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Supporting Air and Space Expeditionary Forces

Analysis of CONUS Centralized Intermediate Repair Facilities

Ronald G. McGarvey • James M. Masters • Louis Luangkesorn
Stephen Sheehy • John G. Drew • Robert Kerchner
Ben Van Roo • Charles Robert Roll, Jr.

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1776 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138
1200 South Hayes Street, Arlington, VA 22202-5050
4570 Fifth Avenue, Suite 600, Pittsburgh, PA 15213-2665
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Summary

In 2004, the United States Air Force Deputy Chief of Staff for Installations and Logistics, Lt Gen Michael E. Zettler, directed his staff to develop plans for the implementation of centralized intermediate repair facilities (CIRFs) to provide off-equipment repair of major aircraft components at a small number of regional facilities in the continental United States (CONUS). Failed aircraft components, such as engines or avionics, would be shipped from operating locations to CIRFs for repair, and serviceable replacements would be shipped from CIRFs to sustain the operating units. The logic behind the CIRF concept is simple. The CIRF operations, being larger than the traditional, local operations, would enjoy economies of scale and thus could be expected to handle the workload more economically—that is, with significantly less manpower. What was not yet well understood about this off-site maintenance concept, however, was how it would impact weapon system availability.

The RAND Corporation was asked to perform an analysis to determine whether CIRFs provide for cost-effective maintenance of CONUS fighter and attack aircraft. RAND had performed a number of CIRF analyses in past years, but these had all focused on the use of CIRFs outside the continental United States (OCONUS), primarily in support of Air and Space Expeditionary Force contingency operations. These analyses had a different motivation in that the attraction of an OCONUS CIRF is its ability to reduce the AEF's deployed footprint and increase the combat unit's flexibility and speed of deployment. However, because combat units would receive CIRF support when

deployed, adherence to the USAF doctrine to "train like you fight" would imply that units should also receive in-CONUS CIRF support for normal peacetime training.

This monograph describes the new modeling approach we developed to construct CONUS CIRF network designs. It also presents detailed results for specific analyses based on F-15, F-16, and A-10 aircraft force structure bed-downs that will result from the 2005 Defense Base Closure and Realignment (BRAC) process. For these three types of aircraft, all CONUS active duty bases, ANG installations, and AFRC installations possessing combat-coded or training aircraft, along with some AFMC assets, were included as locations to be supported by the CIRF networks. We constructed CIRF network designs for

- aircraft engines (TF34, F100, and F110)
- EW pods (ALQ-131 and ALQ-184)
- LANTIRN navigation (AN/AAQ-13) and targeting (AN/AQ-14) pods
- F-15 avionics LRUs.

Tasking scenarios considered in the analyses included normal peacetime training and readiness, AEF deployment taskings, and MRC taskings. The key ground rule for this study was that any increase in maintenance efficiency achieved by implementing CONUS CIRF structures could not come at the cost of a reduction in combat support capability (measured as a mission capable rate or serviceable spare component level).

From our many analyses of CONUS CIRF implementation options across a range of individual commodities, force structure bed-down assumptions, and operational scenarios, we developed general findings and policy recommendations on the employment of the CONUS CIRF concept, as well as more-specific findings and recommendations on particular commodities and implementation details. Our general findings are as follows:

1. CONUS CIRF is a cost-effective maintenance strategy. In most cases examined, we found the CONUS CIRF concept to be cost-effective. By this we mean that for the scenarios and commodities we evaluated, centralized maintenance networks outperformed decentralized maintenance networks in terms of weapon system availability and cost in every instance but one (F-15 avionics).

2. Potential manpower cost savings more than offset increased transport costs. CONUS CIRF network solutions tend to substitute relatively inexpensive transportation costs for relatively expensive maintenance manpower. The costs of these asset transshipments are more than offset by the reductions in maintenance manpower costs that result from CIRF networks.

3. CONUS CIRF total pipeline requirements generally are not excessive. Pipeline asset requirements did not pose a problem in most implementation scenarios. New transport pipeline requirements are usually not large, and they are often offset by the reduction in awaiting maintenance (AWM) assets that results from centralized repair.

4. Many network designs are virtually equivalent in cost and performance. For each commodity and scenario studied, alternative CONUS CIRF network designs that differ only slightly in cost and performance can be developed. In other words, the specific situation often permits a great deal of flexibility in the choice of network to be implemented.

5. Large user bases are naturally attractive CONUS CIRF locations. Bases that host large users of a commodity are prime candidates for a CONUS CIRF location (assuming all other variables are held constant) because of the resulting elimination of large transport pipelines. Most cost-effective CONUS CIRF networks call for CIRF facilities to be colocated at large user sites.

In addition to our general findings about the characteristics of well-designed CONUS CIRF networks, we offer the following specific, commodity-oriented findings related to CONUS CIRF implementation policies:

1. Spare engine pools are sufficient to support CONUS CIRF pipelines. Our analyses of TF34, F100, and F110 aircraft engines indicate that there are enough spare engine assets to adequately support the pipeline requirements for implementing the CONUS CIRF concept. (See pages 36–58.)

2. CONUS engine retained tasks are not cost-effective. The concept of CONUS retained tasks would allow operating bases that lose their full JEIM shops to retain a small capability for F110 and F100 engines, a capability sufficient to deal with a small subset of relatively "quick and easy" maintenance actions. Our analyses indicate that such retained tasks are not cost-effective for these engines. (See pages 42–46.)

3. F-15 avionics automatic test equipment (ATE) assets cannot support base-level bench check serviceable (BCS) screening. The BCS screening concept would allow F-15 units that lose their avionics intermediate-level maintenance (ILM) capability to retain ATE assets to screen for avionics LRUs that are removed at the flightline but for which the ATE finds no fault (a common occurrence). Our analyses suggest that F-15 avionics BCS screening is not cost-effective. Further, for the units we considered, there is insufficient inventory of certain ATE assets to support this concept. (See pages 89–92.)

4. F-15 avionics LRU spares pools are problematic. Many F-15 avionics LRUs are in critically short supply. The increased pipelines implied by CONUS CIRF implementation can be expected to increase the back-order situations for these assets. (See pages 83–92.)

5. CONUS CIRF network performance is sensitive to assumed removal rates and repair times. While our analyses support the CONUS CIRF concept for the commodities under consideration, the extent of CIRF savings is dependent upon several data factors for which significant uncertainty exists, such as wartime failure rates for pods and engine repair times. (See pages 52–58, 135–141.)

Overall, the results of this study strongly support both the feasibility and the desirability of using CONUS CIRF networks as a cost-effective maintenance policy for providing improved support to USAF warfighting forces at reduced levels of manpower and with lower total operating costs.