To reiterate: The goal of our analysis is to assist in making strategic decisions about forward logistics infrastructure—what and how much should be prepositioned at an FOL, what capabilities should be established at FSLs, and what should be deployed from CONUS. The primary challenge facing Air Force decisionmakers is uncertainty about almost every aspect of expeditionary operations: Where will an ASETF be employed, when, and under what political conditions. Our approach to understanding such uncertainty is to build models of logistics support for different commodities, and to use them to assess how logistics requirements change under different situations. Because our emphasis is on strategic decisions, the models need not be extremely fine-grained: as long as they account for major equipment and personnel, they will be adequate to assess strategies of FOL/FSL/CONUS tradeoffs. However, they must be detailed enough to help evaluate the effects of process improvements resulting from new policies or technologies, and to indicate which resources are constraints if the logistics requirements exceed the capabilities of logistics processes.

DETAILED DESCRIPTION

Our modeling approach is illustrated in Figure 2.1. The left panel represents the mission analysis. We extract the mission parameters that determine the requirements for each commodity. For munitions, for example, these parameters are the aircraft types, their missions (dictating the munitions they carry and expenditure rates), and their flying schedule (closely spaced launches require more loaders.}
and possibly more facilities and personnel for buildup). In contrast, a model to determine shelter or services requirements would primarily be driven by the number of personnel deployed.

The middle panel represents the employment-driven process model. Here, the mission parameters are used to determine the support resources needed for each commodity. The munitions model derives the numbers of munitions expended daily from the flying schedule and expenditure rates, and then uses the daily expenditures to compute the equipment and personnel needed for munitions storage, buildup, and loading. For some commodities, this requirement can be time-phased in terms of either optempo or initial versus full operating capability of the support process. Most of the models were built as simple spreadsheets because the spreadsheet paradigm allows us to lay out the structure of the model and its data clearly and openly to users.

The right-hand panel assesses options for providing the resources computed in the second phase. For infrastructure decisions, the
options are combinations of FOLs (of varying categories), FSLs, and support direct from CONUS, and the option analysis computes the time before a given process can support operations, the necessary transportation resources, and the costs for investment and operation. In the munitions model, for example, one option is to preposition three days' worth of munitions at each FOL and provide the rest from FSLs in the theater. Given a specific scenario, the model can compute the cost of each of these stockpiles as an investment cost for setting up this configuration.

Note in Figure 2.1 the top arrows feeding back to the mission analysis model both from the process model and from the assessment model. Some operational plans may be infeasible in terms of the deployed support process or in terms of possible forward infrastructure options, and a decision will need to be made whether to modify the operational requirements or the support options. The results of the model analyses will be recommendations for forward infrastructure, as well as changes in policies and technologies, all of which will be candidates for testing by the Air Force.

MODELS AND CURRENT STATUS

The results in Chapter Four derive from the models currently in use. Three of the models have been developed and are in the process of being extended and documented. The others are under development but have substantial representations of their commodities. However, there are a few other commodities (such as engines and their maintenance) that must still be addressed, which is why we regard our results as prototypical.

The munitions model is the most advanced of the models to date. Its mission inputs are aircraft type, mission, and loading schedule. Using aircraft loadouts, expenditure factors, and munitions characteristics, the model computes personnel and equipment requirements for the entire process from receipt and storage through loading of munitions on the aircraft. The model also computes the total amount of munitions used, munitions cost, and the airlift required to move different portions (e.g., bombs, missiles, and support equipment). Infrastructure options include prepositioning at FOLs (initial stockpiles versus full stockpiles) and resupply from FSLs or CONUS.
The POL support model is similar to the munitions model in its inputs and outputs, although here the modeling is largely “basic physics,” depending on aircraft and storage capacities and flow rates.

The Air Force Logistics Management Agency (AFLMA) has developed a series of spreadsheet models that compute maintenance personnel and unit equipment for different MDS, based on in-depth interviews with maintainers at active units. An F-15E model has been largely completed, with models for the F-15C, F-16CJ, KC-135, B-1B, and B-52 in various stages of completion.

Initial work has been started on spreadsheet models for vehicles and shelter. The former consists of a list of vehicles needed for a fighter operation derived from focus groups convened at ACC and the Air Staff. Currently, we have firm numbers only for a seven-day ASETF package of fighters, although we also have some information on the vehicles required for bomber operations. The shelter model is largely a listing of the contents of Harvest Falcon (the current Air Force equipment set that provides shelter, water, power, kitchen, and work enclosures for operations at a bare base), although that data have also been used to sketch out a version of a proposed Harvest Phoenix (very austere billeting) equipment set.

Additional work supporting deployment packages and forward infrastructure option assessment has been done on resource spares package (RSP) kits and on repair of F-15 avionics, electronic warfare (EW) pods, and LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night) pods. There are still other functions affecting deployment that we have not studied and are not included in this initial analysis. For example, force protection is a function of the security environment of the FOL and setup times could vary widely for different types of threats.

DATA SOURCES

In building these models, our primary source of information was interviews in the field with units that had deployed with AEFs to SWA, supplemented by interviews at the Air Staff and CENTAF (Central Command Air Force, the air component responsible for air operations in SWA) and by statements of policy in Air Force publications. We also interviewed functional experts in other units and such
organizations as the Air Force Combat Ammunition Center (AFCOMAC). The goal was to estimate the minimum required to staff and support each process. We were most interested in using our models as a general framework for analysis, one in which rules and data could be examined, rigorously questioned, and modified according to experience, testing, and changing circumstances. The data are therefore realistic, coming from actual units that have made this type of deployment several times. In some cases where data were difficult to obtain, we made educated guesses and carefully documented the rationale so that users could judge the adequacy of the inputs.

INTEGRATING MODELS

The models described above focus on single commodities, although they do cut across organizational lines where necessary (e.g., the munitions support model covers both munitions buildup and aircraft loading processes). Eventually all of the resources must be brought together in a deployment. To integrate the process models, we are developing an optimization model to bring together the processes and help determine how to provide each segment of support. That work is not described here. Instead, we use a simpler integration (described in Chapter Four) of the support processes to help assess forward infrastructure options.