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The Tactical Versus Strategic Role of the C-17: An Analysis of Operation Joint Endeavor

*Major Mark Shane Hershman, USAF
William A. Cunningham, III, PhD
Major Kevin R. Moore, USAF, PhD*

Introduction

The recent shift from a strategy emphasizing forward deployed forces to one of power projection for both war and military operations other than war is changing the Air Force logistics planning process. In contrast to the forward deployed force strategy, power projection relies far more heavily on strategic airlift and air mobility forces.¹ This new paradigm for future military operations was tested recently in Somalia, Rwanda, Bosnia and Haiti.

Presently, the Air Force and the Air Mobility Command (AMC), the Air Force command responsible for managing air mobility forces, face several important challenges. Strategic mobility has long been considered a weak link in the US military force structure. With the pending retirement of the C-5, C-141, and C-130 airlift aircraft, one key challenge is the doctrinal problem of how to properly amalgamate the C-17 aircraft in a force projection role. The critical question is: Should the aircraft be a strategic or a tactical airlifter, or can it fulfill a mixture of both strategic and tactical missions?

AMC doctrine for rapid mobility and force projection relies on aerial refueling of airlift aircraft, thus allowing aircraft to deliver cargo and personnel directly to the final destination in a theater of operations. However, such movements in contingencies prior to the introduction of the C-17 required improved airfields at the final destination. Without an improved airfield, an additional tactical (intratheater) movement to the strategic (intertheater) movement was required to reach the final destination. With the C-17, a seamless direct delivery sortie combining both strategic and tactical movements from the Continental United States (CONUS) to any unimproved airfield in the world is now possible.

The objective of this research was to determine the best method of employment for the C-17. To accomplish this, actual airlift movements for Operation JOINT ENDEAVOR were analyzed with a linear programming model. The model was designed to minimize the total cost of cargo movements by determining the number of C-17 and C-130 aircraft sorties required to deliver the actual amount of cargo moved during the operation. Results from this analysis were used to determine if a tactical, strategic or direct sortie mission was the best method of employment.

Background

Currently, the major portion of intratheater airlift is accomplished by C-130 aircraft. After cargo and personnel are

transported to a theater of operations through strategic or intertheater movement, C-130 aircraft are traditionally used to deliver cargo and personnel to the final destination. The final destination can be, and often is, an austere location with an unimproved airfield.

During Operation JOINT ENDEAVOR, the C-17 blurred the traditional lines between theater and strategic airlift. This blurring stemmed from the C-17's capability to haul 180,000 pounds of cargo and land on either unimproved or improved airfields. Further, the aircraft was designed to haul outside cargo, specifically the Army's M-1 tank, anywhere in the world. Consequently, the C-17 has the capability to provide a seamless direct delivery by combining both strategic and tactical movements.

In the direct delivery role, the C-17 provides efficient and rapid mobility to theater commanders. For instance, one C-17 can deliver 18 pallets of cargo directly to the final destination in theater. The alternative would rely on one C-17 to deliver cargo to the theater and then require three additional C-130 aircraft to deliver cargo to the final destination. In the latter case, aerial port operations would be required to download the C-17 and upload the C-130s, taking additional time for delivery of needed cargo. Additional storage space would also be required, creating possible congestion problems. By using C-17s for direct delivery, not only are workload and delivery time reduced, but the risk of losing and/or damaging cargo is lessened.

In past contingencies, moving personnel and materiel from the strategic transport mediums to the tactical mediums has been a slow and labor intensive process.² On the battlefield of the future, there will be an increase in efficiency, speed and lethality. The warfighter needs rapid support. The warfighting challenges are compounded by the need to respond to operations other than war such as natural and man-made disasters, humanitarian assistance and nation building. Time is often of the essence and the air mobility system needs to be flexible and responsive to both support and enhance the capability of the user.³ "If the war fighter is to succeed, the airlift system must address the customers' needs and not expect the customers to sacrifice their capabilities for the sake of eliminating air mobility constraints."⁴

The lack of established bases for transshipment and the vulnerability of forward bases require airlift systems capable of providing direct delivery from the CONUS to the point of use or final destination without the availability of an established support infrastructure. Further, the US needs to field an airlift system that considers cost factors in determining the airlift platform and systems.⁵

Methodology

A linear programming model was developed to compare the costs of using the C-17 in a direct sortie role to the costs of using the traditional C-130 as the intratheater airlifter. The model was used to determine the best employment method for the C-17 by minimizing the total cost of transporting cargo from Ramstein Air Base, Germany, to Tuzla, Bosnia, during Operation JOINT ENDEAVOR. During this operation, cargo was shipped from the CONUS to Ramstein and then flown via theater airlift or driven to the final destination in Bosnia. Since the cost of transporting cargo from the CONUS to Ramstein was borne regardless of the employment method used, this study focused on the cost of transporting cargo within the theater. Thus, the model was used to determine the required number of C-17 and C-130 sorties to deliver actual cargo at the least cost within the theater.

Two different time periods during the operation were selected for analysis: December 1995 and February 1996. December 1995 was a surge period for the operation while February 1996 was a sustainment period for the operation. The total cargo amounts carried by C-130, C-17 and C-141 aircraft during the two time periods were used. We assumed that all cargo was palletized with each pallet weighing 5,000 pounds. The round trip flying time for the C-17 and C-141 was two hours, while the C-130 required three hours.

The model used 90,000 pounds of cargo for the C-17, 18 pallets at 5,000 pounds. The C-130 would carry 25,000 pounds or five pallets. The landing weight for the C-17 was 430,000 pounds (60,000 pounds of fuel). This value was within the weight limits established for Tuzla. No weight restrictions for C-130 operations at Tuzla were imposed. Aircraft operating costs per flying hour were \$3,574 and \$5,694 for the C-130 and C-17 respectively. All operating costs were calculated using Fiscal Year 1996 costs.

Two constraints were used in the model. First, since not all cargo was readily available to fully upload aircraft, the cargo load for each aircraft in the model was constrained by using the average actual weight transported by the aircraft during each month. Second, the model was constrained by using four C-17s and only flying two round trips or sorties per day. This simulated using the majority of aircraft in a strategic role, with only four in a tactical role for this operation. Most ground problems did not occur in Tuzla, since originally the plan had a C-17 arriving every hour for downloading.

The model was solved by minimizing the total cost of operating the aircraft and calculating the number of sorties per aircraft type needed to move the cargo for each month.

Results

As Table 1 shows, 295 sorties (239 C-130; 23 C-141; 33 C-17) were flown from Ramstein to Bosnia hauling 7,360,754 pounds of cargo during December 1995. Using the actual average weights for the month and adding the constraint of four C-17s flying twice a day, the model shows that only 89 C-17 sorties would be required, at a total cost of \$1,013,782. The total cost savings would have been \$2,145,978.

In February, there were 362 sorties (278 C-130; 40 C-141; 44 C-17) transporting 8,031,340 pounds of cargo. The model shows

Month	Sorties	Cost	Cargo (Pounds)	Savings
December				
Actual Employment				
C-130	239	\$2,562,558	4,010,858	
C-141	23	\$221,398	621,303	
C-17	33	\$375,804	2,728,593	
Total	295	\$3,159,760	7,360,754	
Direct Sortie Employment				
C-17	89	\$1,013,782	7,360,754	\$2,145,978
February				
Actual Employment				
C-130	278	\$2,980,716	4,092,804	
C-141	40	\$385,040	1,442,048	
C-17	44	\$501,072	2,496,488	
Total	362	\$3,866,828	8,031,340	
Direct Sortie Employment				
C-17	142	\$1,611,976	8,031,340	\$2,254,852

Table 1. Comparison of Methods

that only 142 C-17s sorties would be required at a total cost of \$1,611,976. The total cost savings would have been \$2,254,852.

Conclusion

The objective of this research was to determine the best method of employment for the C-17. The results indicate the C-17, when used in a direct delivery role, can definitely produce savings and reduce delivery time. For the month of December, the model showed a cost savings of \$2,145,978 and a requirement for only 89 missions instead of 295 missions if only the C-17 had been used. Assuming eight missions per day, the whole month's cargo could have been transported in 12 days. Since the operation was in a surge period during this time, the reduced delivery time may have been beneficial to the operation. During the month of February, a sustainment period in the operation, only 142 C-17 missions would have been required instead of 362 missions actually flown at a cost savings of \$2,254,852. Consequently, less airlift aircraft would have been required to provide sustainment.

With the funding for airlift support coming from the supported commander, any savings a commander can realize in air mobility operations would be beneficial. In the two months analyzed in this study, the direct delivery method of employment for the C-17 could have saved \$4,400,830. Further, the additional costs associated with downloading and uploading necessary for transshipping all cargo to the final destination could have been avoided.

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DTIC '98 Annual Users Meeting and Training Conference

This year the Defense Technical Information Center (DTIC) is hosting its 25th Annual Users Meeting and Training Conference. The conference will be held at the DoubleTree Hotel, National Airport, 300 Army Navy Drive, Arlington, Virginia, from 2 – 5 November 1998. The agenda is packed full of exciting and relevant topics, and the exhibit room will feature vendor displays representing every aspect of Information Technology (IT).

"Maintaining the Information Edge" is the theme for the conference, and the sessions are geared to this topic. This year's keynote speakers include: Lieutenant General David J. Kelley, Director, Defense Information Systems Agency; Carol Cini, Associate Director, US Government Printing Office, and Richard Luce, Director, Los Alamos Research Library. Mr. Louis Purnell, the luncheon speaker, will relate his exploits during World War II as a Tuskegee Airman.

The conference offers four days of varied training sessions that will enable DTIC users to collaborate on the latest IT topics. Presentations will address the most current issues affecting the research, development and acquisition communities. Not only will the conference sessions acquaint attendees with the latest policy and operational developments, they will also provide practical details on valuable and diverse domestic and foreign information resources, security issues, the World Wide Web, virtual libraries, video streaming and the storage and dissemination of electronic documents.

For more information, please contact Ms. Julia Foscue, the DTIC '98 Conference Coordinator, at (703) 767-8236, DSN 284-8236, or e-mail at jfoscue@dtic.mil. Or, access the DTIC Homepage on the World Wide Web at <http://www.dtic.mil>

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Douglas MacArthur

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Lewis Carroll, Alice's Adventures in Wonderland

Mobility is the true test of a supply system.

Captain Sir Basil Liddell Hart, Thoughts on War