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REPORT

Analysis of the Air Force Logistics Enterprise

Evaluation of Global Repair Network Options for Supporting the C-130

Ben D. Van Roo, Manuel Carrillo, John G. Drew, Thomas Lang, Amy L. Maletic, Hugh G. Massey, James M. Masters, Ronald G. McGarvey, Jerry M. Sollinger, Brent Thomas, Robert S. Tripp

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4570 Fifth Avenue, Suite 600, Pittsburgh, PA 15213-2665
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Summary

Background and Purpose

Since the advent of the Expeditionary Air and Space Force concept in the 1990s, the Air Force has undergone numerous transformational processes and initiatives. Many of the initiatives have been local and the changes incremental. The independent effect of each incremental change is likely positive, but it is unknown whether the combined effects, viewed from a systems perspective, align with senior leaders' desired future direction for the Air Force. In 2007, senior Air Force logisticians asked RAND Project AIR FORCE to undertake a strategic reassessment of the Air Force's logistics enterprise to support the Air Force's efforts to realign the enterprise with the realities of the national security environment. A key part of this analysis was to identify alternatives for appropriately rebalancing logistics resources and capabilities between operating units and support network nodes across the total force.

The logistics enterprise analysis has four major objectives. The first is evaluating Department of Defense planning guidance to determine projected logistics system workloads. The second is structurally reviewing scheduled and unscheduled maintenance workloads that may be rebalanced between operating units and support networks. The third is strategically reevaluating the objectives and roles of contract as opposed to organic support in the logistics enterprise. The fourth is performing a top-down review of the management of the logistics transformation initiatives to ensure their integrated alignment with broader logistics objectives.

This report primarily focuses on the first two project objectives, in the context of the Air Force fleet of C-130s, including all Air Force standard C-130Es, C-130Hs, C-130Js, and all Air Force specialty variants including, among others, AC-130s, EC-130s, HC-130s, and MC-130s.[1] However, we also discuss an example of contractor support to the C-130 logistics enterprise. In addition, we discuss one transformation initiative, HVM, that could strongly influence the structuring of network-based maintenance workload between network nodes of differing capabilities.

We examined the C-130 fleet for several reasons. First, the C-130 is used extensively to support deployed missions. Earlier analyses of the F-16 and KC-135 fleets showed that the efficiency gains that could be achieved by consolidating workloads via a network of CRFs are significantly influenced by the maintenance strategy for deployed forces and the envisioned future deployment requirements for an aircraft fleet.[2] Second, the C-130 fleet is distinctive in

[1] McGarvey et al., 2009, addressed logistics support to the F-16 and the KC-135 and presented alternatives for the reallocation of maintenance workload between operating locations and a network of CRFs.

[2] McGarvey et al., 2009.

that it has several variants and supports an array of missions. We wanted to examine how the differences of the variants may affect centralizing the maintenance workload. Third, a portion of the C-130 fleet has already implemented the CRF concept. Air Force Special Operations Command (AFSOC) at Hurlburt Field centralized the isochronal (ISO) inspection process across several operating locations in the continental United States and a European operating location. AFSOC's motivation for centralization of ISO inspections was to free Air Force maintenance personnel from backshop work so they could be allocated to flight line sortie-generation work. The performance of the command's centralized ISO inspection facility provided strong empirical data to support our analysis. Moreover, AFSOC's use of a contractor to perform the centralized workload further develops the discussion of who could perform the maintenance at the CRFs.

A primary goal of this document and the document series is to develop a range of robust alternative policy solutions. The solutions will be used to inform the leadership of the Air Force of a range of options, rather than a single "best" or "optimal" answer. External factors beyond the scope of these analyses will influence the actual design of these networks. Therefore, the Air Force leadership could use the range of solutions provided in this document to weigh the costs and benefits of design alternatives and external factors when choosing the desired levels of capabilities and investment and the network design.

Results

This report presents a methodology for allocating maintenance workloads between operating units and a network of CRFs and examines the effects of centralizing specific maintenance workloads to achieve manpower economies of scale across the fleet while accounting for the manpower diseconomies associated with splitting other workloads between operating locations and CRFs, the costs of establishing CRFs, and the costs of transporting aircraft and components to and from CRFs. This analysis goes further than that of our other work because it also identifies the effects of maintenance consolidation on aircraft availability.[3]

For the purposes of illustration, we assumed that the desired capability is to support a steady-state deployment of 40 percent of the standard combat-direct support (CA) C-130 fleet, and 60 percent of the specialty CA and combat-coded (CC) fleet for an indefinite duration. For the F-16, our earlier analysis identified a requirement for a deployable CRF capability to support forward operations within an area of responsibility.[4] However, similar to the 2009 KC-135 analysis, which was based on current deployed maintenance practices for mobility aircraft and the existing Air Mobility Command (AMC) FOL–Regional Maintenance Facility (RMF) concept, this C-130 analysis assumes the CRF workload would be performed outside the deployed area of responsibility at a permanent location (which could be either inside or outside the continental United States). This analysis extends AMC's FOL-RMF concept by applying the FOL approach to home-station operations and by broadening the CRF workload to include ISO inspections, component repair, the refurbishment process workload, and some FOL nongrounding failure workload. Our analysis led to the following findings:

[3] McGarvey, et al., 2009.

[4] McGarvey, et al., 2009.

Rebalancing the workload with the introduction of CRFs could increase the capabilities and availability of Standard and Specialty C-130 aircraft while providing financial savings to the Air Force. First, we considered a CRF network that would support only the active-duty and AFRC network, with the ANG maintaining its current structure. We found that, if the Air Force implemented such a CRF concept and concluded that the current C-130 mission-generation maintenance operational capabilities were sufficient, the potential savings would be 2,500 personnel authorizations. The reduction in resources would generate an estimated $102 million annually by rebalancing workloads from operating locations to the network. Alternatively, the Air Force could elect to increase mission generation maintenance capabilities by authorizing a "split-operations" maintenance capability at CC/CA units.[5] Although units have been supporting split operations in recent experience, the additional maintenance manpower required to fully support both the deployed and home station responsibilities has not been authorized to these units. If the Air Force elected to apply the $102 million savings to split-operations requirements, the money could provide approximately 1,600 positions out of a 2,400-position split-operations requirement across all CC/CA units, without exceeding the current costs of the system.[6] To provide each active-duty AFRC CC/CA squadron with a split-operations capability (assuming the CRF concept is implemented), an additional 800 (2,400 – 1,600) authorizations need to be reassigned into C-130 maintenance, and the annual cost of C-130 maintenance would increase by approximately $26 million above the current level of expense.

Whether the Air Force captured the savings or reinvested in mission-generation maintenance, an expected 19 fewer aircraft would be in the ISO inspection process at any time. This translates to potentially making an additional 4.8 percent of the active-duty and AFRC total aircraft inventory (TAI) available to the Air Force for operational use.[7] This reduction is associated with a movement from one-shift ISO inspection operations at each unit to two- and three-shift operations at CRFs.

If we consider the Total Force, the CRF concept offers additional benefits and potential savings. Approximately two-thirds of all standard and specialty aircraft are possessed by active-duty and AFRC units (44 percent and 21 percent, respectively), and the remainder by the ANG. If the Air Force believed that the current mission-generation capabilities were adequate, consolidation across the total force could save 3,200 maintenance manpower authorizations, which would translate into a savings of $103 million annually. Alternatively, the resource savings from implementing the CRF concept could fund full-time split-operations maintenance positions. Providing every CC/CA squadron in the total force a split-operations capability would require transferring a total of 4,600 authorizations to the squadrons and increasing Air Force system costs by $120 million. Implementing the CRF concept would

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[5] *Split operations* occur when only part of a squadron deploys and part remains at home station, thus splitting the unit. Mission generation maintenance personnel are required at both locations.

[6] The $102 million annual savings reflects a 2,500 position reduction that is a mix of full- and part-time authorizations, offset by increased expenditures for CRF construction and transportation. Our equation of this $102 million to 1,600 split-operations positions assumed that these positions were all active-duty maintainers. We also had to account for some additional facility and transportation costs. A mixture of active-duty and AFRC full- and part-time personnel could increase the number of split-operations authorizations that could be funded without exceeding current expenditures.

[7] Note that, while 19 fewer aircraft would be in the ISO process at any time, not all these aircraft would be expected to be available, since some of the 19 aircraft would likely be unavailable for other reasons, such as engine failures.

generate approximately 1,600 full-time split-operations maintenance positions at a funding level that matches the current system costs. However, if we expand our perspective beyond this single weapon system, application of the CRF concept more broadly might allow for savings generated from aircraft with lesser deployment burdens, such as fighters, to be invested in a split-operations capability for other weapon systems with a greater deployment burden. Of course, were the leadership to deem the rotational burdens associated with aircraft maintenance acceptable, it could then reallocate any or all of these manpower "savings" out of aircraft maintenance and into other needs within the Air Force. From an effectiveness perspective, an expected 35 fewer aircraft would be in the ISO inspection process at any point in time. This translates to an additional 5.9 percent of the total force TAI that would potentially be available for Air Force operational missions. The reduction of the number of aircraft in the ISO inspection process illustrates the effect of implementing two- and three-shift operations instead of the large number of one-shift ISO inspection operations in the ANG and AFRC.

A number of potential network configurations with alternative CRF locations have comparable total system costs and availability effects. Our analysis determined that many potential sets of CRF sites provide benefits comparable to those of the optimal solution. Air Force leadership can use the range of options discussed in this research to weigh the design alternatives, along with external factors not considered in this analysis, when choosing the desired levels of capabilities and investment and the network design.

Our initial assessment of the HVM concept shows that it can provide savings beyond those the CRF concept offers. Integrating some of the wing-level workload into the depot-level workload for the active-duty and AFRC units could save approximately 3,300 maintenance authorizations, with a financial savings of $132 million. This translates into a savings of approximately 800 authorizations beyond the CRF concept. An estimated 52 fewer aircraft would be in the programmed depot maintenance (PDM)–ISO inspection process on average, twice the aircraft of implementing the CRF concept alone. This translates to an additional 13 percent of the active-duty and AFRC TAI that would potentially be available to the Air Force. If the total force is considered, the savings would increase to an estimated 4,500 maintenance authorizations and a total cost savings of $176 million. An estimated 86 fewer aircraft would be in the PDM–ISO inspection process on average. This translates to 14.5 percent of the total force TAI that would potentially be available to the Air Force. Table S.1 shows the savings from CRFs and HVM.

Finally, we emphasize again that a range of alternatives lies between the analysis endpoints that trade off additional split-operations capabilities with total cost savings. The Air Force

Table S.1
Savings from CRF and HVM Processes

Process	Cohort	Authorizations (number)	Annual Savings ($M)
CRF	Active-duty and AFRC	2,500	102
	Total force	3,200	103
HVM	Active-duty and AFRC	3,300	132
	Total force	4,500	176

could broaden its view of rebalancing resources across several mission design series (MDSs) to best meet the requirements of the future security environments. Similarly, rebalancing options should also consider the reprogramming of resources among maintenance and other career fields, based on projections of relative levels of future demand. Review and assessment of Office of the Secretary of Defense guidance, such as the Steady State Security Posture, could help the Air Force make such discriminations among aircraft and across operational capabilities.