INTRODUCTION AND MOTIVATION

With the end of the Cold War, the United States has entered an entirely new security environment in which the United States is the only global superpower in a world of many regional powers. The resulting demand for U.S. presence or intervention has required the U.S. Air Force to stage a large number of deployments, carried out by a substantially smaller force than existed in the 1980s. Whereas many of these operations required forward presence for patrol or combat (by rotating units from the continental U.S. [CONUS] for varying lengths of time), many others were and remain deterrent, in that forces are poised for a quick response but are not actively engaged (e.g., Phoenix Scorpion in Kuwait or Korea). The increased workload and operational turbulence have been blamed for a decrease in personnel retention and recent troubling decreases in overall readiness.

To meet the challenges of the new security environment with its uncertain demands and to address the problems of personnel turbulence, the Air Force has formulated the Expeditionary Aerospace Force (EAF) concept. The concept envisions highly capable and tailored force packages drawn from a set of Aerospace Expeditionary Forces (AEFs) that could be deployed from their home bases to provide air power on short notice anywhere around the world, which would allow greatly reducing (if not eliminating) deterrent deployments. The responsibility for responding would be rotated across AEFs, so that any one AEF would have a 90-day on-call period
every 15 months. By using the AEFs to meet steady-state rotational deployments as well, the EAF concept should greatly decrease personnel turbulence and create more predictability in planning unit activities.

The shift to an Air Force structured for expeditionary operations (fast deployments to a breaking crisis, possibly to bases with minimal infrastructure in place) has presented the Air Force with a number of challenges in planning and support. In this report, we present analyses indicating that achieving the EAF goals will require strategic preparation of theater infrastructure: development of a global system of support locations (Forward Support Locations [FSLs] and in CONUS) that provide materiel, maintenance, and transportation to deployed units at Forward Operating Locations (FOLs). Determining how support activities are distributed among CONUS, FSLs, and FOLs is the essence of strategic support decisions. These locations must be connected by resupply (because FOLs and the deployed units will depend on CONUS and FSLs for some of their support) and will need to be coordinated by an enhanced logistics command and control (C2) system (because all support will not be with the unit).

GENERAL ANALYTIC FRAMEWORK

The primary challenge facing Air Force decisionmakers is uncertainty about almost every aspect of expeditionary operations: where will an expeditionary force be employed, when, and under what political conditions? Our approach to understanding such uncertainty is to build models of logistics support for various commodities, and run them under different scenarios to assess how logistics requirements change for various levels of conflict in different locations. Because our emphasis is on strategic decisions, the models need account only for major equipment and personnel.

Each of our models has three components. First is a mission analysis that specifies the critical mission parameters that determine the requirements for each support commodity. We then use employment-driven logistics process models, consisting of rules and algorithms, that compute the process timelines and requirements for material, equipment, and people to establish and operate the process. A third component evaluates the performance of alternative infrastructure options in providing these requirements (e.g., prepositioning all
munitions at an FOL versus bringing in air-to-air missiles from CONUS).

We have developed models for munitions, fuel support, unit maintenance, vehicles, and shelters, and we have developed data for the models on the basis of extensive interviews at units that have deployed expeditionary forces to Southwest Asia (SWA). Further modeling work is planned to refine the current models and to develop methods of integrating the individual commodity models.

SUPPORT INFRASTRUCTURE COMPONENTS: FOLs AND FSLs

From this analysis, we have determined FOL characteristics and resource packages for a number of commodities to achieve different timelines for executing expeditionary operations. For analytic purposes, we have divided FOLs into three categories based on their infrastructure:

- A Category-3 FOL is the most austere FOL to which an expeditionary force would deploy; it meets only the minimum requirements for operation of a small fighter package (runway, water supply, fuel availability).

- A Category-2 FOL has the minimum requirements plus prepared space for fuel-storage facilities, a fuel-distribution system, general-purpose vehicles, and basic shelter.

- A Category-1 FOL has the attributes of a Category-2 FOL plus an aircraft arresting system, munitions buildup and storage sites already set up, and three days’ worth of prepositioned munitions.

For each category of FOL, the resources that have not been prepositioned must be supplied during execution so that the supported force meets sortie-generation requirements. The options we consider for supplying these resources are supply from FSLs or from the CONUS.
EXPEDITIONARY DEPLOYMENT PERFORMANCE:
PROTOTYPE ANALYSIS

How well can FOLs with varying amounts of prepositioned equipment support expeditionary operations in terms of timeline, airlift requirements, and cost? And what is the performance of the two options for supplying the materiel that is not prepositioned? The mission package we consider is a force that has been deployed in SWA: 12 F-15Cs, 12 F-16CJs, and 12 F-15Es accomplishing ground attack with 2000-lb precision munitions. For various categories of FOLs and additional resources from an FSL or from CONUS, we compute how long deployment takes, and a rough estimate of investment and recurring costs to support that option. Figure S.1 displays the timelines (to initial operational capability, or IOC) for various prepositioning options for each FOL category for this ground-attack operation. As expected, extensive prepositioning decreases the time required to deploy an expeditionary force, but it imposes a cost penalty for having large stocks of equipment in many forward locations.

Note that these timelines are functions of current support processes and practices. Modifications to these processes will reduce the timelines, and our analysis framework allows us to assess the potential payoff along several metrics. For example, lightweight munitions could reduce the deployment footprint and make airlift of ground-attack munitions feasible.

After examining today’s force structure and its support processes, our analysis leads to a number of insights about FOLs and their support:

• To get close to the 48-hour deadline from execution order to dropping the first bombs on target, fighter expeditionary forces must deploy to Category-1 FOLs. Further, given that a flight halfway around the world takes approximately 20 hours, pushing the timeline below 48 hours will require having people permanently deployed, or materiel at an advanced state of preparation at the FOL, or both.

• Equipping many FOLs from scratch would be expensive. Although much of the cost for some materiel might well be sunk, maintenance and storage costs will still have to be paid.
FSLs provide a compromise in cost between prepositioning at FOLs and deploying everything from CONUS. In terms of timeline, the FSL option offers only a slight advantage over the CONUS option (primarily because ramp space is an airlift limiting factor). However, airlift from an FSL does eliminate having to deploy a tanker air bridge from CONUS for support provided by strategic lift, leaving these resources available for other uses.

Category-2 FOLs represent another compromise in cost and timeline. Deploying to a Category-2 FOL takes approximately three additional days to unload the airlift and two to three days to set up munitions and petroleum/oil/lubricants (POL) storage. There is also a risk that arrangements for rental vehicles, shelter, medical facilities, and the like that are anticipated to be available (perhaps commercially) would require additional time to finalize.

Category-3 FOLs are not useful as FOLs for very quick crisis response, given the time required to unload airlift and set up support processes. However, this is a function of the current processes, and the timeline estimated here is for a stressing
scenario. A less-stressing scenario or a humanitarian operation requiring simpler support might well be feasible from a Category-3 FOL.

ANALYZING OPTIONS FOR EXPEDITIONARY ACS

As originally envisioned, the EAF would consist of AEFs that would provide air and space forces that could be tailored to emerging crises, deployed rapidly to the required location, and be prepared to execute operations immediately (within 48 hours of departure from home). The prototype analysis indicates that this is not possible: *With today’s support processes, policies, and technologies, deploying even a modest fighter-based combat force to a bare base will require several days of development before the FOL can sustain a high flying tempo.*

This finding does not mean that achieving the 48-hour operational goal is impossible. The goal can be met by developing a strategic theater infrastructure with the judicious prepositioning of equipment, materiel, and facilities, but it requires hard thinking about threats and the level of U.S. interests involved to ensure that such investment is worth the cost. Other options include accepting a longer timeline, using bomber operations as a first response, and changing the current processes to add improved technology or new policies.

We assert that the long-term support issues raised in this report about FOLs, FSLs, and their locations and equipage require analyses carried out with a *strategic* perspective, one that views the entire support structure, both inside and outside CONUS, as a *system* of global support.