AIR FORCE JOURNAL of LOGISTICS

FALL
1980

AIR FORCE JOURNAL of LOGISTICS

General Bryce Poe, II
Commander
Air Force Logistics Command

Dr. Robert J. Hermann
Assistant Secretary of the Air Force
Research, Development and Logistics

Lieutenant General Billy M. Minter
Deputy Chief of Staff
Logistics and Engineering
HQ USAF

AFRP 400-1

VOL IV
NO 4

FALL
1980

AIR FORCE JOURNAL of LOGISTICS

CONTENTS

SPECIAL

2 ***Logistics Policy Creation***
Mr. Lloyd K. Mosemann II

ARTICLES

3 **An Analysis of Air Force Logistics Shortfalls of the Vietnam Buildup of 1965-68**
Lieutenant Colonel John T. Quirk

11 **Logistics Long-Range Planning**
Lieutenant Colonel Robert H. Thompson

13 **The Logistics Challenges of Deploying a CONUS Joint Task Force**
Major Stephen G. Crane

21 **Impact of Repair Level Analysis on Future Operational Logistics Support**
Mr. Richard L. Henshaw

23 **Low Rate Initial Production of USAF Conventional Munitions**
Major Wallace T. Bucher

DEPARTMENTS

9 *USAF Logistics Policy Insight*
19 *Career and Personnel Information*
31 *Current Research*

ITEMS OF INTEREST

12 Logistics Management Issues
22 BOA Review Procedures

Purpose The *Air Force Journal of Logistics* is a non-directive quarterly periodical published in accordance with AFR 5-1 to provide an open forum for presentation of research, ideas, issues and information of concern to professional Air Force logisticians and other interested personnel. Views expressed in the articles are those of the author and do not necessarily represent the established policy of the Department of Defense, the Department of the Air Force, the Air Force Logistics Management Center, or the organization where the author works.

Distribution Distribution within the Air Force is F through the PDO system based on requirements established for AFRP 400-1 on the basis of 1 copy for every 15 logistics officers, top three NCO's and professional level civilians assigned.

Subscription Subscription to the *Air Force Journal of Logistics* can be made for $6.00 per year domestic ($7.50 foreign) through the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Single copies are $2.00 domestic ($2.55 foreign). Back issues are not available.

The *Air Force Journal of Logistics* became AFRP 400-1 on 1 Jan 1980 and incorporated *The Pipeline* beginning with Volume IV, No. 1. Authority to publish this periodical automatically expires on 3 Aug 1981 unless its continuance is authorized by the approving authority prior to that date.

An Editorial Advisory Board Perspective

Logistics Policy Creation

The *Air Force Journal of Logistics* with this issue completes its first year as a forum for presentation of logistics research, ideas, issues and information. It has occurred to me that many of our readers may not appreciate the labyrinthine process by which Air Force corporate logistics policy is established. In fact, the Journal can play a key role in this and already has.

"Without vision the people perish." Ultimately, this is the watchword of LIFE, surely including the corporate life of the Air Force institution. Vision is not simply "to see," but especially "to perceive something not yet actually visible through mental acuteness or keen foresight." Immediately, therefore, there is dynamic stress between the vision of what could be and the reality of what is. The latter is familiar, comfortable and unthreatening. The process required to realize the vision is likened to the pains of birth.

The Air Force, as much as we love her, is a complex and dynamic institution. Decision-making (hence, the birthing of policy) is not straightforward along classic hierarchical lines of authority. Rather, it reflects more a series of competing fiefdoms seeking to perpetuate the values which each uniquely represents and epitomizes. Within logistics, there is a dynamic among supply, maintenance, and transportation, and the tension of wholesale versus retail, readiness vs economy, centralized vs decentralized, and lead vs follow. Within the larger corporate Air Force there is the interaction of operations, acquisition programs, financial and personnel interests, old-fashioned politics, public law and media image, and field vs headquarters. From outside we are hounded, cajoled, threatened, and encouraged by a wide range of different and often competing interests. At every level, from action officer to general officer, there are differing levels of risk taking, willingness to learn, and satisfaction with the status quo. How do we ever get anything done?

Policy begins with an idea, such as those reflected in this Journal. The better the description of the qualitiative and quantitative benefits, the more likely that your idea will become someone else's revelation, and their vision, too. Essentially, policy is the crystallized result of a marketed idea. The more the pot is stirred, the more likely that meaningful new directions will emerge.

Time after time, new policy direction emerges suddenly and almost without warning. On numerous occasions a traditional view has been reaffirmed as Air Force policy, to be followed only a few months later by a more progressive, or at least different, policy. Yet, these seemingly sudden and capricious changes are neither sudden nor capricious. They reflect the labored scrutiny and analyses of the corporate decision-making process which, though hidden from view in the womb of the unthinkable, has given birth to a new policy.

Recent articles in the Journal have already had an impact. New policy and practices are being germinated. For example, the Spring quarter's article on the Soviet supply system has reinforced the need to devote more attention to logistics intelligence. The LOGAIR MK2 analysis in the same issue is being used by HQ USAF in reconsidering our LOGAIR needs in light of budget cuts. That same issue also contained an article on application of Delphi survey techniques which is being considered by one of our numbered Air Forces for possible use in logistics plans. Articles in other issues are beginning to have similar influence.

I encourage each logistician, in or out of the Air Force, to seek to contribute meaningful Journal articles, and to promote a climate which recognizes the need for vision.

LLOYD K. MOSEMANN, II
Deputy Assistant Secretary (Logistics)

An Analysis of Air Force Logistics Shortfalls of the Vietnam Buildup of 1965–68

Lieutenant Colonel John T. Quirk
Plans and Program Division
Directorate of Transportation
HQ USAF
Washington, D.C. 20330

Introduction

At no time in the recent past has the need to recall the lessons learned from Vietnam been more important than in the current period of increased tensions in the Middle East. The instability of the Middle East, with the revolution in Iran, the holding of U.S. diplomatic personnel as hostages in Iran, the residual tensions from the Arab-Israeli and Yemeni conflicts and the coup in Afghanistan, gives strong indication of the potential for a limited war mirroring the strategy of gradualism typified by the Vietnam conflict.

The current potential for limited war was indicated by Secretary of Defense, Harold Brown, in the *DoD Annual Report, FY 1980,* when speaking of military balance he stated:

> To stress Europe is not to rule out a major contingency elsewhere. Nor is it to preclude a smaller attack by Soviet or other forces in such sensitive areas as the Middle East and Persian Gulf, or the Korean peninsula. [1:100]

A limited war situation in which U.S. vital interests are jeopardized or infringed would require a degree of military intervention appropriate to the level of threat as constrained by the political realities. The generation of the need for the use of military force could result from political and economic confrontations which would likely be regional rather than global in nature.[2:4-5] In recognition of the variety of small or not so small wars that the United States may have to deter or fight in this turbulent period of international relations, there is heavy reliance on conventional forces to protect U.S. global security interests. Current defense policy has the objective of dealing simultaneously with one major and one minor contingency and identifies the Middle East, the Persian Gulf, and Northeast Asia as the area where the most serious minor contingencies may occur.[3:83] The potential for the occurance of limited war, aside from the tensions in the current scenario of international relations, lies in the fact that limited war maximizes the opportunities for effective use of military force as a rational instrument of national policy.[4:165] In sum, United States policy calls for the maintenance of substantial forces for employment in contingencies beyond those that might arise in the critical European theater.[5:244] With the potential for limited conflict rising, and U.S. policy calling for the maintenance of forces to respond to such conflict, today's logisticians must be aware of and understand how the logistics system actually performed in Vietnam.

In undertaking the historical analysis of the logistics events and systems of the Vietnam era, several assumptions are posited to permit the analysis to proceed along lines meaningful to logistics planners. Initially, it must be assumed that there is a reasonable likelihood or probability of a conflict scenario that mirrors in substantial proportion that experienced during the Vietnam period. Also, it is assumed that a construct model of the logistics system representative of both a future scenario and the past Vietnam scenario, can be used as a basis for analysis. It can also be assumed that the logistics processes composing the model will behave in an essentially similar manner when exposed to the taskings of a future conflict whose components are relative to Vietnam.

The basis for the analysis, in addition to the assumptions above, is expanded to include the limitations that are placed on it in terms of the time period which will be analyzed. To make the analysis relevant to a future scenario, the examination of the Vietnam conflict will be confined to 1965-1968 time period. This time period appears to offer the greatest opportunity for meaningful analysis. It was the time of major involvement of U.S. forces, highest intensity conflict, and greatest involvement of the USAF logistics system. Given that in any scenario the level of logistics capability will exceed, meet, or fall short of the logistics required, it is both feasible, necessary, and valuable to examine a past logistics scenario to determine the nature of the logistics capability, particularly the shortfalls. The examination of the shortfalls in capability can identify both the generalized and specific nature of the shortfalls. By so doing, it can also provide an indication of the degree to which individual components of the shortfalls are interactive and to what degree the same type of shortfalls would affect logistics planners in future contingencies.

THE LOGISTICS SYSTEM ANALYSIS

This analysis of the Air Force logistics system of Vietnam in the 1965-68 time period is essentially historical in nature, using the technique of classification of logistics shortfall events by type. Specifically, the analysis seeks to identify individual logistics events by the process, function, and resource involved and to relate the interactions of process, function, and resource.

This interactive, historical analysis is undertaken to provide an understanding of a major logistics effort of the past in the interest of adapting the understanding to a similar effort in the future. In *Modern Trends in Logistics Research,* Lt. Gen. William W. Snavely, USAF (Ret) former DCS, Systems and Logistics stated:

> Logistics is a vast subject composed of the many elements of determining requirements, acquiring what is needed, and distributing or otherwise assuring things are taken care of. However, what must be understood is that the elements are highly interactive. The elements . . . . must work together at a variety of levels throughout the logistics spectrum. This is fairly well understood at the higher or macro levels and yet there is extreme difficulty in clearly establishing and quantifying cause and effect relationships.
>
> Logistics managers . . . . must achieve a good understanding and a valid description of what impacts the separate logistics processes have on one another. This is essential because management effort and organization are functionally oriented and focused on optimizing the performance of one process or segment of the logistics system. Even policy development and implementation tend to be along functional lines. The result is a disconnect that hampers our ability to perceive cause and effect relationships and a full understanding of the factors within the individual processes that determine cost and establish effectiveness.[6:25]

This analysis seeks to overcome the disconnects between the process, function, and resource elements by describing and understanding the interaction of these elements. Vietnam logistics needs this abrasive of analysis to examine the interactive relationships of the large number of events of the 1965-1968 time period. While it is important to relate effects and effectiveness to doctrine and plans and programs, it may be more important to relate to the actual events which were often the results of departures from plans and programs and doctrine. This analysis of interactive relationships is also important to the growth of interactive logistics understanding because of the lack of precedent interactive analysis. After Vietnam, two schools of thought on the analysis of logistics emerged. One appeared to ignore the issue by admitting the problem of analysis was too large, so it best be left alone. The other treated analysis on a purely commodity basis, that is, by individual resource or weapon system. Both schools ignored the interactive, variable nature of logistics.

Moreover, the lessons of history are not easily accepted by future looking logistics managers. Development of a normative, interactive model or theory has not previously been advanced with any great impetus because the hoped for lessons of hindsight to be derived from the operation of the model offer no guarantee of improvement in foresight. Also, analysis of shortfalls does not automatically produce future practical improvements. Given these considerations, it appears that an interactive analysis offers the most likely opportunity to provide an understanding of the behavior and the complexities of the Air Force logistics system in Vietnam during the 1965-68 buildup. This opportunity is amenable to development by analytical means because, as Martin Van Creveld stated in his *Supplying War:*

> Strategy, like politics, is said to be the art of the possible, but surely what is possible is determined not merely by numerical strengths, doctrine, intelligence, arms and tactics, but, in the first place, by the hardest facts of all: those concerning requirements, supplies available and expected organization and administration, transportation and arteries of communication. . . . It may be that this requires, not any great strategic genius but only plain hard work and cold calculation. While basic, this kind of calculation does not appeal to the imagination which may be one reason why it is so often ignored by military historians.[7:1]

The method of analysis that develops such an opportunity for understanding must provide not only the calculation but must also subject the events to the rigor of interactive analysis. The key to this analysis is the categorization of the shortfall events in Vietnam by process, function and resource.

Air Force Logistics Processes

The operation of Air Force logistics in the system context is based on the concept of logistics as a process. AFM 400-2, *Air Force Logistics Doctrine,* specifies that the logistics process is:

> A task or group of interrelated logistics tasks designed to produce a desired result independent of the organizational arrangement employed.[8:24]

In describing logistics as a process composed of interrelated tasks, the tasks which are included in the process must be determined. Care was exercised in this determination because process is one of the major elements of the overall Air Force logistics system and it is through the action or interaction of the subelements of the process that logistics capability is produced and sustained.

In developing a set of process descriptions that are mutually exclusive and collectively exhaustive, it was first necessary to decide which tasks were involved in the process activity of logistics. In the development, the interaction issue has to be resolved due to the implications of effective interaction on capability. The resolution of the interaction issue involved framing the question as to which programs, activities, procedures, methods, and systems are involved in the generation of logistics capability. In answering the question, the following subelements of the process element of the logistics system were identified. [9]

1. *Requirements Determination* - forecasting the demand for associated quantities or cost of any combination of logistics resources. The key activity in the requirements determination process is the forecasting of demand, quantities, and costs of logistics resources.

2. *Budget Allocation* - deciding how or which requirement will be funded or in what order equally competitive requirements will be financially supported. The key activity of the budget allocation process is the distribution of funds to organizations which use funds to obtain and maintain logistics resources.

3. *Resource Acquisition* - obtaining logistics resources. The key activity in the resource acquisition process is the contracting or procurement activity, which involves the use of available contracting procedures and tools at the local/operational and centralized levels.

4. *Resource Allocation* - assigning limited logistics resources to those organizations which produce a mission related product or service in an operational situation of competitive needs for these resources. The key activity in this process subelement is the assignment of resources by using a wide variety of inventory and cost management techniques linked to mission priorities at unit and stockpile locations.

5. *Resource Distribution* - activities that provide physical movement of resources between production, storage, and consumption points in the logistics system. These activities center on the management of movement to maximize time and place utility of logistics resources.

6. *Production* - the activities that influence the production, manufacture, remanufacture or repair of logistics products or services. The activities involved in this process focus on the changing of raw materials or component items into a finished product or into a responsive service. For example, the manufacturing processes of a centralized logistics depot or contractor are representative of the production process subelements.

7. *Resource Improvement* - activities that relate to improving or enhancing the quality of resources, indirectly changing the frequency of logistics events, altering the duration of logistics activities or reducing the unit cost of resources used in a logistics activity or function. For example, this process subelement can be related to activities such as quality control, scheduling and planning, training, work force composition and sizing, or use of components rather than total units to accomplish reconstitution or repair of a failed resource.

8. *Capability Estimation* - determination of capability needs or identification of shortfalls or determining status of major end items in terms of logistics products or services. For example, the Mission Capability system provides status and identifies specific resource shortfalls.

Air Force Logistics Functions

The functions of the Air Force logistics system are a separate and distinct entity in the context of describing the logistics system. The functions also represent the "who" of the logistics system. AFM 400-2, *Air Force Logistics Doctrine,* describes function as: "The appropriate or assigned duties, responsibilities, missions, or tasks of an individual, office, or organization. . ." [8:2-1]

The functions represent the organizational structure element of the Air Force logistics system. As such, function becomes a major element of the logistics system. In underscoring the structural importance of function as an input to the analysis, the complexity of describing the term function in the context of logistics emerges. In 1965-68 time period, the functions of logistics tended to be those which are most commonly referred to as the classical functions of logistics. However, to those functions specialized organizational elements were appended to meet critical needs, overcome shortfalls in capability, and improve resource postures.

For the purposes of this analysis, it was necessary to develop a mutually exclusive, collectively exhaustive set of descriptors that would be readily familiar to the logistics community, completely descriptive, and capable of classifying or categorizing logistics events of the historical period to be analyzed. Moreover, the descriptors also had to have a correlation to current functional or organizational constructs to provide utility for the outputs of the analysis for current and future logistics managers. Additionally, the set of descriptors of function had to include a descriptor that would provide for classification of an event that was related to more than one logistics function or was not clearly related to a single function.

The following set of descriptors is the comprehensive list of functions developed for this analysis:

1. *Maintenance;*
2. *Supply;*
3. *Transportation;*
4. *Contracting* (or procurement, as it was called in 1965-68);
5. *Logistics Plans*
6. *Logistics General* (to describe multi-functional related events).

Air Force Logistics Resources

The production of logistics capability requires that a task be accomplished or a process take place, a structured environment be available to manage the accomplishment or a function be identified to accomplish the objective or task, and lastly, but no less importantly, process and function require a set of commodities to fuel their interaction. These commodities are the resources of the Air Force logistics system. Again, mutually exclusive, collectively exhaustive set of resources had to be structured that would permit classification of logistics events by a single resource category. It was also desired that the resources be those familiar and related to contemporary logistics thought so as to be acceptable to the widest range of logistics practitioners.

In deciding the nature of subelements of the major element of resouces of the logistics system, there were a large number of considerations that were to a significant degree scenario dependent. For example, it became important to distinguish between supplies that were of common support and those that were essential to mission support. The need for making distinctions produced the following list of eight categories of resources of the Air Force logistics system:

1. *Supplies - Mission/Weapon System* represent those supplies that are used to support a specific mission, that is, those that are related to a weapon system or mission such a security, data automation, or repair.

2. *Supplies - Common Support* represent those common items or commodities that can be used by a wide variety of units with widely divergent missions. Another term for supplies - common support would be administrative supplies.

3. *Equipment* refers to those items that are used to support the mission and require an investment decision at local or centralized levels of logistics management. These equipment items are managed by the Equipment Management Office whereas supplies are managed by the Supplies Management Office of the Base Supply function.

4. *Personnel* is the human resource element of the logistics system.

5. *Facilities* are those permanent and temporary structures, pavements, and buildings provided by the Civil Engineering functions of the military departments.

6. *Procedural Information* is the category of information commonly associated with the generic class of technical data. This information is used by technicians and is contained in regulations, manuals, and technical orders. It provides the technician at all locations in the logistics system with the procedural or "how-to" information needed to accomplish a specific task.

7. *Process Information* is that type of information that is associated with the planning, scheduling and control of logistics processes and functions. It is the information required to insure that logistics capability is used effectively and efficiently. For example, the information needed to plan and schedule maintenance inspections, aircraft generation, vehicle inspections, cyclical inventories and that contained in mobility schedules.

8. *Status Information* in contrast, is condition or capability information related to specific items in or components of the logistics system. Status information can be as simple as the number of support equipment units available on a given day to the Force Status (FORSTAT) report on Operationally Ready (OR) aircraft to the M-rating (mobility) of a War Readiness Spares Kit.

Logistics resources, functions, and processes are the interactive elements of the Air Force Logistics System and are the framework of the analysis.

The Data Sources

The data was gathered from a large number of historical documents. There were 87 major source documents used to generate the data. Included in the sources are a wide range of types of sources from published reports, conference minutes, special reports, histories and analyses, to end of tour reports. The data sources were considered relevant if they were generated in or were specific to the 1965-68 time period in Vietnam and reflected Air Force logistics or joint-service logistics related to the Air Force. The data that was generated from relevant sources was assembled into a data summary of logistics shortfalls.

The Data Assembly

The data was assembled for classification and analysis purposes by arraying the events in a format that would identify each event with a unique number, provide a brief description, and classify each event by process, function, resource, and source by reference and page. To accommodate this classification, each event received a unique number and was coded as to the logistics process, function, and resource subelement. Subcode numbers assigned were the same as those used in the explanation of the subelements earlier in this article. The reference number and page number were also included to aid the reader in identifying the source. The beginning and the end of the completed data assembly is portrayed in Table 1. [10:01]

The entire coded data assembly became the data file for the analytical method employed in this study.

Table 1
Extract From Classification of 596 Logistics Shortfall Events In Vietnam, 1965-68

Logistics Shortfalls

Event	*Description*	*Process*	*Function*	*Resource*	*Ref*	*Page*
1	Lack of procedures caused 90 days spares kits to be mishandled and lost to user.	5	3	1	1	39
2	Mod-kits for 463-L equipment were not documented and were lost.	5	3	1	1	39
3	Vehicles deadlines for parts for 463-L equipment requisitions were taking 6 months to receive.	5	3	1	1	39
594	Push system of supply distribution caused numerous excesses.	4	2	2	86	3
595	Common supply system under U.S. Army direction was ineffective in its distribution pattern.	4	2	2	86	1
596	Lack of qualified military supply personnel.	5	2	4	87	3

Reference Sources

1. Designated Study #7, Interim Report, Corona Harvest. *Vol XV, Support.* Maxwell AFB, Al: Air Command and Staff College, 15 Dec. 1967.

86. Wilhams, Colonel Paul E., Director of Logistics Plans 7th Air Force. *End of Tour Report.* Tan Son Nhut AB, RVN, 1969.

87. Wolcott, Chief Master Sergeant Marshall V. N., NCOIC, Property Accounting, 377 Supply Squadron. *End of Tour Report.* Tan Son Nhut AB, RVN, 1966.

The Data Reduction Model

The data reduction method chosen for the analysis is the Statistical Package for the Social Sciences (SPSS). [11:1] SPSS is an integrated system of computer programs specifically designed for the analysis of social science data. The capabilities of the SPSS package allow flexibility in data format while providing a large number of statistical routines and descriptive statistics. The major routine that was used was Crosstabs. [11:264] This routine was selected because it permits the most complete treatment of the interaction between the major elements of process, function, and resource. For purposes of the analysis, process was designated variable one (V1), function was variable two (V2), and resource was variable three (V3). The analytical routines cross-tabulated the interaction of V1 with V2, V2 with V3, V1 with V3, and V1 with V2 with V3 to identify the degree of interaction among the three major variables. The result or output of the analysis is in a matrix format with supporting tables with a matrix provided for each variable interaction, such as V1 with V2.

ANALYTICAL RESULTS

The analysis of the logistics shortfall events employed by the model, outlined in the previous section, was linked to a generalized methodology which permitted the data to be graphically portrayed. The results graphically outline the integration of the logistics system components of process, function, and resource. These descriptive components were used to classify or type each of the logistics shortfall events. Each event was classified by the individual process, function, and resource involved. Within the process classification element, there were eight subelements used to classify each event. Within the function classification element, there were six subelements, and within the resource element, there were eight subelements. Each shortfall event received an ordinal classification score of one to eight for process, one to six for function, and one to eight for resource. Each of the 596 identified events thus received three individual scores - one each for process, function, and resource. The author assigned these scores using a judgmental scheme based on the description of each subelement. Each score was assigned on the basis of the nature of the shortfall related to the classification previously outlined. While the assignment of individual scores to events developed a generalized portrayal of the nature of the shortfall events, the analytical method was able to address the interactions between events by the process, function, and resource major elements and the subelements of each major element.

The general portrayal of the data identified significant concentrations of subelements within major elements. The subelements within the process element were distributed as shown on Table 2 for the 596 total shortfall events.

The analysis suggests that the greatest number of logistics shortfalls could be expected to occur in the process elements of resource allocation, resource distribution, and production. The allocation and distribution shortfall occurrences would be a reasonable expectation during a buildup period.

The logistics function major element is composed of six subelements. The six subelements were distributed as shown on Table 3 for 596 logistics events.

The analysis would suggest that the functional areas of transportation, supply, and maintenance could be expected to produce the greatest proportion of logistics shortfalls. Given the subelements identifed in the process element of resource allocation, resource distribution, and production, the appearance of transportation, supply, and maintenance as the key subelements in the functional element is not unexpected and to some degree confirms the results in the process element analysis.

The logistics resource element is composed of eight subelements. The eight subelements were distributed as shown on Table 4 for 596 logistics events.

The analysis would suggest that the resource areas of equipment, personnel, supplies-mission, procedure information and process information could be expected to produce the greatest proportion of logistics shortfalls in a buildup period.

Integration of Elements

The integration of the major elements of logistics process, function, and resource was necessary to the analysis to insure that the interactions of the individual major elements could be determined. The interaction of elements was also important to the analysis because it was felt that the shortfall events occurred in an environment of logistics that was multi-faceted or was described by more than a single element.

The method chosen to portray the interactive relationships was to use a matrix format to integrate the individual major elements in an array. The arrays would be able to portray the interactions between the individual major elements in both a two dimensional and three-dimensional framework. The two dimensional framework or matrices would array logistics process against function, process against resource, and logistics function against resource. The three dimensional matrices would array logistics process against function against resource.

The completion of these matrices provided the analytical output which would identify both two and three dimensional interactions between major logistics elements. The determination of element interactions is of significant value to the analysis because it permits the identification of probable shortfalls that have a multidimensional character. If the interactive nature of the elements were not identified, the analysis would be singular in dimension and, therefore, of little value because of its lack of depth. The depth provided by the interactive determinations increases the potential utility of the analysis.

Table 2.
Shortfall Distribution by Process Subelement

Subelement	*Frequency*	*Percent of Total Cases*
1. Determine Requirements	58	9.73
2. Allocate Budget	11	1.85
3. Acquire Resources	54	9.06
4. Allocate Resources	150	25.17
5. Distribute Resources	145	24.33
6. Production	112	18.79
7. Improve Resources	51	8.56
8. Estimate Capability	15	2.52

Table 3.
Shortfall Distribution by Function Subelement

Subelement	*Frequency*	*Percent of Total Cases*
1. Maintenance	124	20.81
2. Supply	156	26.17
3. Transportation	167	28.02
4. Contracting	53	8.89
5. Logistics Plans	48	8.05
6. General	48	8.05

Table 4.
Shortfall Distribution by Resource Subelement

Subelements	*Frequency*	*Percent of Total Cases*
1. Supplies-mission	88	14.77
2. Supplies-common support	44	7.38
3. Equipment	104	17.45
4. Personnel	96	16.11
5. Facilities	60	10.07
6. Procedure information	88	14.77
7. Process information	73	12.25
8. Status information	43	7.21

Element Interactions

The interaction of the elements is portrayed in the matrices generated by exposing the categorization of the 596 events to the cross-tabulation routine of the Statistical Package for the Social Sciences (SPSS). The output from the cross-tabulation portrays the data in both two and three-dimensional formats. The two-dimensional matrices are in a series which includes the cross-tabulation of:

- logistics process (V1) by function (V2)
- logistics process (V1) by resource (V3)
- logistics function (V2) by resource (V3)

In addition to the three two-dimensional matrices, there are eight three-dimensional matrices which include the cross tabulation of:

- logistics process (V1) by function (V2) with the individual resource subelements as the control value.

The two dimensional matrices identifed the interactions between the major variables. In order of magnitude, Table 5 identifies the significant interactions between logistics process and function.

This would suggest that shortfalls could be expected in the process of distribution of resources related to the transportation function, allocation of resources related to the supply function, the production process in the maintenance function, and the distribution of resources involving the supply function.

In the matrix of logistics process (V1) by logistics resource (V3) the significant interactions are identified on Table 6.

This would suggest that shortfalls could be expected which would involve the allocation of personnel and mission supplies, and the distribution of equipment.

In the matrix of logistics function (V2) by logistics resource (V3) the significant interactions are identified on Table 7.

These interactions indicate that shortfalls involving transportation equipment, the supply function related to supplies-mission, the supply function related to supplies-common, maintenance personnel, and transportation procedural information or technical data can be expected in a logistics scenario similar to Vietnam.

The three dimensional matrices identified the interaction between all of the three major elements of logistics process, function, and resource. Each subelement within the logistics resource major element is related individually to the two dimensional matrix of logistics process (V1) by logistics function (V2).

The 88 events that involved supplies-mission (see Table 4) were related to the process (V1) by function (V2) matrix as a third dimension. The resultant significant interactions involving the 88 supplies-mission events are identified in Table 8.

The supplies-mission subelement used as a third dimension suggested that when shortfalls with supplies mission are encountered, shortfalls in allocation of resources and distribution of resources in the supply function may also be encountered. In addition, shortfalls in the distribution of resources in production of maintenance may also be encountered.

Each of the seven other resource subelement events were similarly used as a third dimension of the V1-V2 matrix to finitely identify interrelations.

Table 5.
Significant Process and Function Interactions

Interaction Process by Function	*Number of Events and Percentage (of 596 total events)*
Distribution of Resources and Transportation	78/13.1
Allocation of Resources and Supply	66/11.1
Production aid Maintenance	63/10.6
Distribution of Resources and Supply	52/ 8.7
Acquisition of Resources and Procurement	40/ 6.7
Production aid Transportation	31/ 5.2
Allocation of Resources and Maintenance	24/ 4.0

NOTE: In this summary and all subsequent summaries, only the significant interactions are extracted. Complete data is available in each matrix.

Table 6.
Significant Process and Resource Interactions

Interaction Process by Resource	*Number of Events and Percentage (of 596 total events)*
Allocate resources and Personnel	39/6.5
Allocate resources and Supplies-Mission	37/6.2
Distribute resources and Equipment	34/5.7
Production and Personnel	27/4.5
Distribute resources and Facilities	25/4.2
Allocate resources and Supplies-Common	24/4.0
Allocate resources and Equipment	24/4.0

Table 7.
Significant Function and Resource Interactions

Interaction Function by Resource	*Number of Events and Percentage (of 596 total events)*
Transportation and Equipment	53/8.9
Supply and Supplies-Mission	42/7.0
Supply and Supplies-Common	32/5.4
Maintenance and Personnel	28/4.7
Transportation and Procedural Information	25/4.2

Table 8.
Significant Interaction of Supplies-Mission Resource with Function/Process Interactions

Interaction with Supplies-Mission	*Number of Events and Percentage (of 88 Supplies-Mission Events)*
Allocation of resources and supply	22/25.0
Distribution of resources and supply	10/11.4
Allocation of resources and maintenance	8/ 9.1
Production and Maintenance	8/ 9.1

The most significant interaction for each of the eight subelements within the resource major element is shown in Table 9. The most significant interactions, 140 of 596 possible three dimensional interactions, are arrayed by resource control value, equipment through status information, in order of the frequency of occurrence in the 596 total events.

The results of the interactive analysis identified significant patterns which would narrow the horizon for the logistician engaged in developing a concept for planning a buildup of Air Force logistics. From the interactive analysis as summarized in this article, the planner would be well advised to concentrate on the development of plans which would initially address the distribution of resources in transportation dealing with equipment resources; and the allocation of resources in supply for the supplies-mission resources. Secondly, planning actions should address the area of allocation of resources in supply of the supplies-common resource. The planner should then conceptualize an approach to the process of acquisition of resources in procurement dealing with procedural information and the process of production in maintenance involving personnel. The next priority would be to address the distribution of resources process in transportation dealing with facilities and the production process in maintenance involving process information. Lastly, the areas of distribution of resources in transportation involving both process and status information should be addressed.

Areas of Future Research

This study is an initial step in a potentially broader research effort. Therefore, the results of the study suggest areas for future research to expand the conceptual base of the model and to increase the number of individuals involved in the classification of events or shortfalls effort.

A research area which is suggested by this effort is a closer examination of the model interactions to determine cause and effect relationships. For example, the study points out the interaction of model elements but does not address the direction of the interactions as to how one element influences another. A closer examination of possible cause and effect relationships and the direction of interactions could assist the refinement of the model descriptors and justify the points of interaction within the model.

Table 9.
Most Significant Three Dimensional Interactions

Resource Control Value	*Frequency*	*Percent of Total Cases (596)*	*Significant Interactions in Process by Function by Control Value Matrix*	*Frequency*	*Percent of Total Cases (596)*
Equipment	104	18	Equipment and Distribution of Resources and Transportation	22	3.6
Supplies Missions	88	15	Supplies-Mission and Allocation of Resources and Supply	22	3.6
Supplies Common	44	7	Supplies-Common and Allocation of Resources and Supply	20	3.3
Procedural Information	88	15	Procedural Information and Acquisition of Resources and Procurement	19	3.1
Personnel	96	16	Personnel and Production and Maintenance	16	2.6
Facilities	60	10	Facilities and Distribution of Resources and Transportation	12	2.0
Process Information	73	12	Process Information and Production and Maintenance	12	2.0
			Process Information and Distribution of Resources and Transportation	12	2.0
Status Information	43	7	Status Information and Distribution of Resources and Transportation	5	.8
	596	100		140	23%

An increase in the number of individuals involved in the classification of the logistics events or shortfalls would be useful, since it would further validate the model. A possible means to accomplish the further validation would be to use the group value judgment techniques known as Delphi, a term referring to a more-or-less specific set of procedures for eliciting and processing the opinions of a group. [12:5] A rather extensive set of experiments has demonstrated that in the case of subjects for which the best possible source of information is the judgment of knowledgeable individuals, a systematic and controlled process of querying and aggregating the judgments of members of a group has distinct advantages.[13]

The data base imbedded in the study also presents an opportunity for extending this initial study effort. The data can be restructured easily to make it useful to a wide variety of analysts and analytical or statistical means.

In sum, the greatest opportunities for extension of this initial effort are resident in the possibilities for extension of the conceptual model; application of group value judgment techniques; and use of the data base in historical, logistics, and statistical study efforts.

This examination of the operation of the logistics system in a historical context using an interactive analytical technique establishes that large amounts of historical data can be synthesized into a form that has utility for planners. Moreover, it indicates that such historical analysis has a degree of productivity, since it provides a summary indication of potential future logistics-system behavior.

References

[1] Brown, Harold. *Department of Defense Annual Report*, Fiscal Year 1980. Washington, D.C.; Government Printing Office, 1979.

[2] Moorer, Thomas H. "Commentary," *Wings of Gold*, Summer, 1977.

[3] Osgood, Robert E. *Limited War Revisited.* Boulder, Colorado: Westview Press, 1979.

[4] Osgood, Robert E. *The Theory of Limited War. American Defense Policy.* (2 ed). Edited by Mark E. Smith, III and Claude J. Johns, Jr. Baltimore, Md: John Hopkins University Press., 1968.

[5] U.S. Congress. Senate. Committee on Appropriations. *Presentation by John C. Stetson, Secretary of the Air Force and General Lew Allen, Jr. Chief of Staff USAF.* 96th Congress, 2nd Sess., 1979, Washington, D.C.: Government Printing Office, February 1979.

[6] Snavely, William W. Lt Gen, USAF (Ret), "Major Logistics Problems." *Modern Trends in Logistics Research.* Edited by W. H. Marlow. Cambridge, Mass: MIT Press, 1976.

[7] Van Creveld, Martin. *Supplying War.* Cambridge, United Kingdom: Cambridge University Press, 1977.

[8] Air Force Manual 400-2, *Air Force Logistics Doctrine.* Washington: Department of the Air Force, 1 November 1968.

[9] The process elements were developed by the author with the assistance of Colonel Joseph E. Boyett, Jr. of the Air Force Logistics Management Center, Gunter AFS, Alabama.

[10] Quirk, John T. "An Analysis of Air Force Logistics Shortfalls of the Vietnam Buildup of 1965-68 as an Indication of Shortfalls in Future Conflicts," Air War College Research Report 081-80, April, 1980. This report contains the entire data assembly of events, a fuller discussion of the topics addressed in this article and the complete detailed interactive analysis of the shortfalls. A copy can be obtained through the Defense Logistics Studies Information and Exchange at Fort Lee, Virginia 23801.

[11] Nie, Norman H., et. al. *Statistical Package for the Social Sciences.* New York: McGraw-Hill Book Co., 1975.

[12] The use of the Delphi technique as a tool for logistics analysis has been successfully demonstrated at the US Army Logistics Center, Fort Lee, Virginia. The results of the effort are summarized in "A Delphi Approach to Wartime Supply Requirements" by Lt Col William H. Anchkaitis in the *Journal of the Society of Logistics Engineers*, XIV, (Spring, 1980).

[13] Dalkey, Norman C. and Rourke, Daniel L. *Experimental Assessment of Delphi Procedures with Group Value Judgments.* Santa Monica, California: Rand Corporation, February 1971.

USAF Logistics Policy Insight

Improved WRM Management

In the Summer 1980 issue of the AFJL, this department reported on and described the joint DCS/L&E and DCS/Plans and Operations efforts in developing the approach for Improved WRM Management. Since that time, the final Concept was presented to the MAJCOMs. The MAJCOM comments and the Approach were briefed to the Chief of Staff on 10 Jun 1980. As a result, Gen Allen has approved the Approach for implementation. An Executive Steering Group has been formed to guide and direct the implementation. A progress report will be presented to the Chief in mid-October.

Operating Budget Review Committee Established

In May of this year, the Operating Budget Review Committee (OBRC) was established as a subelement of the Air Staff Board to assist the Board in the formulation, execution, and control of the Operation and Maintenance (O&M) budget process. The OBRC will provide the Board Structure a mechanism through which all Air Staff, Major Command (MAJCOM), and Separate Operating Agency (SOA) inputs to the O&M budgeting process can be made. The OBRC will be chaired by a General Officer from the Directorate of Budget (AF/ACB) and have representatives from thirteen other Directorates. This action will strengthen MAJCOM/SOA representation in the Planning, Programming, Budgeting System (PPBS) process.

Contingency Contracting Conference

Improving emergency contracting support planning Air Force-wide - this was the primary objective of the Contingency Contracting Conference hosted by the Contracting and Acquisition Policy Directorate of HQ USAF at Tinker AFB, Oklahoma on 10-11 October. Major Command Directors of Contracting and other functional representatives participated in presentations and discussions on contingency contracting policy, planning and guidance. The agenda included presentations on TAC, USAFE, and PACAF joint contracting support of deployed forces in Europe, the Middle East, and the Pacific. The conference results will be used to update regulations on emergency contracting support and contracting of local support by deployed units.

TMO/SATO Enhancement Program

The Air Force, in concert with the Air Transport Association, is implementing a procedure to improve domestic travel management. The Traffic Management Office (TMO)/Scheduled Airline Traffic Office (SATO) Enhancement Program recognizes the unique capabilities of the SATO—with its automated reservation equipment and experienced travel clerks—to provide itineraries and make reservations using all available discounts, or other travel savings for official travelers and to capitalize on the SATO's data collection system for information needed to monitor and improve management of unit level travel programs. The new procedure calls for travelers to make their initial contacts directly with the SATO, rather than the TMO, *as soon as the travel requirement is known* and to obtain airline tickets in advance to take advantage of discounts. Codes identifying the travelers' units of assignment, discount fare savings, or reason for non-use are used to capture management information for feedback to commanders, unit travel monitors, and fund managers on how travel programs might be improved.

Official Duty Commercial Air Fare Rates

On 1 July 1980, the General Services Administration initiated contracts with four commercial air carriers to provide low cost travel to all government agencies between eleven city pairs. All official duty travelers of the federal government, including the Department of Defense, are required to use these fares unless: (a) mission requirements demand use of other than contract carriers; (b) space on contract carriers is not available; (c) use of an airline fare in existence prior to 13 March 1980, or another mode is more advantageous, or; (d) travel would occur between 2400 and 0600. Traffic Management Officers may approve the above exceptions. Nine of the city pairs involve travel between Washington, DC, and Boston, Chicago, Denver, Dallas, Los Angeles, New Orleans, San Francisco, Salt Lake City or San Antonio. The other two pairs are Salt Lake City/Denver and Los Angeles/San Francisco.

Air Transportation Eligibility

A new DOD Regulation 4515.13R, "Air Transportation Eligibility," dated January 1980 was published incorporating all previous message changes. The most significant changes: (a) eliminated cash reimbursable option for permissive TDY, but expanded such travel to worldwide; (b) expanded authority to permit space available travel to or from any terminal having adequate border clearance facilities, and on any military aircraft appropriately equipped; (c) revised Environmental and Morale Leave procedures, and; (d) delegated authority to certain CONUS commanders to approve travel of foreign military and civilian personnel within CONUS.

More Realistic Resupply Planning Efforts

For the past several years, resupply requirements for our major joint war plans have been estimated by multiplying a planning factor times either an expected theater population or unit type code. Considering the scarcity of transportation assets, such rough notional estimates may no longer be adequate. Put another way, we can no longer afford to waste our efforts planning for the movement of non-existent tonnages or for items that can not be made available within the required time frame.

As an initial step towards more realistic resupply planning, in May of this year, the Joint Deployment Agency (JDA) hosted an OPLAN 4102P Time Phased Force Development Data (TPFDD) Conference at MacDill AFB, Florida. Although this was the third TPFDD refinement conference conducted by JDA, it was the first to tackle a major OPLAN of the size and magnitude of 4102P. From a logistics viewpoint, Air Force efforts at the conference were largely directed towards validating actual asset availability against the computer generated resupply requirements in the critical areas of Air POL (Supply Class 3A), air munitions (Supply Class 5A) and aircraft engines (Supply Class 7A). POL, munitions and aircraft engines were selected for special review not only because of their direct relationship to aircraft and importance to the mission, but also because they constitute a significant portion of the transportation requirement and yet contain a small enough number of items to be manually managed. With the assistance of personnel from EUCOM, USAFE, AFLC, DLA, and AARCOM resupply tonnages produced by the movements requirements generator, were matched against actual available assets and validated or adjusted as necessary. The Transportation Operating Agencies (TOAs) will now assess their capability to move the validated requirements. Shortfalls will be resolved at a Phase II TOA Conference in the fall.

MAC Service from St. Louis to Japan and Korea

Military Airlift Command plans to begin twice weekly 747 service between St. Louis, MO and Yokota, Japan and Osan, Korea starting 1 January 1981. Persons desiring to ship their automobiles will continue to be routed through West Coast terminals to avoid financial hardship. For those not shipping cars, this new service will bring added convenience and lower travel costs.

Base Procured Equipment Policy Changes

Due to inflationary trends and the need for more flexibility at the operating level, AFR 400-37, Base Procured Equipment Program, is being revised. This revision will raise the dollar threshold on Base Procured Equipment (3080) from $1,000 to $3,000. Major commands and SOAs should incorporate this increased dollar threshold in future budget and buy programs. *Continued on page 20*

Logistics Long-Range Planning

Lieutenant Colonel Robert H. Thompson
Logistics Concepts Division
Directorate of Logistics Plans and Programs
DCS/Logistics and Engineering
HQ USAF
Washington, D.C. 20330

Today's Air Force possesses an increased awareness of the essentiality of support capability. Limited numbers of personnel and rising costs of weapon systems dictate a more effective and efficient use of the resources on hand. Too long we have tried to apply a 1950 logistics system to 1980 technology. Both the environment and our requirements have changed. It is time that we reviewed the basic foundation of our logistics system. How can we do it better? We need not just band-aid type changes but revolutionary ones! We have 30 years of logistics mindset to overcome. Our logistics system has been a good one, built with stability in mind. But let us not confuse stability with stagnation.

The need for change exists today, but we must also look ahead. If we were to recognize only today's challenges, the solutions would be outdated by the time they were implemented. For this reason, we need to look to the future, to influence the planning portion of the Planning, Programming and Budgeting System (PPBS), and to plan ahead with the future in mind.

Long-range planning, with emphasis on "top-down" guidance from senior leaders, is receiving renewed effort Air Force-wide and particularly in the logistics field. Its foundation rests in a methodology consisting of a systematic process of formulating goals and objectives for the future while, at the same time, developing the necessary strategy and resource allocation alternatives needed to achieve these goals and objectives.

On 29 April - 2 May, forty-seven of our top logisticians representing HQ USAF and the major commands met at Homestead AFB, Florida for the first logistics long-range planning seminar. Chaired by Lieutenant General George Rhodes, USAF, Retired, the seminar discussed the impact of the future environment on the logistics system in the year 1995. Faced with a scarcity of raw materials, increased production leadtimes, limited manpower, and a commitment to support worldwide operations, the challenges are numerous. It was recognized from the beginning that no immediate answers were to be found. There was a unanimous agreement, however, on the need for long-range planning and a commitment to support long-range planning efforts.

Insuring Compatibility with Air Force Long-Range Planning

After endorsement of the long-range planning effort, a process and architecture was established to accomplish logistics long-range planning at HQ USAF. The process identified is one that would complement the existing Air Force long-range planning process.

Beginning with the FY 83 planning cycle, Air Force planning will entail extending the planning horizon and expanding the planning process. The objective is to implement a process that institutionalizes a longer term view of the environment in which the Air Force must support national objectives, integrates mid- and long-term planning and involves top decision makers early in the planning process.

The expanded process will yield four products: (1) the USAF Global Assessment; (2) the Secretary of the Air Force and Chief of Staff Planning Guidance Memorandum; (3) the USAF Planning Guide; and (4) the USAF Strategy, Force, and Capabilities Plan. Together, these will comprise the Air Force Planning Memorandum.

The USAF Global Assessment is an examination of the environment in which the Air Force will be expected to perform its mission. As with other elements of the AF Planning Memorandum, the Global Assessment will increase in depth and breadth as the planning process matures. This year's assessment focuses principally upon U.S. long-term regional interests, possible threats to those interests and their implications. It also offers candidate elements of a strategy to meet stated Air Force planning objectives. These candidate strategy elements are not meant to bound thinking but rather to stimulate dialogue. From an Air Force-wide colloquy, specific recommendations will emerge for further action.

The SAF/CSAF Planning Guidance Memorandum is prepared from the background and supporting analyses contained in the Global Assessment. The GM involves the Air Force leadership early in the planning process and provides a "top-down" focus to those major objectives and priorities deemed critical to Air Force planning over the long term. Together, the Global Assessment and Guidance Memorandum provide a basis for beginning Mission Area analyses and ultimately for formulating the USAF Strategy, Force and Capabilities Plan.

The USAF Strategy, Force and Capabilities Plan will replace the USAF objective force. It will be structured to support Air Force inputs to the Joint Strategic Planning Document and to provide planning forces that give a long-range perspective to POM development.

For the FY 84 planning cycle, logistics will publish for the first time a Logistics chapter to the USAF Global Assessment. It is here that major issues will be identified and objectives established. Based on input from the Global Assessment, the SAF/CSAF Guidance Memorandum will be published to include specific logistics strategies.

It is important to note that the USAF Global Assessment is signed by AF/XO and the Guidance Memorandum by the Secretary and Chief of Staff of the Air Force. The Logistics Long-Range Planning Guide will be published and signed by the Deputy Chief of Staff, Logistics & Engineering, AFLC Commander, and Assistant Secretary of the Air Force for Research, Development and Logistics. While the document will largely resemble the Logistics chapter to the Global Assessment, it will also identify specific OPRs for the issues identified.

Immediate Actions

Long-range planning is a very dynamic and evolving process being put on the front "burner." Issues are going to be worked and discussed at every level. At the LG Conference in November, Log Planner's Conference in December, Scientific Advisory Board, AF/LE-AFLC LOGTALK, and next year's Logistics Long-Range Planning Seminar, new issues will be surfaced and progress briefings given. Although the specific guidance will come from AF/LE, AFLC/CC and SAF/AL, all MAJCOMs will be players in one way or another.

Long-range planning cannot be accomplished in a vacuum. The process requires an organization and people.

To meet the immediate tasking of writing and Logistics chapter to the USAF Global Assessment and SAF/CSAF Guidance Memorandum, a logistics long-range planning task force was convened at Bolling AFB in mid July 1980. The group was represented by AF/LEX, AF/LEY, AF/LET, AFLC/XRX, AF/XOXLP, AFLMC, and SAF/ALG. They wrote the Logistics chapter, identified the required strategies for implementation, and presented their results to AF/LE, AFLC/CC, and SAF/AL for endorsement and prioritization of issues. The Logistics chapter was scheduled for presentation to the Secretary and Chief of Staff of the Air Force in late September 1980. The task force was disbanded at that time.

Early this fall, a permanent long-range planning group will be established at HQ USAF under the Director for Logistics Plans and Programs. This multidisciplinary group will receive informational input from all logistics functions in terms of major issues and candidate strategies. Direct input will be provided by AF/LE directors and AFLC/XRX.

The planning group will be responsible for drafting the Logistics chapter to the USAF Global Assessment, providing input into the SAF/CSAF Guidance Memorandum, and publishing a Logistics Long-Range Planning Guide. In addition, they will monitor the status of all issue/strategies as they are being worked toward implementation. Perhaps one of the most important functions of the logistics long-range planning group will be to interface with the HQ USAF Deputy Director for Long-Range Planning. Not only will logistics be represented in all operational long-range planning, but logistics will be more aware of how to better support the operational force in the 1980 - 1990's.

Logistics long-range planning is moving ahead. The efforts to date have been productive and essential to institutionalizing a process and architecture. If the challenges of 1995 are to be met, and there are many, then logistics planning must begin now. Now is the time to begin building the logistics system for the 21st Century.

AFJL Item of Interest

Logistics Management Issues

Since January 1977 the US General Accounting Office has issued more than one hundred reports on logistics matters, primarily within the Department of Defense. A recent study on "Logistics Management Issues" (LCD-80-48, April 1, 1980) identifies those reports and, more important, the GAO's current assessment of government logistics and the specific issues on which future GAO attention will be focused. The following excerpt succinctly conveys the current view and future emphasis:

> Many of the problems pertinent to this issue area are grounded in parochialism and resistance to change by Government managers. Often new concepts of performing various functions are accepted on a theoretical basis but little emphasis is given—from top management on down—to getting them implemented.
>
> For example, the single manager concept has been implemented in the Government for a number of functions or activities. The establishment of (1) a single manager for ammunition, (2) the Defense Logistics Agency, (3) the Military Airlift Command, and (4) the General Services Administration are examples. Yet much more can be done. One possibility would be the designation of a single overall logistics manager in DOD.
>
> Insufficient progress in greater intra or interagency logistics support is another problem area that requires GAO's attention. The Government has to identify and implement ways in which it can perform its material management functions more economically and efficiently. Elimination of unnecessary duplicate activities offers the potential for large savings.
>
> Finding better ways to determine needs, manage inventories, and utilize equipment to preclude acquiring more items than are necessary to further approved programs are areas to which GAO has devoted considerable attention in the past because of the potential for savings and will continue to do so in the future.
>
> The failure to identify logistics requirements early in the development stage of major weapons systems or items of equipment and plan for the logistics support of the system throughout its life cycle can result in substantial unnecessary costs over a long period of time. Although DOD has developed an integrated logistics support planning procedure, GAO will have to evaluate the manner in which it is being implemented for new weapons systems now under development.
>
> The military has had problems keeping up with its maintenance workload despite large increases in its maintenance budget and reduced asset activity. Specific areas that need attention include (1) shipyard maintenance, (2) the potential for using private industry for depot maintenance, and (3) the proliferation of Air Force aircraft component repair resources in support of new aircraft. Also, new, more economical maintenance concepts and practices used by private industry have not been adequately considered and adopted when feasible. Much needs to be done to improve maintenance productivity.
>
> A number of serious problems exist concerning the distribution of Government material. Shipments are not being managed to achieve lower transportation costs. Order and shipping times are excessive resulting in unnecessary inventory investment. Loss and damage to material in transit is not minimized. New concepts and techniques in transportation have not been adequately considered.

The entire study is essential reading for Air Force logistics managers.

The Logistics Challenges of Deploying a CONUS Joint Task Force

Major Stephen G. Crane
Chief, Materiel Management Branch
401st Supply Squadron
401st Tactical Fighter Wing
United States Air Forces in Europe

In a recent report to the Congress, the General Accounting Office found that joint commands adequately identified exercise lessons learned, but had extreme difficulty in implementing, following up and applying the results of these lessons learned. [1:29] The report further states that "JCS directed and coordinated exercises are essential to the joint training and readiness of U.S. military forces and should be continued." [1:20]

This article is written in the interest of passing on some logistics lessons learned during past joint exercises. It is based primarily on first-hand experience gained as a joint task force (JTF) bare base support officer on nine exercises. It is directed primarily to those who may be responsible for the logistics support of similar CONUS exercises in the future.

The activities related to a deployment exercise can be grouped in several phases: preliminary investigation, initial planning, deployment, arrival airfield operations, establishment of the JTF area, disestablishment, movement to the departure air field and redeployment. Because the final three phases are, for the most part, simply the reverse of the preceding phases, this examination will concentrate on the logistics tasks and problems associated with supporting an exercise through the JTF establishment.

Table 1 provides an overview of the primary logistics related tasks involved, when they are accomplished and when applied.

Preliminary Investigations

External coordinating agencies must conduct two preliminary investigations directly affecting support for a logistics exercise before the logistician develops and finalizes the plan for supporting the JTF headquarters. Although these investigations are usually outside the logistician's area of control, logistics planning depends directly on the results of the investigations. The necessity for early completion of their investigations must be stressed with these agencies to allow ample time to "pour the foundation" for logistics support.

The first investigation involves environmental impact studies that determine, to a major degree, the location of the exercise area and the JTF headquarters. These studies may range from analysis of potential erosion in desert warfare scenarios to identification of the extent of potential damage to wildlife habitats. Included in the studies are analyses of possible water pollution and violations of cattle grazing land. Land restrictions must play a major role in selecting headquarters locations. As the participants in Brave Shield IX learned, initially disregarding such restrictions can play havoc after an exercise has begun:

> Early in the planning phase for Brave Shield IX, maneuver areas were established for field operations at Fort Polk. Plans were established and headquarters located within these areas. (After deployment began), the first of three land use restrictions surfaced which required changes in headquarters locations and plans of operation. [3:III-6]

In a study of joint training exercises, Lieutenant Colonel William Reynolds emphasized the problem of restrictions: "Joint training exercises cannot be conducted in the United States on the order of magnitude of past years. Primarily the environmental restrictions limit the size of the maneuver space. . . ." [2:18] Land restrictions based on environmental impact studies will continue to affect logistical preparations to support JTF headquarters.

The second preliminary investigation considers the availability of airspace for the air maneuver portion of the exercise. Although logisticians seldom influence decisions regarding airspace, any decisions involving the Federal Aviation Agency, commercial airlines, local commercial air terminals, and local military air operations affect the placement of the JTF headquarters, and this is a logistical responsibility. Exercise Brave Crew 74 demonstrated the difficulty of providing realistic joint training under CONUS environmental constraints: "The restrictions placed on the use of exercise airspace . . . to accommodate the requirements of land owners and environmentalists had a direct impact on the exercise." [4:III-4] The following statement from Gallant Hand 73 is just as true today as it was seven years ago: "The reality of limited ground and airspace will continue to produce artificialities and continue the requirement for controlled exercises." [5:I-7]

Preliminary investigations are very important to headquarters logisticians because they identify the boundaries of the area available to establish the JTF headquarters. They provide the framework required by the logistician to develop the logistical support concepts basic to the initial planning of the exercise.

Table 1.
Primary Tasks

KEY TASK	ACCOMPLISHMENT PHASE	APPLIED PHASE
Identify land use and maneuver restrictions	Preliminary Investigation	Initial Planning/ JTF Establishment
Planning	Initial Planning	All
Coordinating trips	Initial Planning	All
Site Location selection	Initial Planning	JTF Establishment
Potable water source	Initial Planning	JTF Establishment
Identify natural camouflage	Initital Planning	JTF Establishment
Backup power sources	Initial Planning	JTF Establishment
Distance to resupply base	Initial Planning	JTF Establishment
Coordination Conferences	Initial Planning	All
Identify logistics requirements	Initial Planning	Deployment/JTF Establishment
Personnel responsibilities	Initial Planning	Deployment/Operations/JTF Est.
Airlift Requirements	Initial Planning	Deployment
Prioritize logistics requirements and support personnel	Deployment	Deployment/Operations/ JTF Establishment
Separate airlift loads by priority	Deployment	Deployment/Operations/ JTF Establishment
Logistics uploading	Deployment	Deployment
Arrival Airfield Operations	Operations	Operations
Down load aircraft	Operations	Operations
Prepare cargo for movement	Operations	Operations
Equipment/personnel arrival at site	JTF Establishment	JTF Establishment
Prioritized establishment of JTF	JTF Establishment	JTF Establishment
Support of JTF	JTF Establishment	JTF Establishment

Initial Planning Phase

The initial planning phase begins six to nine months prior to the actual exercise. The length of this phase depends on the complexity and size of the exercise; however, the larger the exercise, the longer the planning phase. During this phase, the logistician develops the plan that not only provides the foundation for logistics support of the JTF headquarters but also directly affects the other phases of the logistics mission. Figure 1 depicts the relationship of the planning phase to the other phases.

It is an all-encompassing relation, one further defined by Max Havas when he wrote that planning includes:

> . . . all the managerial activities which lead to the definition of goals and the determination of appropriate means to achieve these goals. When all resource aspects of an objective are evaluated as a part of a systematic approach to problem resolution (a planned support approach to planning) the function becomes logistics planning. [6:50]

In the JTF arena, the overall goal is a successful exercise. Thus, logistics is the "means" of assisting in attaining this goal, and the logistics plan is developed to support accomplishment of the goal. Initial development of the plan involves coordinating trips to the exercise area. These trips are vital to the overall goal and are keys to the entire support posture for the JTF headquarters. The initial trip confirms the primary location of the headquarters and possible alternatives to the primary location. The choice of a location depends on the results of the environmental impact studies and the availability of airspace discussed earlier.

In selecting the location for the headquarters, the logistician must consider many important logistics aspects. Of prime importance is a survey of the terrain for its adaptability to the headquarters complex, which can total 2,000 or more personnel in a large-scale exercise. The survey includes identifying and avoiding low-lying areas that cannot be incorporated into the JTF operational area. Low lying areas coupled with adverse weather conditions may not only hamper the logistics mission but may also affect accomplishment of the overall mission. These two factors played an important role in Gallant Hand 73, conducted at Fort Sam Houston and Fort Hood in April 1973:

> Weather had a significant impact on the installation of communications facilities at Fort Hood, Texas and James Connally Airfield, Waco, Texas. The heavy rains which occurred in these areas during the second and third weeks of April significantly hindered movement and caused unanticipated delays of 24-48 hours in emplacing equipment, laying communications cables, and erecting antennas. [5:III-5]

And Empire Glacier 78 faced a similar situation when ". . . initial placement and activation of the OPP-GND HQ (opposing ground forces headquarters) communications support was hampered due to geographical location and inclement weather." [7:I-7]

The point is that the JTF headquarters could face the same situation if the logistician does not develop accurate plans or survey the site selected for the headquarters. Specialized vehicles, including communications vans dedicated to the headquarters, trailer and skid-mounted generators, refrigerated vans for the mess operation, and water trailers for shower operations must have access to the headquarters operational area. The joint operations center and the supporting staff that form the headquarters will definitely function less effectively if they are bogged down in mud and water in their operational area. Thus, the entire JTF mission could be jeopardized if it is established in an unsuitable environment.

The second area of concern in surveying the location for the headquarters is a source of potable water. Identification of a convenient source of water will not only reduce the number of trailers required but will also eliminate the need for transportation to and from a dislocated water source. That is, a potable source will reduce the logistics requirement for equipment (water trailers and haulers), personnel (drivers), and transportation costs (distance between the JTF location and the source of water).

Identification of natural camouflage is an important consideration whether the JTF operates in a tropical, timberline, cold weather, or desert scenario. Camouflage is a vital necessity in any wartime scenario and, as such, has become a major task for the logistician. This task is complicated by the environmental restrictions posed earlier and the nature of the equipment requiring camouflage. The evaluation report for Brave Shield IX points out some of the problems

Exercise Phase Relations

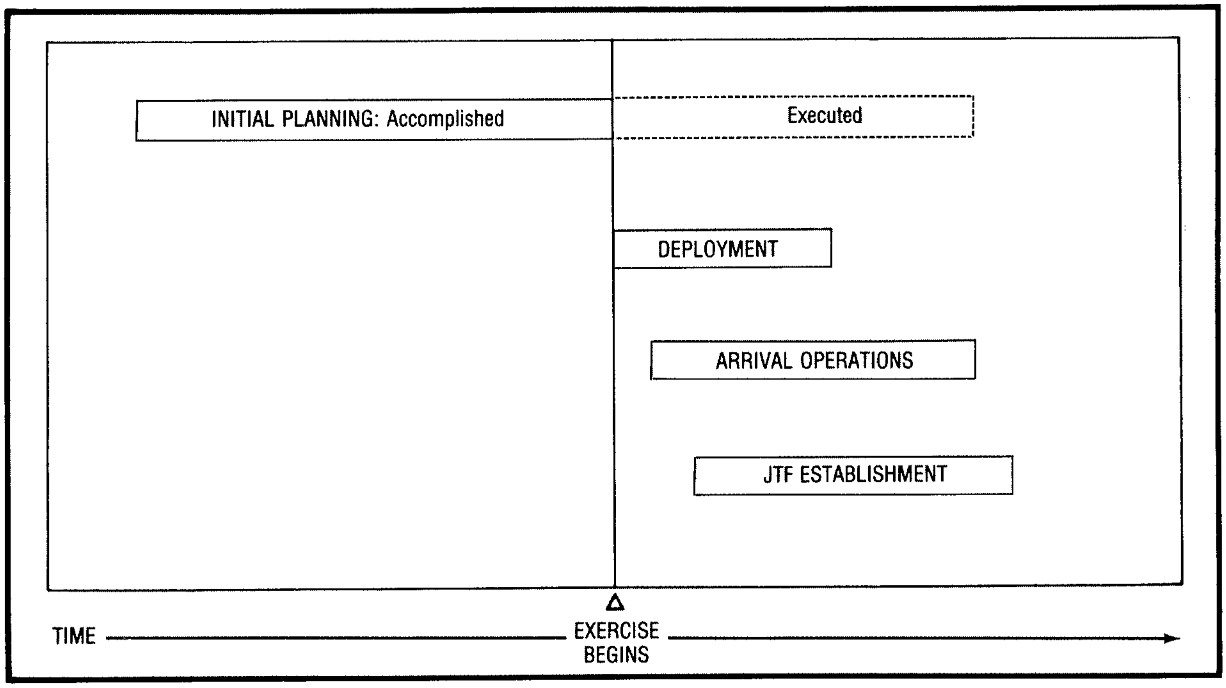

Figure 1.

of developing adequate camouflage:

> The command emphasis on camouflage discipline/techniques during the exercise was not consistent with environmental restrictions . . . It is difficult enough to camouflage white portable toilets, refrigeration vans and aircraft rotor tips using all available resources, but near impossible to strive for excellence using scrub brush, broad leaf weeds, and axle grease in all pine-wood forest. Notwithstanding the restrictions on cutting natural foliage, the camouflage effort was further frustrated by inadequate nets and lack of garnish material. [3:III-7]

Camouflage in the desert is even more difficult than camouflage requirements in either a tropical or timberline location. Pilots reported to the author during Gallant Shield 75 that a camouflaged tent above ground appeared exactly as a camouflaged tent from the air. Proper site selection can assist the camouflage problem, but man-made camouflage materials for specific scenarios will always be the long-term solutions to the problem.

Other factors to consider in selecting a site for the headquarters are sources for backup power and the distance to the resupport base. The availability of a commercial source for backup power can reduce the need to transport generators by air or over the road and will save on transportation costs. If the resupport base is near the JTF headquarters, the logistician can plan to use facilities at that base to store supplies, equipment, and rations instead of erecting tentage for storage areas. Early identification of the site will provide sufficient time for effectively planning JTF logistical support.

Personnel and Equipment Requirements

In conjunction with the survey of the terrain for the headquarters, logistics coordination conferences are necessary to identify requirements for equipment and personnel. These conferences address all logistical aspects of supporting the headquarters, ranging from methods of supporting the mess to the quantity of JP-4 required for the sophisticated communications vans/generators used by the joint communications support element. The logistician must identify requirements above those available at the JTF garrison location and task them to other supporting bases or posts. He must begin this action early in the planning process to provide enough lead time for the "tasked unit" to integrate the requirements and arrange transportation to the exercise location. Failure to accomplish this tasking could result in severe logistics shortfalls at the onset of the exercise.

The headquarters logistician is the focal point for all logistical requirements because he provides expertise to the support mission and establishes their procedures. Augmentees - personnel assigned to the JTF logistics structure from other Army and Air Force units-provide most of the exercise logistical support for the exercise. The headquarters logistician must also insure attendance of tasked logistics personnel at all coordinating conferences. Jack Frost 77 shows what can happen in the absence of that coordination:

> In a few instances, key logistic worker personnel of participating units had not performed personal coordination prior to the deployment phase which resulted in unprogrammed requirements and delays in providing required or requested support. [8:II-4]

Personnel play vital roles in supporting all logistics phases of the JTF headquarters operation. People are the logistician's most valuable resource and their most valuable attribute is their knowledge of duties and responsibilities in all four phases. The absence of such knowledge was obvious in Empire Glacier 78:

> Most augmentees on the . . . staff were inexperienced in joint operations. Consequently, staff actions and planning during the early portion of the exercise were sometimes delayed or incomplete. This highlights the importance of joint staff training prior to an exercise and reinforces a need for thorough training workshops prior to staff involvement. [7:II-3]

Such training was accomplished for in Brave Shield IX, with obvious tangible benefits:

> JTF Headquarters augmentation personnel reported to HQUSREDCOM . . . and orientation and training sessions were conducted. This procedure permitted augmentees to become oriented with the exercise scope and their duties prior to arrival in the exercise area. It also permitted the JTF staff to be well organized and prepared to initiate exercise activities immediately on arrival at Camp Beauregard. [3:III-2]

Training of augmentees is vital to the success of the logistics effort and training prior to deployment is definitely the preferred approach in accomplishing this important task.

Training of key deployment personnel is more important in the long run than augmentee training. The deployment cell (D-Cell) nucleus, consisting of approximately 40 Air Force NCOs from JTF garrison provides the potential for a successful logistics effort in any JTF exercise. These people are assigned to the D-Cell with specific specialties (i.e., supply, food service, carpenter, vehicle maintenance, or security police). However, the headquarters logistician must insure that these people broaden their expertise to include supplementary deployment responsibilities. For example, the entire D-Cell should receive loadmaster training, which provides valuable up-load assistance during deployment and off-load assistance during the operations phase at the arrival airfield. All members should have valid military driver's licenses and some should be qualified to operate two and one-half ton trucks, forklifts, and tractor trailers. Special authorization to drive the vehicles onboard the airlift aircraft is necessary during on-load and off-load operations. This additional expertise not only provides a smooth transition from one phase to another during exercise support, but also could become a critical factor in supporting an actual contingency or humanitarian relief action anywhere in the world. Another value is that it builds "esprit de corps" within the D-Cell, and this spirit overflows to the augmentees. If key personnel are willing to accomplish tasks outside their normal specialty, then the augmentees will tend to follow suit. Trained key and augmented personnel are vital factors in successful logistical support for the JTF headquarters from deployment through the establishment phases of any exercise. And the most effective training of augmentees occurs at the JTF garrison location prior to deployment.

Also included in identifying requirements for the headquarters is the airlift necessary to deploy the joint task force from garrison to the operational area. This planning must allow sufficient lead time for the Military Airlift Command to work the JTF requirements into the total airlift air flow for the exercise. Failure to allow enough lead time could jeopardize deployment of the headquarters to the operational site. The key to successful planning is to begin early enough to allow for the inevitable changes and responses from "tasked units" in performing their specialized logistics functions.

Deployment Phase

Following the initial planning phase, the logistician must concentrate on the deployment phase. At this point, the airlift flow has been finalized and the deploying logistician knows the aircraft (C-130, C-141, or C-5) that will be used in the exercise. The logistician must also know the scheduled departure date and time and the required loading time for each airframe. Absence of this information could cause a drastic extension in the time required for the airlift. And, if severe enough, this extension will have a rippling affect and cause delays at the arrival airfield and the headquarters operational area.

The first task in this phase is to prioritize the logistics requirements identified in the initial planning phase. This priority must be based on the time that specific equipment or supply items are needed at the JTF location. And support personnel must be prioritized on the same basis. For example, certain mess personnel are needed before other support personnel are deployed to the site. This necessitates the arrival of mess equipment, tentage, rations and cooks at the deployed location early in the prioritized logistics scheme. In any event, proper prioritizing of logistics requirements is essential for successful deployment.

The next step is to separate the prioritized logistics requirements into chalks by aircraft departure time. These chalks consist of the equipment and supply items needed first, second, third, etc., at the JTF site. The logistician must insure maximum use of the dedicated airframes to reduce airlift costs and allow rapid deployment to the operational area. The final report on Brave Shield XIII stated: "Several missions operated with less than full utilization of aircraft allowable cabin load. For example, one C-141 mission contained only 33 passengers and four tons of cargo." [9:II-16] Consolidation of loads in this case could have reduced transportation costs and permitted faster deployment. After completion of the prioritized plan and separation of the cargo into chalks, the logistician marshalls the chalks at the departure airfield prior to the arrival of aircraft. He then marks the chalks according to the prioritized plan, and they are ready for deployment.

Bumping Loads

One problem beyond the logistician's control is the "bumping of loads" at the departure airfield. Bumping occurs if another unit using the same departure airfield has equipment carrying a higher priority of need at the destination. Or it can occur if a deployment aircraft is not capable of performing its mission. The prioritized plan plays a major role if either of these situations occur. If "bumping" becomes a reality, the prioritized deployment plan for logistical requirements will allow slipping the least needed supplies and equipment until later in the deployment air flow. This situation occurred in the tactical deployment (C-130) of the joint task force to Camp Beauregard, Louisiana, during Brave Shield IX. The joint communications support element had to deploy two communications vans earlier, and dedicated aircraft were not capable of performing the mission. The headquarters logistician "bumped" lesser priority cargo to allow airlift of the vans and rescheduled the JTF equipment on a replacement aircraft. He used the prioritized plan and chalks to accommodate the "bump" without suffering critical time delays at the arrival airfield or the JTF operational area. Prioritization thus assists the logistician in determining *what* will arrive and *when* it will arrive at the site, insures maximum use of deployment airframes, and allows for "bumping of loads."

The final step in the deployment phase is the up-loading process of moving the equipment from the marshalling area onto the deployment aircraft. During the initial planning phase, particularly in the coordinating conferences, the logistician must request all up-load equipment required at the departure airfield from the Military Airlift Command or from the host transportation function. Insufficient up-load equipment resulting from lack of coordination will definitely slow down the up-loading process and cause delays throughout the deployment and subsequent phases. Since up-load equipment is used primarily in loading palletized cargo, the user must provide the material necessary to up-load pallets onto forklifts or other primary loading equipment and secure this cargo onboard the aircraft. Otherwise, delays will hamper the mission. Jack Frost 77 confronted this problem during redeployment:

> During the outloading of units for redeployment, the units were arriving at the departure airfield without shoring/blocking/bracing material to properly secure cargo, equipment and vehicles. This deficiency on the part of deploying units created problems with aircraft loading time . . . Loading time of aircraft was longer than required due to departing units not being prepared with sufficient blocking/bracing/shoring/material. [8:36]

Wheeled vehicles, especially gas-driven hauler vehicles, pose additional problems during the deployment phase. The problems appear prior to the actual up-loading process, but they can still cause delays during deployment. The most common vehicle problem involves improper preparation of the vehicles or improper documentation of dangerous cargo. Both conditions occurred during deployment in Brave Shield XIII:

> A 12-ton maintenance van loaded aboard a C-5 aircraft began to leak fuel shortly after take-off. The source was found to be an uncapped fuel line which fed an internal heater that had been removed from the van before shipment. The fuel tank on a generator trailer vented fuel in-flight aboard a C-141 aircraft. Cause was displacement of fuel toward the top of the tank due to securing the generator with its tongue lowered to the aircraft floor. At one location, several vehicles were inspected and allowed to pass through the marshalling area checkpoint with improperly prepared DD Forms 1387-2, Special Handling Data/Certification. [9:II-15]

Proper planning and coordinating overlap in the initial planning phase and, ultimately, determine the success of the deployment phase. And problems that delay successful deployment will have far-reaching effects during the operations phase at the arrival airfield and establishment of the JTF headquarters. Prevention of these deployment problems will simplify the uploading process, provide maximum use of aircraft, keep the prioritized plan on target, and insure a successful joint training exercise.

Operations Phase - Arrival Airfield

Operations at the arrival airfield begin with the arrival of the first deployment aircraft. Since other aircraft are still deploying from their home station, the deployment phase and the operations phase overlap causing unique logistics problems. At least two key logisticians are required at this point - one at the home base to direct the remaining deployment and one at the arrival airfield to direct operations. The operations at the arrival airfield are the reverse of the actions at the deployment airfield. The aircraft must be down-loaded and the cargo must be prepared for movement to the JTF operational area. As in the deployment phase, equipment is needed to off-load the palletized cargo. Again, the logistician must have tasked this requirement during the initial planning stage. As in the deployment phase, inadequate or improper off-load equipment will delay operations at the arrival airfield and cause delays in establishing the JTF operational area.

Insufficient off-load equipment can seriously jeopardize the JTF mission and the mission of other units. Since aircraft from all parts of the CONUS deploy to the same arrival airfield, lack of proper equipment will cause loaded aircraft to "stack up" and limit aircraft parking space. This, in turn, can cause delays in recycling the aircraft back to a deployment location to up-load its next mission for deployment to the arrival airfield. Any slowdown of the off-load process will threaten the priority status of logistics needs developed during the initial planning and deployment phases. For example, priority cargo three may be off-loaded for movement to the JTF site before priority one or two cargo, since all three airlift aircraft could be on the ground at the same time.

Since wheeled vehicles require less time and effort to off-load and proceed to the JTF area, the primary concern during this phase is to off-load and move the palletized cargo. After the palletized cargo is down-loaded, transportation is required to move this cargo to its destination. Again, arrangements for this action should have been made during the initial planning phase. In Gallant Shield 75, the writer deployed to Biggs Army Air Field on a C-141 aircraft with 10 pallets of JTF cargo. The off-load was readily accomplished, but the "tasked" flatbed trucks convoying from Fort Carson had not arrived to transport the pallets from Biggs to McGregor Range. The resulting 10-hour delay in moving tentage for the joint operations center to the exercise area further delayed establishment of the headquarters.

Of prime importance during operations at the arrival airfield are *key* support players who know and perform their individual responsibilities. The nucleus of this expertise is the deployment cell mentioned earlier. They play dual functions in the sense that a cook serves as the driver of a two and on-half ton truck or as a vehicle maintenance technician to assist in the down-loading of the cargo at the arrival airfield. In any event, the headquarters logistician must see that all JTF support personnel know their specific responsibilities at the arrival airfield. Proper planning insures that personnel onboard each aircraft know what to do and how to handle the cargo during operations at the arrival airfield.

Successful operations at the arrival airfield depends on the effectiveness of the initial planning and deployment phases. Even the most thorough plans, however, can be disrupted by external events. The writer recalls such an instance on an exercise to Fort Bliss. During redeployment, the C-141 airlift was diverted to South Vietnam for the refugees. C-130s began to replace the C-141s on the exercise and support personnel had to reconfigure all the JTF pallets from the C-141 configuration to the C-130 configuration. Time was lost as the headquarters logistician was forced to react to events that were completely outside the scope of his initial planning.

JTF Establishment Phase

This phase overlaps the arrival airfield phase just as the arrival phase overlaps the deployment phase. Equipment and personnel begin to arrive at the JTF location during operations at the arrival airfield, and, as in the previous phase, these individuals must know their duties and responsibilities. As stated earlier, the JTF headquarters consists of the joint operations center and the supporting staff.

Upon arrival at the deployed location, the logistician's overall task is to establish the JTF operational area. Like the other phases, this phase is a real challenge to the logistician because the prioritized equipment plan merges with the prioritized plan to establish the headquarters. Staking out each functional area within the headquarters complex will guide the logistician through the establishment phase and keep him within the confines of the prioritized establishment plan. Without this plan of attack, he may find it necessary to reassemble some functions. Delays of this nature are frustrating to support people, and they waste valuable time in establishing the operational headquarters.

This plan prioritizes the sequence for erecting tentage. Usually, the tentage for the joint operations center is erected first because this activity is the "hub" of the JTF operation. The generators are then set in place, followed by the remaining functions contained inside the security wire. Upon completion of the prime functions inside the security wire, the logistician begins to establish those support functions outside the security wire. Designated support teams establish the mess facilities, motor pool activity, and shower facilities. Each team must have key logistical support personnel, normally D-Cell members as team chiefs. These individuals direct the establishment of their assigned area and insure compliance with the prioritized establishment plan. The teams consist largely of Army augmentees that may number more than 150 members on a typical exercise. These individuals are furnished by the 82nd Airborne Division, the 101st Airborne Division, or a support company. If the augmentees arrive at the location without prior training in the mission, the team chiefs must take the time to explain the operation before commencing with the task at hand. The final report of Brave Shield XIII points out this problem:

> The Joint Task Force Headquarters was not manned with sufficient experienced personnel to adequately perform its functions right from the onset in such a large exercise . . . [9:II-2]

A similar condition existed during Gallant Shield 75:

> Further the establishment of the JTF headquarters was a true challenge since most of the staff members had never seen each other before arriving in the exercise area. Only 24% of the JTF staff were experienced joint staff personnel. [10:III-9]

Although these observations pertain primarily to the headquarters staff, they also apply to the overall logistics effort. If augmentees are not familiar with the type of equipment required to support the joint task force, experienced logistics people must train them to insure smooth and timely completion of the establishment phase. An example occurred in Brave Shield IX when the Air Force provided the majority of the cooks as augmentees in the mess operation. The duty schedule required three augmentees cooks on duty for the midnight meal, but they did not understand how to operate the gas stoves used under field conditions. The problem may appear simple, but, to the headquarters logistician, hungry troops coming off duty are very real indeed.

Other factors can likewise tax the logistician's patience. His best plans can go astray when he must recognize "suggested" changes in configuration after the headquarters has been established or when five female augmentees report in at two o'clock in the morning and he has not planned separate billeting tents or showers. The latter oversight, no matter how understandable in the past, would be inexcusable today. Overall, meticulous planning, endless coordination, experienced key workers with training ability, and a great deal of patience and fortitude pay rich dividends in this type of logistics exercise. There are some final observations that must be made.

Future Considerations

The logistician's foremost concern is to avoid the great logistics time crunch. And an orderly plan that allows enough lead time for completion of key milestones in each phase is a tremendous step away from this crunch. If the logistician gets "time crunched" early in the deployment phase, his problem of "digging out" will certainly become a monumental task. The planning phase, of course, is the time to staff all possible logistics complications that could occur during the exercise. However, the prioritized plan for deployment equipment and the prioritized plan for establishing the JTF will supplement initial planning actions and provide the framework for avoiding the time crunch in the deployment and establishment phases.

The logistician should use rolling stock wherever possible because it reduces confusion and eliminates much of the up-load/off-load equipment at the deployment and arrival airfields. And it provides organic transportation for support people from the arrival airfield to the JTF site. Rolling stock also reduces time delays and moves the equipment at a faster rate. Of course, pallets are necessary at times to support JTF requirements.

A container approach is most beneficial when pallets are required. This approach includes grouping specific functional assets together The container approach not only offers greater protection from damage during shipment but also provides faster response capability and easier handling from the garrison storage area. Prioritizing is much easier if all assets of a specific function are grouped in containers. Under this approach, bin labels affixed to each container show owner, contents, and priority of need at the exercise area. The total prioritized containers then become the pallet portion of the prioritized equipment plan. Containers on wheels further enhance loading/unloading operations and maneuverability at the JTF site. Thus, rolling stock is logistically more efficient than pallets, but, if pallets are required, the logistician should rely on a container approach to facilitate the support effort.

Development of a simplfied support concept will enhance future logistics support of the JTF headquarters. This concept builds on the container approach mentioned earlier. The logistician should avoid tasking units other than the support base for suppllies and equipment. This action will reduce the complexity of logistical support by stocking those items near the site or transporting them from a single location, preferably the JTF garrison location. A single location permits faster logistical response to a short-notice contingency and less coordination on exercise deployments. The equipment is easier to maintain at a central location than at three or four different geographical locations across the United States. Centralized equipment storage simplifies the flow of the airlift since deployment occurs from one base or post, avoids duplication of effort, and reduces the possibility of failure to ship an essential equipment component needed at the exercise location.

Another consideration is to use the container approach in developing a standardized basic support package. The standard JTF package would include all of the equipment used in any scenario, location, or weather condition - tents (without liners), mess equipment, administrative equipment, weapons, and vehicle maintenance tools, to mention a few. This standardized package provides the support baseline for any exercise. Depending on the location and weather, the logistician supplements the basic support package to satisfy the logistics of the particular situation. If the exercise is conducted in Louisiana during August, the logistician would supplement the basic support package with mosquito nets and bars. Since an exercise in New York during January requires heaters and liners for the tents, the logistician would add these items to the basic support package to satisfy the cold weather scenario. The standardized package concept coupled with the container approach greatly eases the burden of the headquarters logistician and provides an efficient method of accomplishing the prioritized equipment plan. It can be used to plan either rolling stock or palletized loads and it satisfies the equipment requirements for any scenario.

The author's experiences in supporting a joint task force have proven that the support company is the most efficient and effective method of augmenting the D-Cell. In using this method, the logistician can meet counterparts early in the planning phase, identify problems and avoid the time crunch, minimize equipment shortfalls, and see that people know their duties and responsibilities throughout all phases of the exercise. The support company arrives as a "package of manpower," trained in the specialties required in supporting bare-base operations. They function as a unit at their home station and are better able to adapt to the deployed environment than augmentees assigned to the JTF from various units across the United States.

In summary, the logistician's challenge includes controllable and uncontrollable events in the diverse and complicated tasks of supporting a joint task force. The planning phase circumscribes the other three phases and creates the support environment for the entire logistics challenge. The real keys to sound logistical support are to avoid the great logistics time crunch, plan for delays, simplify and centralize the support to the extent possible, train key people and augmentees, and develop patience and intestinal fortitude. With these keys, the logistician has the proper tools to meet the challenge of a rapid deployment force like that announced by the Carter administration in December 1979 to provide a joint task force for areas of the world other than NATO countries and Korea. Logisticians will play major roles in formulating and activating this renewed concept. Colonel James B. Agnew's either/or question in *Army,* September 1979 provides a challenging thought:

> Will we see STRIKECOM (now USREDCOM) revived as a planning-and-transfer agency as before or will it be empowered to operate as a transportable joint command moving as a headquarters with its designated troops into the crisis spots? [12:30]

The actual result will fall between these two extremes. The creation of the rapid deployment force will provide the day to day management and conceptual development of the force which will deploy. However, this structure requires personnel augmentation from all the services for a complete "force package." The logistics necessary to support this package will be a challenge playing a major role in its success.

References

[1] General Accounting Office , *Report To The Congress,* Comptroller General of the United States, December 11, 1979.

[2] Reynolds, William H., Lt Col, USAF, *Study of USREDCOM Joint Training,* Air War College, April 1977.

[3] Brave Shield IX, Evaluation, REDCOM, 22 July - 12 August 1974.

[4] Brave Crew '74, Preliminary Report, REDCOM, 7-26 June 1974.

[5] Gallant Hand '73, Final Report, REDCOM, 18 April - 6 May 1973.

[6] Havas, Max, "Logistics Planning," *SPECTRUM,* Spring 1979.

[7] Empire Glacier '78, Final Report, REDCOM, 16 January - 5 February 1978.

[8] Jack Frost '77, Preliminary Report, REDCOM, 1977.

[9] Brave Shield XIII, Final Report, REDCOM, 6 October - 5 November 1975.

[10] Gallant Shield '75, Final Report, REDCOM, 12 March - 14 May 1975.

[11] Brave Shield XII, Final Report REDCOM, 11-31 August 1975.

[12] Agnew, James B., Colonel, USA, "Unilateral Corps': Is The U.S. Turning a New Strategic Corner?", *Army,* September 1979.

Most Significant Article Award

The Editorial Advisory Board has selected "Aircraft Battle Damage Repair: A Force Multiplier" by Lieutenant Colonel Richard S. Greene, USAF, as the most significant article in the Summer 1980 issue of the *Air Force Journal of Logistics.*

General Thomas P. Gerrity Memorial Award for Logistics Management

Colonel William P. Bowden, Assistant Deputy Chief of Staff for Logistics Operations, Hq AFLC, has been selected by the Air Force Association as the recipient of this year's General Thomas P. Gerrity Memorial Award for Logistics Management. Colonel Bowden was recognized for his accomplishments while assigned to the Oklahoma City Air Logistics Center as the Director of Materiel Management.

CAREER AND PERSONNEL INFORMATION

Selective Continuation

Selective continuation is a program of giving "selected" reserve officers the option of remaining on active duty after being twice deferred to temporary major. This program was implemented to meet Air Force requirements for middle management experience. Here is how it works.

To be eligible for consideration for continued active duty under this program an officer must be serving in an Indefinite Reserve Status (IRS) and be subject to involuntary release from active duty due to having failed selection for the second time to the grade of temporary major. The officer must not be eligible for consideration for continued service on extended active duty as a commissioned officer under any other Air Force policy or provision of law. Personnel separated as a result of a prior selection board(s) are not eligible. This includes Reserve officers who separated after one consideration for temporary major.

Selection is by a board of officers. Board composition and procedures are consistent with those established for temporary promotion boards. Officers selected for continuation must be deemed by the board to be qualified for service in a continued status in their current grade. Board results are approved by the Secretary of the Air Force.

Continuation is for a period of three years. The three year period will begin on the date the officer would have been involuntarily released from active duty had the officer not been approved for continuation. (Exception: In no case will an officer be continued beyond the date on which first eligible for retirement in an officer status under any provision of law.)

Pursuant to 10 U.S.C. 681(a) the Secretary of the Air Force may at any time release a Reserve officer from active duty. Continued officers, however, will not be released from active duty due to Reduction in Force prior to the completion of two years active service from the date on which they otherwise would have been involuntarily released.

Continued officers must agree to serve on active duty for at least one year from the date they otherwise would have been separated. The date of separation of the continued officer will be the same as it was when considered for temporary major the second time.

Prior to completing three years service in a continued status, a board of officers will review the performance of those officers in a continued status. Officers deemed by the board to be qualified for service in a continued status in their current grade will be continued until eligible for retirement in an officer status under any provision of law unless involuntarily separated under another directive or provision of law.

Continued officers remain eligible for reassignment and for TDY schools and training provided that the active duty service commitment associated with the assignment, school, or training can be completed prior to the officer's date of separation.

Provided they meet other established eligibility criteria, continued officers remain eligible for promotion. Officers who are subsequently selected for and who assume the grade of temporary major will no longer be considered to be in a continued status. Upon promotion, they will be subject to established Air Force policy as it applies to officers of their grade, length of service, and component.

Assuming they meet other established eligibility criteria, continued officers will also remain eligible for augmentation into the Regular Air Force. Should the Defense Officer Personnel Management Act (DOPMA) or other legislation be enacted subsequent to an officer entering continued status, the officer's status will be the same as that of other officers of their grade, length of service and component unless otherwise provided by law.

(Note: Reserve officers must, by law, be considered for promotion to Reserve major so that they may be promoted on the date on which they complete 7 years promotion service and 14 years total commissioned service (10 U.S.C. 8366(a)). Continued officers who are selected for Reserve major will not change active duty insignia. A Reserve officer is, however, generally entitled to retirement in the Reserve grade held at retirement. Generally, Reserve officers, including continued officers, who are twice failed to Reserve major must be transferred to the Retired Reserve (if they are qualified and apply) or discharged from their Reserve appointment (10 U.S.C. 8846).)

Officers selected will be continued if they sign a statement agreeing to the terms of the program. Officers not selected and selected officers who do not accept continuation within the specified acceptance period will be released from extended active duty in accordance with established Air Force policy. The release of an officer who is selected for continued active duty but does not accept continuation will be considered an involuntary separation and will be paid readjustment pay if otherwise eligible. Officers who accept continuation and who subsequently apply for separation (resignation or release) will be considered as having voluntarily separated and will not be entitled to readjustment pay.

Those officers desiring to be continued on active duty must sign a statement to that effect *no later than 90 days* after the public release date of the board results. Officers may not change their election after the 90 day time period specified for acceptance has elapsed.

For the last two years, the Air Force has continued selected Reserve officers twice deferred to temporary major. In the first year of the program, 243 officers were considered with 91 officers selected. Of the 91 selectees, 71 accepted. Ten of the 71 accepting selective continuation in 1979 were promoted to temporary major this year. Of the 364 officers considered this year, 349 (96%) were offered selective continuation.

(Capt Russ Weaver/MPCROS1E/AV 487-6417)

Registration Opens for Logistics Civilian Career Program

The Office of Civilian Personnel Operations (OCPO), Randolph Air Force Base, Texas, has announced the open season for Cycle II registration in the Air Force Logistics Civilian Career Enhancement Program (LCCEP) will be the period October 15 - November 15, 1980. Registration will be conducted as set forth in the program regulation AFR 40-110, Volume 4. Registrants are urged to become familiar with the provisions of this regulation.

Air Force employees who are eligible for GS-12 and above positions in one of the occupational series in the logistics family and who have not previously registered are encouraged to register for the program during this period.

The registration process is simple and requires completion of AF Form 2675, Civilian Career Enhancement Program (Registration and Geographic Availability), which may be obtained from the employee's servicing Central Civilian Personnel Office (CCPO). Upon completion of the form, it should be returned to the CCPO for verification of the employee's eligibility from official records. If verification substantiates eligibility, the information is input into the automated Personnel Data System-Civilian (PDS-C) for program participation.

The registrant should indicate desire for assignment to any number of the locations listed on the form. The grade level of positions for which consideration is desired should also be indicated. In registering, employees are reminded that there will be greater opportunity to participate in the program if more than one location is reflected since there are approximately 1200 positions in the program, Air Force-wide. Employees should also indicate their interest in the Logistics Executive Cadre if they believe that they have high potential for higher managerial positions in the logistics arena. If the employee's Logistics Managerial Potential Assessment prepared by the immediate supervisor reflects their potential at a high level, an Air Force Panel will interview the employee for possible selection into the Cadre.

Benefits

Cadre members enjoy several benefits in the LCCEP including consideration for positions reserved for Cadre members, priority consideration for management, executive and developmental training, priority consideration for broadening and developmental assignments, and Air Force-wide top management visibility as logisticians with high managerial potential.

The initial increment of Cadre selections has just been completed. LCCEP program positions will be filled through the centrally automated referral system immediately. If an employee is not selected into the Cadre, the employee will still be considered for career essential positions centrally controlled by the LCCEP. Employees are urged to register if they feel that they can demonstrate a positive potential for accepting prgressively more complex assignments and in turn enjoy a more rewarding career as a logistician.

Future open seasons for registration in the LCCEP will be on an annual basis.

Questions pertaining to the above can be addressed to Mr. W. P. Arnold, Logistics Program Administrator (Transportation), OCPO/MPKCL, Randolph AFB, TX 78148, AV 487-5351.

Logistics Policy Insight continued from page 10

MILSTAMP Improvement Program

In June 1980 OASD (MRA&L) advised the military services and agencies to proceed with the implementation of the Military Standard Transportation and Movement Procedures (MILSTAMP) Improvement Program. Air Force Transportation will take the lead to accomplish a number of short range improvements in the documentation, handling and movement procedures for cargo in the Defense transportation system. One significant long range item relating to MILSTAMP conceptual changes is the responsibility of the Air Force Logistics Management Center (AFLMC). AFLMC is to consider the existing techniques for an interactive computer processing system. The system with terminal to terminal units to eliminate the requirement for movement and control documents and trailer cards will be reviewed. AFLMC will develop a coordinated concept prototype of a single system for cargo documentation of all shipments in the DTS and perform a limited feasibility test/evaluation for DOD approval.

Air Force Feedback Policy

Air Force Regulation 800-13, "Air Force Feedback Policy," was published 19 May 80. This regulation was prepared to provide a uniform policy on the use of engineering and management experience to develop and improve systems and to avoid repeating past mistakes. This regulation lists basic sources of "feedback" and provides a reference document to aid in getting the needed data/information. It outlines responsibilities of AFLC and AFSC in collecting and using "feedback" and collateral responsibilities of other Air Force organizations.

Front End Logistics

Four significant DOD policy documents were issued January through July 1980: DODD 5000.39, on Integrated Logistics Support, January 1980; DODD 5000.1 and DODI 5000.2 on Major Systems Acquisitions, March 1980; and DOD 5000.40 on Reliability and Maintainability, July 1980. Considered together these new directives elevate the importance of logistics during the acquisition process to equality with cost, schedule and performance. These directives also stress the requirement to quantitatively link readiness to the level of logistics support resources planned. Detailed supportability, Operating and Support Cost and Reliability and Maintainability goals, thresholds and objectives are now required. In addition, specific Logistics Support Analysis requirements are outlined for all acquisition programs. A meeting chaired by HQ USAF/LEYE and attended by AFSC, AFLC, AFTEC and AFALD was held at HQ AFSC on 19-21 Aug 80 to develop a baseline and time phased plan for Air Force implementation.

Impact of Repair Level Analysis on Future Operational Logistics Support

Richard L. Henshaw
Supervisory Equipment Specialist
Directorate of Materiel Management (MMIRAA)
San Antonio Air Logistics Center
Kelly AFB, Texas 78241

With the complexity of modern and advanced weapons systems and associated equipment, logistics planning and future support determination is of prime importance during the initial acquisition and follow-on phases.

To accomplish the initial analysis of support concepts relative to the most economical and valid methods of procurement of spare parts, technical data, support equipment, training and depot technological support, various programs have been proposed, tried, and implemented. All of these methods must consider Life Cycle Costing for the weapons system support as a main factor.

Repair Level Analysis

One such tool employed and implemented during systems acquisition is Repair Level Analysis (RLA), formerly Optimum Repair Level Analysis (ORLA), as prescribed by AFSC/AFLC Regulation 800-28 (publication pending) which will replace AFLCM/AFSCM 375-4 (ORLA). The concepts of RLA are basically the same as ORLA and the basic implementation, use and problems of ORLA can be applied to RLA.

While the development of specific RLA programs for major weapons systems lies with the prime contractors, the review and approval must naturally lie with AFSC/AFLC personnel. In the past the RLA/ORLA working plans as approved by AFSC/AFLC on major systems have sometimes impacted initial and follow-on support in an unfavorable manner due to unrealistic initial computations and Source Maintenance Recoverability (SMR) codes.

Since the results of RLA/ORLA form the basis and rationale for the equipment maintenance concept and the support source coding recommendations for the various Air Force maintenance levels, the RLA/ORLA program requirements must be established to insure that equipment designs meet specified maintainability and support requirements coincidentally with minimizing life cycle support cost. The life cycle cost model must be sensitive to reliability and maintainability and must also take into consideration the total mission logistics support impact.

Past use of RLA/ORLA has shown that the initial ORLA Mean Time Between Failure, Mean Time Between Demand (MTBF/MTBD) computations (based on contractor mathematical model derived recommendations relative to SMR codes for either repair or discard) have failed to take into consideration real world logistics support problems.

A classic example of this was the use of ORLA on certain Contract Furnished Equipment (CFE) programmed for rapid activations with the Initial Spares Support Listing/War Readiness Support Kit (ISSL/WRSK) for the F-15. The F-15 Avionics Intermediate Shop (AIS) was the major recipient of CFE Support Equipment (SE) utilizing full range RLA/ORLA. The AIS consists of seven major test stations with many items of auxiliary equipment, such as 102 Line Replaceable Unit Interface Test Adapters. As an indication of the complexity involved, initial and follow-on provisioning of AIS resulted in the source coding of approximately 900,000 line items of spare parts. As the initial provisioning moved forward totally utilizing RLA/ORLA down to what was considered the lowest repairable level (in most cases circuit card level) it was apparent that ORLA computed MTBF/MTBD factors along with cost factored support equipment, technical data, etc., on similar items appeared to be inconsistent. Many like items (circuit boards with same number and type of components) were SMR coded quite differently, with some being discard (ERRC N) and some being repair (ERRC T). The initial and final RLA/ORLA work sheets computations for these like items were approved in some cases with great variances; for example, one item had a computed MTBF/MTBD of 40,000 hours approval with an ERRC of T (Repair) while a like item would have a mathematical model computed MTBF/MTBD of 500,000 hours resulting in a discard decision of (ERRC N).

Impact on Weapons System Support

Use of RLA/ORLA, if properly computed and applied, can be valuable aid in determining the most economic method of support for a system down to the lowest repairable level. However, if RLA initial and final computations during acquisition and initial provisioning are unrealistic the result can be of insuffìcent spare parts, technical data, support equipment, training and other vital logistic support elements. Experience on the F-15 has shown that additional follow-on support had to be developed down range as the result of inaccurate RLA/ORLA computations. This had a direct impact on active units' operational ready status with side effects such as low fill rates on Initial Spares Support Listings (ISSLs), War Readiness Support Kits (WRSKs) and increased MICAP conditions.

What Should Be Done

Future use of RLA should take advantage of lessons learned as submitted to AFALD on systems such as the F-15. A more realistic approach should be taken on mathematical model computed MTBF/MTBD along with sensitivity analysis. The requirement as now outlined in AFLCR 800-28 to review new items at maturity and recommend changes to SMR codes in accordance with T.O. 00-25-195 (which should include using the sensitivity analysis of final RLA report as an indicator of when repair level should be changed) is not sufficient to assure overall logistics support of weapons systems as they activate and go into full operation. If an item is a complex unit and RLA has made it a discard (ERRC N) item, logistics support is often impacted before the situation can be brought under control. It therefore behooves system project offices, Logistics Support Cadres, AFLC system managers and users to determine during initial Research Development and Test Evaluation (RDT&E) and Operational Test and Evaluation (OT&E) those areas that appear to indicate high usage with probable miscomputed RLA MTBF/MTBD and inaccurately assigned SMR codes (*Discard* instead of *Repair*). Action on these types of items should be immediately taken and RLA analysis reiterated to a more desirable position. This must be done to assure proper logistics support later on. Waiting to make the decision on a so-called mature item is often too late to prevent MICAP and non-operational conditions during activation and operational mission assignments. While we all recognize that economics is one of the prime considerations in utilizing RLA it must be remembered that the basic purpose of the Air Force is in mission accomplishment. Without the logistic elements there when they are needed the mission can fail. The sensible use of tools such as RLA can be valuable if used properly. However, if not utilized and carefully controlled even RLA can be a dull tool and create a poorly supported weapons system.

Air Logistics Center Item of Interest

Basic Ordering Agreement Review Procedures

Basic Ordering Agreements (BOA's) between the Government and industry are intended to expedite the ordering of supplies and services. The rapid changes of Public Laws (PL) and Executive Orders (EO) over the past few years have rendered many BOA's out of date and unusable without change. This has caused the buyer to review each BOA for clause changes prior to issuance of orders. The Purchasing Contracting Officer must perform the same review. Also, any other required level of review must assure compliance with the Executive Orders and Public Laws. There was much time wasted in these repetitive reviews.

A more efficient system was developed at the Ogden Air Logistics Center to deal with this problem. A central review point was established for all active BOA's in the Contracting and Manufacturing Directorate to be reviewed and documented. The review document is then distributed to each section for their use.

Specifically, there are six areas of information provided to the buyers in this review:

General Information: Any information that might be of use to the buyer is included here.

Deleted: Clauses that are in the BOA that are no longer active because of Public Law or Executive Order changes. This would also include clauses that are commonly negotiated out in the individual order.

Updates: Clauses that have been updated by Public Law or Executive Orders.

Incorporated: Clauses that are listed in the "b" section of the general provisions are clauses that require manual inclusion in the order.

Added: Clauses that are not in the BOA, but that are required by EO or PL.

Change: Clauses that include a blank that must be manually filled.

Operationally, a word processing system generates the review sheets. All the clause listings are entered in the system and a call symbol assigned. To simplify the review procedure a matrix has been developed. For each clause listed an entry is made in the appropriate column. The review is then read directly into the Word Processing Center and a review sheet generated. The review is maintained in tape for future changes caused by new Executive Orders or Public Laws. Changes caused by BOA modifications can also be easily made.

Dependence on the review sheets is such that two levels of review are appropriate to insure accuracy. The system is credited with a large savings of time. Another benefit is accuracy. Because the procedure is handled by one individual, that person becomes an "expert" on BOA's and is able to pass this knowledge on to others by way of the review sheet.

The system is not designed to anticipate every change that may be made on a BOA for a specific order. All Public Law and Executive Order changes are listed and the common clauses that require incorporation are listed. The buyers still have responsibility for the unusual changes. (00-ALC/PMC, Joseph Ford, AUTOVON 458-6591)

Low Rate Initial Production of USAF Conventional Munitions

Major Wallace T. Bucher
Deputy Director, Program Control
Airlift and Trainer System Program Office
Aeronautical Systems Division
Wright Patterson AFB, Ohio 45433

Introduction

It ought to be remembered that there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things. Because the innovator has for enemies, all those who have done well under the old conditions, and lukewarm defenders in those who may do well under the new. [3:9] — Machiavelli, 1513

Since its inception, the Armament Division (AD) of the Air Force Systems Command (AFSC) has been attempting to introduce new and innovative approaches to the acquisition management process for conventional munitions. Prime emphasis has been placed on the reduction of the time required to develop and field weapons. The division has, as its present commander Maj Gen R. M. Bond states, felt "a sense of urgency, an impatience with ourselves, to get new weapons with improved capability into the hands of the operators." [5:41] In addition to improving the capabilities of the Air Force, a reduction in the acquisition cycle is also a reduction in the total cost of weapons systems. In this period of rising inflation and high contractor overhead rates, any savings in time will directly affect cost. These are the two primary reasons for the emphasis that AD has placed on reducing acquisition time. The major innovative efforts of the AD centered around a series of organizational changes which were paralleled by concurrent changes in business practices.

The organizational changes culminated on 1 October 1979 with the elevation of the Armament Development and Test Center (ADTC) to the status of a full AFSC Product Division—The Armament Division. "Elevation of the organization—which has a staff of almost 8,000 and an annual budget of about $1.2 billion—to the division level signifies recognition by the Air Force and the Defense Department of the growing importance of the weapons, munitions, submunitions, sensors and other electronics that combined are known as armament." [5:41] Clearly, armament development and production is big business and it is the last in a series of evolutionary strategems and practices associated with this business that this paper is designed to illuminate.

Specifically, this paper* will examine a new methodology for the transitioning of munitions from the Full Scale Engineering Development (FSED) phase of the Acquisition Cycle into the Production Phase. The name given to this transitional methodology is Low Rate Initial Production (LRIP). The definition of LRIP is the "initial phase of an approved production program which requires the contractor to demonstrate the complete manufacturing process and to successfully pass First Article Acceptance Testing (FAAT)." [39:4] This concept was first proposed in 1977 after the completion of a study entitled, "The Munitions Acquisition Process."

The purpose of this study was to analyze the acquisition strategies employed at the AD and recommend alternatives which would reduce the time required to develop and build weapons. The study was necessitated by the fact that at this time, the acquisition cycle for armament lasted approximately 13 years. That is, from concept formulation to delivery of the first production items to the operator took 13 years. The most time consuming step was from the start of FSED to first production delivery. This part of the process required approximately six to seven years. [41:5] The study recommended the implementation of LRIP as a method to assist in the transition from FSED to production by introducing limited concurrency thereby reducing the total time required to reach an initial operational capability. The anticipated results were a 25 percent or at least 18 months savings in development time and the potential to save approximately 20 percent of the total program acquisition cost. [41:27]

Potential savings of this magnitude led the AD to enthusiastically brief the results of the study to HQ AFSC and HQ USAF. The reception at higher headquarters was less than enthusiastic. With some skepticism, it was agreed that programs could be structured along the lines of the LRIP concept and they would be approved on a case-by-case basis. In other words, there was no wholesale agreement by higher headquarters to support the LRIP concept. Since it is within the purview of the

**This article is based on a 1980 Air Command and Staff College research report, same title. by Major Bucher.*

Division Commander to structure his programs as he deems appropriate, the AD began to implement LRIP on several development programs. It is however, within the purview of HQ AFSC to recommend funding levels for programs and HQ USAF to allocate funds for the development and production of weapons. As of this date, sufficient and concurrent funds have not been provided for any program which has implemented the LRIP concept.

This presentation of the LRIP concept will develop the history of the AD to establish a frame of reference for the presentation of the study which initiated the LRIP concept, and the implementing instructions which were issued to the System Program Offices (SPO) at AD. Further, it will focus on the implementation of the concept on the first major weapon system acquisition program to which it was applied—the Wide Area Antiarmor Munitions (WAAM) Program. Following this, the AD implementation of LRIP will be compared to a similar concept employed by the Army in the Copperhead Program. The Copperhead Program will be used for comparison as the business strategy and technology are nearly identical to the WAAM Program. Finally, the major objections to the LRIP concept will be analyzed.

Background

Everything should be done to increase to the maximum extent the effectiveness of destructive material because, other conditions being equal, the offensive power of an Air Force is proportionate to the effectiveness of its destructive material. [2:158] — Gen. Guilio Douhet, 1921, 5th fundamental principle of air power.

In order to understand the impact that the introduction of the LRIP systems acquisition strategy had on the munitions acquisition community, it is necessary to develop an historical perspective of the evolution of the organization and business practices of the Armament Division (AD). From 1940 until the mid-60s, Eglin AFB, home of the Armament Division, was primarily a test organization. In fact, it bore the name Air Proving Ground Center (APGC) until it was redesignated the Armament Development and Test Center (ADTC) in 1968. This redesignation was due to the expanding research and development activities which were highlighted by the establishment of the Air Force Armament Laboratory (AFATL) in March 1966. [31:3]

The assignment of the AFATL to ADTC, and the attendant increase of research, development and acquisition activities, focused attention in the early 1970s on the transition from development to production. There were several problems in this area which were causing delays in production and cost growth. Significant among these problems were inadequate data packages and inaccurate cost and rate projections for full production. [40:1] The root causes of these problems were two fold: (1) ADTC was not organized or manned to cope with the full range of systems management tasks, and (2) the acquisition strategy required refinement.

The organization of ADTC was refined and expanded in a series of changes from 1971 to 1977. The first in this series of changes occurred in 1971.

In March of this year, ADTC was assigned the responsibility for the development planning for all air launched nonnuclear missiles. The actions were taken to achieve the two-fold objective of down-loading of Aeronautical Systems Division (ASD) and establishing ADTC as the prime Air Force organization responsible for the development and testing of nonnuclear munitions. [50:1]

This action served to significantly expand the role of the Deputy for Development Plans as the first step in expanding the scope of systems management at ADTC.

The next step in the evolution of AD was the assignment of additional programs. This occurred on 1 July 1971 when seven air-to-air and air-to-ground missile programs were transferred from ASD to the Deputy for Procurement and Production, ADTC. [52:1] ADTC was then responsible for major weapons system acquisition programs and events moved rapidly toward a total system management capability. On 1 July 1973, the Deputy for Armament Systems was established and charged to perform the total spectrum of systems acquisition functions. Initially this meant that the Deputy for Armament Systems would take programs from the AFATL or Development Plans and guide the program through Full Scale Engineering Development (FSED) and production. This was a significant refinement in that a single agency at ADTC was charged with the transition from development to production. In 1976, the mission of the Deputy for Armament Systems was further expanded to include validation phase efforts. The AD organization was given one further refinement a year later. At this time, the Deputy Commander for Development and Acquisition was established to command the activities of the Deputates for Armament Systems and Development Plans as well as the AFATL. The organization for total systems management was now complete. This organizational evolution brought about changes in acquisition strategy and business practices.

To reiterate, the first problems encountered in transitioning items from development to production arose when the AFATL attempted to place items into production in the late 1960s and early 1970s. "This was prior to the establishment of a systems acquisition capability at ADTC and AFATL with limited systems skills had the responsibility for full scale development and the initial production buy for munitions developed at Eglin." [40:1] When the Deputy for Armament Systems was established in 1973 "to provide a systems approach to weapons acquisition, a scheme called Pilot Production was introduced." [44:1] This transition strategy was introduced to provide solutions to problems of unacceptable Technical Data Packages (TDP) and to allow accurate cost and rate projections which would form the basis of the decision to proceed with full scale production. [40:1] This strategy had worked successfully in the past for a number of Navy programs, most notably the AIM-9 Sidewinder air-to-air missile series. [22:38]

The elements of this strategy, as illustrated in Figure 1, were a sequential, competitive process of moving from FSED to pilot production to full rate production. Pilot production would not be initiated until Initial Operational Test and Evaluation (IOT&E) was completed. A Critical Design Review (CDR) was also required to ensure that technical drawings and specifications reflected government desires and were sufficient for production of the item. Once pilot production was initiated, First Article Acceptance Testing and Operational Test and Evaluation could take place but sufficient assets to achieve an Initial Operational Capability (IOC) would not be received until full-rate production was approved and initiated. Consequently, pilot production tended to increase the time required to field weapons.

The pilot production technique did help, but did not eliminate the basic problems of inadequate data packages and insufficient demonstration of intended manufacturing process. The pilot production technique resulted in an extension of the acquisition cycle since there was usually a break between pilot production and rate production, due to testing and procurement lead times. [44:2]

Pilot Production Sequence

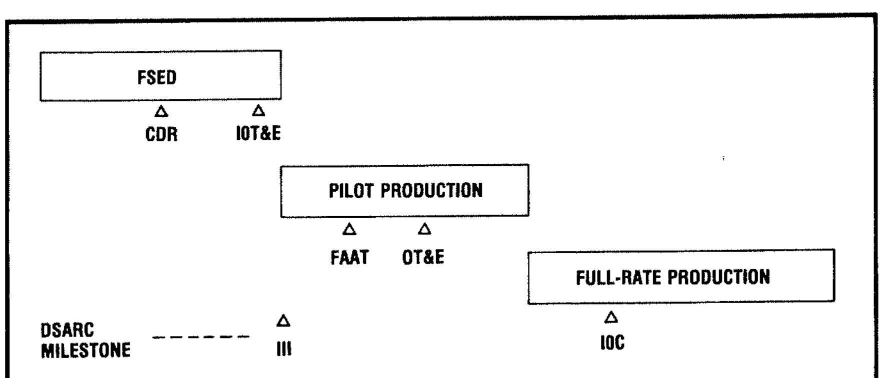

Figure 1.

Table 1.
Comparison of AD and ASD Acquisition Lead Times [38:7]

AD Programs	*Months From Validation Phase Start to IOC*	
FMU-112 (Fuze)	135	
Combined Effects Bomblet (CEB)	123	
Aerial Stores Lift Truck (ASLT)	107	AD Average:
Air Inflatable Retarder (AIR)	99	97 Months
GBU-15 (Modular Glide Weapon)	86	
FMU-113 (Fuze)	76	
Mutiple Stores Ejector Rack (MSER)	46	
ASD Programs		
A-10	107	ASD Average:
F-15	90	79 Months
F-16	80	
ARC-164 (UHF Radio)	76	
MJU-7/B (Flare)	43	

These acquisition lead times were indeed long. Table 1 compares the acquisition lead time of a selected, representative sample of ADTC programs against similar times for the programs of ASD. The lead times shown in this figure were measured from the start of the Validation Phase to the delivery of first production assets. All of these ADTC programs, with the exception of the Multiple Stores Ejector Rack (MSER) program, began in the AFATL before a systems management capability was established at ADTC. The pilot production technique was used in all of these programs with the exception of the GBU-15 and MSER. The ADTC average was 97 months while ASD required only 79 months to move a program from validation to first production delivery. If the MSER program is removed from the average, as this program was initiated in 1976 after systems management was adopted, the lead time becomes 104 months. It took then, an average of 8.6 years to develop and field fuzes and bomblets, while requiring only 6.6 years for aircraft and avionics. [38:4]

In 1976, the Deputy for Armament Systems sought ways to reduce the acquisition lead times. He commissioned a study to look into every aspect of the acquisition process and attempt to find ways to save time. The results of this study formed the basis for major improvements in the management of programs at AD.

The Study

The study uncovered six major problem areas in the development of munitions and transfer to production. The first of these probem areas was "entering FSED without a clear definition of required production rates or quantities." [39:ANNEX 1:1] This deficiency has serious impact on meaningful production planning during the development phases. This is especially important since most munitions items are amenable to high volume production. If production engineering can be addressed as the design matures, then a lower probability of encountering production problems exists. "Once the design is definitized, approximately 85 percent of all costs are virtually defined. The design and manufacturing process (should) evolve together as part of an iterative process." [34:7] This deficiency left serious "gaps" in the overall acquisition strategy and made total program cost estimates virtually meaningless.

The second identified deficiency was "inadequate emphasis on production engineering and related functions during FSD." [39:1] Essentially this deficiency, coupled with the first, meant that virtually no systematic planning for production or consideration of producibility were entertained during the development of munitions. The result is increased cost and schedule of programs due to redesign to facilitate production. As might be guessed, this led to "significant changes in manufacturing processes in the transition from final R&D hardware to production hardware." [39:1] This was the third identified deficiency in the study and was "directly responsible for the majority of production problems." [39:1]

The fourth identified deficiency also reflects the apparent lack of synchronization between development engineering and production engineering. This was "inadequate data packages for initial, competitive, high volume production." [39:2] It is a small wonder that, if production planning and engineering are not threaded through the program and tightly interfaced during the final stages of development, the final product of design—the data package— will not reflect a producible product. Indeed, this series of problems makes it virtually impossible to coalesce a procurement strategy. This was the fifth finding of the study. Specifically, the finding reads, "End game procurement strategy is not always identified at the onset of the FSED program. This study points out the importance of the government recognizing the causal factors and to develop a procurement strategy which best adapts and develops with the program in question." [39:2] The effect of this deficiency is that no production strategy, then, is tied to the availability of procurement funds at the end of development. In summary, no real production program exists at the point of initiation of the production contract. This has obvious negative connotations for the overall funding posture.

The principal funding problem cited in the study is characterized by the phrase, "poor boy syndrome." [41:15] This is an attitude which dictates that the program managers make do with those funds which can be made available. [41:15] This means that munitions development programs become unnecessarily long due to lack of sufficient funds. Front loading programs with production engineering tasks becomes infeasible and the transition from development to production is interrupted until sufficient funds can be made available. [41:15] Often called the "Bow Wave Effect," this deficiency also shows a lack of support for munitions development efforts on the part of the user (typically TAC) and sponsors (HQ AFSC and HQ USAF).

To summarize, AD had not, prior to 1976, properly integrated production engineering tasks into its development efforts. One causal factor was the split responsibility for development and production among its agencies. This problem was corrected by expanding the mission of the Deputy for Armament Systems. The remaining deficiencies could now be corrected "in-house" with the exception of the procurement strategy and funding deficiencies. These two problems form the heart of all difficulties with the introduction of the LRIP concept. The study made specific recommendations for corrective actions in each area.

The recommendations of the study were aimed at improving the production planning and engineering process of the average System Program Office, from the start of FSED until the item reaches full production. The study called for the establishment of a "rigorous production engineering program" on all development efforts with particular attention to new programs. [41:11] It called for increased management attention to production aspects at all program reviews and the establishment of specific and measurable production engineering "Gates" which would increase visibility of production issues. The study also recommended establishing an education program for SPO managers and increasing the size of the pool of production engineers at ADTC. With increased attention and personnel to support the SPO activities, the study concluded that the actual manufacturing techniques could be identified earlier in development. A baseline identification of the production process would be required early in FSED. [41:13] Once this baseline was established, any change required would be reviewed by the SPO. After the Critical Design Review (CDR), all hardware would be "fabricated from the same process to be used in production." [41:13] By concentrating on the production process, it was felt that deficiencies in technical data packages could be identified and overcome. The study recognized, however, that data packages produced during FSED are generally not satisfactory for competitive high volume production. This is a classic problem encountered by virtually every program. Consequently, the study stated that "sometimes it is appropriate to make the initial sole source production buy from the full scale developer." [41:15]

In summary, ADTC would focus more attention on production planning while items were still in

Table 2.
Acquisition Lead Times [38:—]

System	*Months in Validation*	*Months in FSED*	*Cumulative Time to First Production Delivery*
Anti-Armor Cluster Munition (ACM)	20	26	50
Extended Range Anti-Armor Munition (ERAM)	33	33	76
Mini-Missile (WASP)	36	51	96
Advanced Medium Range Air-to-Air Missile (AMRAAM)	33	41	79

development. The actual manufacturing process would be identified earlier, baselined, and subject to stringent review as the item approached full production. Initial sole source procurement may be necessary due to the limitation of technical data packages. All of these recommendations, coupled with requirements to provide realistic program cost estimates, could be implemented "in-house" at ADTC. Indeed, ADTC has adopted the recommendations, as will be seen later. While these recommendations would clear up most of the production problems, none of them would reduce the acquisition lead times. Consequently, the study team began to analyze various acquisition strategies to see if lead times could be reduced.

The study team analyzed "various combinations of development, pilot production, production and their relationship to a competitive procurement." [34:7] This analysis resulted in the simulation of 32 combinations of acquisition strategies. Only six were presented in the final study. Of these six, the most promising strategy was selected which borrowed from Army munitions experiences, and is entitled Low Rate Initial Production (LRIP).

The similarity in approach to the Army model can be seen by comparing definitions. The Army definition of LRIP used in the study was "a low rate of output at the beginning of production to reduce the Government's expense to large retrofit programs, while still providing adequate numbers of production items for a final development and operational test prior to full-scale production decision." [34:4] The ADTC definition of LRIP used in the study is "the initial phase of an approved production program which requires the contractor to demonstrate the complete manufacturing process and to successfully pass First Article Acceptance Testing." [39:4] The Army defintion is centered around cost avoidance and completion of development and operational tests. The ADTC definition reflects the concern for the demonstration of the manufacturing process, but makes no mention of completion of development. In fact, as originally envisioned, LRIP preparation and production line set-up would take place during FSED, but actual production on the LRIP line would not take place until after production approval was obtained. This is demonstrated by the statement contained in the LRIP guidelines that, "This concept is applied after a program has undergone a successful full scale development program and has been approved for production. The concept does not advocate to a preliminary production decision prior to DSARC III." [39:4] The application of this concept can best be seen by illustration.

Figure 2 shows the proposed activities which would take place during FSED and production. It should be noted that design of the production process begins concurrently with initiation of FSED. The process is reviewed at both the Preliminary Design Review (PDR) and Critical Design Review (CDR). In fact, after CDR, all fabricated hardware is required to be accomplished using the approved production process. During the Tooling Process Fabrication phase, an initial production line is set up to accommodate the LRIP rates. When the production decision is reached, LRIP is begun. Full production is achieved by replicating the LRIP line and essentially doubling output. Competition can be induced by allowing other contractors to review and validate the data package, and then to bid on production quantities. Time is saved in this scenario, by setting up the production line during FSED. Consequently, when the production decision is reached, procurement lead time and long lead tooling obstacles have been overcome. Additionally, the sequential steps of pilot production were eliminated.

The implementation of the LRIP concept has aided AD in reducing acquisition lead times. Table 2 shows the time required from validation to delivery of first production items for four major weapon systems at AD, which began validation after 1976. When a comparison is made between Table 2 and Table 1, significant reductions have been made. In fact, the average time from validation to first production has been reduced from 8.6 years to 6.2 years. Now this striking reduction in acquisition time cannot be attributed solely to the LRIP concept. The development of a systems management approach and the reorganization of AD, cited earlier, were major contributing factors. The Acquisition Lead Time Study did, however, show LRIP as a major contributing factor which provides an earlier IOC. [38:15] To develop a perspective of the contributions of the LRIP concept to the programs of AD, it is necessary to look next at the way it was implemented.

Implementation

. . . It takes longer to move a weapon from the drawing board to the battlefield than ever before—an average of five years longer than in the 1950s [6:76] — DOD Task Force Report.

Cognizant of the fact that speed was required, AD began immediate implementation of the recommendations of the study group. A month after approval of the study's recommendations, a background paper was distributed to all SPOs which explained and clarified the findings of the study group. This paper clearly announced the intentions of AD top management to ensure that the deficiencies cited in the study report were corrected. A production annex was attached to this paper which provided a "Strawman" to be used in the preparation of statements of work and Requests for Proposal. The language of this production annex, in stating its purpose, clearly shows the strong intentions of AD.

Proposed LRIP Schedule [41:22]

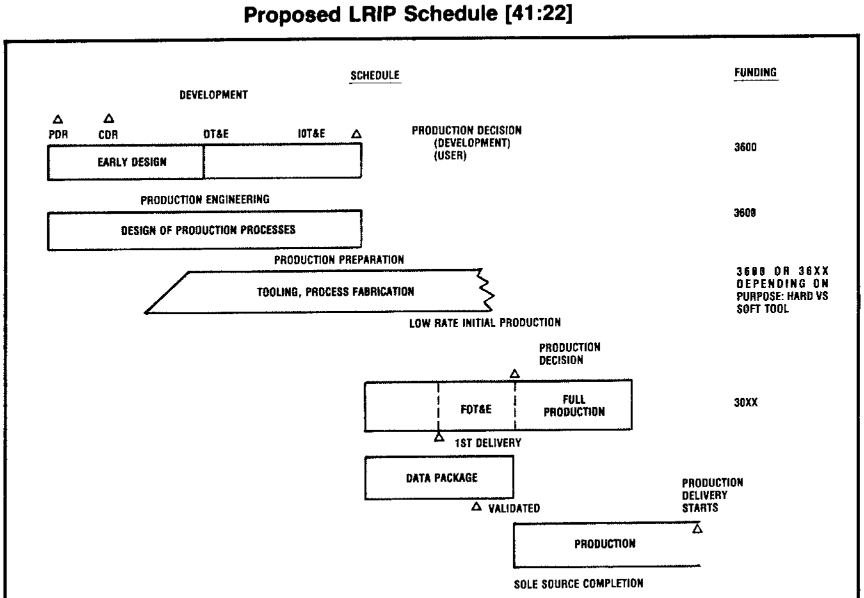

Figure 2.

The purpose of this Production Annex is threefold. First, it is the means to clearly describe that ADTC (AD) is embarking upon a significantly different method of procuring munitions and munitions-related items. Second, it provides the means for each bidder to recognize and to propose a program responsive to this annex which will be costed and identified as a separate contract line item. Finally, it provides the government additional means to better determine which contractor proposal best recognizes and satisfies this new procurement approach. [39:ANNEX 1:1]

This production annex has since been formalized and expanded with the publication of ADTC Pamphlet 84-1, dated 15 Sep 78, and entitled: "ADTC Manufacturing Management Guide for Acquisition Programs." This pamphlet embodies all of the recommendations of the study and provides detailed descriptions of production planning throughout all phases of development.

The recommendations of the study have also been institutionalized in other ways. User participation in Business Strategy Panel reviews and source selection has increased. [44:5] Production planning is now reviewed on a regular basis by top executives of AD. The size of the production engineering staff has increased and more specialists are now colocated in SPOs. "Statements of work for production engineering have been developed and institutionalized. Separate line items are included in the contract so that budgeting and funding can be defined and tracked. The contractor is required to report on this effort during scheduled design reviews and Production Readiness Reviews." [44:5] In summary, the concept of threading production planning and engineering into development has been institutionalized at AD. There now remains only the funding issues and the implementation of the LRIP concept to be discussed.

Wide Area Anti-armor Munitions

The first major program to implement the LRIP concept was the Wide Area Anti-armor Munitions (WAAM) program. This program is developing a "family" of weapons designed to defeat massed armor formations. This family includes the Anti-armor Cluster Munition (ACM), Wasp/Minimissile and the Extended Range Antiarmor Munition (ERAM).

Anti-armor Cluster Munition

The ACM is a simple, unguided submunition packaged in an existing dispenser, the Tactical Munitions Dispenser (TMD, SUU-65B). This program is presently in the validation phase with two competing contractors. "The submunition consists of a warhead, fuze and an orientation device." [42:8] When these submunitions are deployed from the TMD, the orientation/stabilization device (either a ribbon parachute or ballute) positions the warhead and fuze. The fuze, which is a long probe extending from the bottom of the warhead, provides a height of burst capability, and fires the warhead when it impacts the ground. At detonation, the warhead fires multiple "slugs" in a horizontal plane. The warhead is the only subsystem of the ACM which employs new technology. "Called self-forging fragments, these devices are in effect directed high-energy slugs that, unlike shaped charge penetrators, don't require physical contact with the target for detonation, and are effective over great distances." [5:43] The ACM, due to its simplicity, will be the first of the WAAM weapons to reach the field.

WASP

The next member of the WAAM family is the WASP or minimissile. This small (100 lb class) guided missile will utilize infrared or millimeter wave guidance and incorporate lock-on-after-launch and independent target acquisition and tracking. [42:8] The WASP warhead is a conventional shaped charge type which requires the missile to strike the target to achieve a kill. The WASP can be either individually launched from rails or from a 2,000 pound class dispenser, carrying twelve missiles. If pod launched, the missiles would fan out over the target area and acquire their targets. "The F-16 could carry two WASP pods, for a total of twenty-four missiles." [5:44] Due to the complexity of the system, the acquisition lead time for WASP, which is presently in validation, is the longest.

Extended Range Anti-armor Munition

The final weapon system in development in the WAAM program is the Extended Range Antiarmor Munition (ERAM). ERAM is a cluster weapon that uses the same dispenser and self-forging fragment technology as ACM. But that is where the similarity ends, for ERAM is a target-activated, cued system that includes both a direct attack feature, as well as a capability to delay advancing enemy forces." [5:44] The 12 or 16 submunitions contained in the TMD, in this concept, could be deployed in front of the advancing armor forces. At this time, the submunitions would activate seismic and accoustic sensors. As armored targets pass these devices, they would launch a self-forging fragment warhead toward the target. The ERAM is an extremely complex submunition which provides a truly unique capability.

These, then, are the weapons which comprise the WAAM program. The WAAM program was not introduced in this paper simply to describe the weapons in development; rather it was introduced to describe the implementation of the LRIP concept. The best way to illucidate this implementation is to begin with the program schedule.

Figure 3, the WAAM Development Milestone Chart, depicts the sequential development process employed in this program. As can be seen, all programs are presently in the validation phase. What can't be seen is that the Production Engineering effort for these weapons actually began in the validation phase; the first time this has occurred at the AD. This is a direct result of the study recommendations, as is the initiation of LRIP.

When this milestone chart is compared with the proposed activity schedule, Figure 2, as recommended by the study group, inconsistencies are noted. The LRIP facilitization and production occur in the WAAM program before a production decision is reached; as stated in the model, the facilitization could occur before a production decision is reached, but actual production is delayed until after IOT&E and production approval. This unique feature of the WAAM programs apparently violates the concept of LRIP and the disciplined process AD is attempting to introduce. This, however, is not the

WAAM Development Milestone Chart [42:19]

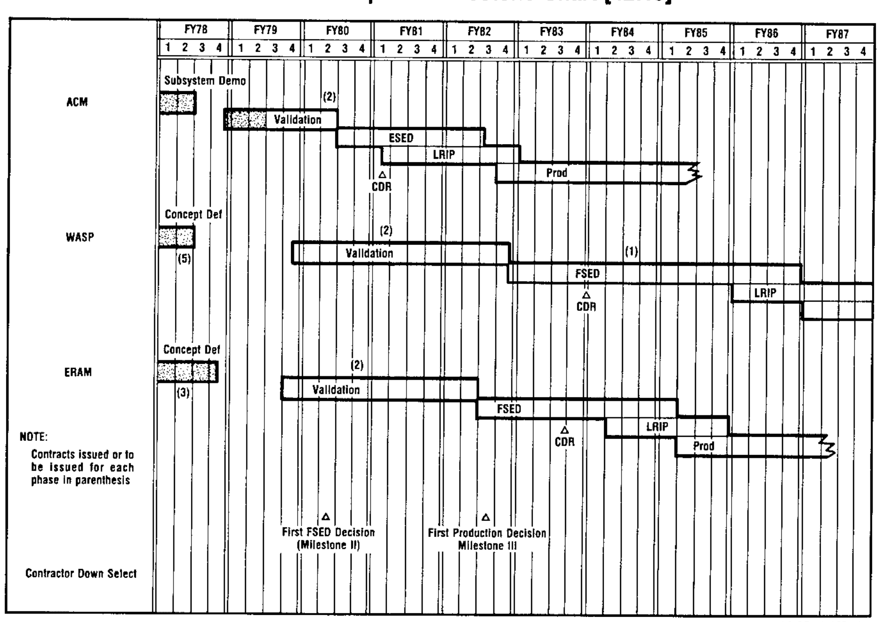

Figure 3.

case. The rationale for this deviation is best seen by examining the ACM program.

As stated previously, there will be either 48 or 56 submunitions packaged in the TMD, which make up the ACM system. During FSED, 190 ACM systems will be produced in a 13-month fabrication effort, 170 of these systems are required for the combined Development Test and Evaluation (DT&E)/Initial Operational Test and Evaluation (IOT&E) and 20 systems for contractor qualification testing. This means that a maximum of 10,690 submunitions or a minimum of 9,120 submunitions will be produced. This will require production rates for these test assets to approach or exceed 800 per month. Clearly, rates of this magnitude cannot be supported by anything short of a production line. Since, in accordance with the LRIP instructions, the production process must be identified at the start of FSED and identical to the final process after CDR, the notion grew in the program that all of the elements necessary for LRIP initiation would be in place earlier than on normal programs. Since WAAM weapons are urgently needed to blunt Warsaw Pact armor initiatives, the SPO Director proposed to initiate LRIP at this time and achieve earlier first delivery and deployment. The LRIP program was, consequently, structured as an option to the FSED contract.

Other arguments which support this decision are that first of all the ACM is a technologically simple device. The ACM contains no electronics and the self-forging fragment warhead has been demonstrated. This does not say that the ACM is risk free. The system design requires optimization and this is the purpose of the competitive validation program with its extensive test program.

The second point in favor of this method of LRIP implementation is that all of DT&E and 90 percent of IOT&E will have been completed before the first LRIP items are produced. This reduces the risk of changes to the Technical Data Package (TDP) resulting from the test program. Figure 4 shows how the LRIP program is introduced and full rate production achieved by replicating the LRIP production line. Remember, there is a significant production history built up in this program as a result of the fabrication of the test items. This same rationale was applied to the other WAAM development efforts. [56:—, 57:—]

The levels of risk attendant to this deviation from the LRIP model were considered acceptable by the top management at both AD and HQ AFSC. This is evidenced by the fact that the program has successfully passed all levels of review to include a Defense Systems Acquisition Review Council (DSARC) Milestone I review. In fact,the only area in which the WAAM program has failed to receive support is in the budget formulation process. Production funds, required by regulations, have not been provided in either the FY 80 or 81 Program Objective Memorandum (POM). This failure to receive funding has been considered by many to be a repudiation of the LRIP concept. LRIP and similar techniques have been successfully applied to many programs. In fact, the Crang-Cook low rate initial production policy was used to introduce the F-101 aircraft into the USAF inventory. This concept called for "limited production at first, in conjunction with early flight testing and correction of deficiencies, followed by accelerated production." [17:1,43] LRIP, simply, never has been applied to high-volume munitions programs in the USAF. To find successful munitions programs utilizing LRIP, one must look to the Army. The current Army program which most closely approximates the WAAM family of weapons is the Copperhead Program.

Army Experience with Copperhead

The Copperhead is a 155mm Cannon Launched Guided Projectile (CLGP). This projectile

> is equipped with a terminal guidance system and is launched from conventional howitzers into a ballistic trajectory. During flight, the target is illuminated by a forward observer with a laser designator. The seeker, in the ogive of the projectile, acquires the semi-active laser signature. The onboard computer continuously refines the terminal trajectory and provides guidance to the control group, causing the projectile to home in on the target. [37:1]

This program has just completed FSED and is about to begin LRIP.

The Copperhead Production Plan is nearly identical to the model LRIP activity chart developed by the study group at AD, as indicated in Figure 2. The Initial Production Facilitization (IPF) portion of the Copperhead program corresponding to the tooling and process fabrication block shown in the AD LRIP model, begins shortly after a producibility engineering and planning program is begun early in FSED. During this phase of the program, which cost $54.7 million, (of which $17.5 million was contractor invested), the tooling and equipment for the production line is designed and set up. [43:7] The initial production line is established for a rate of 700 per month on a single shift basis. This line must be expandable to 3,000 per month. Another similarity to the AD LRIP model is that operational testing is completed and the TDP is validated using assets produced on the low-rate line. In both the AD model and the Copperhead program, competition may then be introduced into the program. The LRIP production line and processes are then replicated by either contractor and full production is achieved.

The entire IPF program of the Copperhead is funded using Army production funds. It is interesting to note that when the Copperhead program's DSARC Milestone III slipped nine months, the program office was allowed to produce 37 systems from this line as proof of capability. This closely approximates the concept which the WAAM program is trying to introduce.

In summary, the Army implementation of LRIP, of which the Copperhead is typical, is nearly identical to the implementation proposed by AD. This method of production has been proven successful and conceptually valid.

Conclusion

> *The engineering part of our program we're very good at. It's the time before and the time after, that's killing us. So the argument that we need to streamline our engineering process is bunk. Our industry is still very, very good; it's very fast. It's the management superstructure we put on it in Washington that's strangling the process. [7:33] — Dr. William J. Perry, Director of Defense Research and Engineering.*

Once one leaves Eglin AFB it is difficult to find a strong supporter of the LRIP concept within the USAF. There are many objections to this acquisition strategy. One of the first that this author encountered was the supposedly poor track record of the AD. As this paper illustrates, the AD

LRIP to Full Production Quantities and Rates for ACM Systems

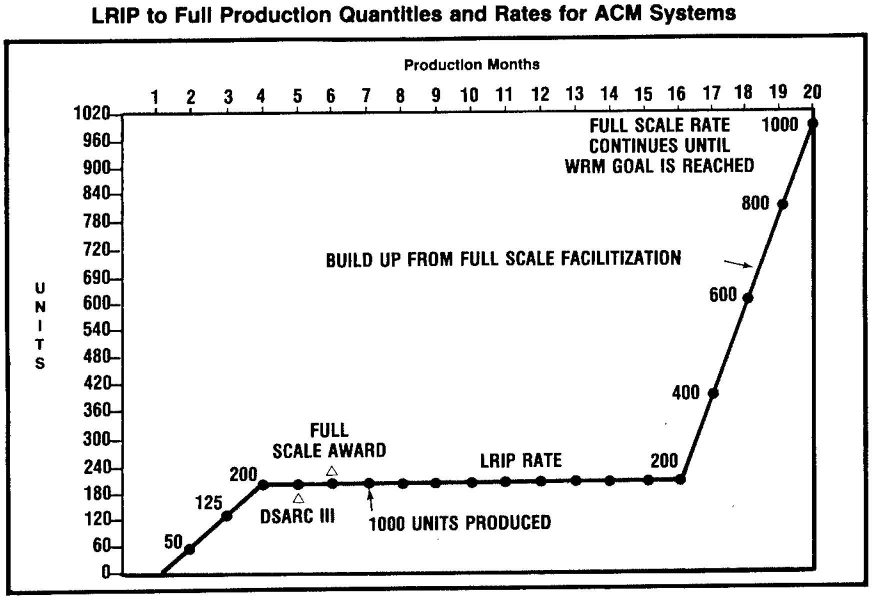

Figure 4.

has experienced difficulties in fielding weapons but the major problem areas have been identified and concerted management attention has been applied. New initiatives attempted by this organization should not be judged on the merits of programs initiated prior to 1973; before that time, AD lacked system skills and the organization to apply them. The AD has learned from its own development history and is making significant progress in improving the management of its systems. This division must be allowed to try new and innovative techniques or its past performance will become the mode of operation. This objection to the LRIP concept is not as significant as the problems posed in the funding arena.

The funding problems associated with the implementation of the LRIP concept breakdown into two interrelated categories. These are the funds available within the appropriations for conventional munitions procurement and the view of Congress concerning concurrency. The funding problem confronting the AD is the massive "bow wave" in the 3080 Other Procurement appropriation accounts. This appropriation provides for the procurement of "vehicles, electronics and telecommunications equipment, base maintenance and support equipment, and investment type spares, as well as conventional munitions." [9:63] The funding level required to produce the programs presently in development at the AD and that portion of the 3080 appropriation set aside for the procurement of munitions in the fiscal year 1980 Program Objective Memorandum (POM) indicate a shortfall that grows from $120 million in fiscal 1981 to $940 million in fiscal 1985. [31:—] In other words, the Air Force cannot afford to produce the conventional munitions presently in development. In order to correct this situation, the Air Force faces some difficult decisions.

There are a variety of options open to correct the shortfall. The Air Force could decrease the expenditure for the other systems in the 3080 account. This would be difficult in light of the growing requirement for additional spares required for tactical aircraft. The Air Force could attempt to convince Congress to increase the size of the 3080 appropriation. This seems at least partially feasible, given the increased emphasis on improving national defense since the Soviet invasion of Afghanistan and the President's commitment to increase the defense budget by 3 to 5 percent annually. Another option is the cancellation of development efforts. The Air Force cannot afford to waste scarce Research, Development, Test and Evaluation (RDT&E) funds on programs which it cannot produce.*

There are several ways in which this situation can be avoided in the future. Requirements can be defined in terms of the capability required and the quantity of items to be produced. Providing an estimate of the quantity to be produced at the time of program initiation would facilitate the entire development process. It would permit improved production planning at earlier stages of development which would result in better cost estimates and smoother transition to production. Presently, few programs are provided with production quantity projections at the time of their initiation. This practice should be stopped and all Program Management Directives (PMD) should be required to contain desired production quantities. These estimates should also be a part of the mission area analysis, Statement of Operational Need (SON) and Mission Element Need Statement (MENS). This provides to the developer a more complete picture of the user's requirements. It also allows design tradeoffs to be accomplished earlier and facilitates the comparison of programs for the purpose of determining program priority and budgetary requirements.

Another facet of the 3080 appropriations account that directly impacts the ability to produce conventional munitions is the unique technique employed in the allocation of funds within the Air Force. The composition of this appropriation is determined at semiannual meetings called the "buy-budget review." This review process, which is not described in Air Force regulations or other documents grew up during the Vietnam era when production requirements for the various systems changed repeatedly. This review process provided the Air Staff with the flexibility to respond to wartime requirements by adjusting the funds allocated to systems every six months. The process has continued and still exists. This has some strong negative connotations for the development community. Planned production funds can change on a semiannual basis. This means changes in the total production planning process could occur twice a year. This condition is not conducive to program stability.

AFSC Headquarters has discontinued the practice of participating in the "buy-budget review" in favor of a single POM submission. This process change just occurred in 1979. Since the "buy-budget reviews" have not been discontinued by the Air Staff, it remains to be seen if a lack of AFSC representation will have a negative affect on the amount of production funds allocated to conventional munitions. One way to avoid the turbulence created within the development community by the "buy-budget review" and still provide the Air Staff with the flexibility it requires, is to remove conventional munitions from the 3080 appropriations and establish a new appropriation for conventional munitions only. This would provide stability, increased visibility, and easier prioritization of the vital systems in this category.

The second major funding obstacle to the LRIP concept is the congressional view of concurrency. There are several different definitions of concurrency, but as it applies to the LRIP concept, it should be defined as entering production before the FSED portion of the program has been completed. Congress has been reluctant to provide "procurement funds for programs which still have significant Research, Development, Test and Evaluation (RDT&E) remaining." [47:1] The genesis for the congressional aversion to concurrency lies in the excessive cost growth found in programs of the 1960 era. The two programs most frequently cited are the C-5A and F-111 programs. In analyzing these programs to determine the causes for their excessive cost and technical problems, former Deputy Secretary of Defense Packard concluded in a memo to the service secretaries in 1969 that, there had been a "general deficiency in the amount of test and evaluation before we commit significant resources to production. . . . While it is generally a mistake to schedule a complete break between development and production, we have tended to drift too far in the direction of concurrency and this must be reversed." [32:3] Consequently, a concept called "fly before you buy" was introduced. This concept requires that development programs move through a sequential process with discreet decision points at the completion of each development phase. Further, it requires that programs complete all development and testing prior to initiation of full production. [25:—] This concept was adopted by the Department of Defense and the Congress and has been the prevalent mode of operations in the development community since the early 1970s. The continuing commitment of the Congress to this concept was again evidenced in The House Appropriations Bill for 1980. The Congress expressed deep concern over the "apparent virtual abandonment of the 'fly-before-buy' concept espoused by the Department of Defense and embraced by the Congress several years ago." [29:283] While neither the AD nor this paper argues for the abandonment of the "fly-before-buy" concept, there are several factors which indicate that the introduction of limited controlled concurrency would have utility.

First of all, the military balance has changed since the late 1960s. The Warsaw Pact now possesses a quantitative advantage in virtually every category of general purpose forces. The qualitative advantages which our forces currently possess is rapidly diminishing as the Soviets produce and deploy advanced weapons at an astounding rate. There is a strong military need to deploy new weapon systems which, like the WAAM weapons, provide a force effectiveness multiplier to counter Soviet developments.

Another factor which mitigates in favor of increased concurrency is the expanding lead times for the acquisition of basic materials. In 1973, it took approximately 15 weeks to obtain sheet and plate stocks of 3 basic aerospace materials: aluminum, steel and titanium. In 1979, it took 70 weeks to obtain aluminum, 50 weeks to acquire steel and 104 weeks to procure titanium. [35:31] The lead times for finished products such as forgings has also increased by a factor of three since 1973. [35:32] What these trends indicate is that a gap from development to production will cause increasing delays in the deployment of systems. These trends also indicate that an increasingly large portion of the materials for the first production run will have to be procured as long lead items during the FSED portion of the program if any reasonable Initial Operational Capability (IOC) date is to be met. This does not mean that the Department of Defense should

Ed. Note: Direct action to correct this long recognized shortfall was recently taken by the Air Force when it increased the emphasis on both spares and munitions in the outyears of the POM. See "FY 1982-1986 Program Objective Memorandum Logistics Perspective," *Air Force Journal of Logistics* (Summer 1980), p. 7.

abandon the "fly-before-buy" concept. Clearly Congress would not permit it.

"Congress is a partner of the Department of Defense in providing for our national defense. In this role, Congress should be presented with certain minimum basic data on which a reasoned judgment can be made." [29:286] Congress will not permit the Department of Defense to "somehow find the reasons to enter production regardless of the lack of successful testing, immaturity of the system and a failure to meet contractural specifications." [29:285] Congress has also stated that there are "good and valid reasons for certain programs to proceed with a great deal of concurrency, namely our national strategic programs." This is the exception and not the rule. [29:286] It seems that what the Congress desires is what Secretary Packard envisioned—"an acceptable level of confidence that we know what we are doing before we move ahead." (45:ATCH 2) In other words, any acquisition strategy should attempt to manage risk and not avoid it. Each program is different and the acquisition strategy must be tailored to support it. The development community should use an approach of "sensible continuity."

The term "sensible continuity" was coined by Mr. Art Boykin of the Aeronautical Systems Division to denote a balance between concurrency and the incremental approach of "fly-before-buy" which is tailored to each program's needs. [35:14] What this implies for the implementation of the LRIP concept is that if a program has an urgent, well documented need and the technology is judged to be low risk, then an LRIP acquisition strategy which introduces limited concurrency could be employed. If this urgent need does not exist, the LRIP model originally proposed in the "Munitions Acquisition Process" study should be employed. This later process is acceptable to Congress as evidenced by the fact that they have provided procurement funds for the facilitization of the Copperhead program since 1978; while that program had virtually all of its FSED phase to complete. [55:—] If concurrency is to be introduced, several conditions will have to be met.

The first of these is a strong management commitment. This requires a strong justification by the user of requirements, and need dates. The requirement must be coordinated with, and agreed to by all levels of DOD. Program direction should include need dates and estimates of production quantity, as well as an indication of the sponsor's intent to introduce and support concurrency in the program. Having accomplished these actions prior to the initiation of the conceptual phase, the next critical point in the development process is the initiation of FSED.

At this point, typically referred to as Defense System Acquisition Review Council (DSARC) Milestone II, sufficient test data must be in hand to demonstrate the technical feasibility of the item. The business strategy and preliminary production planning should also be defined. The decision to proceed into FSED should then reflect a commitment to produce the system. If this commitment cannot be obtained, then either the program should be cancelled, or concurrency removed and a more conservative approach taken. If the decision is to proceed with a concurrent approach, then the nature of the FSED program should be strictly constructed and managed in accordance with the guidelines established in the original LRIP study and ADTCP 84-1. Significant among these guidelines are that the manufacturing process must be identified early in development, and after CDR the process must be identical to that used in production. In order to avoid funding difficulties and comply with AF budget instructions, RDT&E funds should be used for initial tooling as the product of this production line would be test assets. [8:14-3] Production funding would be used only for long-lead items associated with inventory assets.In order to avoid a gap between FSED and production RDT&E funds could also be used to procure assets for Follow-on Operational Test and Evaluation (FOT&E). Once the decision to enter full production (DSARC Milestone III) is reached, production funding would be used. This procedure would minimize the impact on the 3080 appropriations account and satisfy virtually all of the constraints on the implementation of the LRIP concept.

LRIP is a very important and critical issue in the acquisition of USAF munitions and equipment. Since acquisition lead times, from Validation to Production are approaching 10 to 12 years, it is apparent that initiatives that could reduce the lead time in the systems acquisition cycle can produce tremendous savings in cost and at the same time provide qualitatively superior weapons to the operational forces in a more timely manner. Today, the USAF inventory is filled with conventional munitions which do not represent the same technological advantages prevalent in the modernized USAF fighter aircraft recently introduced. With the demand for production funds discussed in this paper, it is absolutely necessary that a meaningful initiative, such as LRIP, be supported through all levels of DOD management to the US Congress. It is concluded that the LRIP policy, delineated in this paper should be integrated into major DOD policy, such as DOD 5000 series directives, so that field organizations can appropriately implement this concept in their acquisition strategy.

References

[1] Colley, John L., Landel, Robert D. and Fair, Robert R. *Production, Operations, Planning and Control.* San Francisco: Holden-Day Inc., 1977.

[2] Douhet, Guilio. *The Command of the Air.* (Reprinted in Air Command and Staff College, Readings and Seminars, Vol 11, Maxwell AFB, Alabama), 1979.

[3] Hutchins, Robert M. (ed.) *Great Books of the Western World.* Vol 23: "Machiavelli and Hobbes." Chicago: Encyclopedia Britannica, Inc., 1952.

[4] Timms, Howard L. *The Production Function in Business.* Homewood, Ill.: Richard D. Irwin, Inc., 1966.

[5] "Armament: The Business End of the Air Force." *Air Force Magazine,* Vol. 62, No. 12 (December 1979).

[6] Barron, James. "Bad Weapons Never Die, Onward and Upward with the GBU-15." *The Nation,* Vol. 228, No. 3 (27 January 1979).

[7] Schemmer, Benjamin F. "It's the Management Superstructure That's Strangling the Process." *Armed Forces Journal International,* Vol. 115, No. 11 (July 1979)

[8] Air Force Manual 172-1, *USAF Budget Manual Policies and Procedures.* Washington: Department of the Air Force, 15 March 1974.

[9] Air Force Pamphlet 172-4. *The Air Force Budget.* Eleventh Edition. Washington: Department of the Air Force, 1979.

[10] Air Force Systems Command Pamphlet 800-3. *A Guide for Program Management.* Andrews AFB, D.C.: Department of the Air Force, Headquarters Air Force Systems Command, 9 April 1976.

[11] Air Force Regulation 80-14. *Research and Development, Test and Evaluation.* Washington: Department of the Air Force, 19 July 1976.

[12] Armament Development and Test Center Pamphlet 84-1. *ADTC Manufacturing Management Guide for Acquisition Programs.* Eglin AFB, Florida: Department of the Air Force, Headquarters ADTC (AFSC), 15 Sep 78.

[13] Department of Defense Directive 5000.1. *Major Systems Acquisitions.* Washington: Department of Defense, 18 January 1977.

[14] Department of Defense Directive 5000.2. *Major Systems Acquisition Process.* Washington: Department of Defense, 18 January 1977.

[15] Department of Defense Manual 7110-1-M. *Budget Guidance Manual.* Washington: Department of Defense, 13 August 1976.

[16] Dreyfuss, David J. and Large, Joseph P. *Estimated Costs of Extended Low-Rate Airframe Production.* (R-2243-AF) Santa Monica, California: Rand Corp., March 1978.

[17] Eckert, Jon S. *Trends in U.S. Air Force Tactical Fighter Life Cycle.* Cornell University: Peace Studies Program Occasional Paper No. 11, April 1979.

[18] General Accounting Office. *Opportunities for Improving Management of Ammunition Components, Department of Defense.* Washington: General Accounting Office, 16 April 1976.

[19] Large, Joseph P., Hoffmayer, Karl and Kontravich, Frank. *Production Rate and Production Cost.* (R-1609-PA&E) Santa Monica, California: Rand Corp., December 1974.

[20] Office of Federal Procurement Policy Pamphlet No. 1. *Major Systems Acquisition, A Discussion of the Application of OMB Circular No.* A-109. Washington: Executive Office of the President, August 1976.

[21] Office of Management and Washington Budget, Circular No. A-109. *Major Systems Acquisitions.* Washington: 5 April 1976.

[22] Parry, Dennis S. *Second Sourcing in the Acquisition of Major Weapon Systems.* Monterey, California: Naval Postgraduate School, June 1979.

[23] Smith, Larry L. *An Investigation of Changes in Direct Labor Requirements Resulting from Changes in Airframe Production Rates.* Cameron Station, Virginia: Defense Logistics Agency, 9 July 1976.

[24] Rand Corporation. *Choice among Strategies for Systems Acquisition.* Santa Monica, California: Rand Corp., March 1972.

[25] Rand Corporation. *System Acquisition Strategies.* Santa Monica, California: Rand Corp., June 1971.

[26] U.S. Congress, House, *Department of Defense Appropriations Bill, 1973.* (Report of the Appropriations Committee No. 92-1389) Washington: Government Printing Office, 11 September 1972.

[27] U.S. Congress, House, *Department of Defense Appropriations Bill, 1974.* (Report of the Appropriations Committee No. 93-662) Washington: Government Printing Office, 26 November 1973.

[28] U.S. Congress, House, *Department of Defense Appropriations Bill, 1978.* (Report of the Appropriations Committee No. 95-451) Washington: Government Printing Office, 21 June 1977.

[29] U.S. Congress, House, *Department of Defense Appropriations Bill, 1980.* (Report of the Appropriations Committee No. 96-450) Washington: Government Printing Office, 20 September 1979.

[30] U.S. Congress, Senate, *Hearings of the Committee on Appropriations—DOD Appropriations for FY 1980.* Washington: Government Printing Office 1979.

[31] "ADTC Strategy for Armament Development and Acquisition," Briefing given to the 1979 Industrial Symposium, Eglin AFB, FL.

[32] Aeronautical Systems Division. "Gaps in Systems Acquisition," Briefing, Wright-Patterson AFB, OH, undated.

[33] Aeronautical Systems Division. "Production Lead Times and Their Effect on Acquisition Procedures." Briefing, Wright-Patterson AFB, OH., undated.

[34] Babineau, Alphee A. "Munitions Acquisition Process." (Staff Study, Deputy for Armament Systems, Eglin AFB, FL.), April 1977.

[35] Boykin, A. "Acquisition Strategy and Systems Management." Wright-Patterson AFB, OH.: Aeronautical Systems Division, 1979.

[36] Boykin, A. "Lessons Learned in Systems Acquisition." Wright-Patterson AFB, OH.: Aeronautical Systems Division, 1978.

[37] Copperhead Program Office. "155MM Cannon Launched Guided Projectile." Pamphlet, undated.

[38] Deputy for Armament Systems. "Acquisition Lead Time Study." Staff Study, Eglin AFB, FL., October 1979.

[39] Deputy for Armament Systems. "Low Rate Initial Production." Background Paper, Eglin AFB, FL., May 1977.

[40] Deputy for Armament Systems. "Production Concepts and Low Rate Initial Production." Background Paper, Eglin AFB, FL., undated.

Continued on page 32

CURRENT RESEARCH

AFIT School of Systems and Logistics 1980 Theses

The following theses have been completed by the class of 1980 of the Air Force Institute of Technology's School of Systems and Logistics. The LSSR included with each thesis is a School of Systems and Logistics identification number.

Most will be on file with the Defense Logistics Studies Information and Exchange (DLSIE) and the Defense Technical Information Center (DTIC) by December 1980. Organizations interested in obtaining a copy of any thesis should make their request to either DLSIE or DTIC organizations, not to AFIT. The complete mailing addresses are as follows:

Defense Logistics Studies Information Exchange	Defense Technical Information Center
US Army Logistics Management Center	Cameron Station
Ft Lee, Virginia 23801	Alexandria, VA 22314
(AUTOVON 687-4546/3570)	(AUTOVON 284-7633)

Class of 1980 Theses

Charles R. Hatch and Captain Robert E. Mansfield, Jr. LSSR: 1-80
Energy Self-Sufficiency for Air Force Logistics Command Bases: An Initial Investigation

Captain Gary W. Pierce and Captain Erika A Robeson 2-80
Attitudes and Opinions of USAF Jet Engine Personnel Concerning Enlisted Career Progression

Linda K. Allen and Capt Michael J. Hubert 3-80
The Relationship of Source Selection Sensitive Data to Competition and Negotiations

Maj Henry E. Laakman, Jr. and Capt Clyde E. Gulick 4-80
An Analysis of Factors Influencing the Turnover of United States Air Force Pilots in the Six to Eleven Year Group

2Lt James P. K. Smith and 2Lt Steven M. Pittman 5-80
Some Civil Engineering and Management Aspects of Conversion from JP-4 To JP-8 Fuel by The United States Air Force in the Continental United States

Capt Robert E. Dorough and Capt Robert H. Holliway 6-80
A Simulation Study of Checkout Operations at the Wright-Patterson AFB Commissary

Capt Dean H. Haylett and Capt Craig W. Spiess 7-80
A Strategic Airlift Pilot Scheduling Technique Utilizing Statistical Analysis

Capt Harry W. Gullett (USMC) and Capt Thomas N. Stiver (USAF) 8-80
A Study and Model of the Noncombatant Evacuation Operation in the Federal Republic of Germany

Maj Roland A. Hassebrock, Capt John R. Forster (USA) and Sqdn Ldr Mahboob A. Khan (Pakistan AF) 9-80
A Study to Determine the Role of Competition in Contracting for the Movement of Air Freight Within the Domestic Market

Mr. James D. Mayer and Mr. David F. Whealdon 10-80
Defense Contractor Employee Overseas Compensation and the Foreign Earned Income Act of 1978

Capt Thomas E. Falconer and Capt David J. Murphy, Jr. 11-80
An Analysis of Factors Which Should Be Considered in Developing Reprocurement Data Requirements

Mr. Carmine J. Forzono and Capt Robert I. Mitchell 12-80
An Analysis of Essential Logistics Support Data Items

2Lt John N. Allen and Capt Carl J. Wiles, Jr. 13-80
Cost Impact Investigation of AFLC Unfunded Type 1 (Contractor) Training

Maj Robert J. Harvey and Capt George C. Kiessling, Jr. 14-80
Analysis of the Planning Variable as It Relates to the Closure of a Small Air Force Unit

1Lt Abdul-Latif R. Al-Zayani, Capt Paul V. Lewis and Capt Timothy R. Ziegler 15-80
The Applicability of Teleteach Technologies to the Minuteman Education Program

Capt Kenneth G. Kaneda and 1Lt Robert M. Wallett 16-80
Development of Productivity Measures for the Design Section of a Base Level Civil Engineering Organization

Capt Stephen J. Mott and Capt Sherman D. Nelson 17-80
A Study of Fuel Supplies for Emergency Power Generation at Air Logistics Centers

Mr. James C. David and 1Lt Joseph S. Price 18-80
Successful Communication in Full Scale Engineering Development Statements of Work

Capt Edward O. Jacques, Jr. and Capt Michael G. Woolley 19-80
The Fuel Efficient Missile Combat Crew Routing Network

Capt Laurence J. R. Little and Capt Joanne M. Flanigan 20-80
A Model of Aircraft Maintenance Officer Turnover

Capt William M. Aven and 2Lt Donald R. Root 21-80
A Study of the Computational Requirements for Spares in the USAF A-10 SAIP Program

Mr. Herman Williams and Mr. Arthur B. Winn, Jr. 22-80
A Correlation Between the Assignment of Personnel to Technical Order Validation/Verification Versus Technical Order Deficiency Forms Generated

Capt Edward L. Preston and Capt Thomas J. Land 23-80
A Comparative Analysis of Two Cost Performance Forecasting Models: The Automated Financial Analysis Program, Electronic Systems Division, November 1976 Versus A Cost Performance Forecasting Concept and Model, Aeronautical Systems Division, Nov 1974

Capt John W. Dutcher III and Capt Douglas C. VanWiggeren 24-80
An Assessment of Current Methodologies Used to Evaluate Foreign Military Sales Payment Schedule Effectiveness

Capt Donald L. Kemp and Capt Andrew T. Rybacki 25-80
Analysis of Minuteman Missile Crew Member Attitudes Towards Present Minuteman Education Program and Possible Alternatives

Maj James R. Ballard and Maj Herman D. Lohse 26-80
An Evaluation of Forecasting Methods Used to Determine Air Force Logistics Command Manning for Foreign Military Sales

1Lt Coy S. Baxley and Capt Roy K. Salomon 27-80
A Study of the Relationship Between Worker Attitudes and Organizational Effectiveness in Base Level Environmental and Contract Planning Sections

2Lt Conrad W. Felice and 2Lt Vincent S. Franz 28-80
An Analysis into the Prioritization of Maintenance Actions in the Air Force Civil Engineering Recurring Maintenance Program

Capt Lynn J. Willadsen and Capt Steven D. Kahne 29-80
CONUS-to-Country Physical Distribution Systems for Danish and Norwegian F-16 Assets

Capt Edward D. Mayfield and Capt Robert W. Walter 30-80

Relationship Between the Initial Duty Assignment and Successive Assignments in the Aircraft Maintenance Officer Career Field (AFSC 4024)

Capt Robert L. Doerr and Capt Thomas H. Gross — 31-80
A Comparative Analysis of Fire Protection Systems for Essential Electronic Data Processing Equipment

Capt Douglas A. Grant and Capt Kim H. Keller — 32-80
A Comparative Analysis of the Minuteman Education Programs as Currently Offered at Six SAC Bases

Maj Stanley G. DeGruccio and Capt Glen A. Lindsey — 33-80
An Analysis of the Acquisition of Specific Items of Support Equipment for the F100 Engine

Mr. Robert J. Arthur and Mr. Ottis Fisher — 34-80
Spares Acquisition Integrated with Production and Its Influence on the Obsolescence of Spare Parts

2Lt Christopher (NMI) Carson and 2Lt Charles D. Munon — 35-80
An Analysis of the Future Requirements for Materials Handling Equipment in the Military Airlift Command

Mr. Russell M. Genet and Capt John M. Wallace — 36-80
A Controlled Evaluaton of the Differences Between Two Approaches to Reliability Investment Screening

Capt Jack L. Grubb and Capt Thomas O. Sutliff — 37-80
Criteria for Applying Commercial Aircraft Warranties in USAF Aircraft Purchases

Capt Mark D. Greenly and Capt Joseph R. Schuler — 38-80
Determination and Analysis of Problems in Air Force Foreign Military Sales of Munitions

Mr. Gerald O. Wade — 39-80
Responsiveness and Configuration Control for Embedded Computer Software

Capt Milton O. Payne, Jr. and Capt Darryl A. Scott — 40-80
The LOGAIR Route Structure: An Exploration of the Single Hub Concept
Advisor: Capt Masters/ENS

Mr. John A. Berg and Mr. Wayne R. Woosley — 41-80
The Usefulness of Precious Metal Recovery Management System Information as the Basis for Assignment of a Precious Metals Indicator Code

Capt Scott C. Allen and Capt Charles M. Farr — 42-80
An Investigation of the Effect of Production Rate Variation on Direct Labor Requirements for Missile Production Programs

Maj Grantland W. Johns and Capt Philip M. Ray — 43-80
A Comparison of the Usefulness of the Facilities Management Program in the Graduate School of Systems and Logistics and Similar Programs in Civilian Institutions as Perceived by Former Students

Col Husam K. Abo Ghazaleh and Mr. Ardel E. Nelson — 44-80
A Foundation for an International Logistics Language

Mr. Eugene Chin and Maj Robert A. Heldt — 45-80
A Statistical Analysis of Cooperative Logistics Supply Support Arrangements Based on Source of Delivery

Mr. Joe Hernandez, Jr. — 46-80
Validation of the Operating and Support Cost Model for Avionics Automatic Test Equipment

Capt Troy E. Belyeu and Capt John E. Kuhn — 47-80
A Computer Based Scheduling System for Use by Base Level Civil Engineering in Development of the In-Service Work Plan

Capt James F. Shambo and Maj Robert P. Andrews — 48-80
A System Dynamics Analysis of the Factors Affecting Combat Readiness

Capt David E. Fortna and Capt Ronne G. Mercer — 49-80
An Evaluation of the AFIT Teleteach Expanded Delivery System (TEDS) Method of Instruction

1Lt Mary K. Allen and 1Lt Robert E. Linteau — 50-80
A Critical Analysis of Management Indicators for the Director of Materiel Management, Sacramento ALC

Capt Edward A. Richter and Capt David C. Tharp — 51-80
A Comparative Analysis of Enlisted Career Progression Systems

Capt Barry L. Hood and 1Lt David A. Diener — 52-80
Production Oriented Maintenance Organization: A Critical Analysis of Sortie-Generation Capability and Maintenance Quality

Mr. Francis J. Hall and Capt Clark K. Nelsen — 53-80
A Historical Perspective of the United States Air Force Enlisted Personnel Promotion Policy

Capt Paul M. Biernacki and Capt Patricia S. Lumpkin — 54-80
The Effectiveness of a Joint-Labor Management Council on Increasing Productivity and Enhancing the Quality of Work Life

1Lt Forrest E. Smith and Lt (jg) Monrak Saengaram — 55-80
An Analysis of Reports of Item Shipment Discrepancies Submitted and Processed by Selected Department of Defense Agencies

Mr. Ronald C. Wilson, WCdr Nazar Muhammad and 1Lt Charles Middleton, Sr. — 56-80
Macro Aircraft Spares Analysis

SqnLdr John R. Baker and Mr. Stephen C. Forgle — 57-80
A Dynamic Model of the Air Force Graduate Education System

Ms Beth A. Judson and Ms Lucinda A. Littlejohn — 58-80
Foreign Military Sales Requisition Processing by the Armed Services

Mr. Matthew R. McGuire — 59-80
Computed MISTR Requirement Changes and Parts Support - Analysis of a Mismatch

Capt Danny C. Rehm and Mr. David R. Baker — 60-80
Feasibility of Direct Funding as an Alternative to the Current DOD Calibration Funding Methods

Capt Henry P. Mitchell and 1Lt Todd R. Garland — 61-80
Multiple Model Demand Forecasting Compared to Air Force Logistics Command DO62 Performance

Capt Robert J. Lamkey and Mr. Curtis T. Pavy — 62-80
Software Control During Development and Acquisition

Capt James M. Bradney and Capt Mark M. Perkins — 63-80
Proposed Criteria for Evaluation of the Reliability Improvement Warranty Concept

Capt Jeffrey W. Ackerson and Mr. George H. Baum — 64-80
Selected Effects of Contractor Reactions to Standardization of Avionics Acquisitions

Capt Calder D. Kohlhaas, Jr. and Capt Richard L. Williams — 65-80
Investigation of the Adequacy of the Training Program for Civil Engineering Prime Beef Contingency Force Teams

2LtAlbert P. Allan and 2Lt Gary D. Transmeier — 66-80
A Review of the Methods for Passive Solar Systems Analysis

Capt Dwight R. Boggs and Mr. David W. Palm — 67-80
An Analysis of the Forward Based Mini-Depot Level Specialized Repair Activity: RAF Lakenheath

Capt Elbert B. Hubbard, III, and Capt Gregory A. Swecker — 68-80
An Analysis of Air Force Management of Turbine Engine Monitoring Systems (TEMS)

Mr. Charles D. Pendergraft — 69-80
Relationship of Subjective Organizational Assessment Indices to Objective Organizational Indices

LRIP continued from page 30

[41] Deputy for Armament Systems. "Results of Study, Improved Acquisition of Munitions." Briefing, Eglin AFB, FL., April 1977.
[42] Deputy for Armament Systems. "Wide Area Antiarmor Munitions (WAAM) Program Management Plan." Part I. WAAM Program Office, Eglin AFB, FL. May 1979.
[43] Martin Marietta Aerospace. "Copperhead Production Program." Orlando Division Briefing, undated.
[44] Wolniewicz, Peter F. "Improved Acquisition of Munitions—Two Years Later." Research Paper, University of West Florida. December 1979.
[45] Colonel George W. Lutz. "Fly-Before-You-Buy Policy Statements and Studies." ASD/SDMS Memorandum, 14 January 1972.
[46] Captain James D. Evans. "Proposed Strategy for Armament Acquisition, Low Rate Initial Production." AFSC/SDZW, Memorandum, undated.
[47] Colonel Leo Marquez. "Proposed Strategy for Armament Acquisition—Low Rate Initial Production." USAF/LEX Letter, 31 January 1978.
[48] Colonel Ronald W. Terry. "Proposed Strategy for Armament Acquisition—Low Rate Initial Production." AFSC/PM Letter, 27 April 1978.
[49] Colonel Vincent Kelty, Jr. "Low Rate Initial Production." AFSC/PM Letter, 30 August 1978.
[50] General George S. Brown. "Unloading Aeronautical Systems Division." AFSC/CC Letter, 13 April 1971.
[51] Lt Col Alphee A. Babineau. "LRIP" ADTC/SD Memorandum, 21 November 1978.
[52] Major General Clifford J. Kronauer. "Program Action Directive for the Transfer of Missile Programs Division, ASD to ADTC." AFSC/CC Letter, 19 July 1971.
[53] Major Joseph F. Greenfield. "Low Rate Initial Production." ADTC/JAN Letter, 17 May 1977.
[54] Babineau, A. Lt Col, USAF (Ret.) Interview, 11 November 1979.
[55] Batchis, G., Chief, Production Engineering—Copperhead Program Office, telecon, 10 December 1979 and 15 January 1980.
[56] Blevins, J., Lt Col, USAF. Chief, Program Control Office, (WAAM SPO) ADTC/SD-8G, Eglin AFB, FL., Interview, 30 November 1979.
[57] Burda, J., GS-15, USAF. System Program Director, (WAAM SPO) ADTC/SD-8, Eglin AFB, FL., Interview, 30 November 1979.
[58] Campbell, R., Lt Col, USAF. Deputy Director, Strike Systems, AFSC/SDZW, telecon, 7 November 1979.
[59] Cesarotti, W., Major, USAF. Program Element Monitor, CSAF/RDPV, telecon, 6 December 1979.
[60] McKrill, R., Lt Col, USAF. Action Officer, CSAF/LEXP, telecon, 11 December 1979.

Information for Contributors

General. The *Air Force Journal of Logistics* is dedicated to the open examination of all aspects of issues, problems, and ideas of concern to the Air Force logistics community. Constructive criticism of logistics as it exists today is encouraged if it is issue oriented, rationally expressed and indicates the positive action necessary for future improvement. Contributions are welcome from any source inside and outside the Air Force.

Scope. The *AFJL* will consider for publication articles and research results that add to the understanding or improvement of any aspect of Air Force logistics from maintenance, supply, transportation, and logistics plans, to engineering and services, munitions, and contracting and acquisition; from base-level and operational units to depot-level and military and civilian industrial and production logistics; from logistics civilian, enlisted and officer personnel and manpower requirements to training and education; from internal organizational structure, policies and procedures to external relations with other services, government agencies, civilian industry and allies; from daily mission support challenges to the logistics aspects of national security objectives and Air Force strategy, doctrine and tactics.

Special Interest. Articles are especially invited that:

- ☐ give the results of the application of sound analytical and research techniques to existing Air Force logistics operations;
- ☐ offer possible alternatives to current operations based on a logical assessment of today's posture and tomorrow's requirements;
- ☐ demonstrate the interrelation of various parts of Air Force logistics systems internally and with non-USAF systems;
- ☐ consider basic Air Force logistics functions and issues from an unusual perspective;
- ☐ focus on logistics and Air Force mission accomplishment;
- ☐ or, provide insight into the reasons for and impact of recent or future changes in Air Force logistics.

Original Material and Revisions. Submitted articles are received with the understanding that:

1. They have not been published nor are being considered for publication elsewhere. Articles based on research planned for publication *only* as an in-house report or in symposium proceedings are acceptable.

2. Those articles with multiple authors have been approved by all. The *AFJL* will work with the lead author in preparing the manuscript for publication with the understanding that any approved changes are acceptable to all.

3. To the greatest extent possible, necessary revisions in the manuscript will be coordinated with the author.

Length. In general, manuscripts should be between 2000-3500 words. Shorter and longer papers may be published on an exceptional basis. Formal research papers should briefly recognize the most significant research accomplished in the area of investigation and the relation of that research to the work addressed in the paper. A 50-75 word abstract should accompany each manuscript.

Format. Manuscripts should be typed with one inch margins, double-spaced on one side of standard size bond paper. References should be numbered and double-spaced on a separate page(s) at the end of the manuscript. The double number system for identifying references within the article should be used, i.e., (7:15), with the first number identifying the number of the source in the reference list and the second number indicating the specific page number in that source. When possible, potential textual footnote material should be incorporated in the main body of the article. Do not include a separate bibliography.

Figures and Tables. Supporting figures, if any, should be numbered consecutively and prepared on separate pages, one to a page. The text should clearly indicate where each figure is to appear. Tables should be numbered consecutively and be prepared within the appropriate text of the manuscript.

Awards. Published articles are eligible to compete for the Most Significant Article Award in each issue. The quarterly award winners will compete for the annual award from the *AFJL*. Selection is made by the members of the *AFJL*'s Editorial Advisory Board. Articles published by the Editorial staff, Contributing Editors, and Editorial Advisory Board are ineligible for the awards.

Reprints. Permission for schools and other publications to reprint material appearing in the *AFJL* will usually be granted, if requested.

Address. All correspondence and manuscripts should be sent to:

Air Force Journal of Logistics
AFLMC
Gunter AFS, Alabama 36114

Telephone: AUTOVON 921-4087
Commercial: (205) 279-4087

"There must be great care taken to send us munition and victual withersoever the enemy goeth."

(Francis Drake, 1588)

Air Force Journal of Logistics
Air Force Logistics Management Center
Gunter AFS, Alabama 36114