

INTERNET DOCUMENT INFORMATION FORM

A. Report Title: Air Force Journal Of Logistics, Volume XXIII, Number 3, Contractors On The Battlefield: What Have We Signed Up For? Expeditionary Airpower, Part 2 – EAF Strategic Planning

B. DATE Report Downloaded From the Internet: October 18,1999

**C. Report's Point of Contact: (Name, Organization, Address, Office Symbol, & Ph #): DEPARTMENT OF THE AIR FORCE
AIR FORCE JOURNAL OF LOGISTICS
501 WARD STREET
GUNTER ANNEX
MAXWELL AFB, AL 36114-3236**

D. Currently Applicable Classification Level: Unclassified

E. Distribution Statement A: Approved for Public Release

**F. The foregoing information was compiled and provided by:
DTIC-OCA Initials: __pm__ Preparation Date OCTOBER 18, 1999**

The foregoing information should exactly correspond to the Title, Report Number, and the Date on the accompanying report document. If there are mismatches, or other questions, contact the above OCA Representative for resolution.

19991022 107

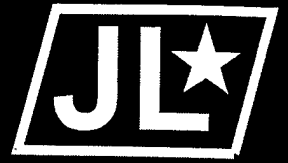
**Contractors on the Battlefield:
What Have We Signed Up For?**

By Colonel Steven J. Zamparelli, USAF

**Expeditionary
Airpower**
Part 2 - EAF Strategic Planning

Also in this edition:

*Transition to Jointness: A Joint Acquisition Force
The Logistics Constant Throughout the Ages
International Armaments Cooperation
Logistics and Airpower—A Failure in Doctrine*



AIR FORCE JOURNAL *of* LOGISTICS

Volume XXIII,
Number 3

AIR FORCE JOURNAL *of* LOGISTICS

Volume XXIII, Number 3

Fall 1999

AFRP 25-1

FEATURE

- 4 **Strategic EAF Planning—Expeditionary Airpower Part 2**
Robert S. Tripp, PhD, RAND
Lionel A. Galway, PhD, RAND
Timothy L. Ramey, PhD, RAND
Paul S. Killingsworth, PhD, RAND
Chief Master Sergeant John G. Drew, AFLMA
C. Chris Fair, RAND

ARTICLES

- 3 **Transition to Jointness: An Analysis and Appraisal of Consolidating Service Acquisition Personnel into a Joint Acquisition Force**
Major Jaimy S. Rand, USA
- 11 **Contractors on the Battlefield: What Have We Signed Up For**
Colonel Steven J. Zamparelli, USAF
- 20 **The Logistics Constant Throughout the Ages**
Cadet First Class Daniel McConnell, USAFA
Captain Richard A. Hardemon, USAF
Senior Master Sergeant Larry C. Ransburgh, USAF
- 24 **International Armaments Cooperation and Theater Missile Defense: Why South Korea is Reluctant to Join the Club**
Captain George A. Hutchinson, USAF
Craig M. Brandt, PhD

DEPARTMENTS

- 28 **Candid Voices**
Logistics and Airpower—A Failure in Doctrine?
Air Commodore Peter Dye, RAF
- 31 **Inside Logistics**
Collocating Air Force Weapon Systems Inventory with the Defense Logistics Agency Premium Service Facility
Major Monte J. Murphy, USAF
- 36 **Personnel Career Information Needed—Agile Logisticians**
Major Nancy A. Stinson, USAF
Captain Malcolm E. Blair, USAF
Captain Alex E. Dubovik, USAF



General Michael E. Ryan
Air Force Chief of Staff

Lieutenant General John W. Handy
Deputy Chief of Staff, Installations and Logistics

Colonel Richard M. Bereit
Commander
Air Force Logistics Management Agency

Editor-in-Chief
Lieutenant Colonel James C. Rainey
Air Force Logistics Management Agency

Editors
Beth F. Scott
Air Force Logistics Management Agency

Captain Scott C. Naylor
Air Force Logistics Management Agency

The *Air Force Journal of Logistics (AFJL)*, published quarterly, is the professional logistics publication of the United States Air Force. It provides an open forum for presenting research, innovative thinking, ideas, and issues of concern to the entire Air Force logistics community. It is a nondirective publication published under *AFI 37-160V4*. The views and opinions expressed in the *Journal* are those of the author and do not necessarily represent the established policy of the Department of Defense, Department of the Air Force, the Air Force Logistics Management Agency, or the organization where the author works.

The *AFJL* is a refereed journal. Manuscripts are subject to expert and peer review, internally and externally, to ensure technical competence, accuracy, reflection of existing policy, and proper regard for security.

The publication of the *AFJL*, as determined by the Secretary of the Air Force, is necessary in the transaction of the public business as required by the law of the Department. The Secretary of the Air Force approved the use of funds to print the *Journal*, 17 July 1986, in accordance with *AFI 37-160V4*.

Air Force organizations should contact the *AFJL* editorial staff for ordering information: DSN 596-4087/4088 or Commercial (334) 416-4087/4088. *Journal* subscriptions are available through the Superintendent of Documents, US Government Printing Office, Washington DC 20402. Annual rates are \$8.50 domestic and \$10.65 outside the United States. Electronic versions of the *AFJL* are available via the World Wide Web at: <http://www.ll.hq.af.mil/afjma/lgi/Afjhome.html>. The *Journal* editorial staff maintains a limited supply of back issues.

Unsolicited manuscripts are welcome from any source (civilian or military). They should be between 1,500 and 5,500 words. The preferred method of submission is via electronic mail (e-mail) to: editor@afjma.gunter.af.mil. Manuscripts can also be submitted in hard copy. They should be addressed to the *Air Force Journal of Logistics*, 501 Ward Street, Maxwell AFB, Gunter Annex AL 36114-3236. If this method is used, a 3.5-inch disk, Zip disk, or compact disk containing an electronic version of the manuscript should accompany the hard copy. Regardless of the method of submission used, the basic manuscript should be in Microsoft Word® or WordPerfect® format and all supporting tables, figures, graphs, or graphics must be provided in separate files (preferably created in Microsoft Office® products). They should not be embedded in the manuscript. All submissions will be edited in accordance with *AFJL* style guidelines and the *Gregg Reference Manual*, Eighth Edition.

Articles in this edition may be reproduced in whole or in part without permission. If reproduced or reprinted, the courtesy line "Originally published in the *Air Force Journal of Logistics*," should be included.

Transition to Jointness: An Analysis and Appraisal of Consolidating Service Acquisition Personnel into a Joint Acquisition Force

Major Jaimy S. Rand, USA

With the momentum established by both the Goldwater-Nichols Defense Reorganization Act of 1986 and the Defense Acquisition Work Force Improvement Act (DAWIA) of 1991, why has the defense acquisition work force across the Services not yet been reorganized into a consolidated, joint organization? Would such an organization serve stakeholders (soldiers, sailors, airmen, marines, taxpayers, and work force members) better than the current system? Where has the concern surrounding these questions escaped? Some of the answers lie in the events that have transpired over the last 12 years.

Background and Significance

After the passage of the Goldwater-Nichols Defense Reorganization Act of 1986 and more so after implementation of the DAWIA of 1991, it seemed the *handwriting was on the wall* and the inevitable would happen: the defense acquisition work force would become a joint acquisition work force. This rumor seemed destined to become reality given intense media coverage of duplicative requirements between the Services and defense contract fraud stories. The idea of a joint acquisition force was and still is today an unpopular suggestion, especially among military members of the respective Services' acquisition corps.

Since enactment of DAWIA, the Services are producing more professional (formally educated and trained) defense acquisition employees. However, that has not solved the numerous issues for which the defense acquisition work force gets blamed. In parallel with progression toward *jointness* is the advancement of technology and increasing capabilities in the form of: (1) weapon system technology, precision, range, and lethality and (2) information technology.

Such leaps in technical capability, coupled with the inability to capitalize on efficiencies related to both interoperability and production, presents an ominous sign. The inability of the acquisition field to bring this all together in a succinct, integrated package suggests that a revolution in military affairs is being suspended because defense acquisition leaders lack the understanding of how best to package the acquisition process organizationally. The increasing trend toward *jointness* in the shaping of, responding to, and preparing for the US strategic environment and the possible damaging and pervasive issues suggesting perhaps a *broken* acquisition work force in supporting joint operations, therefore, merits closer examination.

Definition of a Joint Acquisition Force

Reference to a *joint* or *purple* acquisition force requires an explanation of how such a force would be organized and what functions would be performed. What did Senators Goldwater and Nichols—as well as Representative Mavroules, the architect of

DAWIA—have in mind? Typical of federal legislation in being deliberately vague, no language accompanies either act (or implementation guidance thereof) on what type of structure a joint acquisition organization should have.

One perspective is that all acquisition organizations and professionals are subordinate to the Under Secretary of Defense for Acquisition and Technology (USD[A&T]) and hence already comprise a joint organization. In following the pattern of *jointness* provided by the Unified Action Armed Forces (UNAAF) model, the USD (A&T) would be considered the Defense Acquisition and Technology Commander in Chief (CINC).

On the other hand, the perspective at the other extreme is defense acquisition organizations today, regardless of the fact they are all (directly or indirectly) subordinate to the USD(A&T), are not combined nearly enough in joint structure and function. A major reason consistently used to support this perspective is the large number of systems fielded by the different Services having duplicity and/or poor to nonexistent program connectivity. This reason is the one most used to infer the need to better organize in order to solve many acquisition issues. So in reality, how would a joint acquisition force be organized?

A commonly accepted definition for *jointness* is “. . . the art of combining capabilities from the different military Services to create an effect that is greater than the sum of the parts. Not all military functions or capabilities need to be joint.”¹ This definition supports a continuum of solutions, to answer the question. Solutions range from a consolidated joint acquisition organization under a CINC to a separated acquisition force spread across the Services to a combination of the two falling in between.

Setting the Precedent for Jointness in Defense Acquisition

Numerous legislative and administrative events are responsible for the trend toward *jointness* within not only defense acquisition but also defense operations in general. The National Security Act of 1947 established not only the Department of Defense (DoD) and the Secretary of Defense, with sole managerial responsibility over the Armed Forces and their operations, but also the Joint Chiefs of Staff (JCS) as an advisory body to the National Command Authority (NCA). The formation of the JCS marked the beginning of *jointness* in name only.

One of the next major steps toward *jointness* took place in the early 1960s under Secretary of Defense Robert McNamara. He brought the Planning, Programming, and Budgeting System (PPBS) to DoD from the Ford Motor Company. One of McNamara's goals in introducing it was to force the Services into

(Continued on page 37)

Strategic EAF Planning

The future combat support system should be designed to maintain readiness levels to support immediate deployments, provide responsive support to deal with unanticipated events, provide support for the full spectrum of potential operations, transition support effectively as the units move along the spectrum of operations, and be efficient and affordable.

The EAF and Combat Support System Planning

Under the EAF concept, the Air Force is divided into several Air Expeditionary Forces (AEF), each roughly equivalent in capability, among which deployment responsibilities will be rotated.¹ Each AEF is required to be able to project highly capable and tailored force packages, largely from the continental United States (CONUS), on short notice anywhere around the world in response to a wide range of possible operations. This concept requires the ability to deploy and employ quickly, adapt rapidly to changes in the scenario, and sustain operations indefinitely. To meet the demanding timelines, units must be able to deploy and set up logistics production processes quickly. Deploying units will, therefore, have to minimize deployment support. This, in turn, demands the support system be able to ensure the delivery of sufficient resources when needed to sustain operations.

To meet these operational requirements, the future combat support system should be designed to maintain readiness levels to support immediate deployments, provide responsive support to deal with unanticipated events, provide support for the full spectrum of potential operations, transition support effectively as the units move along the spectrum of operations (transportation from one kind of operation to another), and be efficient and affordable. Moreover, maintaining readiness to meet potential major theater war (MTW) requirements while a significant portion of the force is temporarily deployed to meet boiling peacetime commitments presents additional support challenges. These challenges differ considerably from those posed by Cold War employment concepts and require a complete reexamination of the combat support system to determine how they can best be met. Strategic Agile Combat Support (ACS) design trade-off and investment decisions need to be made in the near term to create the ACS capabilities necessary to achieve the operational capabilities required in the future.

Focus on Strategic Planning

The time horizon over which planning is done determines a number of key planning process characteristics. These include the response time required to construct a plan, level of detail of inputs, and flexibility of available resources. Planning for the ACS system could operate on three different time horizons at the:

Expeditionary Airpower Part 2

Robert S. Tripp, PhD, RAND
Lionel A. Galway, PhD, RAND
Timothy L. Ramey, PhD, RAND
Paul S. Killingsworth, PhD, RAND
CMSgt John G. Drew, AFLMA
C. Chris Fair, RAND

A key challenge for the Air Force in the future is strategic planning to support the Expeditionary Aerospace Force (EAF). The EAF concept requires a rethinking of the entire combat support system, and subsequently the strategic planning framework for combat support should also be reexamined and enhanced. To a large degree, future global combat capability will be dependent upon strategic choices concerning combat support system design that will be made in the near future.

- Level of execution (days to weeks): the ACS system should support ongoing operations.
- Midterm or strategic level² (months to years): the system should acquire or construct resources to support the current force structure across the full spectrum of operations and in any location critical to US interests, subject to peacetime cost constraints.
- Long-term level (decades): the ACS mobility system and its strategic infrastructure should be modified to support new force structures as they come on line and to utilize new technologies.

While much of the Air Force's attention has been focused on the execution time horizon to support the EAF, this segment of research concentrates on an integrated planning framework that addresses strategic decisions. These ACS system design and policy issue planning decisions made in peacetime affect the logistics footprint, closure time, peacetime costs, and other important metrics for evaluating support of expeditionary operations. The goal of this research is to begin formulating a strategic planning process that addresses how to make decisions about infrastructure development, resource positioning at forward or rear locations, and other policies and practices affecting logistics support.

An Enhanced Strategic ACS Planning Framework for the Expeditionary Aerospace Force

A detailed, continuous, careful end-to-end planning process focusing on strategic time horizons is required to develop the infrastructure necessary to transition to the EAF effectively and efficiently. Further, much, if not most, support effectiveness comes from planning and decisions made for these longer time horizons where options include redesigning support equipment, developing support processes and infrastructure, setting up prepositioned resources, and negotiating base access and relationships with coalition partners.

Characteristics of Strategic ACS Planning in the EAF Environment

Generally, a strategic ACS planning system for the new environment should assess how alternative logistics designs affect a number of important metrics. These include timelines to achieve the desired operational

capabilities, peacetime costs, risks, and flexibility. It should also provide feedback as to how well the existing ACS system meets the spectrum of operational requirements. In comparing the current planning system with the ACS planning requirements for the EAF concept, enhancements should be made in the following areas:

- **Supporting the entire spectrum of operations.** The current planning system assumes that combat support capabilities designed for MTW scenarios can handle any situation. However, resources required to support peacetime operations (missions other than war) may be greater than or differ substantially from those required for MTWs.
- **Dealing with uncertainty.** Expeditionary operations are fraught with uncertainty. For example, denial of base access may require both preparation of several reception sites (forward operating locations) to support combat operations and minimal resource prepositioning at multiple sites to increase the probability of access. Moreover, there is great uncertainty surrounding the operational scenario, which will greatly affect support resource requirements. For instance, low operating tempos (OPSTEMPOs) may require far less prepositioned resources to meet rapid employment timelines, whereas high OPSTEMPOs may create a need for much more prepositioning. The current planning system, which focuses on MTWs, needs to be enhanced in order to address these uncertainties as well.
- **Evaluating alternative designs for deployment/employment timelines and associated costs.** The EAF concept emphasizes rapid deployment timelines that should be accounted for in future ACS system design. Alternatives to achieve fast deployment (for example, prepositioning equipment, developing FOLs with adequate facilities and resources to support rapid deployments and immediate employment, and developing host nation support agreements) have significant peacetime costs. On the other hand, the timelines might be slightly longer if materiel were held at regional storage sites. This would significantly lower costs. Assessing such trade-offs between timeline, cost, and risk is integral to future strategic ACS system planning. The current support planning system does not address these issues.³
- **Integrating ACS planning among support functions and theaters and with operations.** The current combat support planning system is stovepiped in several ways. Each commodity and its support processes are viewed largely independently in order to determine resource requirements. In this fragmented process, opportunities to develop consolidated support operations or other policies that may support more than one theater may be missed. Moreover, feedback needs to be provided among commodity managers (for example, engines and low-altitude navigation and targeting for night) so they may determine how the best support option for one commodity (for example, consolidated intermediate maintenance) may affect the best ACS design for the other. Additionally, feedback on support options and costs needs to be provided to operations planners for trade-off analysis decisions. As an example, a deployment window of 96 hours versus 40 hours produces dramatic savings of resources.
- **Integrating the assessment and development process for technology and policy.** In the areas of technology and policy, many different organizations and agencies are pursuing initiatives that are part of the overall ACS system. However, these initiatives are formally uncoordinated below the level

of the Air Staff. There has been little attention given to developing a capability that can evaluate options among those sets of competing policies and technologies that may be developed both to produce the most cost-effective global ACS capability and serve multiple theaters and operational scenarios.

- **Controlling variability and improving performance.** Ensuring that a redesigned support process is working and identifying areas for improvement will require monitoring the support system as it evolves, yet feedback for system design improvements is not routinely captured. A few critical parameters drive wartime and peacetime requirements for resources. While some of these parameters are measured, much improvement can be made in controlling their variability. Further, improvement may be made by developing a measurement system that can indicate when corrective action is needed or when the system may need redesigning.⁴

A Framework for Strategic ACS Planning Employment-driven ACS Requirements Determination

The approach to requirements generation and determination is called *employment driven* because it starts with operational analysis: forces, weapons, OPSTEMPO, and required timelines. These key parameters determine most of the support requirements. This step is the leftmost panel in Figure 1, which depicts the overall approach to analyzing support requirements.

The middle panel represents the requirements determination model, which generates time-phased combat support requirements for each support resource as a function of the operational requirements and alternative logistics policies, practices, and technologies. ACS planning is beset by uncertainties and options. Some simple aggregated spreadsheet models were constructed to compute requirements for fuel, munitions, vehicles, support equipment, and shelters. As these models are easier to specify and run than the usual highly detailed models, they may be used to quickly screen several scenarios permitting a more thorough analysis of uncertainty. Yet, these relatively simple models provide enough detail to estimate the personnel, equipment, and commodity requirements to support alternative operational requirements and the timeframes required to assemble the production function for those commodities and operate them to sustain operations for an operational scenario.

For example, in the fuel model, the refueling system requirements (number of R-9 refuelers) are determined by the aircraft go sequence, aircraft fuel acceptance rates and capacities, and refueling system flow rates. For refueling by truck, the system flow rate would be determined by the truck acceptance rate, distribution system pumping rate (fill stand), and driving time to and from the fill stands. While not a detailed simulation of the fuels support operation, the model can be used to compute requirements for a number of fuel reception, storage, and distribution methods.⁵

As noted in the middle panel of Figure 1, two of the key outputs from the requirements determination models are the initial operating requirement (IOR) and follow-on operating requirement (FOR) for each resource (if applicable). The IOR is the amount of resource that is necessary to initiate and sustain operations while resupply pipelines are initiated for that resource. In the case of munitions, it may be that 3 days are required to reestablish resupply of munitions. Thus, 3 days of munitions would be the IOR. The FOR is the projected amount of the resource that is required during the remainder of the

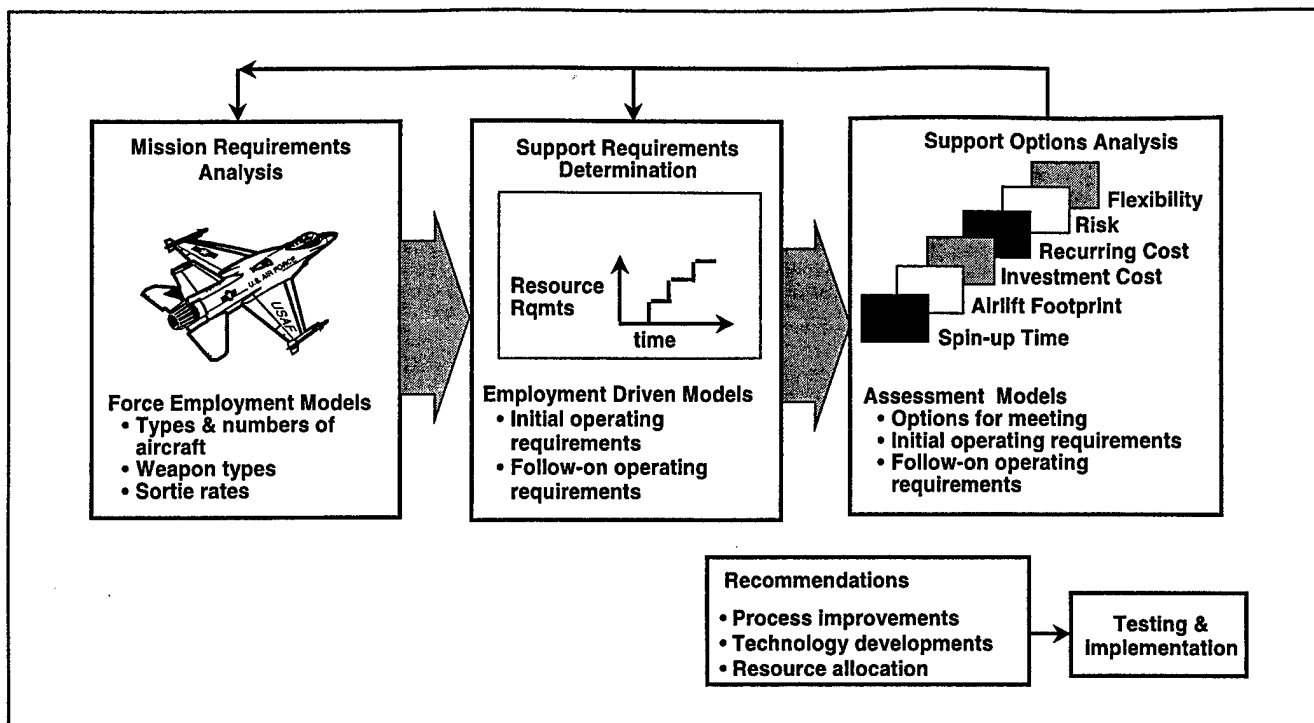


Figure 1. Employment-Driven Combat Support Requirements Generation

planned operation. The FOR can be delivered periodically to keep the flow of resources into the FOL easy to handle by a relatively lean forward support force. These parameters are the key to determining deployment resources and timelines and sizing the resupply capability, respectively.

As depicted in the rightmost panel of Figure 1, the support options for various commodities need to be evaluated across the different phases of operation. As with operational analysis, the aim is to identify support options that provide good performance (in terms of the set of metrics) across all phases of operation and across a range of potential scenarios (the number and range depending on the time horizon under consideration). Again, trade-offs may have to be made across the scenarios and the metrics (for example, a low-cost option may have a large risk). Additionally, support options may be evaluated for different mixes and for CONUS versus forward-based logistics. This approach allows these trade-offs to be made with a clear picture of the effects across different options and scenarios.

Integration of Individual Commodities Options into an ACS System

The next step is to select options in each of the commodity areas to create candidate AEF support concepts. As shown in Figure 2, preliminary work was done on an *integrating model* to choose among the options analyzed. This is a mixed-integer optimization model that selects combinations of the options that meet the objective function subject to several constraints and thereby quickly identifies feasible support concepts. Taken together, these options represent a possible support concept for AEFs that could then be looked at more closely to consider additional issues, such as the flexibility of the concept and its transportation feasibility.

For each commodity considered, the model can select from as many as six alternative ways to provide the resources needed to support operations. Each option has different fixed (investment) and

variable (recurring) costs and varies according to its robustness and suitability for long-term use.⁶

The model accounts for such issues by allowing each option to be given a subjective rating with respect to its robustness. It then requires options with low robustness (but high initial deployability) to be replaced by more robust options within a specified period of time.

While the model allows the identification of potential EAF support concepts, it is also useful in answering a range of questions that give insight into the robustness of the concepts. For example, by varying the costs of certain aspects of a concept of operation (CONOP), the *breakpoints* could be identified that would motivate a switch to another CONOP. This allows a number of important questions to be explored; for example, the maximum desirable cost associated with the opening of a new forward support location or how sensitive a CONOP might be to annual transportation costs. Another important issue that can be analyzed by the model is the effect of various levels of airlift availability, which is a key make-or-break assumption associated with each AEF support CONOP. Finally, the payoff of improved technology to lower the deployment footprint of a resource option could be explored. In this way, the effect of an improvement in the deployability of a particular resource on the overall AEF deployment could be gauged.

As the Air Force extends its analysis of support structures beyond single theaters of operation, the complexity of issues will make the application of automated techniques, such as the integrating model, essential. The complex interactions between the region-specific security challenges, mutually supporting theaters, geography, and required levels of responsiveness will create an almost overwhelming number of possible support structures. Automated models such as the integrating model are needed to manage this complexity in order to identify low-cost global support structures for the EAF.

Integration of ACS and the Mobility System

Executing AEF deployments requires that a multitude of mobility-related actions be set in motion. These include forward

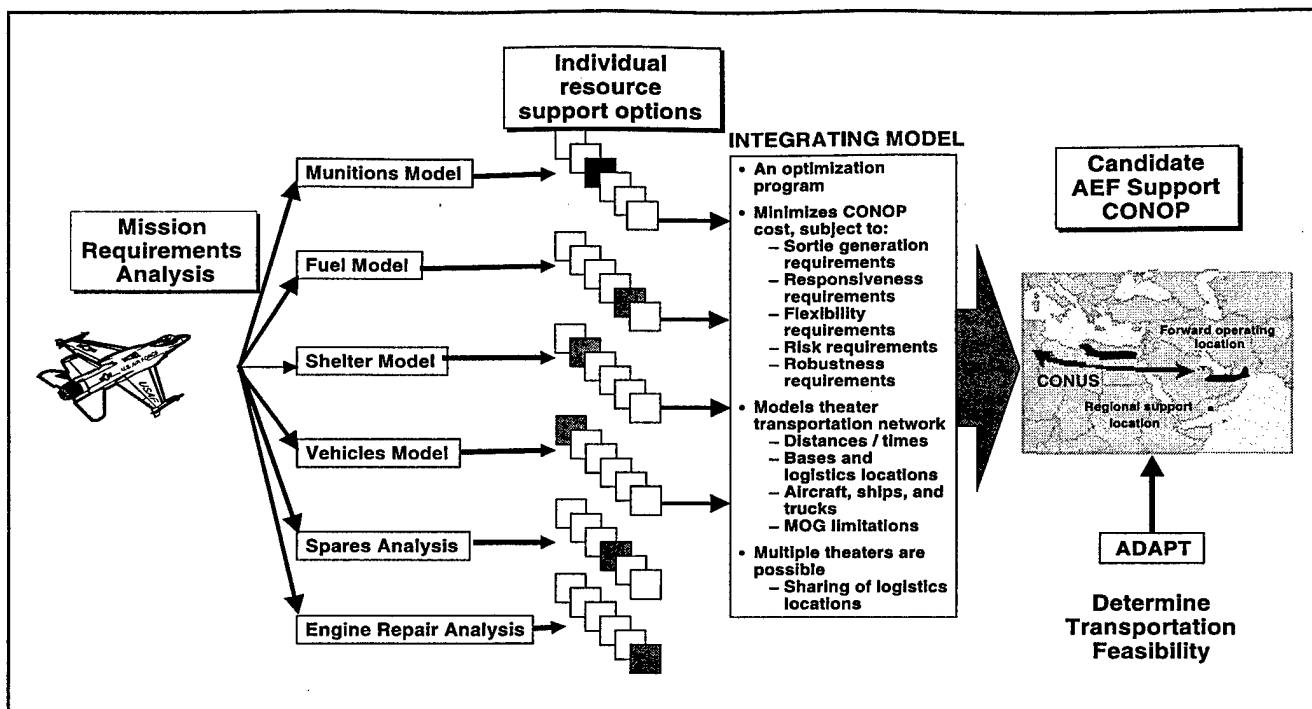


Figure 2. The Integration Model Assists in Choosing Among EAF Support Options

positioning of tankers, deploying aerial port personnel, placing mobility crews in crew rest, and so forth.

Mobility processes comprise a substantial portion of the overall AEF deployment timeline. As interweaving mobility processes with logistics support processes are a key aspect of future AEF Agile Combat Support structures, there should be a way to test the mobility/logistics interfaces for any candidate AEF support structures devised. Toward this end, a high-level simulation model of the air mobility system, called the AEF Deployment and Planning Tool, was developed.⁷

This model provides insight into the chain of mobility-related events that makes AEF deployments possible, and can test the transportation feasibility of possible AEF support structures.

Feedback Loops for Control

The final element of the proposed planning framework is feedback, which provides indications that there are discrepancies between plans and reality. Information on deviations from plans can be used to initiate correctional actions to solve the problems. Two primary feedback loops are envisioned in the planning framework.

The first feedback loop is between logistics planning and operations planning as shown at the top of Figure 1. Operational analysis can provide alternative force packages that can accomplish *equivalent* goals. This is important because the alternative force packages can have very different support requirements.⁸

In some circumstances, logistics constraints may not be removable because some logistics resources may be strongly tied to an expensive and relatively fixed infrastructure that has limited flexibility. For example, fuel resources available within a given country and distribution capabilities to forward operating bases may not be available to support a sustained, high EAF optempo. Operational plans may have to be modified to deal with this constraint. This requires close interaction between logistics and operations in designing the ACS system of the future. With these strategic time horizons, the interaction needs to be continuous but not real-time. Time is available to plan and acquire a logistics infrastructure that can support more ambitious

operational plans if the costs and risks are judged to be acceptable.

The second feedback loop is between logistics planning and the control of the logistics infrastructure. First, there is a diagnostic loop in which logistics constraints identify areas of the ACS system where enhancement is needed. The diagnostic results are used to focus modifications to the logistics infrastructure to enhance its capabilities at the points where such improvement is needed to support operational plans.

A tracking and control feedback loop is needed to monitor the performance of logistics processes that are not (currently) constrained and to ensure their performance remains adequate. These feedback loops and control system ensure the logistics system evolves as needed to support current and future operational plans and the system achieves and maintains the required support capability.⁹ The result is a continuous cycle of planning, diagnostics, improvement, and replanning.

Planning Process Modifications and Organizational Development to Support Continuous Expeditionary ACS System Planning

The proposed support planning system likely requires integration across Air Force organizations and across commodities with one agency endowed with responsibility and authority to integrate and rationalize this global strategic planning from an Air Force perspective. While each major command (MAJCOM) and appropriate numbered air force would be responsible for developing ACS requirements based on its own area of focus, appropriately supplemented by other internal and external organizations, the requirements should be analyzed and integrated at a system level, ensuring trade-offs are made and resources are directed appropriately. There are several ways the Air Force could organize to develop the future combat support system using the process described above.

One option for integration is that the Deputy Chief of Staff, Installations and Logistics (AF/IL) could initiate organizational and process changes needed to support the new strategic ACS planning framework by creating a director for ACS Design and Development. Each of the functional areas would be represented in this organization.

Another method to integrate the development of combat support requirements across all command lines is to include them in an ACS Technology Planning and Policy Integrated Process Team (TPPIPT), which would formally review the MAJCOM outputs on a periodic basis. Membership of this TPPIPT might also be expanded to include coalition partners, academics, and *think tanks* to help ensure policy alternatives receive due attention.

A third option for accomplishing this integration would be to continue the functioning of the Air Force Directorate of Expeditionary Aerospace Force Implementation (AF/XOP) and extend its charter to evolve the ACS system of the future along with developing new employment concepts.

With regard to implementation, the Air Staff could delegate most of these responsibilities to the MAJCOMs in a system of centralized control but decentralized execution. The integrating agent, either the Director of ACS Development, the TPPIPT, or AF/XOP would provide direction and guidance to the MAJCOMs to ensure multiple area-of-responsibility (AOR) infrastructure developments are considered. As requirements are approved for development, they could be approved for funding and delegated to the MAJCOMs. Alternatively, the responsibility for acquisition and maintenance of the global support infrastructure could be the responsibility of a system program office for infrastructure at Air Force Materiel Command, which would be responsible for building the infrastructure and ensuring its performance meets the needs of operators.

Specific Elements of an ACS Planning Framework for the EAF

Based on the foregoing, the following elements can be seen to be integral components of an enhanced ACS planning framework:

- A closed loop strategic ACS planning process to develop alternative strategic ACS designs for the EAF concepts of the future. This planning framework would be provided to the MAJCOMs for development of specific AOR ACS designs in concert with the warfighting commander in chief's A3.
- Use of employment driven end-to-end requirements generation models to specify requirements as a function of operational requirements and logistics policies, practices, and technologies for important logistics commodities and processes.
- Use of support options assessment models to compute metrics to compare alternative approaches for satisfying the requirements for individual commodities and processes across the phases of operations—peacetime operations and readiness preparation, deployment, employment/sustainment, redeployment, and reconstitution.

- Use of an integration model to evaluate integrated commodity ACS structures and processes.
- Evaluation of the impacts of uncertainty and alternative transition paths to MTW operations.
- Use of measurements and assessments of actual process performance and resource levels with those that were planned.
- Designation of ACS planning and assessment responsibilities to direct and advocate the strategic system design and evolution.

The EAF concept is a radical departure from past Air Force employment concepts. It holds promise for enhancing the Air Force's ability to deal with a new and uncertain international environment while alleviating some of the serious readiness problems being caused by lengthy overseas deployments. An integrated, continuous strategic ACS planning process will enable the realization of the full potential of EAF capabilities.

Notes

1. As this concept has evolved, some of the details have been modified. At this writing, the structure consists of ten AEFs as described, including two units for pop-up contingencies and five AEFs for humanitarian/evacuation operations.
2. The term strategic is used because these decisions are affected by not only time horizons but also the geopolitical strategic situation, technology, and fiscal constraints. As will be argued, these decisions have to be made by complex trade-offs of risk and benefits using criteria that are strategic in the broadest sense.
3. Logistics planners in US Central Command Air Force have had to develop their own methods to address these questions since they may host many deployments.
4. Raymond Pyles and Robert S. Tripp, "Measuring and Managing: The Concept and Design of the Combat Support Capability Management System," Santa Monica, California: RAND, N-1840-AF, 1982.
5. To determine munitions support and avionics repair requirements and associated personnel and equipment work load, new algorithms and modeling technology had to be developed. In other cases, suitable models exist or can be modified to generate requirements for resources. Such is the case for spare parts. In this case, the Aircraft Equipment Model provides requirements for spares as a function of OPTEMPO, force module size, maintenance concept, resupply times, and so forth.
6. For example, an austere shelter option may be permissible during the first few days of a deployment but may be replaced by a more robust option as time goes on and the airlift capacity is available.
7. The model is programmed using ithink Analyst software. (ithink Analyst Technical Documentation, High-Performance, Inc., Hanover, New Hampshire, 1997).
8. For instance, an AEF operational analysis might indicate that, under some scenario variations, an AEF composed of 12 F-15Es, 12 F-16Cs, and 6 F-16CJs could produce the same results as an AEF composed of 18 B-1 bombers and 6 F-16CJs. The support requirements and corresponding support alternatives are very different for these force packages. They may also have different deterrent implications. The fighter package may involve bedding down the force closer to the adversary. Using the reception sites of a neighbor may have a greater deterrent impact than indicting to an adversary that punitive strikes may be inflicted from bomber bases located farther away. These alternatives also have different costs and risks.
9. Pyles.

Drs. Tripp, Galway, Ramey, and Killingsworth are all senior research staff members at RAND. Ms Fair is a research assistant at RAND and a doctoral candidate. Chief Drew is the Superintendent of Maintenance Analysis at the Air Force Logistics Management Agency.

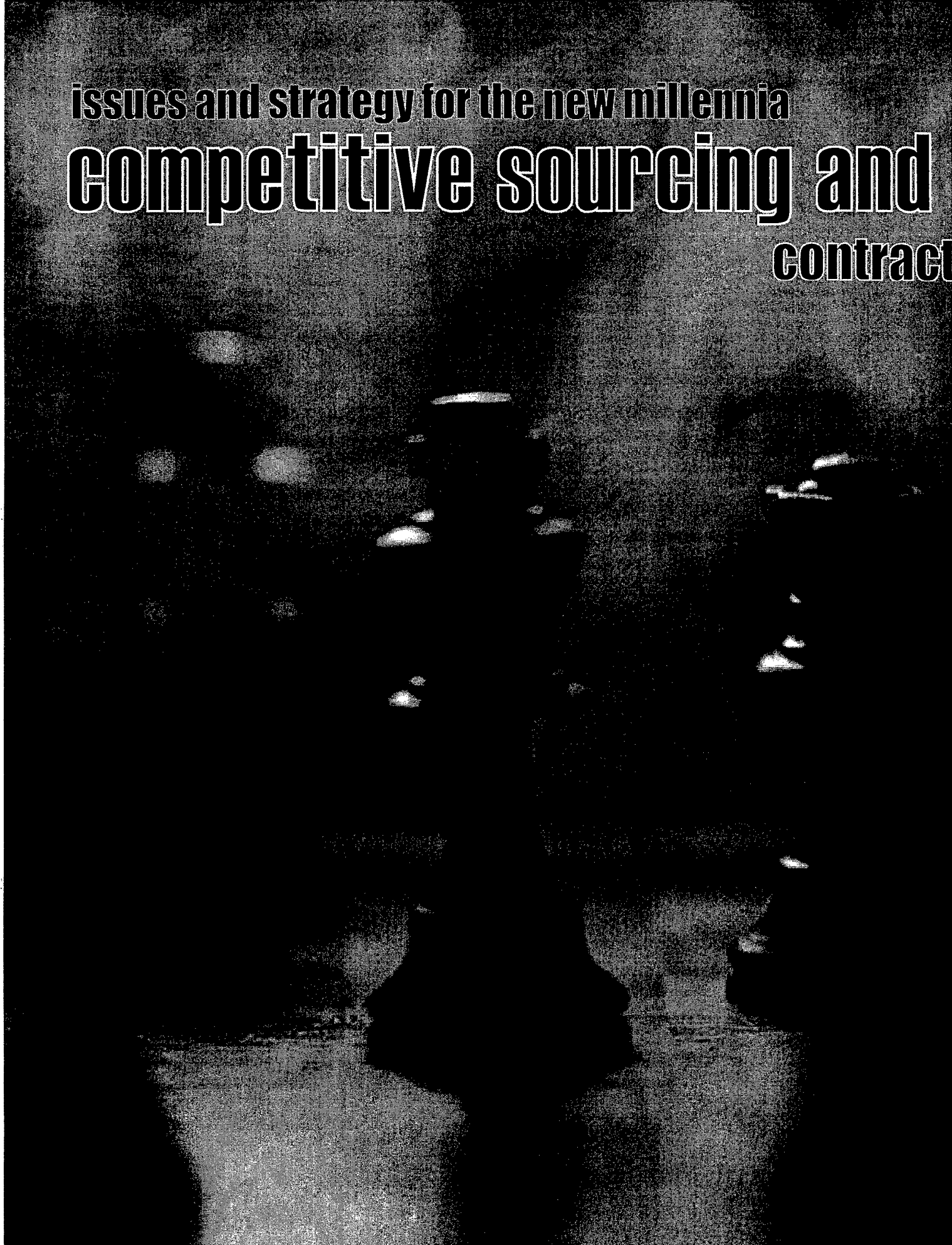
JL*

Strange as it may seem, the Air Force, except in the air, is the least mobile of all the services. A squadron can reach its destination in a few hours, but its establishment, depots, fuel, spare parts, and workshops take many weeks, and even months to develop.

—Winston Churchill

issues and strategy for the new millennia

competitive sourcing and contract



privatization contractors on the battlefield

what have we signed up for?

Colonel Steven J. Zamparelli, USAF

"When war broke out on the morning of Jan 17th as United States and allied aircraft bombed Iraq and Kuwait, the US contractors did not leave Saudi Arabia; some industry personnel even remained on the front lines with US troops."¹ From now into the foreseeable future, when the US military deploys for combat, peacekeeping or peacemaking efforts, Department of Defense (DoD) contractor personnel—significant numbers of them—will deploy with the military forces. This is not such a startling revelation since civilian contractors have accompanied troops to war throughout history. No, what makes this issue worthy of research is not the fact that contractors are supporting these operations but the scope, location, and criticality of that support. Nonmilitary members are maintaining fielded weapon systems, supporting field operations, and managing and operating information and intelligence systems. "Contractors and civilians have been participating in military operations since Vietnam [or earlier], but never at current levels."² Senior Army logisticians interviewed by the Logistics Management Institute (LMI) for a post Desert Storm report were almost unanimous in their belief contractors played a vital role on the battlefield, especially in supporting high tech weapon systems.³ According to the DoD Inspector General (IG) in a June 1991 audit:

If contractors leave their jobs during a crisis or hostile situation, the readiness of vital defense systems and the ability of the Armed Forces to perform their assigned missions would be jeopardized.⁴

That finding was more than 7 years ago when there were some 1 million more personnel on the DoD roles.⁵ Never has there been such a reliance on nonmilitary members to accomplish tasks directly affecting the tactical success of an engagement. This has blurred the distinction between soldier and civilian. This blurring is evident in the following passage from Air Force Core Values, regarding why we have core values:

The first reason is that Core Values tell us the price of admission to the Air Force itself. Air Force personnel—whether officer, enlisted, civil servant or contractor—must display honesty, courage, responsibility, openness, self-respect and humility in the face of the mission.⁶

Air Force personnel? Price of admission to the Air Force? Contractor personnel may have all of these virtues, but they are not Air Force personnel! Their contract is their admission ticket, not an oath. Contractors are not DoD employees, no matter how much the Services wish it to be so. This fact and our cultural differences cannot be simply ignored through inclusion. On the other hand, this new reliance on in-theater contractor support is reality and cannot be disregarded.

In a postwar article entitled “Desert Storm and Future Logistics Challenges,” former Army Chief of Staff General Carl Vuono did not even mention the role of contractors in the war or, more importantly, a logistics challenge of the future.⁷ The military is facing a fundamental change in the way it conducts warfare, and there is little evidence that the players have been adequately prepared for that change. Both commanders and contractors need to understand the legal and operational implications stemming from or escalated by the increasing operational role of DoD contractors. The point is not to cast doubt about the patriotism or the loyalty of DoD contractor personnel—they have done the job when called. Rather, we must recognize and plan to accommodate the important differences in roles and responsibilities. If we do not, we will create significant operational and legal challenges for the field commanders, as well as for the civilian operators. After providing some background on civilians in the combat environment, this article will focus on the following critical issues: the contractors’ responsibilities; command and control or the commanders’ authority to discipline and direct; and the contractor personnel’s combatant versus noncombatant status and implications and their effect on force protection requirements.

Background

Throughout the history of warfare, civilians have traveled with armies and accomplished those functions now call logistical support.⁸ The State’s employment of these civilians in this capacity has been recognized in the laws of armed conflict as defined by the Laws of the Hague in 1907 and the Articles and Protocols of the Geneva Conventions, last held in 1949. Civilian support to armies was accepted based upon a universal perspective that noncombatants could accomplish support tasks as long as those tasks kept them out of direct confrontation with the enemy. This would allow the soldiers to handle the business of warfighting and allow the private sector to do what it does best. Today, we unquestionably accept that the use of civilian support remains legal yet the requirements of warfare have dramatically changed the scope and relevance of the support tasks they provide, thus making their distinction as noncombatants less obvious.

US History

In US history, as far back as General Washington’s Continental Army, civilians were employed to drive wagons, provide architect/engineering and carpentry services, obtain food stuffs (when not foraged), and provide medical services.⁹ The Continental Congress believed civilians should accomplish these tasks so that the soldiers could be freed up to be with their units and focus on their warfighting responsibilities.¹⁰ It made sense to use civilians to accomplish these logistical tasks because they were considered either too menial for soldiers or were well established or specialized functions in commercial industry.¹¹ This philosophy and thus the use of civilians in

noncombat roles remained relatively unchanged from the War of 1812 up through the Vietnam conflict. In each of those conflicts,

War/Conflict	Civilians	Military	Ratio
Revolution	1,500 (est)	9,000	1:6 (est)
Mexican/American	6,000 (est)	33,000	1:6 (est)
Civil War	200,000	1,000,000	1:5 (est)
World War I	85,000	2,000,000	1:2.0
World War II	734,000	5,400,000	1:7.0
Korean Conflict	156,000	393,000	1:2.5
Vietnam Conflict	70,000	359,000	1:6.0

Table 1. Civilian Participation in Conflict

significant numbers of civilians continued to accomplish basic logistics requirements in support of the soldiers, as shown in Table 1.

The use of civilians in wartime was not, however, without problems. During the Revolutionary, for example, a regiment of artificers was raised to work with civilian artificers supporting construction and ordinance requirements. A special report to Congress on the state of this regiment emphasized the disgruntled comments of the military members contrasting their wages with those paid to the civilians.¹² “It was difficult to persuade men to reenlist after the expiration of their three-year terms.”¹³ Sound familiar? Additionally, there was often a question of these contractors’ commitment and responsibility. During the Civil War:

... draft exemptions were sought for teamsters to encourage them to drive wagons to western posts; however, teamsters were not only difficult to find, they proved to be recalcitrant employees, so toward the end of the war, the tendency was to replace civilian drivers with soldiers who could not resign or swear back with impunity.¹⁴

The key point is that when problems with contractor support did arise commanders could turn the task over to military personnel who had at least some basic skill. Additionally, the general policy of the military related to employing contractors was: “. . . the closer the function came to the sound of battle, the greater the need to have soldiers perform the function because of the greater need for discipline and control.”¹⁵

With the Vietnam, conflict the employment of civilians began to change. *Business Week* called Vietnam a war by contract.¹⁶ “More than ever before in any U.S. conflict, American companies are working side by side with the troops. One big reason is that military equipment has become so complex.”¹⁷ “Specialists in field maintenance checking on performance of battlefield equipment, have dodged Vietcong attacks on military bases at Da Nang and Pleiku.”¹⁸ No longer were contractors away from the sound of battle. No longer were they relegated to basic logistics tasks. They were becoming specialists in the tools of war. “There might have been a time in the past when the site of military operations was an exclusive club for those in uniform, but those days are waning.”¹⁹

When U.S. troops set foot on Saudi Arabian sand, many defense industry contractors were close behind. The contractors followed the military to the make sure that their multi-million dollar weapon systems functioned properly in the harsh desert environment.²⁰

The trend is for an increasing number of civilian operators in theater to support logistics and, more importantly, combat operations. “One in 10 Americans deployed for NATO peacekeeping operations in Bosnia is a civilian. By contrast,

one in 50 Americans deployed for the Persian Gulf war was a civilian.²¹ (Note that these figures are for contractors deploying with the troops and should not be compared with the figures in Table 1.) That ratio will continue to shrink as more functions are being turned over to the private sector through competitive sourcing, privatization, and changing logistics practices such as lifetime contractor logistics support.

Why Has This Happened

Three factors have contributed to this trend: deep cuts in uniformed personnel, a push to privatize functions that can be done outside the military, and a growing reliance on contractors to maintain increasingly sophisticated weapon systems.²²

Actually, there is a fourth reason for the deployment of contractors into the battlefield: to provide flexibility in the face of congressional, executive branch, or host-country-mandated troop ceilings.²³ For example, at the height of the Vietnam War, there were more than 80,000 contractor personnel supporting the war effort who did not count against troop ceilings set by President Johnson. Similarly, in Bosnia, the US military has been able to get more tooth (soldiers) in-theater by having more than 2,000 contractor personnel in forward locations above the congressional limit of 20,000 US troops. However, while there is certainly a benefit to the Department of Defense stemming from an increased reliance on contractors, whether this is a cause of the increased contractor participation or simply the result is open to argument.

Manpower Reduction

Since the end of the Cold War, the Department of Defense has cut more than 700,000 active duty troops from the ranks.²⁴ Additionally, more than 300,000 DoD civilian positions have been eliminated. These cuts have occurred without a commensurate reduction in operational requirements. In fact, all of the Services have experienced a significant increase in operating tempos over the last 10 years while operating with about one-third fewer forces. The Air Force, for example, has an average of 12,000 airmen deployed on any given day, while 10 years ago, that average was around 2,000.²⁵

The Army has had a 300 percent increase in mission commitments during the past several years and they do not appear to be tapering off. During the same period, the Army has reduced the U.S. Army Materiel Command's (AMC) military strength by 60 percent and reduced the number of AMC depots by 50 percent.²⁶

Out of necessity, there has been a growing recognition that more of the jobs previously accomplished by military members must be accomplished by civilians. This move to a greater reliance on nonmilitary support is recognized by all the Services. In the Air Force, it is articulated in *Global Engagement: A Vision of the 21st Century Air Force*. "The force will be smaller. Non-operational support functions will increasingly be performed by Air Force civilians or contractors."²⁷ Two parts of this excerpt need to be scrutinized.

First, the reference to increased participation by Air Force civilians must be looked at with skepticism. While historically a significant portion of the competencies cut from the active duty forces were passed on to DoD, that is no longer possible. As discussed above, they, like the active forces, have faced significant cuts since the Gulf War. Those cuts continue. According to Deputy Secretary of Defense John Hamre, 237,000 DoD employees will participate in public-private competitions from 1997 to 2003.²⁸ Only a year earlier, the *Air Force Times* had reported that Service planners were considering giving private contractors more than 160,000 jobs

performed by service members and DoD civilians.²⁹ Additionally, Global Engagement's statement regarding nonoperational support functions is suspect. As cuts to the military forces and budgets continue, the skills being reduced or eliminated are becoming more related to operations, as opposed to their historical base support focus. During Desert Shield and Desert Storm, for example, contractors had maintenance teams supporting Army tracked and wheeled vehicles (anything from 2-1/2-ton trucks to 65-ton M1A1 tanks); the Fox nuclear, biological, and chemical vehicles; and TOW and Patriot missiles.³⁰ The Air Force had contractors flying in support of the Joint Surveillance, Target Attack Radar System (JSTARS), as well as performing in-theater organizational maintenance. During Operation Just Cause, a total of 82 contractors were in Panama to support aviation assets.³¹ These certainly appear to be operational activities. They may even be considered combat operations. Nonoperational is defined in terms of what is privatized rather than by whether the function is core to warfighting.

Privatization and Contracting Out

While declining manpower is placing more operational jobs directly in the hands of the private sector, the budget and manpower reduction is also forcing the Department of Defense to look at demilitarizing large areas of core functions through privatization or contracting out. In the past, core functions were defined as those requiring a military or organic capability because it was combatant in nature, required potential deployment into harms way, or required the capability to be expanded (surged) in times of crisis. They were specific skills, maintenance and munitions handling, for example. Today, there has been a move away from functions toward a focus on more broadly defined core competencies. For example, the Air Force identifies its core competencies as Air and Space Superiority, Precision Engagement, Information Superiority, Global Attack, Rapid Global Mobility, and Agile Combat Support.³² Thus, functions previously felt to be sacrosanct are now candidates for transition to contractors. The largest of these function being rapidly transitioned is maintenance, most significantly, depot maintenance. Less than 10 years ago, maintenance was considered to be a core logistics function. For years, the Pentagon has been after Congress to repeal the law requiring that government employees accomplish 60 percent of depot weapon system maintenance. They have recently succeeded in reducing that to 50 percent and are not through yet.³³ By 2003, almost 40 percent of DoD maintenance depots, and 55 percent of the depot work force will have been eliminated.³⁴

Another core function facing either privatization or contracting out is information and communications—the functions supporting Information Superiority. Information Superiority, which includes information warfare, is identified as a core function in Global Engagement and emphasized in *Joint Vision 2010*. Yet, the Air Force has plans to reduce the communication-computer occupational field by 24 percent within the next 5 years.³⁵ There are many other examples. Where noncommissioned officers used to test and calibrate weapons, civilian technicians are now doing the work.³⁶ The Aerospace Guidance and Metrology Center—once the military facility responsible for the maintenance, repair, and calibration of missile guidance systems and Air Force measurement standards—is now completely a contractor operation. New initiatives under consideration include contracting out all software maintenance on the B-2 bomber and the total maintenance effort for the F-117 fighter. The Air Force is also studying the possibility of outsourcing all of its precision measurement equipment laboratories. If implemented, the Services will eventually be devoid of the organic capability to support these systems and missions. In

time of war, they will be completely dependent on contractors to provide whatever support is needed, whenever it is needed. Commanders need to ensure the contract supporting them accurately reflects and supports peacetime and wartime requirements.

Outsourcing and privatization among the Services or even within each Service is not being accomplished in a standardized manner. In the Air Force wing or center, commanders are strongly encouraged to contract out base support functions. However, a standard has not been set for outsourcing functions identified by higher headquarters. Some wings, for example, have turned the majority of their civil engineering functions over to contractors, while others have not. As the Air Force moves into the Air Expeditionary Force (AEF) structure, concern is growing over the lack of organic engineering skills at some locations.³⁷

Two related outcomes of privatization are further reducing the availability of skilled DoD technicians. First, for those military members in a career field that is being privatized, there are fewer places they can be stationed. Often, the only place they can go is overseas or to a continental United States (CONUS) base which has significant deployment responsibilities, therefore, reducing quality of life and retention. Second, privatization provides civilian job opportunities for skilled military members. "When a military repairman achieves journeyman status, he can easily be wooed to leave the Service and accept private employment at higher pay. Often these journeymen then work for contractors who support the military."³⁸ On the other hand, in the long term, industry is losing a primary source of trained and uniquely skilled labor for the military systems it is now supporting. This most certainly will increase future contractor costs.

Support of High-Technology Weapon Systems

This situation is further exacerbated by reliance on cutting-edge weapon systems technology. The Army's logistics after action report from Operation Desert Storm said, "There is a role for contractors on the battlefield, particularly when the tasks are so complex that it is not economically beneficial for the Army to maintain needed capability within the force."³⁹ Continual and rapid technological change has made it uneconomical to keep soldiers technologically capable of maintaining, troubleshooting, and in some cases, employing sophisticated weapons. This is driving the military to rely on contractor support, at least during the initial fielding phase of a system and possibly for its life (C-17 contractor logistics support). In the not too distant past, it was DoD policy that the Services establish organic support for the logistical sustainment of new weapon systems as soon as possible after fielding. DoD Directive 1130.2, *Management and Control of Engineering and Technical Services*, required the military to achieve self-sufficiency in maintaining and operating new systems as early as possible and limited the use of contractor field service to 12 months thereafter.⁴⁰

The purpose of this directive was to ensure the Services did not come to rely too heavily on the use of civilian technicians to support their systems.⁴¹ Today, that directive is gone, and the general philosophy has completely reversed. Congressional language now requires that maintenance and repair for all new critical weapon systems be under contractor support for at least 4 years and for life for noncritical systems.⁴² Once again, in the future when US forces deploy, there will be many situations where a contractor employee is the only person with the technical skill to perform functions necessary for the employment of a weapon system.

Downsizing has made it a necessity that contractor personnel go to the front lines to support their weapon systems and perform functions the same as military members. We have, in effect, stopped trying to keep an organic ability, thus creating a hybrid, not a military member, but

not quite the historical civilian who accompanies the troops. The ramifications could be significant to fighting and winning.

Issues

The challenges or issues generated from increased reliance on contractors to perform combat support functions are not new to the Department of Defense or the Services. As far back as 1980, there have been several studies, audits, and articles highlighting the Services' increased reliance on contractors, along with warnings of the risk that accompanies that reliance during crisis or hostile situations.

Contractor Responsibility

The greatest risk, at least from a field commanders' perspective, is that the contractor will not be there to perform or will leave when hostilities break out. How great is this risk? It is really defined by four elements: the criticality of the missions being performed, availability of alternative resources, authority to direct compliance, and finally, history. There is no doubt that the systems supported and the functions being accomplished are critical to the prosecution of the battle. The systems involved include JSTARS, Patriot, AN/GYQ-21 data-processing equipment, and the Fox chemical biological system, to name a few. Functions performed include maintenance and even systems operations. As a result of downsizing, privatization, and modernization, there are no DoD resources available to fill potential voids.

Regarding the authority or capability of the commander or the Service, virtually every audit, study, or article written on the subject says the same thing. The Services cannot ensure that the contractor will be there when hostilities begin. Legally, contractors cannot be compelled to go into harms way, even when under contract, unless there is a formal declaration of war. In 1980, the Logistics Management Institute published a study entitled *DoD Use of Civilian Technicians*. The report summary stated:

... continued reliance on civilian technicians means that maintenance skills are not being successfully transferred from the producer to the ultimate user of the system. Should civilians leave their job in wartime or other periods of heightened tension, the material readiness of key systems would be jeopardized.⁴³

In November 1988, a related DoD IG report expanded this perspective, stating there was:

... no capability to ensure continued contractor support for emergency-essential services during mobilization or hostilities, no central oversight of contracts for emergency-essential services, no legal basis to compel contractors to perform and no means to enforce contractual terms.⁴⁴

The report recommended that all commands identify war-stoppers that should be performed only by military personnel and other services that could be contracted out if there was an adequate contingency plan that ensured performance if a contractor defaulted. The DoD responded with DoD Instruction 3020.37, *Continuation of Essential DoD Contractor Services During Crises*, which simply lays the responsibilities on the commander for finding alternatives or accepting the risk on the commander. In June 1991, the DoD IG completed a follow-up audit report entitled, *Civilian Contractor Overseas Support During Hostilities*. The report's bottom line again was, "DoD components cannot ensure that emergency-essential services performed by contractors would continue during crisis or hostile situations."⁴⁵ The report goes on to say:

If the contractors leave their jobs during a crisis or hostile situation, the readiness of vital defense systems and the ability of the Armed Forces to perform their assigned missions would be jeopardized. Therefore, it is necessary to seek ways to assure that civilian contractor support will continue during periods of greatest need.⁴⁶

Their findings and recommendations for accomplishing this, along with DoD's response to those findings, are summarized as follows:

Finding 1: DoD components cannot ensure the continuance of emergency-essential services during crises or hostile situation.

Response: DoD Instruction 3020.37, while published in November 1990, had not been completely implemented. That instruction provides that the heads of components ensure annual reviews are accomplished to identify such services. The activities commander shall "... either obtain alternative personnel to perform the services or prepare a plan to obtain the services from other sources or accept the risk."⁴⁷

In reality, the component commander cannot compel contractors to perform, even under contract, if it would force them to go into harm's way. Additionally, the three options provided in the response are not realistic. There are no other available resources. Thus, the commander has no real alternative other than to accept the risk.

Finding 2: Require identification of war-stopper services that should be performed exclusively by military personnel.

Response: Not necessary, DoDD 1100.4, *Guidelines for Manpower Programs*, identifies those functions that must be military.⁴⁸

IG Final Report: DoDD 1100.4 is 37 years old. It does not establish standard criteria for identifying these functions, without which the components will continue to identify a wide range of services.⁴⁹ (The report, overall, implied the current reporting was ineffective.) That now 44-year old regulation says:

Civilian personnel will be used in positions which do not require military incumbents for reasons of law, training, security, discipline, rotation or combat readiness, which do not require a military background for successful performance of the duties involved and which do not entail unusual hours not normally associated or compatible with civilian employment.⁵⁰

Finding 3: Require an annual reporting system identifying the number of contractors performing emergency-essential services and the number of contractors involved.

Response: The requirement for the components to conduct the annual assessment and to have contingency plans is sufficient. "The number of contracts is not the important factor; the need is to make sure we are able to carry out our mission."⁵¹

IG Final Report: The number of contracts and contractors is valuable information. That is evident by the fact that the Assistant Secretary of Defense (Production and Logistics) requested that the IG provide data on the number of contractors and contractor personnel in theater.⁵²

This is important information. How does a commander in chief (CINC) or a field commander plan requirements without knowing who and how many personnel will be there or what requirements are actually on contract? It is also a critical factor in determining force protection requirements, an issue discussed later.

Finding 4: Revise DoD Instruction 3020.37 to include "Provisions to safeguard personnel performing emergency-essential services during a crisis or hostile situation."

Response: Not necessary, "... the commander is charged by the Geneva Convention with protecting the lives of all noncombatants."⁵³

IG Final Report: The response to this finding will not afford the contractor employees with similar priority, rights, and privileges accorded to DoD personnel. Geneva conventions deal with identification of noncombatants, not protection. "Only 1 of 67 emergency essential contracts reviewed contained provisions to protect contractors against chemical and biological warfare."⁵⁴

The DoD response to this finding was incredulous. In Desert Storm, the coalition forces had to provide chemical and biological gear to Civilian Reserve Air Fleet (CRAF) pilots to ensure their continued operations into theater. Today, the United States will not allow CRAF, which provides approximately 33 percent of heavy lift, to travel into a chemical or biologically tainted airfield.⁵⁵

In fact, the DoD response to all of the findings reflects that they either did not understand the issues or, worse, did not care. This is reflected in their policies. In addition to the Services being governed by a 44-year-old instruction, there is a 13-year-old directive, DoDD 1100.18, *War-time Mobility Planning*, which states that DoD manpower utilization policy is to "... encourage civilian employees who occupy emergency-essential positions and contractor personnel who are performing critical support activities overseas to remain in the theater."⁵⁶ How? Who? With what? DoDD 1404.10, *Emergency Essential Civilian Personnel*, dated April 1992, says: "It is DoD policy [to] limit the number of emergency-essential civilian to those positions specifically required to ensure the success of combat operations or the availability of combat-essential systems."⁵⁷ Yet, virtually every review and study related to the subject has stated emphatically that civilian contractors are providing vital support to critical systems, and their continued support to those systems in time of hostilities is crucial to mission success.

The final element defining risk is history. History has, for the most part, found contractor personnel doing their jobs during times of crises or hostilities. However, in the previously cited LMI study, the authors proposed:

It was questionable whether the civilians would have remained when the bullets started flying. There were a few instances of contractor/Department of the Army Civilians wanting to leave the theater because of the dangers of war. However, many people have doubts about how long they would have stayed if the operations had been costly in lives.⁵⁸

There have been a few examples to substantiate these fears. In South Korea, in the wake of the 1976 tree-cutting incident in the demilitarized zone, emergency-essential civilian contracting personnel fled their posts at the prospect of imminent hostilities.⁵⁹

Additionally, in the wake of the desert conflict, several CRAF contractors reduced the percentage of systems they would place under the program. We have yet to see any major incident involving contractor personnel or equipment. It must be noted also that in Vietnam and Korea and to some degree in Desert Storm contractor personnel involved "... normally had the advantage of at least some military training and were generally familiar with the tactical and operational levels of employment."⁶⁰ They might be compelled to stay by their understanding of the mission or out of a feeling of camaraderie. This was not necessarily the case in Southwest Asia and in Macedonia and will be even less likely in the future.⁶¹

Again, as reported by LMI in its after action report, senior logisticians felt civilians contractors were vital for Desert Storm.⁶² That was 8 years ago when we had several hundred thousand more military and DoD civilian members. Today, even more critical functions are in the domain of civilians. Contractor support on the battlefield at today's level of dependence has not been tested in a real life-threatening hostile situation. Desert Storm cannot be held up as the way things will be. We need to prepare for the worst case, and that case is where critical contractor personnel leave their posts. The point is not that civilians would not stay. They may or may not. However, they are not combatants. The point is they do not have to stay, and the Department of Defense needs to work to minimize the risk that fact entails.

The Noncombatant

In ancient times, as evidenced by the laws of Manu, the old Testament or the writings of Kautilya on Sun Tzu, there was no attempt to identify those who were entitled to be treated as combatants. In former times, especially in small states, as soon as war was declared, every man became a soldier; the entire people took up arms and carried on the war.⁶³

Warfare slowly evolved into the concept of professional armies and a distinction developed between the soldier and the nonsoldier or noncombatant.

Category	Military Target	POW Status	War Criminal
Combatants	Yes	Yes	No
Noncombatants	No	Yes	No
Illegal Combatants	Yes	No	Yes

Table 2 Combatant Versus Noncombatant

In order to promote the protection of the civilian population from the effects of hostilities, combatants are obliged to distinguish themselves from the civilian population while they are engaged in an attack or in a military operation preparatory to attack.⁶⁴

The distinction between combatant and noncombatant is critically important to all parties as it defines the treatment of the individual in time of war and is shown in the matrix.

The law of war related to this issue stems from both the Laws of The Hague and from the Laws of Geneva. Section 1, Chapter 1, of the Laws of The Hague, 18 October 1907, entitled "The Qualifications of Belligerents," defines combatants as follows:

Article 1. The laws, rights and duties of war apply not only to armies but also to militia and volunteer corps fulfilling the following conditions: To be commanded by a person responsible for his subordinates; to have a fixed, distinctive sign recognized at a distance; to carry arms openly; and to conduct their operations in accordance with the laws and customs of war.⁶⁵

This description was further defined by Article 43 of Protocol I of the Geneva Convention, dated August 1949.

The armed forces of a party to a conflict consist of all organized armed forces, groups and units that are under a commander responsible to that party for the conduct of its subordinates.... Such armed forces will be subject to an internal disciplinary system that, inter alia, shall enforce compliance with the rules of international law applicable in armed conflict.⁶⁶

Those who do not fit these descriptions are noncombatants. DoD civilians and contractors fall into this category. The reasons contractors and DoD civilians cannot be considered combatants are:

- Neither category of civilian is subject to the commander's internal disciplinary system (for US forces that is the Uniform Code of Military Justice [UCMJ]).
- Neither is necessarily trained to conduct operations in compliance with the law of armed conflict.
- The contractor is not subordinate to the field commander.

The law of war, however, has historically recognized the right of noncombatants to be present in a combat area "... and [they] may even be aboard combat aircraft, vessels and vehicles on operational missions. They may provide technical support and perform other logistics functions."⁶⁷ This international recognition is somewhat dated (reaffirmed by the Geneva Convention Protocol I of 1949.) As defined in Air Force Pamphlet 110-31, *Civilians Accompanying the Armed Forces*, a category of noncombatants entitled to prisoner-of-war status, includes:

... civilian members of military aircraft crews, supply contractors' personnel, technical representatives of government contractors, war correspondents and members of labor units or civilian services responsible for the welfare of the armed forces.⁶⁸

It goes on to warn that trends since World War I have tended to blur the distinction between combatants and noncombatants. This includes civilians, resulting in less protection for the noncombatant, because: "(a) growth of the number and kinds of combatant, including guerrillas ... [and] (b) growth of noncombatants engaged in activities directly supporting the war effort, including armament production ..."⁶⁹ The pamphlet is dated 19 November 1976, and a significant changes in weapon systems and operations have occurred since that time making that distinction even more difficult.

While the Protocol and subsequently the Air Force pamphlet recognized the noncombatant status of civilian aircrews, it is extremely improbable that the authors of either document envisioned civilian technicians assisting in the collection of surveillance data during operational missions. Did they envision civilian maintainers providing battlefield maintenance of a TOW missile, the M1A1, the Bradley, or the Patriot missile, as was evident during Desert Storm when they accepted the civilian-accompanying-the-troops philosophy? How about contractors supporting the gathering and interpreting of data from the Joint Air Forces Control Center and feeding intelligence and targeting information to operators. Were they the noncombatants described in these conventions? As we privatize the communications-computer field, will contractors, who at least supplement our information warrior force, be noncombatants?

In his legal opinion regarding the noncombatant status of having contractor/civilian operators for the Dark Stars remotely piloted vehicle, W. Darrell Phillips—Chief, International and Operational Law Division, Air Force Judge Advocate General School, Maxwell AFB, Alabama—determined these operators would risk losing their noncombatant designation and could be considered illegal combatants.⁷⁰ A person:

... cannot be a combatant and a noncombatant at the same time. However, by Article 51 (3) of Protocol I, 1997, a non-combatant, that is to say a civilian who takes part in hostilities, loses his/her status under both the Protocol and Civilian Conventions and for as long as he operates in that capacity, becomes a legitimate object of attack.⁷¹

Additionally:

... since they are not combatants (lawful) and not within the extremely restrictive category of *levee en masse* if they commit a combat act, (defined in the terms of the German manual as "participate in the use of a weapon system"⁷²) then they are liable to trial as "unlawful" combatants or war criminals.⁷³

The implications are that by having a contractor accomplish a particular job, field commanders may be asking them to give up their protected status and even possibly risk execution if captured. Additionally, there is certainly some question as to whether the commander is, therefore, violating the law of war by having a civilian noncombatant participate in combat. So why not just make them combatants? US civil law precludes civilian contractor personnel from meeting the four criteria specified in Section 1, Chapter I, Article 1 of the Laws of The Hague and the requirements of Article 43 of Protocol I of The Geneva Convention, which determine legal combatants. Regardless of their inclusion in the Air Force Core Values, contractor personnel have not been held to the same standard that society holds its military members. The fact is these personnel are different from soldiers, and these differences mean a great deal to a commander's pursuit of combat operations. If employed improperly, the commander could risk being liable for violation of the laws of war. Additionally, a commander could commit the US Government to care and benefits for contractors commensurate with those of veterans.

Discipline and Control

One of the key differences between the contractor and the soldier—and also one of the primary reasons contractors do not qualify under the definition of combatants—is they are not subject to the military's internal disciplinary system, the Uniform Code of Military Justice, unless there is a declared war.⁷⁴ In an overseas deployment, contractor personnel cannot be disciplined by the military for violations of the UCMJ. In fact, typically, the only recourse commanders have for punishing contractors for crimes committed on post is, working through the contracting officer, to send them home and let their respective chains of command or boss determine and administer punishment, if any. The military may, if the offense was of a criminal nature, refer charges to the Department of Justice. From the contractor-employee perspective:

... the most important thing contractor employees need to know are the terms of the contract they are working under and the Status of Forces Agreement (SOFA) between the United States and the country they are serving in. Depending on the SOFA, contractor employees may be subject to local and criminal laws of the country in which they are deployed.⁷⁵

In countries where justice is based upon the Talmudic code—an eye-for-an-eye—this could be extremely important.

This issue of contract brings us to another key difference between the military member and the contractor and another significant reason they are not and cannot be considered combatants. A field commander needs to understand this concept for contractor personnel. These personnel are not compelled by an oath of office, but rather by the terms of their employment contract. "One of the hardest things for military personnel to do is to learn to interpret a contractual agreement literally, to assume nothing."⁷⁶ The contractor is authorized to accomplish only those tasks within the scope of the contract and is answerable for performance only to the contracting officer or his representative. The contract language directs that the contractor not take orders from anyone other than the contracting officer or his duly appointed representative. The representative cannot direct action

outside the scope of the contract. This is a fiscal and liability issue. Commanders risk personal liability for the cost of unauthorized work as well as for the cost of property that might be damaged.

Another important point for commanders' operational planning is the fact they cannot command or give orders to these individuals as they do a soldier. It is also important to understand that contractor employees enjoy the legal right to unilaterally terminate employment rather than accept the hardships and potential danger occasioned by exposure to combat operations.⁷⁷ The commander cannot assume that they will remain on the battlefield or even in theater simply because of military necessity or personnel shortages even though they knew the risks when they signed on. Civilians cannot be compelled to deploy, remain in a designated area, or perform certain missions, and they are not subject to criminal punishment for refusal to do so.⁷⁸

One final note. While not a legal issue in the vein of UCMJ or contract law, the laws of war require that combat be accomplished in accordance with the applicable laws of war. This implies a distinct understanding of the conventions and the ability of the State to define its operations in terms appropriate to those laws. The LMI study cited a couple of findings worthy of consideration. First, some of the people interviewed "... perceived a lack of clear command and control over contractors. Army units had difficulty determining who had management control over contractors."⁷⁹ Couple this with their finding, "... our interviewees sensed that the contractors were not aware of the commander's intent and the political consideration of their effort."⁸⁰

Force Security

Since the Kohbar Towers incident where terrorists used a car bomb to severely damage the compound housing US military members working at the base, killing 19 and injuring hundreds, force protection has been one of the number one priorities and responsibilities of commanders. What is not often discussed is the commander's responsibility to protect the growing number of contractor personnel. That responsibility is or at least should be expanding as more contractors move into potentially hostile areas to perform necessary functions. In his article, "Contractors on the Battlefield," Lieutenant General Williams, Vice Commander of the US Army Materiel Command, frames the issue: "Noncombatants require force protection resources."⁸¹ It sounds simple enough, but it is not a simple matter. These personnel may not be living or performing their duty at the base or compound. They may have family members accompanying them, and they are not required to observe the same restrictions that commanders may place on military members.

In a potentially hostile situation, there must be security forces available to escort contractor personnel. For that matter, security is also required for government contracting personnel who oversee the contractors' performance. As previously discussed, contractors and other noncombatants cannot arm themselves other than for self-protection. Use of a weapon to defend coworkers or equipment changes their status and could subject them to treatment as a combatant or possibly even a mercenary (subject to execution). Therefore, force protection is a requirement. This often requires commanders to take some degree of risk, regarding the effect on the security of their bases or posts by dividing scarce force protection assets. It is a risk they will be reluctant to take if they do not understand the issue. In a brief to Defense Contract Command Western District commanders, Lieutenant Colonel Dan Krebs, who had commanded the command's contract administration team in Haiti, stated that one of his greatest tasks was managing the security support for his team as they went to check fuel quality or water shipment.⁸²

One of the related challenges, also identified in the *Army Magazine* article, was, "Noncombatants cannot perform rear area security missions."⁸³ Force protection people are a scarce commodity. Often at overseas locations, other support personnel augment the force protection personnel. The Kobhar Towers after action report even recommended the use of other (non-force protection) personnel to augment the force protection mission.⁸⁴ As military support forces are privatized, the resources for augmentation of the security forces dwindle. The result is longer shifts, more deployments, and a severe drop in retention rates, further compounding the problem. It should be noted that one of the Air Force responses to the shortage and retention problems is to look to contract out some of the functions accomplished by those forces on CONUS bases.⁸⁵

Finally, in long peacekeeping or even conflict situations, contractors often bring family members. The mass exodus of civilian technicians that resulted from the tree-cutting incident mentioned earlier was attributed to their fear for the safety of their dependents. After escorting their families to safety, most returned to their posts to fulfill their missions.

This force protection role may be the least understood, yet most important. The first time a commander fails to provide the security necessary and that failure results in loss of life or capture will be the time we see how well we can operate on our own.

Recommendations

Civilian leaders have a mandate from the people of this country to build a smaller, more efficient military. Therefore, you will not see a recommendation for the Department of Defense to fight force structure cuts or downsizing efforts. The Department of Defense is already well down the road in privatization and competitive outsourcing efforts, as it should be. However, it seems to have started the process without a coordinated master plan. The primary recommendation is to make sure core competency requirements are dictating what is outsourced and not the other way around. What is required now is some forethought and planning in bringing about new reductions and in-depth analysis of the effects of privatization and outsourcing efforts to date on warfighting capabilities. The risks need to be minimized by eliminating the unknowns and illuminating the risks, facts, and issues.

A recent distinguished guest lecturer at the Air War College said that with the advent of the Air Expeditionary Force, the Air Force is looking at every job and skill—his example was civil engineers—at those AEF locations before authorizing outsourcing efforts. It is an excellent start. However, analysis needs to go beyond AEF and include actions taken already. Retention rates, deployment requirements, criticality of the systems supported, private sector sources of supply, and training time need to be addressed. Is AEF determining the support concept for weapon systems; as an example, the C-17? A thorough review of all support specialties is needed.

Commanders have been placed in a precarious position. They need these contractors in order to accomplish their mission but have been given no tools with which to work. Doctrine needs to be developed—a joint publication focused specifically on contractors on the battlefield. Things that need to be considered include contractor deployment and time-phased force and deployment data applicability, force protection and self-protection responsibility, discipline, understanding contract scope and authority, liability, and the law of armed conflict applicability.⁸⁶ This needs to be taught to officers early on and emphasized just the way officers are taught to lead their soldiers. After all, from a strategic perspective, they are being treated as though they were soldiers.

The DoD IG recommendation for developing a methodology and system for reporting the number of and requirements of each contract

with emergency-essential responsibilities needs to be followed up. DoD contracting officers are required to have analyzed the requirements and determined whether they constitute emergency essential services. That information needs to be gathered and made available to CINC planners.

Finally and admittedly a little out of the box, we need to get with our lawyers and acquisition experts and define a methodology that provides commanders with administrative and tactical command of contractor personnel during hostilities—maybe a deputizing clause that in times of Presidential-declared crises makes contractors reservists.

We cannot stop the move to increased private sector involvement and can no longer limit the involvement to base operations or supply. Those functions are already significantly private sector provided. What leaders must do is drive further outsourcing, not by how many military it removes but based upon a risk assessment. The outcome of a wrong choice could well be measured in lives and possibly battles lost.

Conclusion

The Department of Defense is gambling future military victory on contractors' performing operational functions on the battlefield. Contractors are becoming increasingly responsible for in-theater taskings previously accomplished by military personnel. This has occurred auspiciously due to significant and necessary cuts in force structures and the related need to transition, through outsourcing or privatization, *nonoperational* functions to the private sector. However, contractor numbers are increasing in theater and on the front lines, and their support is directly related to combat operations. The functions being accomplished by contractors today are not nonoperational support functions. They include maintenance and even operations of vital warfighting systems, JSTARS, Patriot, MIA1, and Dark Stars, to name just a few. In fact, fiscal policy has driven us to a point where there is, or will be, no organic military capability in many functions critical to weapon systems performance.

What this means is contractors need to be on the battlefield performing their job even when confronted by life-threatening hostilities. The irony is the contractors legally cannot, and possibly should not, be compelled to remain in harms way and participate in hostilities unless war has been declared. They are noncombatants and risk extreme penalty if their actions are determined to be in violation of that categorization. As the US military has attempted to compensate for force drawdowns, the distinction between military member and contractor support has been conveniently blurred. This is placing commanders and civilian operators in a predicament regarding the laws of war, the terms of this *new soldier's* employment contract, and the effect of these issues on the ability to perform the mission. While a transition of support functions, perhaps even operational functions, from the military to private sector is required by budget necessity, it seems to be happening without a master plan or risk-based assessment. There is little evidence that the strategic and doctrinal implication of contractors on the battlefield is being addressed. Each new outsourcing effort must be reviewed and past efforts analyzed based on its overall implications to the warfighting ability. Logistics support concepts may need to be adjusted to accommodate rear echelon or less risky support. Field commanders must be provided with information regarding the size and requirements related to contractor operations. Finally, if nothing else, we must provide field commanders and contractors with a doctrinal-based understanding of the challenges faced in times of hostilities.

The single deadliest incident during the Persian Gulf War occurred when an Iraqi scud missile hit barracks housing Army Reservists who were providing water purification support far from the front. Today, the military relies heavily on contractors for this support.⁸⁷ If death becomes a real threat, there is no doubt that some contractors will exercise their legal rights to get out of the theater. Not so many years ago that may have simply meant no hot food or reduced morale and welfare activity. Today, it could mean the only people a field commander has to accomplish a critical core competency tasking, such as weapon system maintenance or communications and surveillance system operations, have left and gone home. Warfare is changing. It appears, unfortunately, that, rather than face this change, we are hoping that nobody notices.

Notes

1. James C. Hyde, "Defense Contractors Serve on the Front Lines of Operation Desert Storm," *Armed Forces Journal International*, March 1991, 32.
2. Kathryn McIntire Peters, "Civilians at War," *Government Executive*, July 1996.
3. George B. Dibble, Charles L. Horne III, and William E. Lindsay, *Army Contractors and Civilian Maintenance, Supply and Transportation Support During Operations Desert Shield and Desert Storm*, Vol. 1: Study Report AR113-01RD1, Bethesda, Maryland: Logistics Management Institute, June 1993, IV.
4. Audit Report, Department of Defense Inspector General, "Civilian Contractor Overseas Support During Hostilities," No. 91-105, 26 June 1991, 1-30.
5. "Military Personnel Statistics and Civilian Personnel Statistics," Department of Defense. [Online] Available: <http://web1.whs.osd.mil/mmld/military/miltoptop.htm> and <http://web1.whs.osd.mil/mmld/civilian/civtop.htm>
6. USAF Core Values, Department of the Air Force, 1 January 1997.
7. General Carl E. Vuono, "Desert Storm and Future Logistics Challenges," *Army Logistician*, July-August 1991, 28-31.
8. Major William W. Epley, "Contracting in War: Civilian Combat Support of Fielded Armies," Washington DC: US Army Center of Military History, 1989, 1-6.
9. *Ibid.*
10. *Ibid.*
11. James A. Huston, "The Sinews of War: Army Logistics, 1775-1953," Washington, DC: Office of the Chief of Military -
12. Huston, 38.
13. *Ibid.*
14. *Ibid.*
15. Epley, 1-6.
16. "Vietnam: How Business Fights the 'War by Contract,'" *Business Week*, No. 1905, 5 March 1965, 58-62.
17. *Ibid.*
18. *Ibid.*
19. Peters, "Civilians at War," 24.
20. Hyde, 32.
21. Peters, "Civilians at War," 24.
22. *Ibid.*
23. Lieutenant General Joseph M. Heiser, *Civilian Combat Support in Vietnam Some Lessons Learned*, McLean, Virginia: Logistics Management Institute, December 1990, 1-10.
24. Peters, "Civilians at War," 24.
25. Katherine McIntire Peters, "The Price of Peace," *Government Executive*, March 1997, 22.
26. Major General Norman E. Williams and Jon M. Schandelmeier, "Contractors on the Battlefield," *Army Magazine*, January 1999, 32-35.
27. *Global Engagement: A Vision for the 21st Century Air Force*, Washington DC: Department of the Air Force, 19.
28. Brian Friel, "DoD Downsizing, other Reforms Make Progress," *Government Executive*, 9 October 1998, 1. [Online] Available: <http://www.govexec.com/dailyfed/1098/100998b1.htm>
29. Andrew Compart, "Air Force to Study Contracting Out 60,000 Jobs," *Air Force Times*, 31 March 1997, 10.
30. Hyde, 32.
31. Heiser, 8.
32. *Air Force Doctrine Document 1*, Maxwell AFB, Alabama: Headquarters Air Force Doctrine Center, September 1997, 29.
33. Title 10, USC, Section 2466, "Limitations on the Performance of Depot-level Maintenance of Materiel, undated. [Online] Available: http://afmc.wpaafb.af.mil/HQ-AFMC/LG/lgp/lgp_50_50.htm
34. *Depot Maintenance Fact Book*, 23. [Online] Available: <http://www.acq.osd.mil/nog/imp/factbook>
35. Wright-Patterson AFB, Ohio: Air Force Institute of Technology, December 1997, 1.
36. Peters, "Civilians at War," 25.
37. Air War College Distinguished Lecture on the AEF, 13 January 1999.
38. Heiser, 6.
39. Dibble, g-6.
40. Robert D. Kaiser and Richard M. Fabbro, *DoD Use of Civilian Technicians*, Washington DC: Logistics Management Institute, July 1990, iii.
41. *Ibid.*
42. "Outsourcing and Privatization," 1998 Air Force Congressional Issue Papers Extract, undated.
43. Kaiser, iii.
44. DoD IG Audit Report, "Civilian Contractor Overseas Support," 3.
45. "Civilian Contractor Overseas Support," 1.
46. "Civilian Contractor Overseas Support, 1.
47. Christopher Jehn, Assistant Secretary of Defense for Force Management and Personnel, Memorandum to Director, Readiness and Operational Support Director, Office of the Inspector General, "Draft Audit Report on Civilian Contractor Overseas Support During Hostilities," 20 May 1991.
48. *Ibid.*
49. DoD IG Report, 6-12.
50. DoD Directive 1100.14, *Guidance for Manpower Programs*, 20 August 1954.
51. Jehn.
52. DoD IG Report, 6-12.
53. Jehn.
54. DoD IG Report, 6-12.
55. Air War College Distinguished Guest Lecturer, 9 January 1999.
56. DoD Directive 1100.18, *Wartime Manpower Planning*, 23 October 1986.
57. DoD Directive 1404.10, *Emergency Essential DoD U.S. Citizen Civilian Employees*, 10 April 1992.
58. Dibble.
59. Kaiser.
60. Larry L. Toler, "Civilians on the Battlefield," *Army Logistician*, November-December 1994.
61. Toler, 4.
62. Dibble.
63. L. C. Green, *The Contemporary Law of Armed Conflict*, New York: Manchester University Press, 1994, 99-100.
64. *The Contemporary Law of Armed Conflict*, 108, Restatement of Article 44 of Geneva Protocol I.
65. *International Laws Concerning the Conflict of Hostilities: Collection of Hague Conventions and Some Other International Instruments*. International Committee of the Red Cross, 17.
66. Lieutenant Commander Steven R. Sarnoski, USNR, "The United States Law of Civilian Persons Serving with or Accompanying Armed Forces in the Field," *The Army Lawyer*, DA Pamphlet 27-50-260, July 1994, 29.
67. Colonel Johnson, "Background Paper on Civilian Operators," HQ USAF/JAI, 6 March 1997, 1.
68. Air Force Pamphlet 110-31, *International Law—The Conduct of Armed Conflict and Air Operations*, 19 November 1976, 3-4.
69. *Ibid.*
70. W. Darrell Phillips, Chief, International and Operational Law Division, Air Force Staff Judge Advocate School, Memorandum, 13 April 1998, 1.
71. Green, 102.
72. Phillips citing *The Handbook of Humanitarian Law in Armed Conflicts*, Oxford University Press, 1995, 1.
73. Phillips, 2.
74. *Ibid.*
75. "The Business of War and Peace," *Government Executive*, July 1996, 27.
76. Lieutenant Colonel Mary B. Hamlin, "Privatization of Aircraft Maintenance: Maximizing Contract Effectiveness," Maxwell AFB, Alabama: Air War College, May 1990, 10.
77. Johnson, 2.
78. *Ibid.*
79. Johnson, g-5.
80. *Ibid.*
81. Williams, 34-35.
82. Lieutenant Colonel Daniel Krebs, "Haiti, Contract Administration Support," Briefing to the Defense Contract Management Command District West Commanders' Conference, DCMC San Antonio, San Antonio, Texas, 9 November 1994.
83. Williams, 34.
84. Proposed Responses to General Downing Report on the Kohbar Towers Bombing, undated, 2-16. [Online] Available: <http://www.af.mil/cgi-bin/multigate/retrieve?u=z3950r/dtics11:1024/airforce/f691%3a.../htm>
85. Staff Sergeant Michael Dorsey, "Air Force's 21st Century Vision Includes Security Police Changes," *Air Force New Service*, 3 July 1997. [Online] Available: <http://www.af.mil/cgi-bin/multigate/retrieve?u=z3950r://dtics11:1024/news/F1377%3a9.../htm>
86. Minutes, "Contractors on the Battlefield," 26-27 October Contractor on the Battlefield Conference, 5 November 1998. [Online] Available: http://www.cascom.army.mil/automation/combat_developer/combat_developer_98-29.htm
87. Peters, "Civilians at War," 25.

Colonel Zamparelli is currently assigned to the San Antonio Air Logistics Center. At the time of the writing of this article, he was a student at the Air War College.



The Logistics Constant Throughout the Ages

Cadet First Class Daniel McConnell, USAFA
Captain Richard A. Hardemon, USAF
Senior Master Sergeant Larry C. Ransburgh, USAF

War often conjures pictures of combat and large armies moving to the field inspired by a clash of political ideologies or ambitions. Indeed, the intriguing twists and nuances of the strong political current sweeping every conflict forward or the intricate strategy and battlefield tactics that vie for positional dominance can hold one's attention to the exclusion of all other aspects of war. Yet, the bulk of a commander's considerations involve the logistical limitations that drive changes to strategy and tactics in order to keep forces supplied and moving. All manner of logistical supplies are necessary to carry on military operations. However, fuel (fodder for animals or petroleum, oil, and lubricants [POL]) holds a special importance in that its supply has influenced and often dominated strategy as long as nations or states have fielded armies.

Transportation of supplies and materiel preceding modern day machines relied on some form of pack animal, principally horses. The horse's need for fodder dictated to the commander the terrain through which he could campaign as well as the campaign seasons.

Following World War I, new modes of warfare made the use of pack animals obsolete; however, armies still employed them on a much smaller scale to move supplies. Technology—manifested in aircraft and mechanized vehicles birthed in the First World War and nurtured during the interwar period—required a new type of fuel in the form of POL. During World War II, in the European Theater, massive armies raced across battlefields, and mechanized equipment greatly increased the spectrum of strategic possibilities. However, commanders still had to account for logistical considerations that would influence their tactics. Increasingly, POL dominated their strategy and tactics. Further, POL products accounted for the majority of supplies shipped into theater during the war.

Regardless of its modern connotation, POL's intrinsic equivalent throughout history has been fodder.

Military Campaigns, Strategy, and the Need for Fodder

Most great commanders in ancient times, such as Alexander the Great, attempted to limit the number of horses on the campaign by ordering the troops and their attendants to carry many of the own supplies.¹ Yet, historian Donald Engels notes that pack animals were still necessary to carry "... the army's noncomestible supplies, such as tents, hammocks, medical supplies, the ambulance, siege machinery, firewood, booty, and perhaps some of the women and children."² Though Alexander managed to significantly reduce the number of pack animals, Engels estimates that Alexander's army probably had about 6,000 cavalry horses and 1,300 baggage animals. Under the most favorable conditions, where the army campaigned in areas abundant in fodder and only needed to carry 1 day's supply of grain, they still needed approximately 1,100 pack animals to carry 269,000 pounds of grain, if each horse carried 250 pounds.³ Engels notes that if an army traveled through an area devoid of fodder the number of pack animals

needed to transport the grain and fodder requirements for 1 day would jump to 8,400 carrying approximately 1,260,000 pounds.⁴ Noted historian Martin van Creveld, in *Supplying War*, similarly describes a generic premechanized army in which "... the 40,000 animals accompanying an army would, therefore, require 800 acres per day."⁵ Horses were imperative in a campaign, yet their subsistence greatly strained an army's resources.

Prior to the 18th century, few improvements were made to ease the fodder supply problem in Europe. In fact, the French made the problem worse by bringing extra men on the campaign to forage for fodder in the army's immediate vicinity. Historian John A. Lynn estimates between "... 4,000 and 10,000 men [were] necessary to mow forage for an army of 60,000"—each day a horse required approximately 24 pounds of dry fodder.⁶ Interestingly, the French did maintain a magazine system to store troop provisions; however, the need to keep moving to find more fodder tended to cause the army to move too far and too fast away from this system of supply.⁷ The ever present need to forage for more fodder forced the French Army to constantly move even when strategy dictated that it should not.

Strategy had to be adapted to account for horses' needs. Most historians agree the challenge of providing for the pack animals overshadowed the troops' provisions. Accordingly, the fodder requirement restricted an army's area of operations to regions that could sustain a high fodder intake. During the winter months when cold weather made fodder impossible to secure, armies were unable to campaign, and military operations necessarily became a seasonal activity.⁸ Notably, in the 13th century, the Mongols possessed horses that could find food under the snow, so their timeframe for waging war was greatly increased.⁹ Early conquerors bypassed cities and only occasionally conducted sieges, as fodder in the immediate area quickly ran out.¹⁰ Intuitively, the massive effort required to forage dictated strict precautions to prevent being surprised while gathering fodder. Though other factors also influenced strategy, the need for fodder dominated both strategic planning and military operations.

Throughout the first millennium AD, the Muslims were adamant about incorporating knowledge of terrain and vegetation when planning raids. Muslim planners devised contingency plans dependent on the seasons in that, during February and early March, their raids only lasted 20 days so they could get the horses back to Muslim territory to graze. Spring campaigns could only last 30 days, while summer ones were to last 60 because of the availability of fodder.¹¹ However, the Muslims were also sufficiently organized to set up a series of warehouses near their eastern frontiers over which they campaigned. Reports of these warehouses came in the 7th century and again in the 10th century relating the existence of ready supplies, "... including grain and fodder ... [and] located where defensive or offensive action tended to repeat itself."¹² Despite the Muslim's successes, by the 18th century, few countries had adopted a suitable fodder magazine system except for the French

and Prussians.¹³ The French and Prussian magazine system, as well as the earlier Muslim warehouses, gave the respective forces the advantage of surprise and a greater measure of flexibility by allowing them to mobilize and attack more quickly.

As mentioned earlier, Alexander the Great grappled with the fodder problem throughout his farflung exploits across Europe. Alexander realized the problems posed by bringing along numerous horses and pack animals, so he attempted to minimize their numbers by requiring his men to carry packs.¹⁴ He also understood that excessive work and not enough food would wear out his cavalry and pack animals and he would not be able to nurse them back to health.¹⁵ Welfare for the horses dictated that he slow his army's pace so the horses and pack animals could graze. The need to move faster, therefore, motivated Alexander to look for new ways to reduce his dependency on horses. His massive fleet helped alleviate this problem by transporting large fodder supplies from port to port, though this locked him into a dependency on the Mediterranean coastline or large navigable rivers, especially during winter.¹⁶ The need to provide fodder for his horses forced Alexander to work within increasingly narrow boundaries as he moved farther away from Macedonia. Alexander's campaigns provide one of the earliest recorded examples of logistical handicaps.

As long as armies required horses for cavalry and carrying supplies, the need to find fodder restricted flexibility and operations. In 1775, during the American Revolutionary War, American forces under General Philip Schuyler planned an invasion of Canada. However, lack of rain made for a hot, dry summer, and General Schuyler could not move up enough fodder to feed the horses needed for a full invasion. Instead, the lack of fodder forced him to wait until late summer when adequate rain nourished the grass enough to supply the invasions.¹⁷ Winter quickly set in after Schuyler experienced early successes and cut him off from all resupply. The "... inadequate forage in June and July was not the only reason for the failure of the Canadian campaign, but it surely was one of them."¹⁸

Fodder further affected flexibility during the American Revolution when free fodder became hard to obtain and the Colonial Army had to compensate farmers for using their land. Wartime prices steadily rose as good pastureland became less available. However, like Alexander, the American commanders understood that without adequate fodder their limited supply of horses would dwindle. Colonial commanders could send the cavalry away from the army to find cheaper fodder, but they needed the pack animals to stay close and often paid high prices for their nourishment.¹⁹ Without the pack animals, the army could not transport its supplies and conduct operations for very long.

The US Civil War (1861 to 1865) demonstrated the importance of using a rail system to increase strategic flexibility by more efficiently supplying armies. Trains and rail lines came under attack as both sides sought to cripple the other's access to them and prevent valuable supplies from reaching their intended forces. Armies still required cavalry and pack animals to move their food and supplies while in the field and, therefore, continued to need fodder. However, with the locomotive's introduction into warfare, fodder and other supplies could be loaded onto trains and brought to depots within the army's proximity. Established supply lines could then be used to retrieve the materiel. The Civil War became the first conflict in which armies used the new technological innovation to improve logistics, especially resupplying fodder, and to alleviate the need to constantly change camps to find more fodder.²⁰ In fact, historian James A. Huston, in *The Sinews of War: Army Logistics 1775-1953*, relates that shipments of forage during the winter months averaged \$1M. He

goes on to say that fodder continued to dominate supply considerations, in that "... for tonnage and bulk the item of daily supply that was even more important than food for the men was food for the animals."²¹ Trains permitted armies to receive more fodder while maintaining their positions and simultaneously allowed an army to keep more horses.

The period between the Civil War and World War I was filled with advances in technology, which were not fully taken advantage of by the European powers. Further, the dominant powers in Europe (France, Prussia, England, and Russia) failed to truly understand the lessons that could have been learned from the Civil War. Cavalry charges and long baggage trains of horse-drawn wagons persisted, and with that returned the age-old need to feed the livestock. In many ways, the First World War resembled all past wars. However, its rapid consumption of supplies, especially ammunition, dictated that the times and ways of war were changing. But for the moment, it was remarkably similar to the past, in that during the war, Great Britain shipped 5,253,538 tons of ammunition to France as well as the greatest single item shipped, which was 5,438,602 tons of oats and hay.²² Fuel for horses continued to be a dominant factor.

Regardless of the lessons the Germans should have learned from the past, during World War I, they placed a huge emphasis on cavalry and did not prepare for their maintenance in the field. The German high command ordered commanders to feed their horses off the land as a result of the army's sheer numbers of horses. Van Creveld relates that any attempt to supply the army from home bases would have been impossible.²³ As the Germans moved into France early in the war, luck appeared to be with them as the land was rich and the grain had just been harvested. However, much of the grain was still green, causing many of the horses to become sick and die very early in the campaign. A critical shortage resulted in fodder, and by the time of the Battle of the Marne, where French and British forces engaged and halted the German advance, most of the horses were too weak to keep up the pace.

The German invasion plan, known as the Schlieffen Plan, depended on the speed of the invasion, yet the horses employed in reconnaissance and pulling the heavy artillery were so poorly fed that they could not keep up the pace. In fact, many died before the Germans crossed the border into Belgium. By 11 August 1914, preceding the Battle of the Marne, cavalry forces ordered a 4-day halt to find food for the mounts.²⁴ By the Battle of the Marne, the starved horses pulling the German artillery, which was the only arm that had a distinct advantage over French forces, could not keep up the pace. "By this time, too, one German army at least was finding that the states of the cavalry seriously interfered with operations."²⁵ The German high command's severe oversight of properly feeding the horses proved to be a decisive factor in the failure of the Schlieffen Plan.

Following the offensive stall after the Battle of the Marne, the consumption of supplies reached proportions unmatched by any previous war. However, this consumption rate could not have been maintained if the front had not stalled and remained stationary throughout the war.²⁶ Supply movement via horses would have been inadequate given the war's immense scale. Toward the end of the war, both sides began to introduce motorized transport on a very small scale and began to argue that, "... complete motorization of local transportation and the widespread use of combat vehicles would restore mobility to the battlefield."²⁷ Petroleum products, then, came into demand, and by the war's end, more than 759,000 tons of gas and oil had been shipped onto the Continent. War planners deemed the horse obsolete in favor of the more economical and faster moving petroleum-based machines.

Military Campaigns, Strategy, and the Need for POL

Following the First World War, armies began nurturing the technological innovations employed at the end of the war and subsequently developed a strong dependency on petroleum products by the beginning of World War II. POL significantly differed from fodder in that POL had to be manufactured away from the battlefield and then shipped to the battle area.²⁸ For the most part, fodder as a source of fuel for horses quickly became a thing of the past as armies became fully mechanized. The new machines could be worked harder and go farther and faster, and most important, the time of the year and the route taken by the army did not affect its fuel supply. Commanders could expand their range of strategic operations immensely and do more with less.

However, challenges quickly attached themselves to the new machines and their fuel supply. If army quartermasters did not constantly provide the machines with enough fuel, operators could not normally just forage for it. In this respect, commanders lost a measure of flexibility, and the situation forced them to further employ technology to devise ways to overcome the new problems. The result involved underground pipelines and the Red Ball Express, in which a constant stream of trucks traveled distances of up to 400 miles to supply Patton's Third Army.

The beginning of World War II saw the Germany Army still reliant on horse-drawn transport. Hitler neglected to fully mechanize his transport vehicles, though he dramatically increased the number toward the end of the war.²⁹ Historian Julian Thompson relates that the Germans only possessed three motor transport regiments for the whole army capable of carrying 19,500 tons, whereas in 1944, the Allies in northwest Europe could transport 69,400 tons to support 47 divisions. Thompson goes on to state, "Hitler's failure to build up the necessary capacity to provide the transport essential for mobile warfare was one of the principal reasons for the failure of the German invasion of the Soviet Union (Operation Barbarossa)."³⁰ Regardless of the German Army's deficit in mechanized transport, the Second World War became the pioneering conflict to be predominantly affected by fuel in the form of POL.

Following Germany's invasions of Poland and France, POL's role became readily apparent, and Allied strategists sought to cripple the Axis' ability to effectively employ fuel with US entrance into the war. Plans got under way to target the Ploesti oilfields in Rumania as strategists estimated that the fields had the capacity to produce 9 million tons of refined oil per year, though it only produced 4 million. Allied strategists understood well the German's primitive transportation system and the fact their small fleet of motorized transport vehicles had become extremely overburdened by the war's rapid geographic expansion.³¹ Accordingly, the Allies did not attack Ploesti in the hopes of crippling the Axis refining capacity. Instead, they were more interested in destroying Ploesti's refining capability so Germany's limited transportation system would have to move the crude oil from the Ploesti area to other refining sites in Germany or France. The war had already severely taxed the Axis transportation system, and the Allies believed the extra strain would cause supply to other areas to fall apart.

The Allies launched the first Ploesti raid on 1 August 1943 and estimated that the Axis oil supply had been reduced by 3 or 4 percent.³² It was originally believed the raid had destroyed about 40 percent of 6 months of Rumanian refining capacity or a loss of 1.8 million tons of refining capacity as a result of closing the refining facilities from about 1 week to several months.³³ However, the raid's after action analysis indicated that Rumanian oilfields possessed twice their estimated production capacity, so subsequent raids would have had to destroy about 3 million more tons of refining capacity to begin really limiting

Ploesti's actual refining capacity.³⁴ Though the mission proved to be successful, the Army Air Forces sustained a 30 percent loss, making a follow-up raid impractical.³⁵ The Allies moved on to other targets, and the Germans managed to quickly rebuild the facilities.

Evolving into a strategy to attack the entire Axis oil industry, the raid, despite its heavy losses, fueled an intense bombing campaign that managed to strike every major oil refinery in German controlled territory. Ambitiously, the United States and Great Britain set out to severely damage the German oil industry and keep it subdued. Like Ploesti, the Allies' goal was to reduce the German refining capacity as well as the number of refineries available to cannibalize in order to rebuild larger, more productive refineries.³⁶ They wanted to present Germany with only two options: transport the crude oil to old unattacked refineries near Marseilles, France, where they were highly vulnerable, or stay in their present locations and attempt to rebuild in between raids.³⁷ The Germans chose the second option, and the Allies timed return missions to prevent refineries from going back on line.³⁸ As German oil production suffered, so did its armed forces as lack of aviation grade fuel kept the Luftwaffe on the ground and forced the army to heavily dip into rapidly dwindling reserves.

The Germans failed to completely think the entire war effort through and suffered from inadequate fuel reserves. The German Oil Association advised the government that the oil reserves would only last for 5 months given the high rate of consumption. Germany made the reserves last a lot longer by robbing from the civilian sector, but the effects of the Allied bombing after 1943 made the situation critical. Germany's aggressions in 1939 and 1940 were rewarded with its victims' oil reserves. A US investigation following the war relates, "... in January 1941 aviation gasoline stocks were approximately 500,000 tons. When Germany conquered the Netherlands, Belgium, and France, about 1 million tons were secured."³⁹ However, by January 1944, aviation gas had been reduced to 240,000 tons, and by January 1945, it was almost nonexistent.⁴⁰ By May 1944, fuel shortages resulted in drastic reduction in training hours, and operational time was limited strictly to air defenses.⁴¹ The situation had become so critical that the Luftwaffe could provide little opposition to the Allied invasion on 7 June 1944. By 1945, it could not support German ground forces in the Battle of the Bulge after a successful ground offensive.

Germany's lack of fuel reserves also manifested itself in ground operations as the combined bomber offensive and the Allied advance prevented German recuperation. Following victory in North Africa and a successful invasion of Sicily, the Allies drove up the Italian peninsula until stiff German opposition along the Gustav Line halted their advance. The Allies initiated Operation Strangle from 19 March to 10 May 1944 to cut the Germans off from resupply and deplete their fuel reserves. Generally successful, Strangle did not dislodge the Germans, and Operation Diadem got underway on 11 May 1944 to increase German fuel consumption while reducing their resupply through interdiction.⁴² Strategically, the Allies planned to dislodge the Germans while strategic bombing would prevent resupply in hopes they would run out of fuel.

Operation Diadem went according to plan, and by mid-May, 14 fuel depots had been critically depleted, and "... the mobility of the entire army had been called into question."⁴³ German fuel was adequate to compensate for the defensive maneuvers necessitated by the Allied advance at the beginning of the operation. Yet, by early June, the effects of the campaign presented a very hard reality. The German armies had been in retreat for a week, and the American Fifth Army presented a constant threat.⁴⁴ Though this defense suited the mountainous terrain and the situation, it required a lot of fuel that the army did not possess. "By June 6, the army

was making its moves piecemeal—a unit would move, exhaust its fuel, and wait for resupply.”⁴⁵ Defensive maneuvers, the mountainous terrain, and movement at night saved the German Army from total defeat, but fuel’s use in strategy and its subsequent effect on Germany strategy was enormous.

On 6 June 1944, the Allies launched Operation Overlord, and the invasion of Eastern Europe began. Original plans called for the Allies to steadily push the German Army toward the Rhine and then force surrender. However, after a massive aerial bombardment on 25 July, the Allies forced a gap in the German lines and then exploited it by pouring through armored divisions.⁴⁶ New tactical opportunities to quickly defeat the Germans presented themselves instead of the originally planned methodical push to the Rhine.⁴⁷ Patton’s Third Army raced through southern France consuming an average of 350,000 gallons of fuel each day.⁴⁸ By 7 August, the Third Army had exhausted its fuel reserves, though it managed to maintain the rapid advance for another 3 weeks. Fuel supply reached critical levels from 20 to 26 August when both the First and Third Armies, pursuing the retreating German Army, consumed an average of more than 800,000 gallons of gas a day.⁴⁹ However, the supply lines had not yet become so long as to be unmanageable by theater logisticians, and the Allies had enough fuel to enter Paris on 24 August.


Pre-invasion planning called for the Allies to halt and wait for the logistical network of communications and food pipelines. However, their shipping successes and rapid advances into Paris with little German resistance called for a reevaluation of the plan. General Bradley, commanding the First Army, was quoted as saying, “. . . armies will go as far as practical and then wait until the supply system in [the] rear will permit further advance.”⁵⁰ Basically, he proposed to move forward, taking as much ground as possible, until they ran out of gas. Once again, fuel requirements dominated strategic decisions and operational action.

Since World War II, POL has become increasingly important to keep an army going in the field. The past 50 years of technological advance have only optimized modes of transportation, not lessened the impact of fuel on strategy, tactics, and operations. While technological advances may reduce the amount of support equipment required for military operations and the size, lethality, or amount of munitions—all of which will further reduce lift requirements—similar advance is seen as unlikely for fuel. Arguably, fuel will remain the dominant logistics factor that limits strategic and tactical planning as well as actual operations for the foreseeable future.

Notes

1. Donald W. Engels, *Alexander the Great and the Logistics of the Macedonian Army*, Berkeley: University of California Press, 1978, 16.
2. Engels, 16-17.
3. Engels, 18-19.
4. Engels, 20.
5. Martin van Creveld, *Supplying War: Logistics from Wallenstein to Patton*, Cambridge: Cambridge University Press, 1977, 4.
6. John A. Lynn, ed., *Feeding Mars: Logistics in Western Warfare from the Middle Ages to the Present*, Boulder: Westview Press, 1993, 141-142.

7. *Ibid.*
8. Martin van Creveld, *Technology and War: From 2000 B.C. to the Present*, London: Collier Macmillan Publishers, 1989, 47.
9. *Ibid.*
10. *Ibid.*
11. Lynn, 52.
12. Lynn, 45.
13. Van Creveld, *Technology and War*, 116.
14. Engels, 129-130.
15. *Ibid.*
16. *Ibid.*
17. Lynn, 167.
18. *Ibid.*
19. *Ibid.*
20. Lynn, 186.
21. James A. Huston, *The Sinews of War: Army Logistics 1775-1953*, Washington DC: Office of the Chief of Military History United States Army, 1966, 219.
22. Julian Thompson, *The Lifeblood of War: Logistics in Armed Conflict*, London: Brassey’s, 1991, 12.
23. Van Creveld, *Supplying War*, 124.
24. Van Creveld, *Supplying War*, 125.
25. *Ibid.*
26. Huston, 399.
27. *Ibid.*
28. Lynn, 186.
29. Thompson, 53.
30. Thompson, 53-54.
31. Damage Report, Ploesti Area Oil Refineries, 31 August 1943, USAF Historical Research Agency, 142.042-21 V.5A.
32. *Ibid.*
33. *Ibid.*
34. *Ibid.*
35. Tidalwave, the August 1943 Raid on Ploesti, USAF History Support Office. [Online] Available: www.airforcehistory.hq.af.mil/soi.ploesti.htm [21 June 1999].
36. *German Oil Production as of 24 June 1944*, Vol. 4, 1942-1945, USAF Historical Research Agency, 142.042-22.
37. *Ibid.*
38. The Defeat of the German Air Force, 1942-1945, USAF Historical Research Agency, 137.315.11, 39.
39. German Oil and Chemical Production—Effects of Allied Air Attacks, 2 July 1945, USAF Historical Research Agency, 137.315.67, 2.
40. *Ibid.*
41. The Defeat of the German Air Force, 42
42. Eduard Mark, *Aerial Interdiction: Air Power and the Land Battle in Three American Wars*, Washington DC: Center for Air Force History, 1994, 179.
43. Mark, 206.
44. *Ibid.*
45. Mark, 207.
46. Steven E. Anders, *POL on the Red Ball Express*, US Army Quartermaster Museum, Fort Lee, Virginia, 2. [Online] Available: www.qmfound.com/pol_on_the_red_ball_express.htm [16 June 1999].
47. *Ibid.*
48. Daniel G. Grassi, *Refuel on the Move: Resupplying Patton’s Third Army*, US Quartermaster Museum, Fort Lee, Virginia, 1. [Online] Available: www.qmfound.com/pol.htm [16 June 1999].
49. Anders, 3.
50. *Ibid.*

Cadet McConnell is a senior at the USAFA. At the time of this writing, he was a research intern at the Air Force Logistics Management Agency. Captain Hardemon is a project manager in the Air Force Logistics Management Agency Maintenance and Munitions Division. Sergeant Ransburgh is project manager in Air Force Logistics Management Agency Supply Division. 

Although the United States is at present still in a class of its own economically and perhaps even militarily, it cannot avoid confronting the two great tests which challenge the longevity of every major power that occupies the “number one” position in world affairs: whether, in the military/strategical realm, it can preserve a reasonable balance between the nation’s perceived defense requirements and the means it possesses to maintain those commitments; and whether, as an intimately related point, it can preserve the technological and economic bases of its power from relative erosion in the face of the ever-sifting patterns of global production.

—Paul Kennedy

International Armament Cooperation and Theater Missile Defense: Why South Korea is Reluctant to Join the Club

***Captain George A. Hutchinson, USAF
Craig M. Brandt, PhD***

As the last decade of the millennium comes to a close, US defense leaders continue to grapple with a dauntingly uncertain international order. The humpty-dumpty-like demise of the Soviet Union took with it the rationality of the bipolar framework from which US defense planners had operated since the end of World War II. Adding to the new challenges involving international security has been a series of Hobson's Choices.¹ As Senator John McCain stated in March 1996, the United States has:

... had to choose among cutting force strength, maintaining readiness, or funding force modernization within the constraints of continually declining defense budgets. The result has been reductions in all three areas, but particularly in force modernization.

What to do?

International armaments cooperation has been increasingly championed as a way to develop and acquire weapon systems in an era of declining defense budgets.² At its essence, armaments cooperation activities are conducted with nations "... that have solid political and economic ties with the United States, similar military requirements, and a reasonable defense technology base."³ A Department of Defense (DoD) program that has received top billing as an armaments cooperation project with friends and allies is Theater Ballistic Missile Defense (TBMD or TMD). TMD is seen as a way to "... help strengthen US security relationships, enhance the US counterproliferation strategy, and should that fail, protect against such threats."⁴ Over the past few years, the United States has contacted several countries regarding the possibilities of entering a mutually cooperative TMD arrangement. In Europe, the highly mobile and maneuverable Medium Extended Air Defense System is the cooperative TMD project currently underway between the United States, Germany, and Italy. In Asia, the United States has engaged Taiwan, Japan, and the Republic of Korea (ROK) with respective TMD projects. TMD initiatives have met with a fair degree of success. But what happens when an ally is not interested? Despite top-level assurances regarding TMD as a viable solution to the North Korean missile threat, South Korean Government and military officials have continued to reject a US offer for TMD.

International Armaments Cooperation

In a June 1993 memorandum, Deputy Secretary of Defense William Perry set the stage for developing US foreign policy for cooperation:

As we address the issues of defense reinvestment and as our armed forces and those of our allies draw down, it is critical that we look for every opportunity to increase the effectiveness of those forces while making the most efficient use of the resources we apply to our collective defenses. I believe that armaments cooperation can be a primary means of achieving those ends.⁵

The notion of international armaments cooperation was strengthened in February 1995 by Dr. Paul G. Kaminski, then Under Secretary of Defense for Acquisition and Technology. In a speech before a Center for Strategic and International Studies conference, Dr. Kaminski cited the importance of US allies and the increased likelihood of US forces carrying out coalition operations with them: "To modernize the equipment of our defense forces at an affordable cost, we will have to leverage the industrial base of all our nations. [This] means increased emphasis on cooperation with our allies in acquisition and defense equipment."⁶

In March 1997, Defense Secretary William Cohen established formal policy for international armaments cooperation.⁷ This policy was echoed shortly thereafter by Paul J. Hoyer (Deputy Under Secretary of Defense for International and Commercial Programs) at a Defense Industry Consultative Committee dinner. With a South Korean delegation, which included high-ranking civilian and military officials, in attendance, Secretary Hoyer reiterated Secretary Cohen's resolve:

In the evolving environment of coalition warfare, limited resources, and a global industrial and technology base, it is DoD policy that we utilize international armaments cooperation to the maximum extent feasible, consistent with sound business practices.⁸

On 20 July 1998, Dr. Jacques Gansler, Under Secretary of Defense for Acquisition and Technology, addressed the South Korean Vice Minister of National Defense, An Bung-Kil, and members of the Korea Institute for Defense Analysis.

Dr. Gansler offered his perspective on "... the future major acquisition and technology challenges faced by the US and the Republic of Korea."⁹ Dr. Gansler alluded to North Korea, citing the dangers of proliferation of weapons of mass destruction as well as the need for security cooperation in the form of "... greater equipment interoperability in order to conduct integrated operations in coalition conflicts." He called for an adoption of a new international armaments cooperation model, "... one in which governments establish the military requirements and business rules, but the industries involved establish the best international teams of their own choosing to competitively bid on the work." Finally, Dr. Gansler called on South Korea to consider the importance of interoperability in its selection of a TMD option. At the time, in a post-Cold War development unfathomable a decade before, South Korea was weighing the US-made Patriot against the Russian-made S-300 missile system as competitive offshore procurement options to meet its air defense needs.

The US TMD Initiative in East Asia

Formerly known as the Strategic Defense Initiative Organization, the Ballistic Missile Defense Organization (BMDO) came into existence on 13 May 1993 under a new charter. The charter called for

the DoD warfighting commands to become directly involved in planning for the integration of missile defense systems into operational units.¹⁰ As part of the BMDO's Ballistic Missile Defense Program, TMD has evolved into the DoD's first missile defense priority.^{11,12} TMD is a reflection of defense posture adjustments the United States has made since the end of its Cold War standoff with the Soviet Union. TMD is viewed as a way to protect US Armed Forces and allies in forward-deployed locations against the new and growing threat involving the spread of ballistic missile technology and weapons of mass destruction. As a counter to both lower-tier and upper-tier threats, TMD has adopted a family of systems approach.¹³ Lower-tier systems are geared to defend at low altitudes against shorter range ballistic and cruise missiles, while upper-tier systems are intended to handle ballistic threats from longer ranges. For example, the Patriot PAC-3 is one of the core lower-tier systems making up part of the TMD family.

Beginning early in 1994, the United States was growing increasingly uncomfortable with fears that North Korea was developing both nuclear weapons and a ballistic missile capability. As a result, President Clinton began considering the deployment of Patriot missiles to strategic areas in South Korea, and US officials urged South Korea to consider procuring the Patriot. According to a US diplomat at the time, John Deutch, the Pentagon's Under Secretary for Acquisition and Technology, proposed that South Korea join the United States in TMD development efforts. US Government and industry sources were said to have calculated, "South Korea has a requirement to acquire about seven Patriot batteries at a cost of approximately \$600M."¹⁴ Raytheon spokesman Dick Sherman acknowledged that company and US Army officials had said that South Korea needs the Patriot and that the South Korean government had expressed interest in the system. Sherman was "... confident, that in the near term they will be acquiring Patriot systems."¹⁵ While initial prospects for the Patriot appeared favorable, ROK enthusiasm for the missile was restrained. On 28 February 1994, South Korean Defense Minister Rhee Byoung-tae said, "South Korea has no plans to purchase Patriot antimissile batteries ... from the United States."¹⁶ Rhee denied charges from opposition lawmakers that a possible Patriot deployment being considered by President Clinton was part of a long-term scheme to sell them to South Korea. He did, however, admit that the ministry was studying the possibility of participating in the TMD program with the United States. He also said that it was inappropriate to connect that program with the possible Patriot deployment. Rhee went on to disclose "... his ministry [was] preparing a strategy to neutralize North Korean scud missiles using airpower while the missiles are still on the ground," and the "... US Patriot deployment plan is just one facet of this strategy."¹⁷ On 18 April 1994, Patriot missiles began arriving at the South Korean port of Yusan.¹⁸

Cooperative US TMD efforts in East Asia continued with South Korea, Japan, and Taiwan through 1995. Speaking about TMD initiatives with Japan on 23 January 1995, General John Shalikashvili said, "The US is willing to share intelligence from satellite data with Japan if the two countries jointly develop a theater missile defense system."¹⁹ On 21 August 1995, *Defense News* acknowledged that Taiwan, which had already received the US Patriot Modified Air Defense System and was working on an indigenous version of the Patriot PAC-3 called the Tien Kung, was "... assessing the US Army's Theater High Altitude Area Defense (THAAD)."²⁰ By September 1995, Japan was "... accelerating missile defense studies that [were] expected to lead to joint development with the United States of a TMD system," while "Taiwan was showing [continued] interest in the US THAAD system." Thus, while Japan and Taiwan were both showing interest

in US systems, South Korea, nevertheless, was "... considering Russian offers to jointly manufacture the S-300 antimissile system."²¹

In May 1996, enthusiastic US bipartisan political backing for an Asian regional TMD materialized when Republican Presidential candidate Bob Dole called for a "... Pacific Democracy Defense Program that would extend TMD coverage to Japan, South Korea, Taiwan, and other allies."²²

By 1997, support for the US-led TMD initiative with Japan began showing signs of slowing. On 6 June 1997, the *Nikkei Shimbun* reported, "... the Japanese government [had] decided on 2 June to postpone its decision on whether to participate in the US-led TMD initiative," but "... Japan [would] continue studying the ballistic missile defense initiative in cooperation with the US."²³ The *Asahi Shimbun* reported, "... the Japanese government [had] told the new US Defense Secretary, William S. Cohen, last April that another three years may be needed before Japan can make a final decision on participation in the TMD initiative."²⁴ To date, Japanese officials have generally been hesitant regarding TMD. However, a North Korean missile test conducted in August 1998 sparked new interest, and Japan and the United States agreed to begin a joint developmental TMD program in 1999.²⁶ Taiwan continues to welcome the idea and actively support development and deployment of TMD systems. To date, two indigenously developed TMD-capable systems have been deployed, the Tien Kung-1 and Tien Kung-2. These systems "... are touted by Taiwan defense officials as equivalent to the US Patriot air-defense missile."²⁵

While there has been some hesitation on the part of Japan and Taiwan to fully endorse TMD, it is South Korea that has proven to be the hardest sell. At some point in the post-Cold War while South Korea was pondering ways to meet the growing threat posed by North Korea, ROK officials were approached by Russia's state-run weapons export company. Russia was offering "... to sell up to six units of the Russian-built S-300 air defense missile system, including radars, launchers, command and control facilities, missiles, technical support, and associated technology, for a nominal, yet undisclosed price."²⁷ In addition to its obvious military utility, the sale (estimated at \$400M) would also serve as a way for Russia to chip away at an outstanding debt it still owed South Korea, estimated in October 1996 to be \$1.47B." The purchase of South Korea's air defense system was "... posing a political and economic dilemma for officials in Seoul who [had to] choose between a tempting technology transfer and debt-reduction package from Moscow or the Patriot system supported by US political and military leaders."²⁸ By April 1997, the missile debate captured the headlines and dominated the political scene in South Korea. Despite statements from the ROK defense procurement sector acknowledging the importance of interoperability with US systems and the likelihood the Republic of Korea would not buy the Russian S-300s, public sentiment in South Korea appeared to favor the purchase of Russian systems.²⁹ The legitimacy of the long-held reign of the United States as chief weapons supplier to the Republic of Korea was being brought into question.

In its 8 March 1999 issue, *Defense News* reported that South Korean officials were finally "... turning thumbs down on [the] proposed Russian S-300 missile defense package," citing an "... inability to operate with US Patriots already deployed in Korea."³⁰ A headline article in the same issue, however, highlighted the fact that South Korea was still turning away from a TMD solution to deal with the North Korean missile threat. Instead of TMD, "... government and military officials [in Seoul] are seeking Washington's support for development and deployment of medium-range missiles capable of striking critical targets in North Korea."³¹ In essence, the ROK Government announced that it was rejecting a defensive stance in favor of an offensive deterrent capability. However, restrictions have

been in place, that limit South Korea's ability to pursue an offensive capability. These restrictions have been the subject of contentious talks between the Republic of Korea and the United States.

ROK Attempts at Indigenous Missile Development

At some point during the late 1970s, South Korea began to take steps to develop an indigenous missile manufacturing capability. It developed and deployed the Hyonmu surface-to-surface missile (SSM), which was based on a modified version of the US-made Nike Hercules.^{32,33} The Hyonmu had a range of 180 kilometers and a payload of 500 kilograms.³⁴ In 1979, the ROK military began work on an extended-range Hyonmu. The intent behind production of this version was to develop a range capability of 260 kilometers with a payload of 450 kilograms.^{35,36} ROK initiatives in this endeavor were unilateral, as the United States did not support the development effort.

Concerned that development of a missile with a 260-kilometer range could launch a destabilizing missile race on the Korean Peninsula, US officials worked with South Korean counterparts to negotiate an agreement that would basically restrict such production. By 1990, a bilateral agreement in the form of a memorandum of understanding (MOU) was signed between the United States and the Republic of Korea. It was based on a prior agreement reached in 1979 limiting ROK missile development.³⁷ Under the terms of the agreement, the Republic of Korea agreed to forgo plans to develop missiles beyond a range of 180 kilometers. In essence, this meant the Republic of Korea would scrap development of the extended-range Hyonmu. In exchange, the Republic of Korea received security assurances from the United States as well as "... continued support for South Korea's shorter-range missile program."³⁸ Prior to the 1990 agreement, in 1989, the US and ROK Governments signed an MOU for cooperative research and development in missile guidance technology in the development of short-range surface-to-air missiles (SAMs).

During the 1995 annual security talks held between the United States and the Republic of Korea, South Korean officials made a formal request to abolish conditions of the 1990 bilateral missile control agreement in favor of full membership in the Missile Technology Control Regime (MTCR).³⁹ The relevance of South Korea's interest in the MTCR requires some explanation.

The MTCR—created in 1987 by the G-7 governments of the United States, Britain, Canada, Japan, then West Germany, Italy, and France—is an informal, voluntary export control arrangement with guidelines prohibiting the sale or transfer of Category I and Category II technologies.^{40,41,42} Category I technology includes all finished missile and unmanned aerial vehicle systems (with the focus and intent to cover full up ballistic and cruise missile systems) that exceed the MTCR payload and range requirements of 500 kilograms (1,100 pounds) and 300 kilometers (186 miles), respectively. Category II items include materiel, components, machinery, and other technologies that could aid in the design, development, testing, and production of systems that could deliver nuclear, chemical, or biological weapons. Members pledge to adhere to the regime's export guidelines and restrict export of items contained in the regime's annex. The idea for the regime grew out of mutual fears by the G-7 governments that rogue states might acquire missiles or offensive missile technology for use as weapons of terror. Today, the regime has expanded to include 29 members. It operates by consensus, and members are required to incorporate the terms of the MTCR into their respective systems of national export control. The MTCR only intended restrictions to apply to exports of missiles and related technology. However, the 300-kilometer, 500-kilogram restriction on indigenous development has become "... a quid pro quo for US support of any new member of the regime."⁴³

It is noteworthy that while all nations are encouraged to abide by MTCR terms, not all states have been invited to become formal

members. There have been attempts by a number of nonmember states to join the regime. Some nonmembers have gone so far as to make public and legislative commitments to adhere unilaterally to the guidelines and annex of the MTCR. Among these countries is South Korea. Ironically, South Korea's intention to join the regime has not been met with enthusiasm. The reason for this is South Korea has indicated it would use MTCR membership "... as a basis to withdraw from an agreement with the United States that prevents Seoul from developing missile systems with ranges in excess of 180 kilometers."⁴⁴

Membership in the MTCR would permit South Korea to develop missiles capable of carrying a 500-kilogram payload up to a range of 300 kilometers, as opposed to the 1990 US-ROK agreement that limits indigenously produced missiles to a range of 180 kilometers.⁴⁵ A consensus to allow South Korean membership in the regime was not reached. Negotiations have continued intermittently since late 1995; however, no firm agreement has been reached to grant South Korea full membership in the MTCR.

In addition to attempts at developing or acquiring SSMs and related technologies, the Republic of Korea has taken steps to acquire and develop short-range SAMs. The Stockholm International Peace Research Institute lists a Republic of Korea order of 67 French-made Crotale SAMs for 1989.⁴⁶ By early 1990, South Korea was developing a variant of the French Crotale.⁴⁷ The project to modify the Crotale was carried out jointly by South Korea's Goldstar Precision Instruments (missile development), Daewoo Heavy Industries (systems integration), and Samsung (fire control and acquisition radar) with technical assistance from the French contractor Thomson-CSF. On 27 October 1997, South Korea officially announced that it had successfully test-fired its first locally designed, short-range SAM, the Chonma (Pegasus). In the official announcement, officials disclosed that 12 domestic firms and 1 foreign firm were involved in the production of the Chonma but did not name any of the companies.⁴⁸

On 20 October 1997, the ROK Defense Ministry announced that it would purchase 1,000 French-made Mistrals over US Stingers and British Starburst missiles "... in a \$300M project to procure portable surface-to-air missiles."⁴⁹ The announcement came 1 week before South Korea test-fired its indigenously produced Chonma, based on the French-made Crotale design. This gave the Republic of Korea its first indigenous SAM capability against the growing ballistic missile threat from North Korea.

The Reasons for South Korea's Reluctance to Join the TMD Initiative

Recalling the requisites for US armaments cooperation activity—solid political and economic ties with the United States, similar military requirements, and a reasonable defense technology base—South Korea would appear to be the perfect TMD partner. To begin with, the ROK Government has maintained solid political and economic ties with the United States throughout the years. In 1987, South Korea had a \$9.5B trade surplus with the United States.⁵⁰ In 1988, South Korea's annual trade topped the \$100B mark, "... making it the world's tenth largest trading nation."⁵¹ Militarily, US and ROK forces have stood united against a common enemy for the better part of the 20th century. Today, 37,000 US troops remain in South Korea. Finally, in terms of an acceptable defense technology base, South Korea is by no means a lightweight. In the 1990s, the Republic of Korea was producing "... M-16 rifles, M-60 machine guns, F-16 fighters, UH-60 Black Hawk helicopters, and AN-PRC radio sets [via] license production arrangements."⁵² Despite a relationship apparently well suited for TMD cooperation, South Korea has cold-shouldered the idea.

Put simply, the Republic of Korea has rebuffed the notion of signing up to US-led TMD. From as early as 1994, the South Korean Government has systematically sidestepped urgings and invitations from the highest levels of the US Government to join the initiative. The reasons that have brought about ROK reluctance to become involved in TMD appear to be partly political as well as military. Commercial and economic considerations may also play a part.

Politically, the Republic of Korea has made great strides over the years in attaining greater levels of democratization. As a result, public sentiment and pressure from opposition groups are important elements in ROK politics. When South Korean Defense Minister Rhee Byoung-tae stated the Republic of Korea had no plans to purchase Patriots from the United States back in 1994, he was dispelling charges from ROK political opposition leaders that a Patriot deployment to South Korea being considered by the United States at the time was part of a "... long-term scheme to sell them to South Korea."⁵³ This stance was again manifested when the Republic of Korea began seriously considering the Russian S-300 missile-defense system. It remains a question as to whether the ROK Government ever seriously entertained the idea of introducing a non-interoperable [with US forces and equipment] Russian weapon system or if they were symbolically using the issue as a way to assert its national autonomy. The Republic of Korea may also have been looking at the deal as a way to obtain new and sophisticated technology that would help to someday indigenously develop its own air defense system.

The decision by the Republic of Korea to choose French-made SAMs over US-made Stingers was also a bold statement of buyer autonomy. When viewed against the backdrop of the ROK's indigenous Chonma development, it appears the French were probably willing to provide a tempting offset package involving enhanced transfers of technology. This would help the ROK quest for the technology needed to buttress a fledgling indigenous air defense industry.

Militarily, the Republic of Korea appears to have a fundamentally different strategy with regard to North Korea's missile threat. The Republic of Korea has indicated it prefers to employ an offensive capability in order to deter the northern threat. To achieve this capability, the Republic of Korea has expressed its desire to advance production of the Hyonmu SSM. Thus, the Republic of Korea has been attempting (at least since 1990) to work around a 1979 bilateral agreement it had entered into with the United States that restricted development of indigenous missile production to those with a range up to only 180 kilometers. The ROK's approach has been to gain entry into the MTCR. As a member of the MTCR, the Republic of Korea would be able to develop missiles with a range of 300 kilometers.

The ROK's reasons for wanting to develop an indigenous missile production capability are not confined to defense-related matters. From a commercial standpoint, the Republic of Korea has been open in stating its future goal of developing a space program. The ROK views acceptance into the MTCR and the consequent freedom to develop advanced ballistic technology as a vital step toward future development of commercial rockets for the purpose of launching satellites.⁵⁴

The ROK's unwillingness to go along with the TMD armaments cooperation plan, a well thought-out initiative endorsed by US political and defense department leaders at the highest levels, is somewhat disconcerting. However, viewed from a South Korean perspective, it is also possible that the Republic of Korea may have national plans that no longer mesh perfectly with the bilateral framework that evolved over the years during the Cold War. While the bilateral mechanisms developed during the Cold War on the

Korean Peninsula are still in place, the respective goals pursued by the United States and the Republic of Korea may no longer fit the Cold War scheme. It is possible that the post-Cold War era has brought with it a perceived opportunity for South Korea to think beyond the US-ROK relationship and begin planning for its future role in Northeast Asia.

Notes

1. John McCain, "Ready Tomorrow: Defending American Interests in the 21st Century," March 1996. [Online] Available: <http://www.senate.gov/~mccain/jsmforce.htm> [11 April 1999].
2. Paul L. Hartman and Craig M. Brandt, "International Armaments Cooperation: Can it fulfill its promises?" *Air Force Journal of Logistics*, 22: 11-15, 42, No. 3, Fall 1998, 11.
3. *International Armaments Cooperation Handbook*, Office of the Deputy Under Secretary of Defense, International and Commercial Programs, June 1996, 1-5. [Online] Available: <http://www.acq.osd.mil/icp/handbk.pdf> [11 April 1999].
4. "Ballistic Missile Defenses," 1997 Annual Defense Report, Chap. 21. [Online] Available: <http://www.dtic.mil/execsec/adr97/chap21.html> [11 April 1999].
5. *International Armaments Cooperation Handbook*, 2-1.
6. Speech, Paul G. Kaminski, Under Secretary of Defense for Acquisition and Technology, "Cooperating in a Competitive Environment," before the Center for Strategic and International Studies Inaugural Conference on From Shadows to Substance: Defining an Action Plan for Transatlantic Defense Cooperation, 27 February 1995. [Online] Available: http://www.acq.osd.mil/ousda/speech/competitive_env.html [11 April 1999].
7. Hartman, 12.
8. Speech, Paul J. Hooper, Deputy Under Secretary of Defense for International and Commercial Programs, "International Armaments Cooperation for the New Millennium," before the Defense Industry Consultative Committee Meeting Dinner. [Online] Available: http://www.acq.osd.mil/icp/speeches/dicc_speech.htm
9. Remarks, Jacques S. Gansler, Under Secretary of Defense for Acquisition and Technology, "Acquisition Reform: A Model for International Armaments Cooperation," before the US Department of Defense and Korea Institute for Defense Analysis, Seoul, 20 July 1998. [Online] Available: http://www.acq.osd.mil/ousda/speech/korea_ida.html [11 April 1999].
10. Fact Sheet, "History of the Ballistics Missile Defense Organization," External Affairs, Ballistic Missile Defense Organization, Washington DC, March 1998.
11. "Joint Theater Missile Defense Program Efforts," Excerpt from Theater Missile Defense Programs. [Online] Available: <http://www.acq.osd.mil/bmdo/bmdolink/html/talon.html> [16 June 1998].
12. "Missile Defenses," Annual Report to the President and the Congress, 1998, Chap. 6. [Online] Available: http://www.fas.org/man/docs/adr_99/chap6.html [16 June 1998].
13. "Missile Defenses."
14. Barbara Amouyal, "U.S. Urges South Korea to Purchase Own Patriot Missiles," *Defense News*, 31 January 1994. [Online] Available: <http://www.defensenews.com/defensenews/dmembers/darch/darch94/dn0131do.htm> [16 June 1998].
15. *Ibid.*
16. Terrence Kiernan, "South Korea Has No Plans to Buy Patriot," *Defense News*, 28 February 1994. [Online] Available: <http://www.defensenews.com/defensenews/dmembers/darch/darch94/dn0228ju.htm> [16 June 1998].
17. R. Jeffrey Smith and Ann Devroy, "Clinton Orders Patriot Missiles to South Korea," *The Washington Post*, 22 March 1994, sec. A:01. [Online] Available: http://newslibrary.krmediastream.com/cgi-bin/d.../wp_auth?DBLIST=WP94&DOCNUM=2607 [16 June 1998].
18. "First Batch of US Patriots Arrives in South Korea," *Arms Transfers News*, 22 April 1994. [Online] Available: <http://csf.colorado.edu/dfax/atn/atn9406.htm#T-0018> [9 August 1998].
19. Naoki Usui, "US and Japan Near Satellite Data Accord," *Defense News*, 23 January 1995. [Online] Available: <http://www.defensenews.com/defensenews/dmembers/darch/darch95/dn0123on.htm> [16 June 1998].

(Continued on page 42)



Logistics and Airpower—A Failure in Doctrine?

Air Commodore Peter Dye, RAF

To an external observer, it must seem axiomatic that the delivery of airpower is entirely dependent on adequate logistics and infrastructure arrangements derived from and, in turn, sustained by the nation's technological and industrial base. In this regard, the individual weapons platform (and its crew) embodies the collective investment of both industry and the Services over a considerable period of time. As and when the first Eurofighter engages in combat, it will do so on the back of not only the single most expensive procurement programme in the history of the United Kingdom (UK) but also a comprehensive support and training programme across the aircraft's entire operational life that represents an equally large national investment.¹ The scale of this undertaking, as well as the evident difficulty in divorcing the air weapons from such complex support arrangements, is as much a defining characteristic of airpower as are *height, speed, reach, ubiquity, flexibility, responsiveness, and concentration*.

This all-embracing view of what comprises airpower is by no means novel. Many years ago, Sir John Slessor wrote that airpower "... is a compound of air forces and all those things on which air forces directly or indirectly depend, such as a flourishing industry and Civil Aviation, a good meteorological service, secure fuel supplies and so on."² The Royal Air Force (RAF) doctrinal document AP 3000, in addressing the same question, consciously rejects the wider perspective in favour of what it terms a *purely military concept of airpower*.³ When one reads on, it becomes clear this is not so much a more cautious appreciation as it is a narrow definition that focuses almost exclusively on the nature of air vehicles. This seems a debatable strategy, even given the seminal role of the manned aircraft in the creation of the RAF. It is the equivalent of the army describing its doctrine in terms of the tank or the navy, the surface ship.

The blurring of the distinction between aircraft and airpower permeates the remainder of AP 3000 but is particularly noticeable in the debate about airpower's relative strengths and weaknesses. AP 3000 explains that the characteristics of airpower can be divided into primary strengths (*height, reach, and speed*), secondary strengths (*flexibility, ubiquity, responsiveness, and concentration*), limitations (*impermanence, payload, and fragility*), and other considerations (such as cost and dependence on bases). According to Sir John Slessor, the simplest definition of airpower is "... the use of the air to enforce the national will." Even if we substitute AP 3000's more pedantic description "... the ability to use platforms operating in or passing through the air for military purposes ..." it is difficult to understand how *height, reach, and speed* are contributory characteristics. They are, in fact, terms that help describe the lack of friction potentially available when operating

in the air compared to the sea or land. In themselves, they do not and cannot define airpower and, equally, should not be thought of as strengths or, indeed, weaknesses. *Fragility and impermanence* may be regarded as the other side of the coin in that there is a reciprocal relationship between friction and fragility. To exploit the air, we need to develop and support, often at great distances, a level of technology significantly greater than that needed to operate at sea or on land in an environment that is intrinsically more hostile. Crudely put, reduced friction has been gained at the price of greater fragility. In fact, this is a truism across the entire operating spectrum of land, sea, air, and indeed, space.

The secondary strengths of *flexibility, ubiquity, responsiveness, and concentration* are in reality enablers—good practices for air forces in the delivery of airpower. This was certainly how Sir John Slessor saw them, sensibly adding mobility for good measure.⁴ As far as the limitations are concerned and putting *fragility* to one side, it is possible to argue that *impermanence* is as much a strength as a weakness seeking discrete and proportionate military action. This is why airpower is used so often as the weapon of choice by the United Nations and the North Atlantic Treaty Organization to achieve their policing and coercive aims. As to other considerations, the limitations represented by cost or *dependency* on bases seems to be about as relevant to the debate as recording the tank's vulnerability to attack helicopters in a discussion on the nature of land doctrine or stressing the high cost of nuclear submarines when examining maritime power.

In sum, AP 3000 takes an extremely narrow and confused approach to the question of what airpower is, while at times, the argument can appear defensive and self-serving. In the process, the opportunity is lost to focus on the enablers that permit air forces to deliver airpower. The result is a distorted emphasis on the weapon rather than the environment with little attention to the wider constituent components, particularly logistics. Why this has come about is not particularly important, although it could be that it derives partly from a belief the manned aircraft is in itself the embodiment of airpower (rather than the final link in a complex chain of processes) and partly from a historic aversion to any suggestion that the support area has a warfighting role. What is important, however, is the fact that warfighters have inflicted on themselves a definition of airpower that is largely divorced from reality.

So what is reality? The truth is that air forces, by their very nature, consume vast resources. It was Britain's wealth, industrial capacity, and technological development that enabled airpower to be exercised so effectively on the battlefield of the First World War. Without a ready supply of aircraft and trained aircrews and the infrastructure to support both, the RAF would have been stillborn. A vast and complex organisation was created at home and overseas to allow the air war to be prosecuted, in effect, linking industry to the front line. This was not a simple one-way pipeline but a series of complex, interrelated processes encompassing repair, overhaul, modification,

testing, development, and training that saw materiel and manpower move continuously between the home base and the front line in response to technological advances and operational circumstances.

This picture of immense national collective effort, harnessed by the purpose of delivering airpower, is as true today as it was in 1918. If one looks simply at the human resources required to support aircraft in the field over the last 80 years, a familiar pattern emerges. The RAF deployed 54,000 people to France in 1918 and more than 87,000 to support the 2d Tactical Air Force in France and Belgium in 1944. The following graphs indicate how these operations compared with the Gulf War (including the US Air Force).

Interestingly, the number of direct maintenance personnel appears to have remained much the same, at about 10 to 20 per airframe. The higher support total in 1944 reflects the large numbers involved in airfield construction and the demands of a highly mobile campaign. Even allowing for errors of interpretation and the differing scale of individual campaigns, it is clear that airpower is and always has been a maintenance intensive business.

This is equally true of supply. The RAF not only was the world's largest air force in 1918 but also possessed the largest range of stores ever managed by a single organisation. The total number of different items held in stock was in the region of 100,000. Simply organising the purchase and handling of this stock, in the vast quantities required to support the front line, was an achievement in itself.⁵ In the intervening years, the challenge has become even greater as aircraft have inexorably grown in complexity. By 1945, the RAF was struggling with more than 800,000 separate line items, and at the time of the Gulf War, it was probably well over 1 million. Provisioning and storing this immense range of spares would be difficult enough without a high rate of modification action (even before the Tornado entered squadron service, more than 5,000 modifications had been approved, and the total is now probably closer to 15,000) and the overriding concern for airworthiness. In short, it is a task very different in scale and intensity to the management of the 25,000 different food items found in the average supermarket,⁶ and incidentally, the 410,000

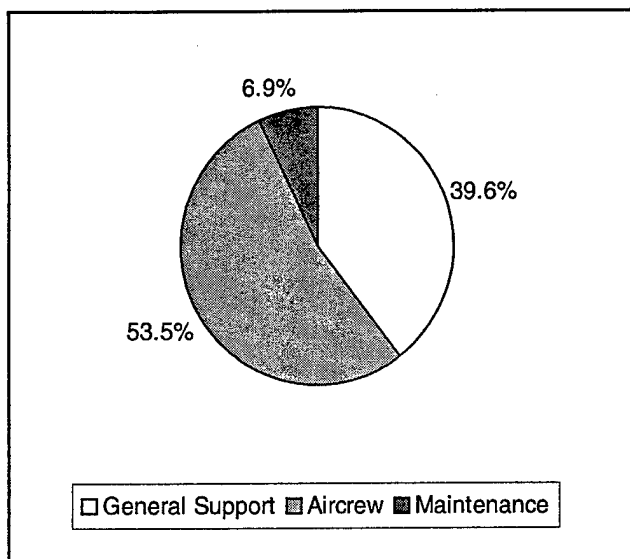


Figure 1. RAF—France 1918

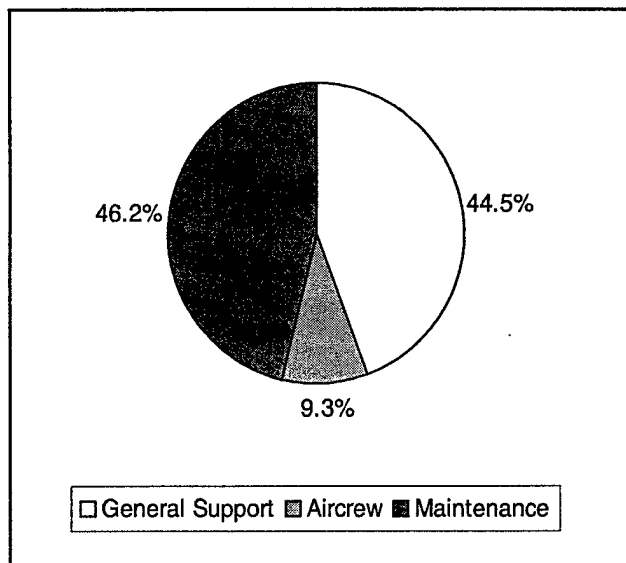


Figure 2. RAF—France 1944

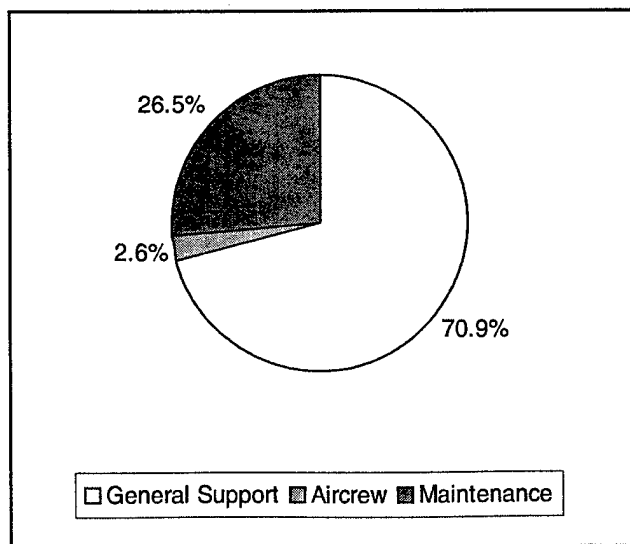


Figure 3. RAF—Gulf 1991

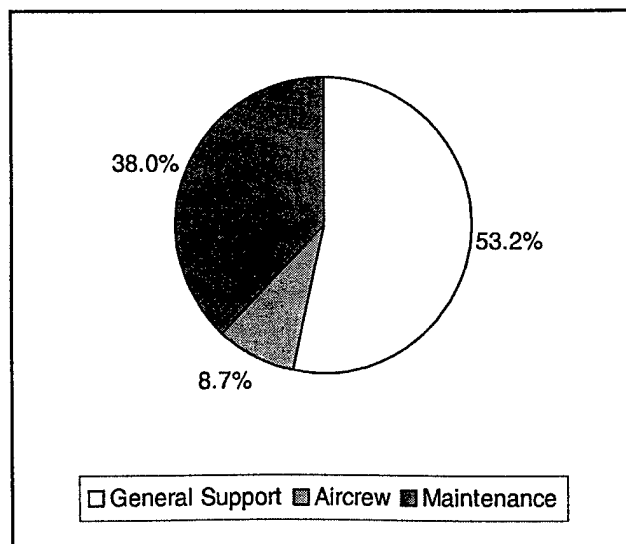


Figure 4. USAF—1991

separate items held by Boeing to support the world's largest commercial aircraft fleet.⁷

Evidence for the broader interpretation of what constitutes airpower can be found by turning the question around and looking at the composition of an air force's center of gravity. Colonel John Warden, USAF, writing in 1988, argued that the enemy's vulnerability lies in the equipment chain, from manufacturing to employment, and other similarly interdependent systems such as fuel or pilot training. He noted that logistics (in this context, supply) might well constitute the real centre of gravity but also added that other targets (or enablers)—such as airfields, personnel, and command and control—might be suitable for attacks aimed at destroying an enemy's airpower.⁸ This echoes Sir Basil Liddell Hart's assessment in 1934, when he noted that the large ground organisation of a modern air force was its Achilles' heel.⁹ Interestingly, this was written before rearmament saw RAF expenditures reach some 35 to 36 percent of total defence spending (much of it on infrastructure) and an expansion programme that demanded the lion's share of the available manpower. By 1942, 750,000 personnel were allocated to the RAF and the Ministry of Aircraft Production alone, as great as the navy, the shipbuilding industry, the army, and the Ministry of Supply put together.¹⁰

A central characteristic of airpower—a thread that has run through the RAF's entire existence—is the provision of a sophisticated and comprehensive logistics system. This is not to suggest that repair and overhaul are somehow more important than any other activity undertaken by air forces. The fundamental point is that we should see airpower as the sum of a series of complex processes stretching over time and across organisations, including flying training stations, repair depots, and industry. In its current form AP 3000 fails to provide this understanding and, in so doing, presents a flawed picture of airpower.

Why should this be a cause for concern? First, by focusing on the weapon system, we deny ourselves a balanced view of what comprises airpower. When difficult resourcing decisions have to be made, people are inclined temperamentally to favour platform numbers at the expense of enablers, such as combat support, training, and logistics. If the latter is not recognised as proper constituents of airpower, the continuity of experience that provides valuable lessons for support requirements cannot be exploited. Appearing to argue that fixed bases and complex logistics support arrangements weaken airpower is confusing and creates the impression the logistics tail is something to be embarrassed about. The idea has been fostered, at least in the minds of external observers, that logistics and airpower are separate entities somehow enmeshed by inefficiency and outdated ways of doing business. As a result, there seems to have been a wider willingness to embrace efficiencies in the support area in the belief the risk is self-contained. That this is not the case has been amply demonstrated over recent years as the hollowing out of logistics has rapidly bitten in the form of falling front-line availability. The effective delivery of airpower is evidently not about teeth or tail; rather it depends upon how we managed the continuum that links the industrial base with the front line.

There is further danger, arising from this doctrinal confusion, in the softening of the distinction between operational and business logistics.¹¹ If the former can be separated from what comprises airpower, then it is a relatively easy step to conclude that the commercial world provides a template for how we should organise our support arrangements. This has particular implications for our ability to maintain the capacity for surge. Once resilience is perceived purely in terms of the overhead involved (because logistics processes are not an integral part of how we deliver airpower), it will inevitably fall victim to the pressure to cut costs.

Not surprisingly, business has little experience of reverse logistics (the flow of materiel back to depots for repair, modification, and reissue) and even less of attrition. All the evidence to date indicates that the

ability to cope with surge is equally questionable, witness the well-publicised problems confronting Boeing. Having adopted a streamlined production process, optimised on the principle of *just in time*, the company discovered that it faced immense difficulties in attempting to double its commercial production rate to meet an unplanned and sudden increase in demand.¹² It was only by halting the production line and, incidentally, recording its first loss in 50 years that the situation was recovered. Not all the contributory problems were production related, but material and parts shortages played a significant role in exacerbating the situation. As one senior executive put it, "... we did not have the resiliency to absorb a series of things that happened to us, none of which was individually big." A similar but less well-known incident occurred when a 29,000-ton forging press producing aero engine components in Houston broke down. This single failure threatened to disrupt not only engine production at three separate manufacturers but also final assembly at Boeing and Airbus. Offloading work to competing companies was complicated because of dies and proprietary processes. Self-evidently, optimisation of the supply chain not only reduces the ability to respond to short notice requirements but also creates a greater vulnerability to *shock*. It is these very dangers that a military logistics system should be designed to counter.

Turning for a moment to a specific issue, it is fair to say the present ambivalence regarding the place of logistics in delivering airpower has made the argument for the retention of third line (depot-level) maintenance facilities more complicated than it should have been. With a clear commitment in doctrine to the principle of managing the logistics chain as an entity—from industry through the depots and on to the front line—there is a risk in seeing what should be a holistic process reduced to a collection of suboptimised and ill-focused activities. Aside from the obvious damage this would inflict on an organisation built around the efficacy of its logistics system, such an outcome would also deny the opportunity to develop the many potential synergies that exist across the support chain. All the evidence indicates there is considerable scope for innovative partnership arrangements between air forces and industry—*smart support* for want of a better phrase—once the role of in-house facilities and the wider place of logistics in airpower doctrine has been clarified.¹³

If technology lies at the heart of war, then the support chain lies at the heart of an air force. The processes and interdependencies that comprise this continuum can only be managed effectively in a holistic manner. Indeed, the Integrated Logistics Support concept, pioneered by the USAF and RAF, is based on this very principle. However, we need to move beyond optimising logistics support to developing a strategy that embraces the entire process, from industry to the flying squadrons, seeking to develop synergies and reduce vulnerabilities. To do this successfully will require the development of appropriate mechanisms and suitable metrics—the latter focusing on not only readiness and availability but also sustainability and resilience. Finally, we must examine how our airpower doctrine relates to the other Services and environmental doctrines and, in the case of logistics, with the integrated approach implicit in the decision to form the CDL organisation.

None of this is to argue that the RAF's logistics system can avoid change or that there is no scope for improvement. Business practices do have a place in the defence environment. The budgetary pressures that demand more effective ways of supporting the front

(Continued on page 43)

INSIDE LOGISTICS

EXPLORING THE HEART OF LOGISTICS

Collocating Air Force Weapon Systems Inventory with the Defense Logistics Agency Premium Service Facility

Major Monte J. Murphy, USAF

With declining defense budgets and the inherent responsibility as stewards of taxpayer dollars, the Services must continue to search for more efficient processes while ensuring the mission can be accomplished. As a result of the Reagan military buildup and subsequent military drawdown, the Services have been tasked to *right size* based on new force structure and inventories. In 1990, Defense Management Report Decision 987 directed the Services to set specific inventory reduction goals.¹ The Air Force was tasked to reduce its inventory level by \$21B over 12 fiscal years.² One way the Air Force has chosen to reduce costs but maintain warfighting capabilities in the logistics arena is by transitioning from a supply or inventory-based system to a transportation-based system. This article explores the possibility of improving the average order and ship time (O&ST) of Air Force-managed secondary items (spares) through the concept of collocating them with commercial carrier transportation hubs such as Federal Express (FedEx) in Memphis, Tennessee. Though quantification is not yet a science in Air Force materiel management, the Air Force spares value has been estimated in the range of \$40M to \$60M per day of inventory. With inventory values of this nature, collocating assets with commercial express carrier hubs may present an opportunity for significant savings.

Air Force weapon system secondary item (spares) inventory requirements are computed by Air Force Materiel Command (AFMC) item managers (IMs). These assets are designated in the wholesale system through the use of budget codes. Budget code 8 delineates secondary items for replenishment, while budget code 15 is for procurement of initial spares for a weapon system. These repairable assets make up more than 90 percent of the Air Force inventory value.³ Among many other factors, they utilize mean time between failure, condemnation, and average O&ST rates. These computations determine the quantity of spares necessary to support a weapon system at predetermined and fiscally palatable in-commission rates. Obligation authority to purchase spares inventory is granted in the budget cycle by Congress to AFMC through the Supply Management Activity Group (SMAG) of the Air Force Working Capital Fund (revolving fund). Customers buy parts from this revolving fund (SMAG) with directly appropriated operations and maintenance (O&M) funds. These funds replenish the SMAG giving it the capability of paying for repairs or replacing the unserviceable/condemned item when necessary. The cost of the item to the customer is determined in part by storage/shipping charges as well as the cost of maintaining the inventory.

If the transportation leg of O&ST could be reduced beyond current levels, the computation model should, in turn, reduce spares

requirements, lower overall weapon systems support costs, and free O&M funds for other Air Force needs. The Secretary of Defense's Strategic Logistics Plan outlines goals to dramatically reduce cycle times.⁴ Reducing O&ST is in direct support of meeting this goal.

The Air Force has recognized the need to reduce O&ST for several years and has taken dramatic steps to this end. For instance, the Air Force Deputy Chief of Staff for Installations and Logistics and his Logistics Board of Advisors made the conscious decision in 1996 to require all shippers to use commercial express carriers to move spares from the warehouse to customers and from customers to the repair depots.⁵ As a result of this decision and subsequent policy implementation, the Air Force realized nearly \$800M in inventory cost avoidance over a 3-year period.⁶ These savings took into account an inventory buy reduction as well as an approximate \$25M annual increase in transportation costs to support express carrier use. This is accomplished by reducing the transportation leg of the overarching O&ST and is possible through significant improvements in commercial carrier capabilities and reduction in transportation costs. For instance, some commercial carriers such as Federal Express boast a 98 percent plus on-time delivery rate while keeping customer costs relatively low.⁷ Another benefit of using the commercial express carrier is a guaranteed on-time delivery. In the event of a service failure (less than 2 percent), under the terms of the General Services Administration (GSA) contract with FedEx, the customer is refunded charges associated with the shipment.⁸

Warehousing Processes

Currently, most Air Force-managed assets are warehoused at either Defense Logistics Agency (DLA) warehouses or at individual Air Force bases. The following will examine the fundamentals of the wholesale (DLA) and retail (base) warehousing processes.

Defense Logistics Agency

The DLA is responsible for receiving, warehousing, and shipping of Air Force managed or repaired assets transiting each of the Air Force-owned air logistics centers (ALCs). The ALCs use SMAG funds to pay DLA for receiving, warehousing, and shipping services heretofore referred to as *line charges*.

Following the typical asset through the supply pipeline begins with procurement from the vendor. Once the item manager determines buy requirements and funding availability, the order is placed with the vendor. The vendor may be directed to ship assets directly to the consumer (base) or DLA warehouses at the ALCs. When receiving a shipment, DLA warehouses the item and charges a predetermined discrete cost per item (line charge) determined by its physical characteristics. For instance, DLA discriminates between medium bulk receipts and heavy/heavy bulk or hazardous material receipts.⁹ These line charges are not assessed for each item received but for each shipment. To elaborate, if a vendor ships ten items in a single shipment with the same national stock number in a carton with

the unit of issue designated by the Air Force as each, DLA would assess a single line charge based on the bulk or hazardous characteristic of the asset. If, however, the same vendor shipped the same assets in ten separate boxes as ten distinct shipments, the Air Force would be charged for ten receipts. In addition to receipted shipments, DLA charges the Air Force in the same manner based on the same principles for issues or shipments.

An additional charge is assessed when DLA issues or ships an item. On- and off-base issues are discriminated between in line charge determination.¹⁰ For unserviceable spares (returned from the consumer vice the vendor) or assets requiring modification, the IM will direct DLA through the AFMC wholesale system to issue the asset to an on-base repair facility. Since there is no commercial transportation required, the line charge for this issue is substantially lower than an off-base issue. DLA's management information system recognizes and adjusts billing based on the different types of issues.

Once the item is repaired, the Air Force depot repair facility requests DLA rewarehouse the item again, and an additional receipt charge is assessed. Finally, once a retail customer places a demand on the wholesale system, the item is either released automatically or flagged for item manager review and then released based on requisition priority. Depending on the point in the duty day the requisition enters the system and the priority of the requisition, the *electrons could be batched* for release later in the day or the next duty day. This presents a problem when trying to reduce O&ST and frequently results in at least one additional O&ST day when compared with the DLA Premium Service option.

Line charges are standardized for all DLA distribution depots regardless of consignment destination or origin. All line charges are assessed through the SMAG to the retail customer in the ultimate *selling price* of the asset. A memorandum of understanding between the Air Force and DLA requires DLA use commercial express carriers for transportation of most weapon systems spares. Excluded from this requirement are those consigned to hard-to-service countries/locations (for example, Turkey or Diego Garcia) where customs or austere commercial service presents problems.¹¹

Air Force Retail Accounts

From a retail perspective, most base supply warehouses are managed as a base operating support (BOS) function. Under this structure, all overhead costs associated with receiving and warehousing budget code 8 and 15 assets are borne by BOS and funded directly with O&M dollars. When an asset arrives from DLA or another base in the case of a lateral shipment, base supply receives, stores, or issues it to the customer (maintenance) with no charge assessed for overhead. The customer does, however, pay the price set in the SMAG, including the line charges assessed by DLA. Once it becomes unserviceable through weapon system use, the customer returns it to supply for carcass value credit, and it is immediately released from supply to the traffic management office (TMO) for shipment. The TMO ensures proper packaging and ships the asset to the ALC (or contract repair facility) using SMAG funds and commercial express carriers.¹² This shipment cost is also considered when determining the retail (SMAG) price of the item.

Federal Express Premium Service

Federal Express operates a worldwide warehousing and distribution system focusing on time-definite delivery of small- to medium-sized packages. While most of their business involves packages weighing less than 150 pounds, they are capable of moving much heavier packages. Most packages transiting through the continental United States (CONUS) are sorted through the FedEx hub near Memphis, Tennessee. DLA and GSA recognize the high quality and value of the

FedEx operation and have modified business practices to incorporate their services.

As a result of the National Performance Review, DLA took action to establish a reinvention lab to look at the possibility of outsourcing receiving, warehousing, and shipping to third-party logistics providers. The culmination of this initiative was the creation of the Premium Service facility whereby DLA partnered with FedEx in Memphis to provide these services to Department of Defense (DoD) customers.¹³ Currently, this facility is managing more than 5,000 specific national stock numbers (NSNs) for the DoD in a 120,000-square-foot facility adjacent to the FedEx hub.¹⁴ DLA lauds the program as the "... fastest, most reliable and customer-oriented distribution channel in the Department of Defense, offering time-definite transportation service for critical, mission essential items."¹⁵ One of the major benefits of the program is the ability for a customer to place an order as late as midnight and have the asset delivered to its door in the CONUS by 10:30 a.m. the next morning. According to DLA, "... for West Coast customers, the additional times to place orders for parts or equipment is like having an additional day's worth of inventory."¹⁶ As of June 1998, Premium Service had supported more than 120,000 requisitions with an inventory accuracy rate reported at 99.99 percent and on-time delivery rate of 99.2 percent.¹⁷ These results translate into satisfied customers and a potential for further inventory reductions and savings. As a Premium Service customer, a Naval Inventory Control Point study concluded the CONUS O&ST over a 3-month sampling period averaged a mere 17 hours with a worldwide 98.48 percent on-time delivery.¹⁸

The customer order process does not change when using Premium Service. For Air Force weapon systems inventory, the retail customer places a Military Standard Transportation and Issue Procedures requisition into the Standard Base Supply System. This requisition passes to the wholesale system for IM determination of asset availability and release. The determination can be automated or manual depending on the criticality and worldwide availability or shortage of an asset. Once the IM has released an asset for shipment in the wholesale system, the release is passed electronically to the Premium Service Facility. A requisition entering the wholesale system during nonduty hours could potentially be en route or delivered before it normally would have been received for order filling under the current whole distribution system. This once again equates to potential inventory savings when factoring O&ST in the IM computation model.

As a result of the logistics lessons learned in Operations Desert Shield and Desert Storm, the DoD mandated that the Services and DoD agencies improve in-transit visibility of assets. Customers should have the access and ability to determine, at any given point in time after a requisition is generated, the status of their requisition in the supply pipeline. Premium Service, through the Defense Automatic Addressing System Center, provides a daily status to the Air Force Advance Tracking and Control and Global Transportation Network.¹⁹ In addition, as with any FedEx shipment, if the customer knows the FedEx tracking number, its location can be determined through the use of the FedEx worldwide web-tracking site by calling a toll free number in the CONUS.

Another potential benefit Premium Service affords is the ability to determine when stockage is low and request replenishment. This is accomplished through coordination with the IMs at service inventory control points that set minimum reorder levels. Once the level is reached, the IM is contacted and a request made to replenish the stock.²⁰ In an efficiently operating wholesale system, the IM should be able to predict an approximate replenishment requirement date and set procurement and depot maintenance lead times to backfill stock levels without Premium Service notification.

It is important to note DLA's Premium Service contract with FedEx requires a minimum 99 percent inventory accuracy level. For an additional charge, customers can request FedEx conduct wall-to-wall physical inventories as needed. With a documented actual 99.99 percent inventory accuracy rate, this added expense appears unnecessary.

Customs clearance in the past has been a problem for overseas customers using commercial express carriers. Working closely with the Air Force, FedEx has solved most of these issues. With the advent of a United States Transportation Command and Air Mobility Command initiative called Worldwide Express (WWX), customs issues are primarily the carrier's responsibility. WWX is a DoD mandatory use contract for packages moving to, from, or between overseas locations. Shipments moving under this contract have maximum weight and size limitations. Though certainly not the only carrier performing under this multiyear contract, FedEx was awarded the lion's share of the contract requirements. Under WWX, FedEx is the only commercial express carrier supporting all four designated regions of the world: European, Pacific, Central, and Southern theaters. In fact, FedEx is the only WWX contract carrier with service into South America.²¹ FedEx's overwhelming participation in WWX and success in solving most customs issues enhances the concept of placing Air Force assets in the Premium Service facility.

As alluded to earlier, GSA solicited and awarded a CONUS small package contract to FedEx. This is also a mandatory use contract for all DoD shippers for shipments weighing less than 150 pounds; originating in the CONUS; meeting specific maximum size limits (length, width, and height dimensions); and with consignors in the CONUS, Alaska, Hawaii, and Puerto Rico. The Navy's experience with 17-hour average CONUS delivery performance from the Premium Service facility also lends credibility to increased Air Force usage.

Premium Service Funding

Each time an asset is received or shipped, DLA charges the customer. There is, however, a significant difference in the line charge for off-base issues or shipments. Premium Service charges a set price when receipting an asset. When a requisition flows into Premium Service and is shipped, DLA assesses a handling charge based on the size of the item (bin or medium bulk). Differing from the line charges assessed at the distribution depots, the Premium Service handling charge does not include transportation costs. In addition to this handling charge, actual transportation charges are assessed based on the destination and applicable GSA or WWX contract rates that are aggregated to the Service customer.

For the actual funds transfer to occur, Military Interdepartmental Purchase Requests (MIPR) are generated by the Services validating maximum funds availability for Premium Service and provided to DLA. DLA, in turn, will determine and assess charges against the MIPR.

Since DLA has negotiated a long-term contract with FedEx, the line charges are not as vulnerable to rate swings as those at the DLA distribution depots. For instance, the Comptroller, in the Office of the Secretary of Defense (OSD[C]), determines, in the Program Budget Decision cycle, rates DLA will assess for services rendered.²² These rates are fed to OSD(C) by DLA based on the previous year and projected profits and/or losses. OSD(C) adjusts or approves these rates, and the Services must then assimilate them with OSD(C)-determined increases in obligation authority. The end result is typically a price increase passed through to the Service customer and a potential reduction in available O&M funds for other uses. Premium Service provides stability to the process through long-term fixed rate contracts with FedEx coupled with long-term fixed rate contracts negotiated in the GSA and WWX contracts.

Inventory Considerations

When considering the use of the Premium Service facility, types of inventory must be explored. The Premium Service program manager does not recommend that the Services place all of their assets into the facility, but they should consider value, demand data, criticality, availability, and maturation in selection.²³

In the weapon system acquisition process, manufacturers may develop military weapon system-unique tooling and processes in order to produce a secondary item (spare). Once the production line is terminated, the cost to reactivate the line is cost prohibitive, and the production lead time is too long for acceptable weapon system support. To ensure long-term weapon systems support, the acquisition community will opt to procure a certain amount of these assets as insurance items. This means there will be little demand due to low anticipated failure rates, but unforeseeable circumstances might arise whereby one day the asset becomes critical to weapon system support. There is no additional cost to the Air Force to warehouse these assets beyond the initial DLA receipt line charge. Utilizing Premium Service could reduce the initial provision requirements and save procurement dollars by eliminating the need for outside the CONUS (OCONUS) inventory placement and centrally warehousing these insurance items.

Other potential candidates include very expensive spares regardless of demand history. For instance, by centrally locating avionics components, IMs could reduce wholesale inventory levels. Premium Service's ability to provide the component to the customer in 17 hours in the CONUS and 48 hours outside the CONUS could potentially reduce safety stock levels and obligation authority requirements in retail accounts. While some safety stock would still be required, with rapid, time-definite resupply, on-hand retail stock reduction should also have the collateral impact of decreasing the work load for inventory sections at retail base supply accounts. In some cases, IMs cannot afford to stock adequate levels of components due to the high asset cost. By leveraging Premium Service, the computation model should reduce the requirement and improve actual weapon system support.²⁴

Additional possibilities may include initial spares (budget code 15) for new weapon systems. Under the current acquisition process, spares requirements for new weapon systems are computed on anticipated mean time between failures, weapon systems use profiles, and condemnation rates. Secondary asset purchase is calculated and executed based on engineering projections vice actual rates. This procedure can drive incorrect procurement decisions resulting in over or under buying spares requirements. For example, the C-17 Globemaster III experienced lower than projected brake failures in the first few years of weapon system life. From this, one could extrapolate there were fewer than anticipated condemnations with excess assets purchased. If the initial provisioners had any doubts of the validity of the engineering estimates concerning mean time between failure, they could have used a time-definite resupply facility such as Premium Service to offset a reduced buy. Once the actual failure and condemnation rates were established, the IMs could reassess buy requirements. The potential dollar savings throughout the weapon system's life cycle in this scenario are obvious. Conversely, if a higher than anticipated usage of a secondary component at the beginning of a weapon systems life demanded a shorter pipeline due to underestimated buy requirements, Premium Service could offset the risk. A prime example of this scenario is the oil pan on the Pratt & Whitney 2000 series engine supporting the C-17. An engineering design flaw on a supporting strut caused premature cracks at the welded points and ultimate failure. This occurred at a crucial time during the beginning stages of the C-

17 airlift into Bosnia. With an extreme shortage of these oil pans, any reduction in the O&ST could have offset the potential reduced aircraft availability rates until additional pans could be procured.

The DLA Premium Service program manager also suggests viable candidates should include materiel purchased on a sole source basis or materiel that has a procurement lead-time where intensive distribution control would simplify procurement decisions.²⁵ Design unstable and configuration specific assets under strict engineering control might also benefit from the distribution service of the DLA/FedEx facility. By having quick access to provide a secondary item to an original manufacturer to reconfigure/modify for a design change, Premium Service could enhance asset availability and weapon systems support. Commercial off-the-shelf, nonstandard hardware and software that must be closely controlled for end item technical suitability should also be considered for placement in a Premium Service facility.

With the advent of an Expeditionary Aerospace Force concept, planners should give consideration to placing contingency stocks at this facility. The Air Force already configures Mobility Readiness Spares Packages at the retail level for quick deployment in the case of a contingency. Placement of this stock at a Premium Service facility would, however, reduce the convenience of the retail customer borrowing from these contingency kits when spares shortages exist in the noncontingency retail accounts. It is critical to note that in order for contingency stocks to be effectively distributed into a combat zone, the Air Force must have a functional Air Mobility Express and battlefield distribution operation in place.

Finally, a potential high-payoff opportunity exists to place high cost, periodically required test and support equipment at this location for quick, worldwide placement. Instead of each base or major command procuring this equipment for just-in-case or periodic use, central warehousing creates potential savings for the Air Force with little to no mission impact. There might also be an option to centrally fund procurement of these types of assets to enhance fiscal efficiency. Premium Service offers an additional benefit to the customer at no cost that might be beneficial to the Air Force with shared test equipment. By FedEx including a preprinted return airway bill, the customer (for example, precision measurement equipment laboratories and aircraft maintenance) can quickly return the asset to the storage warehouse without transiting the base supply or transportation functions. However, this would require central asset management similar to the current engine management process to ensure asset priority and accountability and may offset the fiscal benefits of such a program.

Cost Comparison

Placing wholesale assets at the Premium Service facility will certainly increase the cost of the transportation legs of the SMAG price but may be more than offset by inventory reductions. The following will provide a simple cost comparison of selected secondary components for CONUS customers using the GSA Small Package Contract pricing.²⁶

At the wholesale level, line charges are assessed upon asset receipt/storage or on/off-base issue. Assuming there is an Air Force preferred on-demand repair process vice batch processing, a single asset would be assessed four line charges during a typical depot maintenance cycle upon: (1) asset receipt from the retail account, (2) issue to the depot maintenance activity, (3) asset repair and rewarehousing, and finally, (4) asset shipment to an off-base customer. Ultimately, the Air Force is working toward a process whereby the item proceeds directly to the repair facility upon receipt from the retail account. This would eliminate one of the line charges but is not currently in place at maintenance depots Air Force-wide.

	Premium Service FY 99 Rates	DLA Distribution Depot FY 99 Rates
Receipt		
Bin	\$19.56	\$28.72
Medium bulk	\$19.56	\$40.11
Heavy Bulk/Hazardous	\$19.56	\$53.85
Issue		
Bin	\$10.61	\$16.07
Medium Bulk	\$10.61	\$32.64
Heavy Bulk/Hazardous	\$10.61	\$63.16
Transportation (Of Base)		
Bin	Actual Cost	\$.89
Medium Bulk	Actual Cost	\$10.52
Heavy Bulk/Hazardous	Actual Cost	\$18.55

Table 1. Rate Comparisons²⁷

Using fiscal year 1999 rates as outlined in Table 1, the typical 107-pound secondary asset charge by a DLA distribution depot would be as follows:

Medium bulk receipt	\$ 40.11
Medium bulk on-base issue	32.64
Medium bulk receipt	40.11
Medium bulk off-base issue	43.16
Total	\$156.02

Without changes in Air Force depot repair processes, such as receipting directly for the item in the repair shop and, thereby, bypassing the DLA Distribution Depot, this cost will fluctuate only with rate adjustments. Adding the Premium Service option in the distribution process effectively creates additional warehousing and transportation bills. Using Table 1, the increased cost to the SMAG and subsequent O&M accounts for Premium Service on a typical 107-pound box would be:

Receipt	\$19.56
Issue	10.61
Actual Trans Charges ²⁸	72.25
Subtotal	102.42
Total (Incl DLA Depot)	\$258.44

Adding Premium Service to the distribution process represents a 66 percent increase when warehousing and shipping a 107-pound secondary item in the CONUS. A similar computation for a medium-sized, 10-pound item results in an increased warehousing and transportation cost of 42 percent while a 150-pound item increases in cost by 53 percent. For shipments consigned to an OCONUS location, a corresponding rate increase appears probable. In order for the Premium Service to be fiscally practical, inventory reductions would need to occur.

According to DLA, the Premium Service facility performance and value is best when focusing on packages weighing 150 pounds or less.²⁹ In addition, dimensional requirements must also be met. The maximum package dimensions for Premium Service are 165 inches total length and girth combined with no single side exceeding 119 inches.³⁰ Using data gleaned from the Repairable Pipeline Data Analysis Tool and Recoverable Consumption Item Requirements System (D041) by the Logistics Management Institute, there are 2,700 stock numbered spares (budget code 8 or 15) managed by the Air Force with active demand data that meet the packed weight requirement of 150 pounds or less.³¹ Of these NSNs, only 2,000 meet the Premium Service dimensional requirements totaling 461,500 individual units. However, weight and dimensional data may require revalidation to verify data accuracy.

Based on the latest acquisition cost, the total value of the eligible inventory is \$451.5M with an average cost per unit of \$972, a surprisingly relatively low cost per unit.

Further research shows a mere 14.7 percent of the NSNs in the eligible pool accounts for 38.4 percent of the total inventory value. Furthermore, this 14.7 percent of NSNs (297) equates to only 2 percent (9,400) of total line items in the inventory. These assets represent an arbitrary minimum \$5K break point using the latest acquisition cost and resulted in a high-value item at \$262K.³² This pool appears to have the highest potential for considering placement in the Premium Service facility.

Using these 297 NSNs or 9,400 line items, the computation estimates the total inventory value at \$168M. With an 8.47-day average Air Force Logistics Response Time, each day O&ST for this inventory equals \$19.8M. Comparing the typical DLA distribution depot process to the average Premium Service O&ST (17 hours) substantiates at least a 1-day benefit in O&ST reduction. The actual number of wholesale demands from April 1997 through March 1998 for these high-value, secondary items was 1,927. Using this as a multiplier of the delta between Premium Service and the standard DLA distribution depot rate equates to a \$197,363 annual increase in transportation costs (1,927 X \$102.42).

In the logistics community, the Air Force typically sets a 5-to-1 return on investment for inventory to transportation ratio. Using this pool of inventory and with a 1-day improvement in O&ST results in a 100-to-1 ratio of potential annual inventory cost avoidance to transportation cost increases, clearly an effort worth pursuing.

Retail stocks present a more difficult comparison. A correlation can be drawn, however, between wholesale stock and retail stock O&ST when determining safety levels. Additional study is required in this area to determine potential cost savings.

Potential Drawbacks to Premium Service

If the Air Force chooses to use Premium Service for weapon systems spares, centrally locating them may present a center of gravity or target for exploitation. Particular care should be taken to ensure a sufficient quantity of each type of asset is held in reserve at the air logistics centers to offset this threat.

In addition, placing all assets with a single commercial express carrier may create an unacceptable vulnerability. FedEx and United Parcel Service have experienced problems with labor union strikes over the last several years. The Air Force, in cooperation with the affected carriers, worked to ensure the strikes had minimal impact on its shipments. However, placing all stock on the shelves at a FedEx facility might present unacceptable risks.

Inventory reduction has inherent risks that must be explored. In an *Air Force Journal of Logistics* article, Virginia A. Mattern of the Logistics Management Institute made the case where inventory reduction based on anticipated demand levels could have a disastrous impact on the Air Force in wartime.³³ A study for DLA by the Logistics Management Institute "... found that parts with historically low demands can suddenly experience high demands."³⁴ This could result in an exacerbated effect if inventory reductions are taken based solely on O&ST reduction. The study states, "... buying minimal stock can lead to an unexpected stock depletion that could adversely affect mission capability." This could be a notable problem in wartime.

An additional potential drawback would occur if IMs change the status of an asset from automated release in the wholesale requisition process to one requiring IM review prior to release. This flag would add O&ST and negate any fiscal or weapon systems support benefit from an O&ST perspective.

Finally, as mentioned earlier, it is crucial for the Air Mobility Express and battlefield distribution to be operationally effective in wartime. Placing contingency stocks at the Premium Service facility has little benefit if the stocks can only be moved to an airhead quickly

and in a time-definite manner without the capability to make the final leg of the journey to the warfighter.

Conclusion

FedEx, in partnership with DLA, has streamlined the warehousing process as evidenced by its ability to receive a requisition and process, ship, and deliver an asset to the CONUS customer within 17 hours. Considering the increased transportation cost, not all types of inventory should be considered for placement at this facility, but some certainly make sense. The 297-item pool provides a starting point for consideration.³⁵ Based on potential inventory savings and enhanced warfighter support, the most logical assets to place there are high-value (more than \$5K), high-payback secondary weapon systems assets. Additional research should be conducted concerning the potential of centrally warehousing retail stocks as well.

Notes

1. Virginia A. Mattern, "Inventory Reduction: *When Is Enough Enough?*" *Air Force Journal of Logistics*, 21, No. 2, Spring 1997, 8-12.
2. *Ibid.*
3. *Ibid.*
4. Fact Sheet, William Gookin, "Premium Service Facility," Defense Logistics Agency Support Command, 24 August 1998.
5. Minutes, Air Force Logistics Board of Advisors Meeting, Tyndall AFB, Florida, 1 May 1996, 6.
6. Briefing, Headquarters United States Air Force, Directorate of Supply, Aircraft and Missile Support Division, undated.
7. William Gookin, "DLA/FedEx Provide Premium Service." *Dimensions*, April/May 1998, 45.
8. *FedEx U.S. Government Contract Service Guide*, Memphis, Tennessee, 1997, 23.
9. Department of Defense. Program Budget Decision, Cost of Operations and Customer Prices for the Defense Working Capital Funds, No. 426, Washington DC: Office of the Under Secretary of Defense (Comptroller), 19 December 1997, 128-9.
10. *Ibid.*
11. Memorandum of Understanding, Headquarters USAF/Deputy Chief of Staff for Installations and Logistics with Headquarters, DLA/Director of Materiel Management, 1 October 1997.
12. Air Force Instruction 24-201, *Cargo Movement*, January 1999, 15.
13. William Gookin, "Premium Service Facility," *Loglines*, 3, No. 4, June 1998, 19-20.
14. *Ibid.*
15. Information Sheet. DLA Premium Service, undated.
16. Gookin.
17. *Ibid.*
18. Briefing, Naval Inventory Control Point, "Premium Service," undated.
19. Information Sheet, "DLA Premium Service," undated.
20. *Ibid.*
21. Worldwide Express. [Online] Available: <http://public.scott.af.mil/hqamc/wwx>
22. Program Budget Decision, Cost of Operations and Customer Prices for the Defense Working Capital Funds, No. 426, Washington DC: Office of the Under Secretary of Defense (Comptroller), 19 December 1997, 128-9.
23. Interview, Major Monte J. Murphy with William Gookin, Headquarters Defense Logistics Agency Support Command, Premium Service Program Manager, 5 February 1999.
24. *Ibid.*
25. *Ibid.*
26. *FedEx U.S. Government Contract Service Guide*, Memphis, Tennessee, 1997, 12.
27. Draft Technical Report, "Collocating Inventory with Commercial Express Transportation Hub," Dynamics Research Corporation, 31 January 1999.
28. *Ibid.*

(Continued on page 43)

Personnel



Information

Career

Needed—Agile Logisticians

Major Nancy A. Stinson, USAF
Captain Malcolm E. Blair, USAF
Captain Alex E. Dubovik, USAF

The key to deploying, employing, and sustaining our Expeditionary Aerospace Force (EAF) is developing a core of logistics officers trained specifically to support EAF operations. These officers could then answer many of the challenges outlined in Major General Michael Zettler's article, "Agile Logistics," published in the fall 1998 issue of *The Exceptional Release*. In his article, General Zettler framed the issue, Lean Logistics and the Agile Logistician are key to the EAFs success.

One of the ways to meet this challenge is to create an agile logistics employment school, similar to the USAF Weapons School (USAFWS) in order to produce logistics officers who are experts in EAF logistics operations.

Today, the accepted career path for logistics officers is for them to focus on their core logistics specialty while serving as a company grade officer. This focused, early experience allows officers to become knowledgeable in specific areas before they are considered for a crossflow assignment. Once a crossflow tour is complete, the officers usually return to their primary logistics core area.

This career path directly supports current logistics officer progression and reflects the track many logistics officers will follow in the near future. What this track does not support, however, is the junior officer's responsibility to support enormous logistics responsibilities while deployed in a base operating support role as part of an EAF. An officer with experience and training in only one or two logistics areas is not ideally prepared for this operating environment.

Clearly, there is an emerging EAF requirement for a centralized, comprehensive course that outlines cross-disciplinary responsibilities, focusing on logistics employment in an austere deployed environment. An agile logistician school, focusing on the logistics support employment role, would meet this requirement and fit well alongside the USAFWS at Nellis AFB, much like the relationship between the Contingency Wartime Planning Course and the Joint Doctrine Air Campaign Course at Maxwell AFB, Alabama.

Although there are superb courses offered covering many disciplines throughout the Air Force, there is no centralized training focusing specifically on the competencies required to support EAF operations. The agile logistician school would not only teach these concepts but also actively test and develop them. Transforming the agile logistician from concept to reality will require intensive training in well-defined core competencies. This training would include both

academic and hands-on training in all logistics specialties: transportation, supply, aircraft maintenance support, logistics plans, and contracting. The officers trained as agile logisticians will be true experts in all aspects of the deployed EAF logistics environment.

Agile logistician training is not necessary for all logistics officers. It is unrealistic to assume that all Air Force logistics officers need the training because not all of them will be called to support deployed EAF operations. The concept is to select officers with crossflow experience for attendance at the agile logistician school. Then they can be identified as *ideal* EAF support candidates and earmarked to support EAFs on alert status. They could be identified with a separate Air Force Specialty Code (AFSC) or with a unique prefix to an existing AFSC, marking them as specially qualified logistics employment experts. This would expedite the personnel community's ability to fill the logistics officer support position once a requirement develops.

Just as operators who wear the USAFWS patch have proven they have developed the skills necessary to fulfill the goal of ensuring USAFWS graduates are experts on weapons, weapon systems, weapon system integration, and employment tactics, the agile logisticians must be held to the same high standards. They must receive an education commensurate with that of the lead operators they support and with whom they are deployed.

Expansion of the USAFWS at Nellis AFB to include an agile logistician division would provide the optimum training environment as well as a concentrated pool of expertise in deployment/employment operations development. The weapons school presently trains nonfighter type aircrews as well as members involved in space operations. The agile logistician division would be no different. Additionally, the ongoing missions at Nellis (Red Flag, Air Warrior) present an especially beneficial environment for the logistician in training.

The agile logistician will direct the logistics operations for the Expeditionary Aerospace Force of the future. Cross-disciplinary expertise is the key to ensuring these individuals can effectively employ resources to support an aggressive flying operation with minimum support. The time-proven training, research, and development expertise offered by the USAF WS will solidify the Agile Logistician concept and enable leaders in the logistics field to train like they fight, shoulder to shoulder, with the highly trained operators they will support.

Major Stinson is the Commander of the 56th Logistics Support Squadron; Captain Blair the Commander of the 56th Logistics Training Flight; and Captain Dubovik the Commander of the 372d Training Squadron, Detachment 12, all at Luke AFB, Arizona.

JL

greater unity by requiring them to coordinate their respective budgeting issues as they worked through the PPBS cycle.

In 1986, the Reagan administration injected greater managerial responsibility and accountability into defense acquisition by enacting many of the recommendations of the Packard Commission. Actions resulting from the recommendations were establishment of an acquisition chain of command for major weapon system procurements and the appointment of the Under Secretary of Defense for Acquisition (USD[A]) as the lead managerial acquisition authority and acquisition executive within DoD. The USD(A) (which eventually became the Under Secretary of Defense for Acquisition and Technology) was also labeled as the Defense Acquisition Executive (DAE).

The greatest impact in the military movement toward jointness was the passage of the Goldwater-Nichols Defense Reorganization Act. The act was far-reaching within DoD. It established the positions of JCS Chairman and Vice Chairman. It placed responsibilities on the people filling those positions to consolidate Service positions and report them to the NCA through one unified voice. This was in stark contrast to the requirements established by the National Security Act. That act required the Service chiefs to provide their input on defense operations, independently not collectively, to the NCA. Goldwater-Nichols created the potential for unification and consolidation of functions. Within defense acquisition channels, the work force observed this change and realized its far-reaching potential for consolidation of defense acquisition organizations.

The next and even more focused step toward consolidation of the defense acquisition work force was the passage of the Defense Acquisition Work Force Improvement Act. Given recent enactment of Goldwater-Nichols, legislative interest in the defense acquisition work force, through the enactment of DAWIA, heightened tension in the work force. The new act called for uniformity in both the acquisition process (the Life-Cycle System Management Model or LCSMM) and in training, education, and experience certification requirements of the acquisition work force. The law allowed DoD to delegate responsibility for bringing acquisition personnel to certification by respective Service component acquisition executives. However, because DAWIA introduced uniformity in both process and human resources, jointness and consolidation seemed possible at any moment.

Since passage of DAWIA, numerous acquisition reform initiatives have been legislated through annual Defense Authorization Acts. Although some reorganization has occurred in parallel with acquisition reform, it has primarily occurred as a result of the continuing trend to *size* the force. Many acquisition organizations have taken manpower and personnel cuts. Acquisition reform, on the other hand, has been generally limited to procedural, vice people, changes. Such changes have been far-reaching and beneficial. In general, many former procurement procedures were tightly regulated. Today, acquisition reform has legislatively and incrementally relaxed the rules and their burdensome requirements.

The public policy trend toward jointness has accelerated during the last 12 years. This occurred in conjunction with the changes in the strategic environment that created heightened public awareness of seemingly unlimited military spending during the middle 1980s and subsequent shrinking fiscal resources from the end of the Cold War to the present. These are the factors setting the precedence for jointness across the defense acquisition work force.

The Current Acquisition Work Force and Process

The defense acquisition work force is common only through implementation of DAWIA legislation and the acquisitions cycle it enables: the Life-Cycle System Management Model. Each Service, given prerogative by DAWIA, has, in fact, taken advantage of the flexibility permitted in designing respective autonomous acquisition corps: the Army Acquisition Corps, Air Force Acquisition Corps, and Navy Acquisition Professional Community. While some minimal level of standardization exists, there are a number of subtle differences between the Service acquisition organizations.

Conversely, the LCSMM followed by each Service is the same. It is, however, tailored by all acquisition professionals to fit the acquisition strategy of each program whether the program is Service specific or joint. This common guideline for program management has only evolved with the publication of Department of Defense Directive 5000 series documents and subsequent acquisition reform initiatives. Prior to that milestone, each Service generally followed its own set of rules with the exception of more strict functions such as contracting.

With the release of recent and continuing acquisition reform initiatives, the only consistency across the Services with regard to the LCSMM is change. The process has become more joint through a number of mechanisms introduced by acquisition reform and subsequently initiated and practiced within each of the Services. Types of commonality prevalent in emerging acquisition programs take the form of integrated product/process teams, outsourcing, and fulfillment of legal obligations. In following the change introduced by recent acquisition reform initiatives and the precedent for jointness as discussed, this is no surprise. Aside from a proportionate share of downsizing, the work force that enables the functioning of this process has been largely unaffected. Each Service acquisition corps still has distinct differences.

Comparison of Joint Organizational Options

Defense acquisition organizations are evolving into joint organizations. Some examples are the Defense Contract Audit Agency, Defense Logistics Agency, and Defense Contract Management Command.² Precedent-setting legislation, changes in the strategic landscape driving subsequent changes in materiel requirements, force drawdown, and austere military budgets, as well as technological advancements and lessons learned from private industry regarding best practices, are all variables contributing to the evolution. How remaining Service acquisition personnel would be organized into a joint acquisition force and how soon reorganization would occur are issues that must be researched thoroughly before comprehensive consolidation occurs. There are a multitude of ways to organize, but which way provides for the greatest effectiveness to stakeholders?

There is a continuum of ideas with a force patterned after the current UNAAF structure at one extreme to a force spread across the Services as they currently are at the other extreme. Somewhere in the middle is an evolving joint structure. Outside the bounds of the continuum is yet another option that would serve the purpose of integrating Service programs but would not actually be joint.

UNAAF Structure

A joint force that parallels the current organizational structure of a functional CINC (the UNAAF model) would fit a recognized pattern. Assuming an appointed civilian can serve as the combatant commander of such a force, then the rationale for forming a joint command seems legitimate. After all, the USD(A&T) is responsible for all defense acquisition personnel and processes. The question, however, of a civilian, other than the President, assuming command responsibility over both civilian and military members merits further study.

Joint Pub 0-2 establishes the following criteria for a unified command:³

1. A broad continuing mission exists, requiring execution by significant forces of two or more military departments and necessitating a single strategic direction.
2. Any combination of the following exists and significant forces of two or more military departments are involved:
 - A large-scale operation requiring positive control of tactical execution by a large and complex force.
 - A large geographic or functional area requiring single responsibility for effective coordination of the operations therein.
 - Necessity for common utilization of limited logistics means.

Sufficient rationale exists to argue that both criteria are not completely satisfied for establishing a joint unified command. With respect to the first criterion, identification of a *single strategic direction* could be easily established given the national focus on the use of the Armed Forces as well as spending of taxpayer dollars. Such a direction could provide timely, efficient, customer-focused, and the most technologically advanced materiel capabilities and services to each of the military Services equitably through effective, integrated, and responsive acquisition processes that provide interoperability to the fullest extent possible.

With respect to the second criterion, the USD(A&T), through a unified command structure, could assume *positive control* of the execution of *large-scale [acquisition] operations*. The USD(A&T) actually does this now as the DAE and as a milestone decision authority on large Acquisition Category I defense programs. The acquisition process is a *large functional area* for which the USD(A&T) is totally responsible. With a keen perspective on defense acquisition spending, that person can provide for a *common utilization of limited logistics means* in the form of acquisition programming dollars, manpower, and time.

Conversely, a major disqualifier of the USD(A&T) as a CINC of a functional command is the fact the majority of acquisition professionals are civilians and, therefore, not considered *forces* of the military departments. Functional CINCs, although generally tasked in a supporting role to regional CINCs, are still responsible to lead in a warfighting role if necessary. With the exception of Emergency-Essential Civilians (EEC), civilians cannot be ordered to serve in warfighting capacities.

A unified command is created to perform an active role in warfighting. The acquisition role is less direct. It is organized within the Services and fits within the Service roles in unified commands: maintenance and support to CINCs and their commands. All military entities that are not unified commands exist to support unified commands. This is where acquisition organizations have traditionally and inherently belonged. Because of this role, unlike the CINCs, acquisition organizations are inextricably linked to the PPBS process. Without major change in the PPBS—because PPBS is a 2-year, calendar-driven process that CINCs do not control—it is questionable if the USD(A&T) could attain enough influence over PPBS to perform responsibly as a CINC.

Acquisition Personnel within the Services

At the other extreme of the continuum of organizational structures is an acquisition force spread across the Services. This is where the current structure came from. Prior to DAWIA and Goldwater-Nichols, an untrained, uneducated work force existed in each of the Services. There was no common standard, but each Service had the flexibility to interact with the Planning, Programming, and Budgeting System and acquire weapon systems through their own Service-unique procedures. To attain this organization would require more than 20 years regression. Aside from cases of defense fraud and overspending that continue, sporadically, this type of organization, although very inefficient, worked well during years of unconstrained defense budgets. The legislation and procedures implemented since such times, although associated with drawdown and austere budgets, brought about innovative approaches to working together, overcoming duplicity, and increasing interoperability.

The Evolving Joint Acquisition Force

Somewhere along the continuum between both extremes is a third option patterned after the evolving total force joint structure. It is the current acquisition force with the numerous joint applications and tailored approaches employed in efforts to streamline, reduce acquisition cycle time, and provide real reform. Organizations are a mixture of military, civilian, government, and contractor personnel structured within each Service and within joint organizations at the JCS, DoD, and Joint Program Office levels. Acquisition functions, such as budgeting and testing with the greatest commonality, across the Services are beginning to consolidate. Many functions will be outsourced, but a certain degree of military independence will be maintained to provide inherent flexibility when required.

An Organization Serving in a Joint Role

An all-civilian work force could be employed by adopting the Acquisition Work Force Personnel Demonstration concept that provides incentives and compensation for the civilian portion of the acquisition work force. Although no operational experience would be provided because there would be no military members, interface would be available through a career-broadening assignment program (where military operators are assigned to an acquisition organization and then returned to the field).

Continuity would be strong with an all-civilian work force. Conversely, mobility would be required on a selective basis to provide for professional development of future acquisition leaders. Functions not inherently governmental would be outsourced. Transition to such an organization—removing the military component—sets a precedent that would be difficult to reverse. Investments made in education and training for military personnel thus far would not be fully realized. Inherent military functions, such as contingency contracting and test piloting, would be removed from the acquisition organization's responsibilities and retained in the military. Specially trained Emergency-Essential Civilians would provide those functions deemed inherently governmental.⁴ In the meantime, the military would need to integrate such positions from the respective acquisition corps back into the operational force.

An all-civilian organization could provide increased efficiency and enhanced interoperability. Simultaneously, however, without traditional interservice rivalry and creative competition, a lack of innovative approaches and technologies could be expected, at least initially. A greater proportion of contracted support could counter such issues. After all, the acquisition corps within each of the Services is primarily composed of civilian personnel.⁵ Accompanying contract support, however, is the concern for loss

of control and hence greater risk to the government and ultimately all stakeholders involved.

In addition to the historical precedent set for a joint acquisition force, conditions are set for transition in any number of directions. Many joint processes embedded in acquisition procedures, as well as those recently introduced through acquisition reform efforts, are already inherent in joint staffs. In many ways, the acquisition community may have already surpassed many joint staffs by imposing more joint procedures on its own organizations than the quantity and quality of those used by joint staffs. On the other hand, many of the joint procedures recently imposed for utilization across the defense acquisition community actually compensate for a force that is too large, cumbersome, geographically separated, and inefficient to be compatible with a centrally located joint staff and associated subordinate organizations.

A regressive acquisition force is extreme and costly, although satisfactory to each of the Services. On the other hand, an all-civilian acquisition force would reflect the true direction of the trend toward efficiency, continuous and growing expertise, and interoperability. There are inherent risks with every organizational option. What would be the most effective? Given the current strategic environment and defense spending constraints, there is no question that the unity of effort, centralized planning, and decentralized control characteristic of joint organizations would provide the emphasis necessary and the resulting benefits required by stakeholders.

An Analysis of a Consolidated, Joint Acquisition Force

The merits of a joint acquisition force (regardless of organizational design) are enhanced efficiency, reduced cost, and complete interoperability as a minimum. But such benefits would not be attainable immediately. An initial *break-in* period would be required after reorganization to fine-tune procedural details attached to organizational changes that are not apparent on the surface.

Conversely, there are disadvantages associated with a joint acquisition organization. At least initially, if not over the long term, they would include a clash of Service cultures, an increase in Service parochialism, and some stagnation or lack of innovation and creativity from a lack of competitive pressure between Services. Many in the acquisition work force would feel that a consolidated organization was being forced on them unnecessarily, causing their distrust of decision makers saddled with the responsibility of implementing the changes. Disadvantages may be observable immediately in comparison to beneficial changes that could eventually be realized by the change process. These types of initial, possibly evolving to long-term, responses are not complementary to such changes. Further, if such a jump is made, it could not be easily reversed and reexpanded if another international environment evolved requiring defense buildup akin to that of the Cold War.

Effectiveness of Joint Acquisition Organizations

The advantages of consolidating acquisition organizations into a joint acquisition force are many: greater efficiency, less cost, and greater interoperability, to name just a few. A common acquisition process (in the form of the LCSMM) is already in place and functioning. A work force with generally common standards is in place and functioning as well.

Senator Nunn noted in the fall of 1996 that force levels had been cut by 25 percent and manpower by 31 percent since the end of the Cold War but the defense bureaucracy had not been cut proportionately (only 15 percent since 1987).⁶ A big portion not cut is defense acquisition organizations at DoD and Service component levels. Senator Nunn's message was that DoD's reaction and

subsequent adaptability to new missions has been too slow. The large organization is duplicative, sluggish, and draining the system of its energy.⁷

In following Senator Nunn's suggestion and by using an effective and functioning framework, it is possible for a joint acquisition force to follow any of the options except the regression option. With regard to the unified command structure, command channels are already present: the USD(A&T) would be equivalent to a functional CINC, but responsibilities as a CINC would require modification as the USD(A&T) does not plan for and conduct warfighting operations. With regard to the evolving joint acquisition force, numerous changes would be required but then could be done incrementally as the process has occurred thus far. With regard to the all-civilian force, continuity, consolidation, and streamlining could be gained at the expense of continuous operational expertise.

Consolidation of common functions—such as budgeting, contracting, testing, and military disposal activities, among others—could provide tremendous cost savings as all of these functions follow procedures that are broad and not Service-specific. This activity could apply in varying degrees to any of the alternatives discussed with the exception of the regression option. The calculated savings of such consolidations are unknown but are worth investigating in future studies as the work force incrementally moves toward jointness.

If centralization of such common activities proves effective, outsourcing is another question to be investigated and applied to each of the alternatives. If the functions are inherently governmental and cannot, for reasons of national security, be contracted out, then this becomes a moot point. Conversely, outsourcing a function to a contractor is generally 10 to 20 percent less costly than if performed by government employees.

Ineffectiveness of Joint Acquisition Organizations

Many could easily claim the effectiveness of joint acquisition organizations is more than countered by the ineffectiveness of them. As previously mentioned, with the onslaught of acquisition reform initiatives, numerous processes clearly associated with jointness have already been implemented. With such change came minor and temporary organizational arrangements that exist for the purpose of completing a process or producing a product. Permanent reorganization at this point in time would drive additional change and frustration to the personnel running the acquisition process. The potential for numerous issues affecting human resources and their subsequent performance of the acquisition mission dictates that such a change at this point in time is unnecessary.

During this time of fiscal austerity, it would be imprudent to further consolidate what has traditionally been treated as inherently Service-unique functions. The intent of Congressman Mavroules when drafting DAWIA was not to centralize or isolate the acquisition field. He believed doing so during declining budgets would cause players to be less rational, the exact opposite of his objective with regard to the new legislation.⁸ It is also interesting to note that the Packard Commission considered formation of an all-civilian acquisition work force as a means of streamlining defense acquisition. The commission chose not to recommend such an organizational structure because the operational expertise brought to the process by military acquisition work force members was too important and vital to the acquisition function.⁹

Measuring the effectiveness of a consolidated acquisition force at the present time is difficult. Even though there is some commonality between the respective Service acquisition corps, there are many outstanding issues that would need to be resolved in order to create such an organization. For example, each Service has a different quantity of people in its respective acquisition community, and each

has different requirements for its military and civilian members. There would be questions that would require answers from DoD, such as: Should membership by Service be proportional to military acquisition spending or to force end strength? Do the sizes of the acquisition corps require adjustment? In addition, civilian mobility requirements vary across the Services as do time in service and operational experience requirements for military members. These differences would require reconciliation before consolidation. Addressing such issues has potential for initial conflict between the Services before they reorganize and initial consternation and distrust among the members of the newly formed unified organization.

Many career fields are utilized across the phases of the LCSMM. Many of them are not Service-specific and could be consolidated. Consolidating some and not all functions could serve to disrupt the progress currently being made by consolidating some of the same functions in integrated product/process teams and within joint program management offices. Additionally, it is difficult to prove whether the physical removal of personnel performing such functions and consolidating them into a joint organization would still provide the same level of effectiveness recently introduced by such *process multipliers*. Forcing one change right after another seems counterintuitive and could disrupt the very processes that were recently changed—and rightly so—for the purpose of enhancing efficiency. Over time, such a change could be positive but, from a current perspective, would sacrifice recently attained progress for a new organization that is experimental at best.

There are numerous advantages and disadvantages to both: consolidating acquisition personnel into a joint acquisition force and consideration of how such a joint force would be organized. For the present time, however, the evolving joint acquisition force is currently packaged as the best solution for all stakeholders. It provides for adequate, incremental, nonradical, but necessary change. In the long term, one of the other organizations, such as an all-civilian work force, could replace it.

Transition to a joint force now, although possible, would be ineffective. There has been so much incremental change introduced into defense acquisition over past decades that one more, albeit major, would seem to follow the trend. Conversely, the magnitude of the consequences of such a major undertaking could produce an effect opposite to the one intended. There is no doubt that some, at least initial, Service rivalry and discrepancies over priorities and contributions would result. In addition, however, introducing such a drastic change could result in the demise of the professional acquisition work force as it exists today by driving away the work force that DAWIA legislation authorized millions of dollars to educate and train.

Some day, the work force will be joint. Many say it already is, and many think much more can be done to make it more joint in nature. There are underlying questions at each incremental step toward jointness regarding how much consolidation is adequate, and conversely, how much is detrimental. Defense leaders are struggling with these issues as the joint acquisition force evolves. Numerous topics for further study arise from this subject. They include how best to organize a joint force (not necessarily in following the current framework); whether the effectiveness of transitioning to a joint force counters the immediate and consequential ineffectiveness of doing so and, if not, where the break-even point occurs in time; and finally, what incentives are necessary to attract and retain the best possible defense acquisition work force, organized jointly or not.

An Appraisal of Consolidation Advantages and Disadvantages

The defense acquisition work force across the Services has not been reorganized into a consolidated, joint organization because such an organization is not currently necessary. In light of recent procedural changes introduced as acquisition reform legislation, transitioning to such an organization would not serve stakeholders better than the current system. The current system is continuously evolving, adapting to more efficient methods while addressing joint requirements as they arise. It is flexible in that it provides for both joint and Service-specific programs. Interoperability does need improvement. Driving toward a joint acquisition force is overkill in addressing such an issue. The traditional concerns regarding consolidation that arose approximately 12 years ago have escaped, transformed, and reemerged in the form of acquisition reform initiatives.

Such initiatives will continue to be introduced as their effectiveness is tested in smaller acquisition organizations and then shared with the rest of the acquisition community. The problem will continue, however, for leaders to decide what is appropriate for all as opposed to just some. Many issues in acquisition are so situation-specific that they cannot be applied universally. When future acquisition reform initiatives lead to consolidation, steps will evolve incrementally so that Service parochialism is not a debilitating byproduct. To make such a jump now could result in overdominance by one Service, the stripping of the roles of the remaining Services, and an overall ineffective joint force when it is needed the most.

Consolidation to a joint force will happen eventually. The force already fits a structure similar to that of a functional unified command. The *softening* of regulations from acquisition reform initiatives has provided the same flexibility and ability to tailor programs and processes on an ad hoc basis, for the period of time necessary, as joint regulations allow the joint force commander. The question that remains but that is too difficult to predict is what the joint force will ultimately look like.

Consolidation cannot come quickly; it must be incremental to be effective. There are too many interim steps to be completed. Centralized management systems for acquisition programs and for the acquisition work force itself—both military and civilian—must be created. Decisions must be made regarding whether civilians provide continuity within a given specialty and hence should grow within an organization or whether they must provide a broad understanding as they move between assignments much like military members currently do.

The key to providing the best for all stakeholders involved, whether organized as a joint force or not, is flexibility. There is no fear that a formally organized joint acquisition force will be implemented immediately because a trend is set for an incremental approach, an approach often followed in public policy making. To drastically change the organization over a constrained period of time would be too radical and could put national defense at risk.

Recommendations

Given the current posture of the US post-Cold War national defense and the evolving strategic landscape, in order to maintain a cutting-edge robust force, the process of stewarding the trend toward a joint acquisition process and force must include a number of interim steps. First and most important, maintain flexibility. Although flexibility is inherently inefficient, it is the key ingredient of jointness. Acquisition reform has removed the rigidity formerly inherent in defense acquisition and has placed it on the path toward progress. Continued maintenance of recently injected flexibility measures, along

with continued introduction of a steady stream of initiatives to sustain it, will enable transition to a joint force when the time is right.

Across the Service acquisition corps, there are several critical areas that require standardizing. First, for civilians, the intent of signing a mobility statement must be revisited. Civilians have traditionally brought continuity to defense organizations. With regard to acquisition organizations, this is especially important given the timeframes necessary to complete acquisition of many weapon systems or even to progress between milestone decisions. If military members continue to be reassigned in accordance with normal rotations (except for those under program management charter to remain for longer periods of time), the need for consistency remains. Civilians provide that level of stability necessary for weapon system procurement. Mobility should be permitted but not required. It should be permitted, however, within a program hierarchy so as not to lose continuity. Movement can be permitted outside a program hierarchy once transition to a replacement, with adequate institutional knowledge regarding the program's history, is in place.

For military members, some Services like the Army and Navy require a minimum number of years of operational experience prior to entering the acquisition field. Conversely, the Air Force does not. The Air Force does, however, provide opportunities for career-broadening experiences that provide for acquisition personnel to be exposed to operational assignments. This is an outstanding opportunity that serves to refocus the acquisition specialist on the key system and performance parameters in which the operators are interested. The Services collectively need to merge these requirements. All Services should require a standard level of operational experience prior to entering the acquisition field, and all Services should provide opportunity for career-broadening assignments. After all, military members bring operational experience to the acquisition field. Military members without such experience fulfill the same role as civilians. To maintain balance and strong ties to the stakeholders and their needs, the work force requires both military and civilian membership.

Operational experience prior to entry and career-broadening opportunities will provide the operational expertise that is so crucial to the military presence in the acquisition field. Services should not permit return to operational duty on a permanent basis after accession into the acquisition community. Such allowances directly contradict the very formation and investment in a professional acquisition work force (as enacted under DAWIA).

Ultimately, the work force should maintain a mix of military (to include enlisted support) and civilian members proportionate with defense acquisition budgets consistent across the Services. Both bring unique characteristics to the table. A proportionate mix between the two in each of the Services will make transition to a joint force easier when the time comes. Additionally, balance and proportion provide for *taming* what has the potential to become an unconstrained professional bureaucracy by providing purpose and direction.

To counter the possible effects of the requirement to contain the professional bureaucracy, powerful incentives to draw the best in, as well as retain, them must be established. For example, funding streams must continue to provide opportunities to attend training with industry, graduate school, and operational assignments in order to draw and retain both military and civilian members. Generally, the Services have good records in this area. Conversely, to maintain segments of the work force long term and to get the most out of the investment in education, training, and experience, other incentives must be offered to retain acquisition community members. Acquisition reform initiatives have provided for the mirroring of numerous commercial activities to streamline and cut costs in acquisition processes but have not introduced like measures providing incentives for personnel retention.

Often corporate firms offer individuals financial incentives, such as stock options or raises, to ensure their expertise is retained. While the military cannot afford or permit additional expenses or favoritism, it could offer other less-protrusive incentives to attain a favorable return on the training and experience investment of acquisition work force members. For example, it could require military officers to serve a mandatory Service obligation (possibly prolonging careers) regardless of rank achieved but simultaneously provide proportionate financial rewards for doing so. With civilians, a similar scale (separate from current civil Service system rewards) could be implemented for selected acquisition personnel. The ultimate objective is to draw and retain quality people who can mentor younger members while at the same time serve in positions of responsibility nested in a process that has an inherently longer cycle time than most other military processes. This provides more *bang for the buck* and stability with regard to personnel.

Finally, centralized program and personnel management systems with interface between military and civilian categories, as well as between the Services, is crucial, not just for joint opportunities but for a common basis of understanding and communication. In 1991, DAWIA mandated that such systems be implemented, but to date, the interface has not occurred. There are systems within the Services, but they are independent, with different data elements and variables, thus requiring restructuring in order to interface on any level. This failure to interface is the most difficult to accept given the pace of technology and the accompanying pace of reform. This is a requirement that must absolutely be met soon, not just for the purposes of transitioning to a joint acquisition force.

Conclusion

The handwriting has been on the wall for formation of a joint acquisition work force since the passage of Goldwater-Nichols. The concept was strengthened in 1991 with the implementation of DAWIA directing the establishment of a professional acquisition work force with common standards across DoD. After that, the handwriting was erased, and other measures in the form of acquisition reform initiatives were substituted. Acquisition reform continues to evolve today. The concept of jointness has taken the form of process over content in that the LCSMM has been modified, tailored, and adapted with respect to relaxation of regulations and implementation of innovative ideas as opposed to strict consolidation of acquisition functions in a joint acquisition organization.

Regardless of the numerous acquisition reform initiatives being continuously introduced, the progressive trend toward jointness has not ceased. It is not in the best interests of stakeholders to implement a consolidated, joint force now, but it is in the best interests that the end result be such an organization should the current trend toward jointness, in not only defense in general but also acquisition in particular, continue. Incremental change into a joint acquisition force is a natural progression. Defense acquisition is already joint to some extent, but further change, especially in the area of the people, the assets of the entire process, is too radical and would be detrimental to the nation at this point in time.

In the long term, the possibility for consolidation is extremely high. In order to prepare for it, several changes must be incrementally made to support the current trend. First and foremost, the process and the work force supporting it must maintain flexibility. The key to jointness, as well as addressing Service-unique requirements, is flexibility.

Also, a proportionate civilian and military mix across the Services

is essential to maintaining program continuity and operational flavor. Inconsistencies with regard to civilian requirements for mobility, as well as military requirements for operational experience and career-broadening opportunities, must be standardized across the Services. Ultimately, the right mix will provide for direction, purpose, and avoidance of a professional bureaucracy.

The government must provide adequate incentives to both draw and retain the best military and civilian members possible. Centralized management systems for both programs and personnel are long overdue. Interfaces between systems within each of the Services must be implemented and exercised immediately to provide for a common understanding and communication.

The idea of a joint acquisition force is far from dead, but acquisition reform seems to have substituted, to some degree, in the meantime. How long will this substitute last? When will a joint acquisition force become an acquisition reform initiative? Only time will tell. We must prepare now for the future.

Notes

1. Lecture, Brigadier General James W. Morehouse to Air Command and Staff College, "Joint Warfare, Maxwell AFB, Alabama, 21 January 1999.
2. Suggestion provided by Faculty Research Advisor, Lieutenant Colonel Michael Burney.

3. Joint Pub (JP) 0-2, *Unified Action Armed Forces (UNAAF)*, 24 February 1995, IV-5.
4. Suggestion provided by Faculty Research Advisor, Lieutenant Colonel Michael Burney.
5. AAC is comprised of 91 percent civilian personnel ("Army Acquisition Work Force, *Personnel*." [Online] Available: <http://dacm.sarda.army.mil/workforce/factbook/aawp.html> [30 October 1998]); AFAC is comprised of 63 percent civilians (from DAWIA STATS [Online]. Available: http://www.safaq.hq.af.mil/acq_workf.dawia/1.xls [30 October 1998]); and NACP is comprised of 93 percent civilians (E-mail, Captain Steve Kreutner, USN, Acquisition Professional Advisor, Bureau of Naval Personnel, 23 October 1998.)
6. Sam Nunn, "Future Trends in Defense Organization." *Joint Force Quarterly*, Autumn 1996, 64, [Online]. Available: http://www.dtic.mil/doctrine/jel/jfq_pubs/archive.htm [17 October 1998].
7. *Ibid.*
8. N. Mavroules, "Creating a Professional Acquisition Work Force," *National Contract Management Journal*, Vol. 24, 2, 22.
9. David E. Lockwood, *The Packard Commission Report and Defense Acquisition Organization.*, Library of Congress Report No. 86-717F. Washington DC: Congressional Research Service, The Library of Congress, 1986.

Major Rand is a contingency contracting officer assigned to the US Army Contingency Contracting Command, Europe. At the time of the writing of this article, she was a student at the Air Command and Staff College.



(International Armament Cooperation and Theater Missile Defense: Why South Korea is Reluctant to Join the Club continued from page 27)

20. Jason Glashow and Theresa Hitchens, "U.S. Missile Defense Systems Lure Taiwan Interest," *Defense News*, 21 August 1995, 3. [Online] Available: <http://www.defensenews.com/dmembers/darch/darch95/dn0821dd.htm> [16 June 1998].
21. Naoki Usui, "Defense in the Pacific Rim/NE Asia Ponders Response to Missile Threat," *Defense News*, 11 September 1995: 14. [Online] Available: <http://www.defensenews.com/dmembers/darch/darch95/dn0911hg.htm> [16 June 1998].
22. "China: Missile Diplomacy and East Asian Security," *Global Defence Review*. [Online] Available: <http://www.global-defence-review.com/China.html> [16 June 1998].
23. "Japan's Theater Missile Defense Policy," *Northeast Asia Peace and Security Network Daily Report*, 6 June 1997. [Online] Available: http://www.nautilus.org/pub/ftp/napsnet/daily_reports/1997/06-97_--_June/JUN06.txt [9 August 1998].
24. *Ibid.*
25. "Theater Missile Defense (TMD) in Northeast Asia: An Annotated Chronology," 1990-Present, Monterey, California: East Asia Nonproliferation Project, Center for Nonproliferation Studies. [Online] Available: <http://cns.miis.edu/research/neasia/tmdchron.htm> [11 April 1999].
26. *Ibid.*
27. Barbara Opall, "South Korea Wrestles With US, Russian Missile Proposals," *Defense News*, 14 October 1996. [Online] Available: <http://www.defensenews.com/defensenews/dmembers/darch/darch96/dn1014mc.htm> [16 June 1998].
28. *Ibid.*
29. "Cohen's Remarks on Missile Deal Erode Support for His Seoul Visit," *Korea Times*, 9 April 1997. [Online] Available: <http://www.kpi.or.kr/kinds-c/english.html> [17 June 1998].
30. "South Korea to Reject S-300 Bid," *Defense News*, 8 March 1999, 2.
31. Barbara Opall-Rome, "Seoul Seeks Medium-Range Missile Force: Rejects Defensive Stance vs. North Korea," *Defense News*, 8 March 1999, 1.
32. "South Korea: Data." Excerpt from Foreign Military Markets: Asia, Australia & Pacific Rim, Newton, Connecticut: Forecast International/DMS, September 1997, 7.
33. "South Korea Develops Short-range Surface-to-air Missile 'Chonma,'" *The Korea Herald*, 21 October 1997. [Online] Available: <http://ambassade.france.or.kr/html/tsc/Sectors/aer05t30.htm> [26 February 1998].
34. "South Korea," Missile Proliferation, the Federation of American Scientists Intelligence Resource Program. [Online] Available: <http://www.fas.org/irp/threat/missile/skorea.htm> [19 June 1998].
35. *Ibid.*
36. Theresa Hitchens, "U.S. Enters Talks on South Korea Bid to Quit Missile Pact: Officials to Discuss Seoul's Switch to MTCR Membership," *Defense News*, 11 December 1995, 22. [Online] Available: <http://www.defensenews.com/dmembers/darch/darch95/dn121111.htm> [29 April 1998].
37. "US Statements on US-ROK Missile Talks," Excerpt from the Northeast Asia Peace and Security Network Daily Report, 4 December 1996. [Online] Available: http://www.nautilus.org/pub/ftp/napsnet/daily_reports/1996/12-96_--_Dec/DEC04.txt [30 July 1998].
38. Hitchens.
39. *Ibid.*
40. Special Report, Northeast Asia Peace and Security Network. [Online] Available: http://www.nautilus.org/pub/ftp/napset/special_reports/Treaties.txt [16 June 1998].
41. Howard Diamond (Press Contact), "The Missile Technology Control Regime," Background Paper Produced by the Arms Control Association. [Online] Available: <http://www.armscontrol.org/FACTS/mtrc.html> [16 June 1998].
42. Lora Lumpe, "The Missile Technology Control Regime," Archived by the Federation of American Scientists. Eds. Joseph and Frank von Hippel. [Online] Available: <http://www.fas.org/asmp/library/articles/mtrc1996.htm> [24 April 1998].
43. Hitchens.
44. "Overview of Ballistic, Cruise Missile, and Missile Defense Systems: Trade and Significant Developments," Index of Missile Trade and Developments, Center for Nonproliferation Studies. [Online] Available: <http://cns.miis.edu/npr/misov.html> [15 June 1998].
45. Hitchens.
46. "SIPRI Arms Transfers Data Base Search Results," Stockholm International Peace Research Institute. [Online] Available: <http://www.sipri/cgi-bin/Sfgateyb?multiple=2&document=http%7C432%2520bytes%7CTEXT%7C483> [24 April 1998].
47. "South Korea: Data," 7.
48. "South Korea Test-Fires Its Own Guided Missile," Yahoo News: Reuters, 27 October 1997. [Online] Available: http://www7.yahoo.com/text/headlines/971027/international/stories/missile_1.html [15 June 1998].

49. "South Korea Develops Short-range Surface-to-air Missile 'Chonma.'"
50. Fred Hiatt, "South Korea Discovers America-Bashing: Trade Issue Angers All Political Sectors," *The Washington Post*, 29 February 1988, sec. A:14. [Online] Available: http://newslibrary.krmediastream.com/cgi-bin/d/wp_auth?DBLIST=WP88&DOCNUM=6130 [13 April 1998].
51. "Foreign Trade Policy," South Korea: A Country Study. [Online] Available: [http://lcweb2.loc.gov/cgi-bin/query/r?frd/cstdy:@field\(DOCID+kr0124\)](http://lcweb2.loc.gov/cgi-bin/query/r?frd/cstdy:@field(DOCID+kr0124)) [25 July 1998].

52. Robert W. Beckstead, "International Logistics Cooperation: The US-ROK Experience," *The Korean Journal of Defense Analysis*, Summer, 1944, 53.
53. Kiernan.
54. "US Statements on US-ROK Missile Talks."

Captain Hutchinson is Chief of Logistics, User Equipment Division, NAVSTAR Global Positioning System, Space and Missile Systems Center. Dr. Brandt is currently the Director of Foreign Military Sales at the Defense Information Center.



(Logistics and Airpower—A Failure in Doctrine? continued from page 30)

line cannot be escaped. On the other hand, unless there is a proper understanding of how collective efforts contribute to the use of the air to enforce national will, there is a risk of weakening this very ability in the name of greater efficiency. The aim should be at creating a robust and coherent airpower doctrine that transcends both aircraft and air forces.

Notes

1. The British share of Eurofighter development and production costs is reportedly in excess of £15B. However, the life-cycle costs will certainly match, if not exceed, this sum. (*Daily Telegraph*, 5 September 1998.)
2. Air Chief Marshal Sir John Slessor, *The Past Development of Air Power*, RUSI, 1986.
3. AP 3000, *Air Power Doctrine*, 13-17.
4. Sir John Slessor, *The Great Deterrent*, London: Cassel & Co., 1957, 259.
5. Beyond the immense increase in the output of airframes and engines, huge numbers of spares were provisioned. In November 1918 alone, the output of turnbuckles and bolts was 1.2 million and 10.5 million respectively.
6. On a typical day, some 3,500 lorries head for TESCO's 22 depots. (*The*

Times, 5 November 1996 and 3 November 1997.)

7. Boeing's Spare Parts Distribution Center has more than 410,000 different part numbers in a total inventory of more than 20 million items. (*Overhaul & Maintenance*, July/August 1966, 48-49.)
8. Colonel John A. Warden, *The Air Campaign*, Pergamon-Brassey's, Washington, 1989, 34-38.
9. Sir Basil Liddell Hart, *Thoughts on War*, London: Faber & Faber, 1944, 54.
10. John Terrane, *The Right of the Line*, London: Hodder & Stoughton, 1985, 602-603.
11. *Logistics Spectrum*, Spring 1985, includes a thoughtful article on the difference between military and business logistics and, while agreeing that there has been some convergence, concludes that the disciplines retain unique objectives and characteristics.
12. Boeing, which was building ten 737s in early 1997, was producing 21 a month by early 1998 and was scheduled to be producing 24 every 30 days by the end of the year (*Aviation Week*, 16 March 1998.)
13. The US Air Force has pioneered a similar approach under the Lean Logistics label.

Air Commodore Dye is assigned to the RAF Maintenance Group Defence Agency at St Athan, United Kingdom. He is a frequent contributor to the Air Force Logistics Journal.



(Collecting Air Force Weapon Systems Inventory with the Defense Logistics Agency Premium service Facility continued from page 35)

29. Gookin.
30. Draft Technical Report, "Collocating Inventory with Commercial Express Transportation Hub," Dynamics Research Corporation, 31 January 1999.
31. Robert Burleson, Logistics Management Institute, Excel Spreadsheet with custom data requested by the author, December 1999.
32. *Ibid.*
33. Virginia A. Mattern, "Inventory Reduction: When Is Enough Enough?" *Air Force Journal of Logistics*, 21, No. 2, Spring 1997, 8-12.

34. *Ibid.*
35. Robert Burleson.

Major Murphy is currently the Commander of the XX Transportation Squadron, Beale AFB. At the time of the writing of this article, he was a student at the Air Command and Staff College.



Logistics is the bridge between the economy of the nation and the tactical operations of its combat forces. Obviously, then, the logistics system must be in harmony both with the economic system of the nation and with the tactical concepts and environment of the combat forces.

—Admiral Henry E. Eccles