and contingency stock (2). Since aircraft tires are large and bulky, any significant reduction in storage would result in vast areas of warehouse space becoming available. Shifting the burden of storage to the user installation should not cause undue alarm. Each of the many using installations would have to absorb only a small portion of the total stockage area saved. Eventually, as management synchronized aircraft tire deliveries to the user's requirements, the base-level stockage re-

quirement should settle near current levels.

> 5. Would the Source-to-User concept result in less dependence on LOGAIR (a contract air delivery system servicing many bases in the United States)? This premium mode of transportation should not be considered as a sunk cost, nor should it be used to ship other commodities which can be effectively moved by other modes.

Today, aircraft tires are often shipped from the central storage location to the user via LOGAIR (one tire storage location estimates 80% of outbound shipments are by LOGAIR) (1). With the Source-to-User concept, only those tires necessary for contingency requirements would be shipped from the central storage location to the using installations. All routine and recurring user requirements could be met with truck and rail shipments from the source. As noted earlier, the Navy ships its aircraft tires direct from the source to its using installations via rail and motor carrier, thus avoiding premium air transportation (24). Therefore, it is likely that the number of LOGAIR flights required to transport aircraft tires would be reduced. As LOGAIR cargo space is relinquished from the aircraft tire support role it will become available for movement of other critical items needing premium transportation. Since aircraft tires are often large, bulky, and heavy, the new availability of space should be significant. These savings would act as a force multiplier for the LOGAIR system.

6. Can distribution manpower resources at the central storage location be better utilized under the Source-to-User concept? If manpower is a sensitive issue then correct assignment of existing manpower resources is critical.

The central storage manpower resources, currently dedicated to handling, storing, and processing aircraft tires, serve two basic functions. They receive, store, and ship aircraft tires in support of wartime and contingencies and they receive, store, and ship aircraft tires in support of daily or recurring needs. Deleting the necessity for these manpower resources to attend to the daily or recurring needs of the using installations should enhance their ability to attend to the wartime and contingency requirements. If an actual redistribution of manpower authorizations is justified, the positions at the using installations should be considered the prime candidates for gains since there are unfunded supply slots in almost every major command (28). This action is consistent with keeping logistics support as close to the weapon system as possible (20:5).

7. Will the Source-to-User save transportation dollars? Efficient use of both initial and follow-on transportation costs is essential.

This is the only question that was objectively answered during the Source-to-User field-test of 1981. Table 1 reflects the per tire cost comparison for the KC-135 main landing gear tire. The first column shows the five bases that participated in the field-test and the second indicates

the per tire transportation cost when the present system is used (19). The third and fourth columns show the per tire transportation cost when shipped in less-than-truck-load (LTL) quantities and truck-load (TL) quantities respectively (19). The figures in parentheses show the projected monthly requirements at each base. A total of 260 tires were shipped during the 90 day field-test resulting in a savings of $11,200 (7).

TABLE I

PER TIRE COST COMPARISON

BASE	PRESENT METHOD	LTL COST MFG TO USER	BY TRUCKLOAD WITH STOPS IN TRANSIT ON A ONCE A MONTH BASIS	
TRAVIS	$47.36	$15.49	$4.42	(20)
BEALE	$45.16	$16.81	$4.24	(11)
MATHER	$45.16	$16.26	$4.24	(9)
CASTLE	$45.16	$16.26	$7.49	(40)
MARCH	$47.36	$20.28	$7.49	(13)

FIGURE IN PARENTHESES - PROJECTED MONTHLY REQUIREMENT
(Source: Source-to-User Concept Briefing. HQ Ogden ALC/MMI, 1981)

8. Can delivery times be enhanced? Readiness and customer service should still be our prime goal.

Delivery times from the source to the using installation will definitely be reduced with the Source-to-User concept since the aircraft tires will not have to be processed into and out of the central storage warehouse. Delivery times from the centralized contingency stock to the using installation should also be decreased since the support of wartime and contingency requirements will become the prime focus of the central storage and distribution personnel. The magnitude of decreases in these delivery times will vary. The location of the source, of each using installation and the supporting central warehouse will determine the extent of time saved. As noted before, it will be necessary for management to synchronize the vendor's deliveries with the using installations requirements. Only then can the full impact of pipeline time reduction be realized. As pipeline time reduces, so, theoretically, does the inventory (26:18). This would mean more stock fund dollars available for other critical spares support.

9. What trade-offs would be necessary to achieve the gains above and what new problems, if any, would be generated with a Source-to-User concept?

It is not clear that there are any trade-offs to be made in implementing the Source-to-User concept. There is the

possibility that manpower, equipment and facility requirements might need restructuring based on reduced needs at the central warehouse. These, however, are considered the consequences of streamlining the pipeline and would qualify as benefits rather than trade-offs. Similarly, the need for adequate feedback of inventory receipt data from the using installations to the Item Managers will be necessary in order that total inventory counts and locations can be maintained (19). This, again, is considered a streamlining of the information pipeline that should have already been accomplished. Source-to-User will require, but will also assist in obtaining, closer management of the commodity. The impact of this closer management, in terms of customer service and ultimate cost to the user, should mean increased responsiveness to wartime and contingency requirements and reduced inventory investment.

Summary

This chapter reviewed the responses to the Delphi Process and provided the analysis of the investigative questions. In each case the findings were cautious yet favorable toward the Source-to-User concept. There is an inescapable feeling that the current aircraft tire distribution system, with its almost total reliance on central warehousing, is not optimizing the potential for savings in reduced costs and pipeline times. This information forms the basis for the conclusions and recommendations presented in the final chapter.

V. Recommendations and Conclusions

Recommendations

The Source-to-User concept offers potential savings to the Air Force because it logically satisfies traditional distribution goals. It is a proactive method of distribution that pushes items to the user in an organized manner. It means that requirements have been scrubbed and clearly identified. It requires a qualified vendor which means a stringent contract assignment procedure. These, too, are desirable as normal business practices. The Source-to-User concept can mean more readiness per dollar by reducing the investment in buffer stocks and increasing the investment where shortages exist. It means that commodities flow in a reduced pipeline to where they actually satisfy a mission need. These goals are complex and cannot be achieved overnight. Current technology and information systems can help them become a reality. They are long range goals that represent a significant departure from the current method of central warehousing. Thus, while the Source-to-User concept should receive serious consideration for long term improvement of the Air Force distibution system, there are some preliminary steps that must be taken now. The Air Force should sponsor a complete and detailed field-test using the Source-to-User concept to distribute aircraft tires. The Logistics Management Center, Gunter AFS, Alabama should be

tasked to conduct the test, with bases participating from a variety of major commands. It is important that an independent third party conduct the test and perform the analysis. The Logistics Management Center is uniquely qualified to perform such a study. Their staff of functional logisticians is supplemented by in-house analysts capable of applying sophisticated data evaluation techniques. Capturing true costs and time factors from both the Source-to-User and central warehousing systems will be essential to an accurate and objective comparison. This data is not readily available at this time.

In the interim, the Air Force should take advantage of the established procedures for Amended Shipping Instructions to speed aircraft tires to operational bases. This action would reduce the level of due-outs and eliminate significant processing, handling, and storage of tires at the two central storage locations designated for aircraft tire support. This reduction in cargo flow through the central warehouses should offer opportunities for increased attention and service for the true priority requests remaining in the central warehouse system.

The data/information system associated with the purchase and subsequent delivery of aircraft tires should be revised to provide a complete and accurate audit trail of cost and time. Once this baseline for distribution costs/time is established, management can then attempt measureable improvements regardless of the selected method of distribution.

Conclusions

The current system of distributing aircraft tires through central warehouses at two Air Force storage locations is working; however, there are serious drawbacks to the support it renders. The current system works because of an extremely large inventory that provides a buffer stock to cover the inefficiencies within the pipeline. Aircraft tires are constantly being transported, inspected, received, processed and stored. Each time the tires are handled or moved, they are vulnerable to loss and damage. There are hundreds of Air Force people performing the documentation, processing and distribution of aircraft tires and still the requisition system is awash with backorders from the bases. A recent check of the inventory data system showed current due outs in excess of 1300 (29). Further, the number of Mission Capable (MICAP) requisitions at one tire storage location exceeded eleven per month for 1985 (29). This means that our operational forces are often waiting for tires that are enroute not to them but to a central warehouse for later transhipment to them. The costs associated with the central warehouse documentation, processing and distribution are invisible since the data system does not capture the total cost of providing aircraft tires to Air Force customers. Nor does the inventory system provide ready visibility of total pipeline time from procurement to actual use. Large inventories tend to hide other weaknesses as well. Poor quality

tires may not be evident until a significant number of assets are already accepted into Air Force stock. This can cause extra expense in pulling the faulty tires from the inventory and returning them to the vendor. Additionally, late deliveries can be masked by the condition of over-stock. Each of the above inefficiencies extracts a cost in time and dollars from our distribution system.

The Source-to-User concept appears to offer management a viable alternative to the central warehouse system. It is not a new or untried concept. It is used by the Navy to distribute aircraft tires. It is a distribution system which reduces the pipeline time from the source to the actual Air Force user. In doing so it eliminates the multiple transportation, inspections, processing, and storage of the tires enroute to the flightline for use. The concept, if implemented properly, should reduce the total aircraft tire inventory. In addition, through a coordinated schedule of production and requirements, it should push tires to where they are needed in a timely fashion. These benefits would result in a streamlined distribution process for a highly critical commodity used Air Force-wide.

Appendix: Delphi Questions

Scenario One

The Item Manager initiates a purchase request for the purchase of a specific type of aircraft tire. All tires will be delivered to the Air Logistics Center for receipt and storage. As requirements are generated at the using bases tires are pulled from stock and shipped.

Scenario Two

The Item Manager initiates a purchase request for a specific type of aircraft tire. Some tires will be delivered to the Air Logistics Center to satisfy wartime and emergency stock conditions; however, the remainder will be shipped directly to the bases that have a recurring need for them. The contractor will be provided a schedule showing destinations, due dates and shipping quantities.

Given that Scenario Two is used instead of Scenario One, please use the scale below to give your one best response to each of the following statements. Use the space after the word COMMENTS to justify your response.

1	2	3	4	5
Highly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Highly Agree

1. A push system from the contractor will be more efficient than a pull system based on requisitions. 1 2 3 4 5

COMMENTS:

2. Requisition documentation will be reduced at depot and base-level. 1 2 3 4 5

COMMENTS:

3. In-checking and stock withdrawal at depots will be reduced. 1 2 3 4 5

COMMENTS:

4. Material Handling Equipment and operators at depot will be freed up for other duties. 1 2 3 4 5

COMMENTS:

5. Better and more flexible use of depot warehouse storage space will occur. 1 2 3 4 5

COMMENTS:

6. There will likely be an overall savings in transportation costs. 1 2 3 4 5

COMMENTS:

7. Scheduled shipments from the contractor will permit use of less expensive modes of transportation (ex. truck and rail versus LOGAIR). 1 2 3 4 5

COMMENTS:

8. Reduced cargo on LOGAIR will provide more mission support for other commodities. 1 2 3 4 5

COMMENTS:

9. One less set of transportation-related forms will be needed. 1 2 3 4 5

COMMENTS:

10. The workforce in the depot shipping department will be freed for other duties. 1 2 3 4 5

COMMENTS:

11. One less set of inventory control forms will be required at depot. 1 2 3 4 5

COMMENTS:

12. The Source-to-User offers enough potential savings to warrant a full field test. 1 2 3 4 5

COMMENTS:

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VITA

Major Dan E. King was born on 28 June 1947 in Buford, Georgia. He graduated from Buford High School in 1965 and received his Bachelor of Science degree in Education from Georgia Southern College in 1969. He received a commission in the Air Force through OTS in 1970. His first duty station was Shaw AFB, S.C, where he was the Transportation Management Officer for the 728 Tactical Control Squadron. He was stationed at RAF Bentwaters, England from 1972 to 1975 as the Vehicle Operations Officer and Vehicle Maintenance Officer. While at Bentwaters, he received a Master of Arts degree in Counseling from Ball State University in 1974. From 1975 to 1977, he was an Aerial Port Officer and Vehicle Maintenance Officer at Charleston AFB, S.C. In 1977, he was sent to Osan AB, Korea where he was the Vehicle Maintenance Officer until 1978. During his tour in Korea, he was voted Transportation Officer of the Year for PACAF and the Air Force. From Korea he was assigned to Langley AFB, Va. as a HQ TAC staff officer in Vehicles and Plans. In 1981 he was assigned as a Transportation Analyst at the Logistics Management Center (LMC) at Gunter AFS, Al. In 1984 he became Director of Transportation at the LMC and held that position until entering the School of Systems and Logistics, Air Force Institute of Technology, in 1985.

Permanent Address: 4571 Mt. Salem Rd.
Buford, Georgia 30518

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In October 1985, the Air Force Institute of Technology (AFIT), School of Systems and Logistics, received a letter from the Directorate of Materiel Management (MMI), Headquarters Ogden Air Logistics Center (ALC), Hill AFB, Utah proposing that a thesis be accomplished on the validity of the Source-to-User concept. This concept would permit aircraft tires to be shipped directly from the source of procurement/repair to using bases rather to centralized storage at Hill AFB and Wright-Patterson AFB with subsequent transhipment to users.

A Delphi Process was used to gather professional opinion regarding the potential of the Source-to-User concept to improve the distribution of aircraft tires. A review of historical documents and current policy and procedures permitted a discussion of nine investigative questions pertaining to the Source-to-User concept. Parallels were drawn between other Department of Defense initiatives/programs, the commercial Just-in-Time philosophy, and Source-to-User.

It was concluded that the Source-to-User concept addresses classic distribution goals and its implementation would improve the efficiency and effectiveness of the aircraft tire distribution system. The Source-to-User concept should shorten the extensive distribution pipeline currently in-place. Improvements should include reduced inventory, less documentation, processing, and distribution of tires while permitting the use of less expensive modes of transportation.

It was recommended that the Air Force Logistics Management Center be tasked to conduct a thorough and complete field-test that would collect hard and definitive operational cost and time data. In the interim, the Air Force should use Amended Shipping Instructions to reduce pipeline time for aircraft tires. It was further recommended that current information systems ~~systems~~ associated with the purchase/repair and subsequent delivery of aircraft tires be revised to provide a complete and accurate audit trail of cost and time.

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