Our strategy for global aerospace presence rests on the capability to rapidly deploy forces to a large number of locations with varying characteristics and on having the operational flexibility to employ effectively from those locations. Some locations may be distant from the fight, and long-range weapon systems will be used. Some may be quite close, allowing the responsiveness and intensity of shorter-range weapon systems to be brought to bear, while raising the importance of force protection as a key enabler. As in times past, however, it is superior logistics and mobility capabilities that make possible the defense of an extended strategic perimeter. In this chapter, we highlight the major characteristics of a global logistics and mobility system to support the expeditionary strategy. We also describe the analytic process that the Air Force can use to determine the details of such a system, and provide results from the application of that process.

THE SUPPORT CHALLENGE

Perhaps the greatest challenge the Air Force faces in becoming more expeditionary is overcoming the traditionally heavy nature of its support processes and equipment. Having operated chiefly from MOBs for most of its history, the Air Force has had little need to make items such as avionics test equipment, bomb loaders, and communications gear as light and transportable as possible. For example, the deployment of intermediate-level avionics maintenance for 24 F-15s requires up to three C-17s. Even “deployable” equipment is quite
heavy. The deployment of shelters to support a bare-base operation for a typical AEF strike package requires 20 C-17s.\textsuperscript{1} The challenge involves more than just the transportability of equipment. It also involves finding new, more expeditionary ways of doing business by reconsidering the levels of initial support and infrastructure needed by deploying forces, beginning sustainment operations immediately, or conducting some support functions such as parts maintenance at FSLs and core bases. New deployment processes and practices have the greatest potential for near-term improvements to AEF force package deployability. Examining and reengineering processes such as maintenance concepts and early beddown requirements will be an important part of making the Air Force more expeditionary.

As a point of departure for our examination of Air Force support processes and equipment, we examined the deployment of an AEF force package, the 4th Aerospace Expeditionary Wing (AEW), to the Persian Gulf State of Qatar in 1997.\textsuperscript{2} The logistical footprint associated with that deployment is shown in Figure 3.1. The rapid deployment\textsuperscript{3} consisted of only about 20 airlifter missions, representing only 788 tons out of a total of almost 3200 tons of equipment and materiel that were needed to support operations at the forward location. The balance of the requirement was already in place when the forces arrived. In addition, months of planning, specific to the wing and its known destination, were required before the deployment.

This deployment was a significant waypoint on the Air Force’s course to the EAF concept, and it highlighted two of our early findings. First, we found that with current logistics processes and equipment, substantial amounts of prepositioned equipment and supplies are a necessity if the ambitious deployment goals of the Air Force, such as 48 hours to “bombs on target,” are to be achieved. Whereas new

\textsuperscript{1}We assume a 30-aircraft AEF package and use of HARVEST FALCON base-support packages to support 1100 people at the forward location. The AEF Battlelab at Mountain Home AFB, Idaho, is examining the feasibility of a new base-support package called HARVEST PHOENIX that would substantially reduce the initial transportation requirement.

\textsuperscript{2}This was a deployment of 30 combat aircraft to fill a scheduled “carrier gap” requirement. The package consisted of 12 F-15Es, 12 F-16CGs, and 6 F-16CJs.

\textsuperscript{3}The wing achieved the goal of generating combat sorties at the forward location after receiving 24 hours of strategic warning and 48 hours to actually deploy.
technologies will improve this situation in the mid to long term, implementing the EAF over the next few years will require many in-place, prepositioned resources.

Reducing the overall deployment footprint of deploying EAF forces will be an evolutionary process, involving the procurement over time of lighter and more-deployable support equipment, as well as more-supportable weapon systems. However, we found that the greatest near-term improvements in EAF deployability could be achieved by changing support practices and policies. This led to our second finding, that the best opportunities for improving the situation are in the strategic decisions about the logistics and mobility processes that are involved with deploying and sustaining forces. The 4th AEW deployment focused on streamlining the deployment execution (see the processes shown in Figure 3.2). The figure illustrates the current ACC standard for deployment (72 hours of strategic warning, 24
hours to start deployment, followed by another 18–24 hours to arrive in theater, regenerate the aircraft, and begin to launch strikes. The ovals list the tasks to be executed when strategic warning is given. The 4th AEW made substantial improvement on that timeline.

We found that the biggest payoffs will be achieved by examining the strategic decisions that must be made long before the deployment takes place. Figure 3.3 illustrates the relationship of strategic decisions to the execution decisions shown in Figure 3.2. Of the strategic decisions shown, our research focused primarily on those regarding forward infrastructure—which Kugler (1998) pointed to as critical to
The projection of aerospace power. We found it to be an important element of an overseas support structure for the Air Force.

ELEMENTS OF A GLOBAL LOGISTICS/MOBILITY SYSTEM

Decisions about what to preposition, and where, form the basis of infrastructure preparation. There are tradeoffs to be made between a number of competing objectives, including responsiveness, cost, footprint, risk, and flexibility. Prepositioning everything at the forward location improves responsiveness, but it also reduces flexibility, adds political and military risk, and incurs a substantial cost if a number of such bases are to be prepared. Bringing support from CONUS or an in-theater location increases flexibility and reduces risk, but results in longer timelines and requires increased airlift.
Considering these tradeoffs, there are essentially five elements of a logistics and mobility system to support expeditionary aerospace forces. The first three—FOLs, FSLs, and CSLs—have already been introduced as important aspects of the flexbasing strategy. Here we will consider on their logistics and mobility aspects.

- **Forward operating locations.** As indicated earlier, there are three categories of FOLs, with each category requiring different amounts of equipment to be brought in to make the base ready for operations. Each therefore has different timelines and transportation requirements. A key decision about theater infrastructure is deciding how many FOLs of each type the Air Force needs in a critical area.

- **Forward support locations.** FSLs are regional support facilities outside of CONUS with high assurance of access but not located in a crisis area. FSLs can be joint depots for U.S. WRM storage, for repair of selected avionics or engines, a transportation hub, or a combination of these. They could be manned permanently by U.S. military, by host nation personnel, or simply be a warehouse operation until activated. The exact capability of an FSL will be determined by the forces it will support and by the risks and costs of positioning specific capabilities at its location. FSLs will have an enhanced potential for using local military or contractor facilities to support regionally engaged AEF force packages.

- **Core support locations.** CSLs are MOBs located both in CONUS and overseas. They are the home bases for Air Force forces, and provide the full range of operations support. Some core bases will back up the FSLs, providing repair capabilities and deployable supplies and equipment.

- **An air mobility network** will connect the FOLs, FSLs, and CSLs, including en route tanker support. If AEF force packages are to deploy leanly, rapid and assured transportation links are essential. FSLs themselves will likely be transportation hubs and beddown sites for air mobility forces.

- **A logistics C2 system** will coordinate the entire support structure, organize transport and support activities, and allow the system to react swiftly to rapidly changing circumstances.
Strategic decisions about the global support system for the expeditionary forces will require choices about the roles that each of these elements should play, considering the security challenges in each region. One choice will involve how many Category 1 FOLs are needed to support a rapid response to aggression in a given region. Another could concern the types of supplies to be placed at each FSL—ranging from munitions to humanitarian supplies. Yet another could be a decision about where component repair should take place. Our research has provided a framework for analyzing these questions, along with some initial answers.

ANALYTIC FRAMEWORK FOR STRATEGIC PLANNING

Process Models for Evaluating Support Options

The core of our analytic framework for strategic logistics/mobility planning is a series of models of critical support processes that can calculate equipment, supplies, and personnel required to support operations at an FOL. Because support requirements are a direct function of mission requirements, the models must be employment-driven; that is, they start from the operational scenario with estimates of types and numbers of aircraft, sortie rates, types of weapons, and so forth. Once the support requirements are computed, we need to evaluate options for satisfying those requirements—for example, prepositioning the equipment, deploying it from CONUS, or deploying it from regional support locations. The evaluation considers several dimensions, such as spin-up time (the time required for the deployed force to be ready to conduct operations from its deployed location), footprint (the amount of airlift capacity the deployment requires), peacetime costs (both investment and recurring), flexibility, and risks (both military and political). Figure 3.4 depicts the framework. This process is repeated for each of the resources or commodities needed at the FOL. For our analysis, we developed models to estimate the requirements for munitions, POL support, unit maintenance equipment, vehicles, and shelters. These requirements account for the bulk of the support needed at an FOL.
The primary advantage of employment-driven models for making strategic support decisions is that they allow us to deal with the pervasive uncertainty of expeditionary operations. The models can be run for a variety of mission requirements selected by operators, allowing examination of support performance for different types of missions (humanitarian, evacuation, small-scale interdiction, etc.), the effects of different weapon mixes for the same mission (e.g., new, light munitions), and other potential modifications to the theater environment.

To use the support models in this manner, the models must run quickly and estimate requirements at a level of detail (numbers of personnel, pallets, and large pieces of equipment such as fuel trucks, bomb loaders, cranes, etc.) appropriate for the strategic decision. At the same time, they must contain enough detail so that major changes to the process can be reflected and evaluated in terms of their effects on different metrics. For example, one insight gained from our research is that the requirements for some support processes can be divided into Initial Operating Requirements (IOR)—the equipment, people, and supplies needed to begin operations—and Follow-on Operating Requirements (FOR) needed for sustainment. Being able to distinguish these in the model provides a more flexible set of options for providing the necessary support.
The next step compares an option’s capability and cost with those of other options. This allows the tradeoffs to be observed between options involving the movement of resources from CSLs, from FSLs, or prepositioning them at the FOLs from which the aircraft will fly. Mobility requirements enter the process here as well. For example, prepositioning equipment at FOLs reduces mobility requirements and spin-up time, but at higher costs (to preposition sets of resources at a number of FOLs) and possibly greater risks (access to the equipment would be subject to political or military interference). Positioning resources at an FSL or CSL is less expensive but extends the spin-up time and assumes the availability of substantial amounts of airlift.

Figure 3.5 shows a sample tradeoff between cost and spin-up time for munitions support in a scenario where heavy bombs would be used for ground attack. The bars show the cost for each of the munitions storage options, and the lines show an optimistic to pessimistic
range of responsiveness.\textsuperscript{4} Note that substantial levels of possibly costly prepositioning are necessary to achieve the highest levels of responsiveness.

**Integrating Models for Design of Overall Support Concepts**

Models of individual support processes can yield important insights into support processes for expeditionary operations. However, for strategic planning of a logistics/mobility system, we need to integrate the outputs of models of different processes and consider mixes of options. Support concepts could include a mix of prepositioning some materiel, deploying other materiel from FSLs, and deploying still other from CONUS. To choose among all the options for each resource group, we developed a prototype mixed-integer optimization model. The use of optimization techniques, which have a long history of application to logistics planning and analysis, was a way to identify feasible least-cost support concepts. This automated tool selected one or more support options in each of the commodity areas, using the criteria of responsiveness and cost. Taken together, these options represented a possible support concept for expeditionary aerospace operations that could then be examined more closely to consider additional issues, such as the operational flexibility of the concept and its transportation feasibility. Figure 3.6 lists the main characteristics of the model.

When we applied this model to the positioning of munitions, fuel, vehicles, and shelter for a single theater—Southwest Asia, the results were as shown in Figure 3.7. We chose 48-, 96-, and 144-hour deployment timelines as benchmarks for three types of FOLs. The Category I FOL, with the most in-place equipment, provides the most responsive capability. If less responsiveness is allowable, more supplies and equipment can be provided from FSLs and CONUS, which provides planners with better flexibility with regard to possible operating locations. Note that, in general, little support can be provided from CONUS unless even longer deployment timelines are

\textsuperscript{4}The “Deploy from CONUS” option is considered more variable because the greater distances imply greater risk of delay arising from maintenance problems, diplomatic clearances, and the like. The airlift flow in the analysis was constrained by a maximum on the ground (MOG) of two aircraft at the FOL.
Enabling the Strategy: A Global Logistics/Mobility Support System

- Selects a candidate mix of support options
- Minimizes peacetime cost, subject to:
  - Wartime sortie generation requirements
  - Deployment timeline requirements
  - Limitations of air mobility system
  - Robustness requirements
- Models transportation network
  - FOL, FSL, and CSL locations
  - Distances/travel times
  - Aircraft, ships, and trucks
  - MOG limitations
- Multiple theaters are possible
  - Sharing of logistics locations between theaters

Figure 3.6—Integrating Model Characteristics

accepted. Another important result of this analysis was that in every case, the regionally located FSL was an essential contributor in least-cost solutions. This would seem to support the FOL-FSL-CSL aspect of the flexbasing concept from both a cost and deployability perspective.

As the Air Force extends its analysis of support structures beyond single theaters of operation, the complexity of the tradeoffs involved will make the application of automated techniques such as those illustrated here even more essential. The complex interactions between the region-specific security challenges, mutually supporting theaters, cost, and required levels of responsiveness will create many possible support structures. In addition, as new and more deployable equipment is being considered, or new policies and procedures are formulated, their effects on the overall cost and deployability of the EAF concept will be difficult to judge without an integrated and automated analytic framework.\(^5\)

\(^5\)For a more thorough discussion of integrated strategic planning for an ACS/mobility system, see Tripp et al. (1999).
Deployment times and distances are based on Southwest Asia.

FMSE = fuels management and support equipment.

<table>
<thead>
<tr>
<th>Timeline</th>
<th>FOL</th>
<th>FSL</th>
<th>CSL</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 hours</td>
<td>Bombs (IOR)</td>
<td>Missiles (IOR &amp; FOR)</td>
<td>Unit equipment</td>
</tr>
<tr>
<td>(Category 1)</td>
<td>Fuel</td>
<td>Bombs (FOR)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FMSE</td>
<td>Repair: avionics and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shelter</td>
<td>engines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vehicles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>96 hours</td>
<td>Bombs (IOR)</td>
<td>Bombs (FOR), FMSE</td>
<td>Unit equipment</td>
</tr>
<tr>
<td>(Category 2)</td>
<td>Fuel</td>
<td>Repair: avionics and</td>
<td>Missiles (IOR &amp; FOR)</td>
</tr>
<tr>
<td></td>
<td>Shelter</td>
<td>engines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vehicles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>144 hours</td>
<td>Fuel</td>
<td>Bombs (IOR &amp; FOR)</td>
<td>Unit equipment</td>
</tr>
<tr>
<td>(Category 3)</td>
<td></td>
<td>Repair: avionics and</td>
<td>Missiles (IOR &amp; FOR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>engines</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shelter</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vehicles</td>
<td></td>
</tr>
</tbody>
</table>

NOTES: Deployment times and distances are based on Southwest Asia.

FMSE = fuels management and support equipment.

Figure 3.7—Least-Cost Resource Positioning to Meet Timeline Criteria

SYSTEM DEPLOYMENT PERFORMANCE

Employment Scenario and Metrics

As described earlier, our analytic method uses employment scenarios to derive logistics requirements. In the analysis described here, we addressed a scenario that places heavy demands on those commodities (munitions, POL support, unit maintenance equipment, vehicles, and shelters) that account for most of the support footprint. The scenario is illustrative of the type of questions that can be answered by our analytic framework. Other missions, weapons, sortie rates, etc. could also be examined to evaluate the robustness of any proposed support concept.

6The discussion in this subsection is taken from unpublished work by Lionel Galway et al.
The scenario elements that determine the requirements for the major commodities are the number of aircraft and their types (mission design series (MDS)), their sortie rates, their missions (which determine the munitions they carry), and their munitions expenditure rates. The key outputs of the models are the people, equipment, and consumables. In this example analysis, we will focus on the cost and weight of the equipment and consumable items. We converted the weight into airlift requirements by using standard planning factors.

The scenario illustrated here is based on the deployment experience in Southwest Asia (SWA), since it has been in this theater that the concept has been most tested. Although the aircraft, missions, and sortie rates are taken from the Air Force component of Central Command (CENTAF) experience, we believe that the experience is useful in addressing the support needs of AEF force packages more generally. The basic AEF force package in the analyses below consists of

- 12 F-15Cs for air superiority,
- 12 F-15Es for ground attack with GBU-10s, and
- 12 F-16CJs for SEAD missions.

In our baseline scenarios, these aircraft execute 80 sorties per day (rates of 2.3, 2.3, and 2.0 sorties per day, respectively).\(^7\) We consider only the equipment and material required to conduct the first seven days of operations.\(^8\)

In comparing the performance of different infrastructure components both individually and in different configurations, we use five metrics: deployment timeline, deployment footprint (equipment and people), peacetime cost, flexibility, and risk. Our analytic method provides quantitative treatment of the first three, which will be described in more detail below. Flexibility and risk were ad-

---

\(^7\) This is a demanding scenario, and some Air Force planners have questioned whether such a small force could sustain this optempo for seven days.

\(^8\) Seven days has emerged as a canonical planning parameter for the initial operation. Clearly, if combat operations are initiated and extended beyond seven days, daily resupply will be a necessity.
dressed subjectively, although ongoing research is considering ways to more systematically evaluate these factors. Figure 3.8 displays the

---

**Figure 3.8—AEF Deployment Metrics**
metrics estimated with the employment-driven process models for six support Concepts of Operations (CONOPs). The metrics are displayed together to facilitate comparisons.⁹

Timelines to Deploy

For a Category 1 FOL, the optimistic time to set up the base is just under two days, even though most equipment is prepositioned. This result is primarily driven by the time to deploy personnel from CONUS and to set up munitions and fuel-storage facilities.

For the rest of the options, the times are primarily driven by the MOG and by the assumption of C-141s as the transport aircraft. The difference in timelines between CONUS and an FSL is minimal because the bottleneck is in unloading.¹⁰ For Category 3 bases, the primary time driver is unloading the bulky HARVEST FALCON package. Setting this package up requires four to six days with a dedicated 150-man crew, in a temperate climate.¹¹

In summary, meeting the 48-hour timeline will be virtually impossible with current processes and equipment unless most equipment is prepositioned. Even then the timeline is extremely tight.

Deployment Footprint

We define the deployment footprint as the amount of equipment and material that must be moved to the FOL for operations to commence.¹² The footprint is derived from the model outputs: the model computes the equipment and vehicles needed for each commodity, and then converts this to airlift requirements using standard planning factors for each selected aircraft (raw short tons could be

---

⁹A feature of the process models, called a TradeMaster, facilitates these comparisons.
¹⁰This assumes that the tanker airbridge, which can add time, has already been deployed.
¹¹It is current Air Force practice to set up complete HARVEST FALCON sets before declaring an initial combat capability. This could change as more austere base-opening packages are proposed and approved.
¹²As indicated in the previous footnote, the size of the deployment footprint can change with changes in support policy.
used as well). The upper right-hand panel of Figure 3.8 shows the initial airlift requirements for the three categories of FOL (i.e., the amount of airlift required to get the base operating).

**Peacetime Cost Estimates**

Although transportation and material costs are of secondary importance when a crisis looms, fiscal concerns require that part of the evaluation of any set of options include the peacetime costs of setting up and operating the system. These are shown in Figure 3.8 as investment and recurring costs. To estimate the costs, we assumed that there were two theaters of operation covered by the system, with an FSL in each theater. To implement the hedging strategy for base access discussed in Chapter Two, we assumed that there were five FOLs in each theater. We also assumed that the system needed the capability to support two simultaneous AEF force package deployments per year.

As expected, providing for five Category 1 FOLs per region is expensive, and munitions are by far the greatest cost (although recall that only the munitions IOC is prepositioned at each base). Drawing materiel back to the FSLs decreases the cost, increases flexibility, and (may) decrease risk because each FSL requires only two sets of equipment. However, airlift requirements are increased.

The recurring costs have two components—transportation costs for exercising the system with force package deployments twice a year, and the storage and maintenance costs for the equipment stored at the various locations. The lower right-hand panel of Figure 3.8 shows our estimate of the recurring costs for the base configurations we are examining. These recurring costs show a different pattern.

---

13 The actual computations are a hybrid. For most equipment, we compute the weight in short tons and divide by the capacity of the aircraft used for airlift planning purposes. For some bulky equipment, we also use area taken up to correct the computation, or, in some cases, the pallet positions required by the shipment. The measures are usually quite close.

14 The investment costs do not include costs for building new FSLs. These could be considerable, but are highly dependent on the nature of the relationship with the host country. In addition, some of the costs we counted could be sunk, meaning they have already been paid. However, the costs include those associated with the periodic maintenance and inspection of the equipment stored at FSLs.
from the investment costs—now the Category 3 bases supported from CONUS are relatively expensive to operate, primarily because of the large costs of transporting munitions and the HARVEST FALCON sets twice a year for exercises.

Looking at Figure 3.8 as a whole, we can see that Category 1 FOLs give the fastest response but at a high investment cost. As one might expect, Category 2 FOLs have a longer response time but at a lower investment cost. In general, stockpiling at FOLs has higher investment costs than stockpiling in CONUS, but it has lower recurring costs. These costs provide useful insights into the sources of cost for the flexbasing concept. We believe that these observations are robust across a wide range of scenarios, and that they will need to be taken into account in a broader analysis of the structure of the global logistics/mobility support system for expeditionary aerospace operations.

SYSTEM SUSTAINMENT PERFORMANCE\(^\text{15}\)

It seems clear that a global network of FOLs, FSLs, and CSLs will be essential for rapid deployments for intensive combat operations. We also find that such a network is required to sustain expeditionary forces. FSLs, in particular, will play an important role in sustainment, as can be seen by examining the tradeoffs between transportation time and the requirements of such sustainment processes as aircraft and munitions maintenance.

Figure 3.9 shows some of these tradeoffs. The vertical axis represents the fraction of shipments from CONUS to SWA that can be delivered by the day indicated on the horizontal axis. The left-most curve shows the distribution of expected resupply times for small items (e.g., 150 lb or less) that could be shipped via commercial express carriers. This distribution includes the entire resupply time, including the time from requisition submission to receipt of the item by the customer, and has a mean of about four days (including weekends, holidays, and pickup days). The distribution was generated by using optimistic times for each related process, and by assuming the processes are perfectly coordinated (no delays resulting from weather,

\(^{15}\)The discussion in this subsection is taken from unpublished research by Tripp et al.
mechanical problems, or enemy actions). The curve is therefore a “process optimum.”

The second curve shows the expected distribution of Worldwide Express (WWX) deliveries in a peacetime environment. WWX is a Department of Defense (DoD) contract with commercial express carriers to move small items within CONUS and from CONUS to the rest of the world. The contract has specific in-transit delivery times for shipments between specific locations. For instance, most in-transit times to sites within SWA are about three days, although this time excludes the day of pickup and weekends. With these delays included, the delivery times shown are greater than our optimistic assumptions in the previous curve. The third curve shows the distribution of resupply times for AMX-M, the system used for large cargo

Figure 3.9—Supply Times and Support Breakpoint Solutions
in wartime. These delivery times are longer than both the commercial delivery and WWX options. The fourth curve represents the delivery times experienced by an actual AEF deployment to SWA.

We combined this transportation information with data from studies we conducted on two combat aircraft sustainment processes. For component repair of LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night) pods and F-15 avionics components, we calculated the cost breakpoints for (1) locating repair facilities at a CONUS-located CSL or (2) positioning the facilities forward at a location such as an FSL. The results are shown at the top of Figure 3.9. For F-15 avionics, the cost breakpoint occurs at seven days. That is, if delivery time from CONUS is reliably less than seven days, it makes more sense to perform the maintenance in CONUS. If it takes more than seven days, it would make more sense to perform the maintenance regionally, at an FSL. For LANTIRN pods, the breakpoint is lower, about two days, because there are fewer parts available to fill the delivery pipeline.

The curves show that whereas F-15 avionics could be supported from CONUS if the transportation times reached our commercial “best-case” estimate of six days to deliver 100 percent of shipments, the LANTIRN would still be better supported from a forward-positioned regional maintenance capability. However, the real-world and contractual experience shown in the other curves suggests that transportation performance will not come close to the best-case estimate. In addition, it is unlikely that the Air Force would rely solely on commercial package carriers to resupply a unit conducting combat operations. These considerations make forward maintenance preferred for F-15 avionics as well.

The overall peacetime cost of the sustainment system is an important concern. Centralizing certain maintenance functions at FSLs may help contain costs by consolidating assets, reducing deployments for technical personnel (who could be assigned to FSLs during AEF on-call periods), use of host-nation facilities, and possibly sharing costs with allies. Further, considerable infrastructure, including

---

16The third possibility—performing the maintenance at each FOL in the theater—is not shown because the FOL option was clearly the most costly, as a result of the expense of deploying multiple sets of test equipment to a large number of FOLs.
buildings and large stockpiles of war reserve materiel, may already be available in areas such as Europe.

Our analysis has indicated that many support functions such as component repair and engine maintenance will be provided cost-effectively from regional locations. Regional FSLs will play an important role in both the sustainment of deployed AEF force packages, as well as in their deployment.

TYING THE SYSTEM TOGETHER: MOBILITY AND DEPLOYMENT SYSTEMS

We have indicated that planning for the logistics/mobility support system must be global in scope. The need for this global perspective is perhaps no better demonstrated than by the inherently global nature of the transportation network that will support it. We have proposed a worldwide system of FOLs, FSLs, and CSLs with characteristics tailored to the defense challenges of the various regions in which they are located. Very much in keeping with air mobility doctrine going back to World War II, these sites will be connected by air links that will regularly go into and through a number of CINCs’ areas of responsibility (AORs), providing mutual support between them. The transportation services needed to support the flexbasing system with channel services, special airlift missions, aerial refueling, and theater airlift must be centrally planned to provide a global EAF deployment capability.

The implications of flexbasing for the air mobility system are yet to be fully understood and are the subject of ongoing research. However, it is clear to us that the chief issues related to mobility support for expeditionary aerospace forces do not hinge on the availability of sufficient numbers of airlift aircraft per se. The Air Force already has a large fleet of airlifters, and movement constraints such as en route and destination infrastructure almost always come into play before the number of available airlifters runs out. The best opportunities for improving air mobility support to the expeditionary operations lie instead in improving mobility and deployment processes. These processes were developed during the Cold War, when plans and requirements were much more stable and predictable. More dynamic and flexible processes are needed to support today’s expeditionary
operations. We next discuss the air mobility processes needed to support our flexbasing strategy during peacetime, and then during contingencies.

**The System During Peacetime**

The roles of the mobility air forces (MAF) in supporting the EAF concept and the logistics/mobility support system during peacetime fall into two categories: those missions needed to maintain the system over time and MAF participation in the forward deployments of AEF force packages.

To maintain the logistics/mobility system during peacetime, the air mobility system will:

- Deploy and redeploy the forward-based AEF force packages every 90 days
- Support the surveillance and maintenance of equipment stored at FOLs and FSLs
- Deploy and redeploy avionics technicians, munitions maintenance specialists, etc. to FSLs
- Discretely build up or decrease regional capabilities as security challenges change
- Test wartime routes used by assured resupply missions; gather resupply statistics for planning wartime sustainment operations.

It appears that the chief peacetime support of the mobility system to expeditionary aerospace forces will lie in enabling the regular deployment and redeployment of the forward-based AEF force packages. Although the true effect of these requirements on MAF OpTempo is still being evaluated, preliminary analysis has indicated that the effect should not greatly exceed the current demands being placed on the mobility system. These periodic movements closely mirror the current support given to operations such as NORTHERN WATCH, SOUTHERN WATCH, and DENY FLIGHT.

---

17 The MAF is a term that includes all mobility forces in the Air Force, including those assigned to AMC, PACAF, USAFE, AFSOC, ANG, and AFRC.
In addition to the force movements, however, air mobility will play a critical role in maintaining the system by providing channel and contract air carrier services. These flights will be a regular U.S. presence at the FOLs and FSLs, and move personnel and equipment to maintain system integrity. The flights will allow the quiet reapportionment of capabilities around the system as circumstances change. Finally, the periodic exercise of the assured resupply routes that will be used during wartime will allow the collection of essential statistics on order-and-ship time (OST) throughout the global system, enabling better logistics planning.

The MAF will not simply maintain the system. It will also deploy its own forces as part of the AEF force packages. These forces can:

- Regularly forward-deploy theater airlift and tanker forces to unstable regions
- Support “shaping” activities
- Train with coalition partners
- Visit for humanitarian and goodwill reasons
- Visit potential FOLs
- Deploy forces to build up en route and theater systems during crises.

As they have in numerous deployments over the past decade, MAF forces will deploy forward with the combat aircraft to provide aerial refueling and theater airlift support to employment operations. In addition, regular short-term visits by air mobility forces to forward areas will advance the shaping aspect of U.S. military strategy. Visits by C-17s, C-130s, or KC-135s are less sensitive than visits by combat aircraft and perhaps present more opportunities for training with potential coalition partners. For example, many other countries around the world fly C-130s, making airdrop training a natural way to interact with foreign militaries. In addition, because of their lower profile, MAF forces could more easily visit potential FOLs within a region, testing air traffic control services, instrument approaches, terrain clearances, fuel availability, ramp space, and other critical parameters that need to be known to implement the flexbasing strategy. Finally, with a regular and nonthreatening air mobility presence
throughout the system, it will be easier to quietly deploy theater airlifters, mission support forces, and tankers during periods of heightened tensions. This could allow a “leg up” on building the airbridge to support rapid expeditionary deployments.

**The System During Contingencies**

The air mobility system has been conducting deployments of U.S. forces during crises and contingencies for many years. Most of the mobility processes that the Air Force has developed are clearly applicable to the rapid deployment of AEF force packages. In addition, many “expeditionary” concepts, such as the quick projection of infrastructure and bare-base operations, were presaged by such MAF practices as the Global Reach Laydown of support forces and the beddown of theater airlift at austere locations. There are, however, a number of processes that are holdovers from a time when the deployment system was designed solely to execute major operations plans (OPLANs). These OPLANs, and their associated deployment requirements [time-phased force and deployment databases (TPFDDs)], are years in the planning, and there was little perceived need to rapidly assemble coherent deployment requirements or to react to unforeseen events. In what follows, we recommend changes to deployment processes to better support rapid expeditionary deployments.

**Quicker Assessment of Deployment Requirements.** The EAF concept assumes rapid deployment of aerospace forces that are tailored to the needs of a CINC in a particular crisis. However, today’s deployment system was designed to simply execute OPLANs and transport their deliberately planned TPFDDs. There is little capability to rapidly tailor deployment requirements to the needs of a specific crisis. Efficient automated tools are needed to quickly identify and integrate the deployment requirements of AEF force packages as a crisis unfolds.

The chief determinant of deployment requirements is the level of support that is available at the intended FOL. If the deployment is to a Category 3 bare-base FOL, for example, the requirements will be much greater than if it is to a Category 1 FOL. Also, the flexbasing strategy assumes the capability to deploy on short notice to any of a possibly large number of sites within a region. As indicated in
Chapter Two, this will require the collection and storage of a great deal of information, and the capability to disseminate that information to deployment planners during a crisis.

There is a pair of automated tools that holds promise to provide these capabilities. The Survey Tool for Employment Planning (STEP) and the Beddown Capability Assessment Tool (BCAT) are part of a suite of applications called the Logistician’s Contingency Assessment Tools (LOGCAT). STEP allows survey teams using laptop computers to efficiently collect the information needed on potential FOLs, including digital photos and video. Base Support Plans (BSPs) can then be developed and made available during crises to logistics planners at all levels. If AEF force packages are to be deployed quickly into available locations, it is critical for logistics planners to have access to pertinent high-quality data.

BCAT is a system that draws on both the forward-location data provided by STEP and on employment requirements from the Air Tasking Order (ATO). Figure 3.10 shows a BCAT interface that uses the data to compare the sortie-generation requirements of the commander’s employment plan with the overall logistical capability of a base to generate the sorties. This information will be useful for quickly assessing AEF deployment requirements and tailoring them to the needs of a particular contingency. STEP and BCAT are examples of the types of systems that can help implement expeditionary operations and the flexbasing strategy.

**Ability to Rapidly Develop TPFDDs.** During a crisis, requirements can change rapidly. A CINC may cancel the deployment of one unit in favor of another as the tactical situation unfolds. The beddown locations of deploying units can change at the last minute. To accommodate the dynamic and fluid situations that expeditionary forces are intended to address, deployment requirements must be quickly combined and put into operationally valid TPFDDs. A system in development that is designed to do this is the Deliberate Crisis Action Planning Execution System, or DCAPES. DCAPES will draw on an array of information systems, including STEP and BCAT, to allow Air Force planners to rapidly assemble the TPFDD for deploying AEF force packages. The ability to rapidly assess, tailor, and assemble deployment requirements should be considered a fundamental ex
peditionary capability. Some of the functions that DCAPES will perform are

- TPFDD editing
- TPFDD sourcing
- Manpower tailoring
- Personnel monitoring
- Manpower/personnel feasibility analysis
- Personnel rotations
- Unit type availability/apportionment
- Unit type development/TUCHA (type unit data file) updates
- Logistics planning
Use of “Playbooks.” Today most deployment planning takes place in the deliberate planning process in support of the major OPLANs. When contingencies pop up that do not have associated OPLANs, the deployment planning must take place quickly, in the so-called “crisis action planning process.” In the past, this has led to confusion and, in some cases, poor plans. There is a multitude of important details that must be taken into account in planning a deployment, and in the midst of a crisis there is often not enough time. In addition, proper attention may not be paid to the flexibility and robustness of the plan, causing it to fall apart at the first unforeseen event.

If expeditionary aerospace deployments are to be responsive and reliable, there needs to be a level of preplanning that is flexible to the situation but addresses many of the details that could be overlooked when time is short. One initiative already undertaken by the MAF to provide more flexible and responsive plans is the idea of developing contingency “playbooks.” As the EAF concept is currently envisioned, AEF force package deployments will draw from forces originating from bases across the country. These deployments will be complex, and rapid deployments will need to be carefully choreographed. A “playbook” is a mini-deployment plan that can be tailored to the current on-call AEFs. The level of detail can vary, however, depending on the number of situations the plan is intended to cover. For the MAF to support the expeditionary operations and the flexbasing strategy, less-detailed playbooks should be developed to cover various types of contingencies in each theater of operation. These could include robust and flexible concepts of operations (CONOPs), surveys of the available theater resources (e.g., MOG, fuel, billeting), and what FOLs could become available.

Enhance Capability to “Lean Forward.” The deployment of Global Reach Laydown (GRL) packages [i.e., mission support teams and Tanker Airlift Control Elements (TALCEs)] and the setup of tanker airbridge operations are necessary precursors to the rapid deployment of AEF force packages. Currently, the need to position this critical infrastructure has motivated the provision in MAF playbooks of a 24-hour period of strategic warning prior to the deployment exe-
If this infrastructure positioning can be given a head start in deploying, the overall responsiveness of expeditionary aerospace forces will be enhanced. With a “warm” en route structure designed around the system of FOLs, FSLs, and CSLs, and with playbook plans, it would be easier to deploy certain elements of infrastructure overseas prior to the execute order. It should be standard procedure to move tankers, theater airlift, and mission support forces out into the system during times of heightened tensions. In addition, as discussed earlier, periodic rotational deployments to key sites by tankers and theater airlifters, along with combined training exercises with regional partners, could increase the likelihood of having air mobility forces where and when they are needed. MAF forces would conduct these deployments during their AEF deployment eligibility periods.

Another way to enhance the capability to “lean forward” is to simply decrease the need for such preparatory activity. The amount of positioning at on-load sites by airlifters could be minimized. AEF force package deployments require the movement from many locations of much non-unit equipment and personnel to provide support functions, such as force protection, combat communications, space support teams, Patriot batteries, and chemical warfare defense. Each of these requires a positioning movement by airlifters, which is accomplished during the strategic warning period prior to actual deployment. These movements could be minimized by co-locating many of the support functions with the airlift, that is, at the airlift bases themselves.

We have outlined the essential characteristics of a global logistics/mobility support system for expeditionary aerospace operations and described how this system could support the rapid deployment of AEF force packages overseas, as well as how it could sustain these forces. We have also discussed the role of the mobility and deployment systems that will tie the system together. In the next chapter, we address force protection for deployed forces.

---

18 Most of this pre-execution positioning is done within CONUS, with the overseas GRL deployment waiting until the execute order.