
The C-17 Transport—



C-17 Globemaster III.

U.S. Air Force (David McLeod)

Joint Before Its Time

By GEORGE M. DRYDEN

Jointness does not spring full blown from the mind and will of operational commanders. It must be cultivated not only through planning and training but in acquisition. For acquisition to be joint, cooperation among the services must exist at each step along the way.¹ Although infrequent, joint acquisition programs have been successful. The C-17 Globemaster III transport was a program in which the Army and Air Force cooperated in drafting specifications, source selection, promotion, engineering

and development, testing, and doctrine formulation.² In this program, the Air Force supported the C-17 and accepted participation by the Army.

The Requirement

“The failure to appreciate the importance of airlift is as old as modern airpower—and even the Air Force is occasionally guilty of it.”³ Strategic lift has always been regarded as a bureaucratic stepchild and the Air Force commitment to the C-17 program was routinely questioned because the Army would be the principal user.⁴ In addition, the C-17 competed for fighter dollars. Conventional wisdom would thus presume inattention by the Air Force. While support within the

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Military Airlift Command (MAC)—now the Air Mobility Command (AMC)—was always absolute, the Air Force as a whole was not enthralled by the C-17 until 1991 when it was seen as a means of commanding scarce budget dollars because of its cross-service mission.

But the Air Force steadily supported C-17 procurement—at higher than authorized levels. As one observer stated: “The Air Force took the rare step of awarding the contract for [the C-17 program] to McDonnell Douglas even though Congress had not provided any funds.”⁵ And others emphasized that the mere existence of the program demonstrated commitment because C-17s were not necessary for any Air Force mission. If the service opposed the program it could have easily shifted its support to an alternative program. Thus most observers agree that Air Force support has been consistent if not overwhelming.

Cooperative Foundation

In 1979, Major General Emil Block, USAF, took command of the cargo/transport aircraft-experimental (C-X) task force that was charged with developing a program management directive, preliminary system operational concept, and draft mission element need statement. His Army and Marine Corps counterparts were tasked with providing service requirements to the Air Force.

Following the failed advanced medium take-off and landing (AMST) program—an attempt to produce a jet-powered, outsized, cargo-capable C-130 replacement—the C-X program intended to meld the intercontinental range and outsized cargo bay of the C-5 with the austere field capability of the C-130. AMST produced two prototypes, one of which, the McDonnell Douglas YC-15, was a direct technological predecessor of the C-X program product, the C-17.

General Block oversaw four sections of the task force. Army and Marine representatives were responsible for representing service interests and each oversaw a section.⁶ Additionally, the operations panel was jointly chaired by an Air Force officer from MAC and another from Logistics Command and an Army officer. The program thus considered service interests to ensure general if not total satisfaction.

Concept and Design

Rather than prescribing particular technical characteristics, the request for proposal (RFP) described missions to be accomplished by C-X aircraft. Teams that developed those requirements were comprised of both Air Force and Army officers.

Mission design was divided into two sections. Army representatives developed scenarios for the types and numbers of units to be transported. As the Joint Chiefs noted in a memo to the Secretary of Defense:

*Major Army field commands assisted in developing a series of individual (intratheater) airlift requirements that were derived from OPLANS for Europe, Southwest Asia, and Korea. These “snapshots” provided a sound basis for evaluating the qualitative airlift requirements of the CINCs.*⁷

As a result, the process produced both payloads and schedules by determining how many troops and how much equipment had to be moved, to what destinations, and how fast.

Simultaneously, the Air Force developed a catalogue of global airfields (including runway and ramp specifications) and operational ranges required to utilize them. This revealed how far the aircraft had to fly and how austere a field it could land on.

By merging data, the task force created 24 mission scenarios which the winning contractor had to solve. Mission 7, for example, was described as follows:

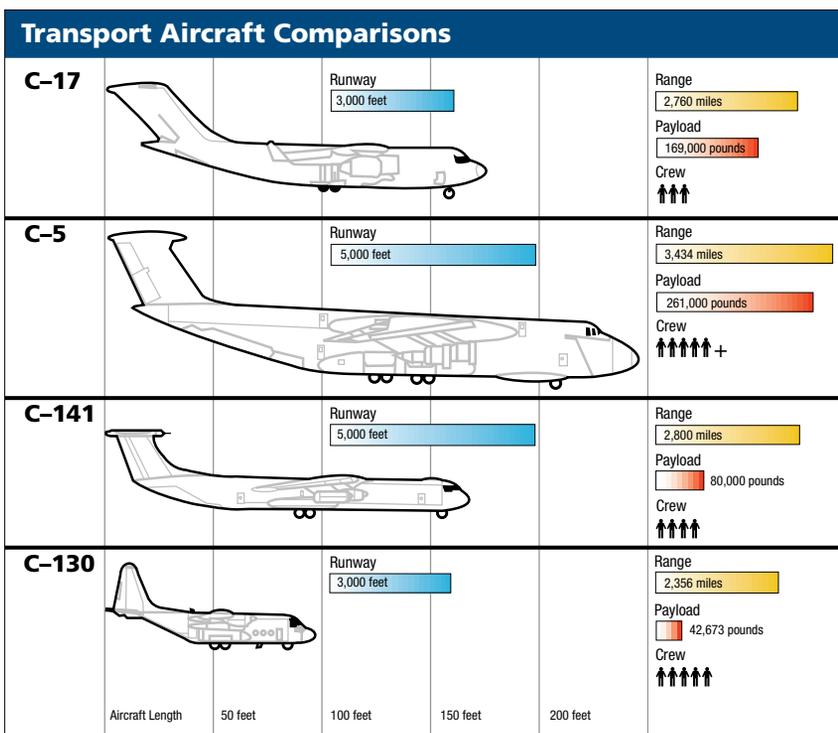
*Logistics missions with payloads at 100 percent of the 2.25 G capability (of the aircraft) . . . final one hour at 500–1100 feet above ground level . . . at an average speed of 300 knot equivalent airspeed using low level (contour flying) . . . procedures. . . Land on a 4000 foot paved runway with adequate fuel to fly an additional 500 nautical miles after offload. . . . At the midpoint of low altitude cruise at 300 KEAS, [the C-X should be able to perform] an evasive maneuver of up to 2.25 G.*⁸

As a result, the C-X aircraft was conceived in terms of overall joint warfighting capabilities, not as an organic Air Force requirement.

Because C-X concept development and design included Army involvement in a traditionally Air Force domain, new design factors became important: how to load and tie down cargo, how much time it takes, and transitioning from one mission to another. Such factors may not have been addressed as thoroughly without direct Army participation.

With RFP completion, the program moved on to the process of source selection in which the Air Force did not solicit Army input but had an Army general on its board. As one Air Force officer told the author, “The Army had primary input at source selection. Some would even say one of the designs lost because of the Army. They didn’t like it as well.”

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The C-X contract was awarded to McDonnell Douglas for a design designated C-17. After that decision, the Army was no longer involved in the contract negotiations but remained informed of developments. The Air Force served as the contractor's sole point of contact.

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Jointness also extended vicariously to the contract design teams. In designing the C-17, McDonnell Douglas employed a studies and analysis group composed of up to 75 percent former Army personnel. In response to the mission-based RFP, this group designed what some called the optimal cargo compartment. The C-17 transport was built around a back-end cargo area which could accommodate paratroopers, vehicles, palletized loads, roll-on/roll-off shipments, airdrop, and medical evacuation. Designers looked at what the Army had to move and created the smallest transport possible based on that requirement.

Testimony

Congressional scrutiny was intense as both the Air Force and the Army promoted the C-17. At a hearing in May 1993 before the Senate Armed Services Committee, the Army chief of staff, General Gordon Sullivan, and the Air Force chief of staff, General Merrill McPeak, testified in support of the aircraft. Sullivan remarked that on

his service's birthday that year, "the first C-17 will be delivered to Charleston Air Force Base [which is] a very significant event for the United States Army."⁹ McPeak, in turn, noted that the two services planned a joint celebration of the first delivery. "The C-17 is important to meet our mobility requirements. I plan to help celebrate the Army's birthday . . . by flying the C-17 personally into Charleston."

The following year, the Army and Air Force chiefs together with the Marine Corps commandant each sent personal letters to Congress on behalf of the transport. Sullivan's letter stated:

*We will need the C-17 to provide the strategic airlift for troops and equipment to provide our forced entry capability and simultaneous application of joint combat power across the depth of the battlefield in the 21st century. The C-17 is the only aircraft that can get the Army's outsized combat systems to the next war when required.*¹⁰

This echoed what the chiefs had said a decade earlier in support of the aircraft: "Because it offers superior military utility at a competitive price, the C-17 has strong support from the Air Force, Army, and Marine Corps."¹¹ It is hard to find similar joint backing for any other recent program.

Those who worked inside the program confirm that these public statements of cooperation were genuine. In the early days, one participant recalled the Army and the Air Force chiefs of staff closely coordinated their support for the program. But such high-level support also had its perils. Some Air Force participants grouched that though the Army consistently supported the requirement, it was sometimes evasive in backing the aircraft. Further, a charge was made that the Army never pushed too hard for the C-17 because it feared being compelled to supply the funding. Yet as one Air Force officer commented, "the C-17 wouldn't be there without Army support."

Jointness on other levels of the program was at least as important as those described above. It would have been futile for the Army to provide input only at the outset since years of engineering development and testing programs have created hundreds of design changes.

Personnel Involvement

In the early 1980s, about 25 Army officers were assigned to the C-17 program. As one of them later recalled, initially the Air Force "didn't

Humvee in cargo area for air-drop.



U.S. Air Force (Mike Fleinhardt)



U.S. Air Force (Ken Bergmann)

Jumping over Sicily drop zone, Fort Bragg.



U.S. Air Force (Paul Caron)

know what to do with Army [representatives] at the program office." Yet eventually cooperation took root without any extraordinary problems. The Army representative at Wright-Patterson—first a colonel, later a lieutenant colonel—served as a requirements officer to provide input to the Air Force.

But the Army's presence in the program office did not in itself guarantee a joint outcome. Some representatives were ineffective. In addition, a change in the chain of command reassigned the representative, who originally re-

ported to the Army chief of staff, to the U.S. Army Training and Doctrine Command which arguably lessened his clout and ability to represent Army interests.

Army and Air Force officers working C-17 issues in Pentagon budget offices also coordinated efforts. Despite interservice cooperation, there were problems in locating the appropriate points of contact when questions arose or information was requested. Responsibilities for various aspects

of the program were widely diffused within the services and identifying counterparts was difficult. One solution was to set up a special distribution system within the Pentagon to speed documents between the Army and Air Force.

Joint Products

The measure of an effort is the product, which begs the question: have Army requirements been satisfactorily addressed? Three examples come to mind in answer. Early in development, one Army officer noted that the RFP document had omitted red cargo bay lighting to preserve night vision, an operational consideration which is central to Army doctrine and planning. Although the contractor balked at adding the lights, they were put in once specifications were provided by Army laboratories at Fort Rucker, Alabama.

Later, in November 1992, the U.S. Army Logistics Command alerted the Air Force that the Army wanted an update on the program. This occurred shortly after a C-17 wing broke during a

static loading test. (Sections of fuselage and wings were tested using large hydraulic pistons prior to flight testing to simulate stress on the airframe; the wing was designed to withstand 150 percent of expected maximum flight stress.) Concern was expressed because of an earlier experience with the Lockheed C-5 which also had failed loading tests and did not fully satisfy Army needs.

Based on this concern, the Air Force briefed Army officials. During one of those sessions, the Army III Corps commander noted that the test plan had not been updated since the 1980s. This was a problem because the equipment listed in the plan was no longer in the inventory. M-60 tanks, for example, had been replaced by M-1s. This discovery allowed the Air Force to update the test plan, avoiding delays and embarrassment during subsequent cargo loading tests.

Another example involved paratrooper seat design. In the specifications, the seats were made of fiberglass and designed for a soldier weight of 310 pounds. But in the intervening decade the Army increased the weight to 400 pounds. While an Air Force official claimed the information had been miscommunicated, the result was the same. The seats were too small and the fiberglass caused "hotspots" on the paratroopers' backsides.

The Army lobbied for redesigned seats which it regarded as an issue of "fit and function." The Air Force, believing the point was solely comfort, opposed the change because it would result in more weight, time, and money. After three years,

the Army convinced the Air Force of the need for a redesign. The outcome was larger seats which accommodate more weight and are made from a Kevlar composite to provide protection and lessen hotspots, again indicating the constructive role of the Army throughout the program.

Joint Testing and Doctrine

Similar to the role of Army officers at Wright-Patterson was that of the Army officer posted to the C-17 "test-bed" at Edwards Air Force Base, California. He worked daily with the Air Force testers and was responsible for Army paratroopers and technicians involved in the program. In 1993 the representative was a lieutenant colonel from the Army Materiel Command. Involvement in testing was a logical extension of the Army's participation in previous stages. Design elements that the Army requested—like paratrooper seats—had to be verified, and the service's involvement has been accordingly high. One McDonnell Douglas official explained that the Army was integral to testing. One of the first C-17 flights was to Fort Hood for load analysis. On reaching Texas the aircraft was packed with 1st Cavalry Division tanks, artillery, et al. and performed as designed. At the end of the test program the Army Airborne Board certified that the C-17 can carry equipment, thus ensuring that it satisfied Army needs.

Finally, the acquisition effort will be wasted if the C-17 is not employed jointly. Doctrine is consequently essential because it sets the tone for conduct in the field (especially for the Army). Both Army and Air Force officers acknowledged the need to develop joint doctrine, although one Air Force officer claimed that it is less of a problem for his service. He argued that Air Force doctrine would employ the C-17 jointly and effectively as soon as it became operational but Army doctrine may lag. An Army officer countered that doctrine within his service is to "deliver supplies as far forward as possible or practicable," thereby implying that it will fully utilize C-17 capabilities without adjustment.

Regardless of which opinion is more accurate, jointness required data on C-17 capabilities to be disseminated throughout the services. The center for this activity was Scott Air Force Base, Illinois, where both AMC and Transportation Command (TRANSCOM) are located. There the Army, Air Force, and Marines established the joint Airlift Concepts and Requirements Agency (ACRA) whose leadership rotates among them every two years. The agency coordinates doctrine

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C-17A taking off from Jordanian air base.

U.S. Air Force (Paul R. Caron)

and helps develop joint system operating concepts. It was tasked to publish a pamphlet to help field commanders employ the C-17 and integrate all its capabilities into operational plans.

In December 1990 ACRA issued a draft pamphlet entitled *Multi-Service C-17 Employment Concept*. Its recipients ranged from the Joint Chiefs and commanders of the 25th Infantry Division and 1st Marine Amphibious Force to the Air National Guard.¹² The pamphlet's purpose was clear:

*This concept describes how the services will use the C-17. The concept provides a basis for actions to improve the Nation's ability to deploy, employ, and sustain combat forces by airlift. The signatory headquarters will examine the concept, evaluate current employment concepts, and investigate possible changes to doctrine, training, materiel, procedures, plans, and force structure.*¹³

The document also defined terms such as "small austere airfields" and "direct delivery," provided cargo load plans for various types of equipment, and explained aircraft capabilities. This information is similar to that found in promotional literature distributed by McDonnell Douglas. It represents a first step in revising doctrine and operational plans to jointly utilize the C-17.

The Lessons

Many would agree that efforts to make the C-17 program joint have been sincere if imperfect. As one Army officer stated, "The Air Force had always been cooperative but [problems are inevitable] in a program this big." He further noted that the sheer size of the C-17 program re-

quires a constant effort to keep current. The situation was exacerbated by a tight defense budget, hostile press, and congressional pressure. Despite disagreements, the process has been open with both sides making concessions. As one congressional expert put it: "Interservice cooperation has kept the program going. I have never heard that the services were dissatisfied."

A final question remains: Why has the program proven to be joint? The C-17 began before the Goldwater-Nichols Act brought jointness to the fore. Nor was an interservice effort the natural thing to expect: the Army and Air Force had feuded for decades, especially over roles and missions such as tactical/close air support.

Explanations depend greatly on perspective. The Air Force recognized from the beginning that the Army was the prime user. As indicated, the Air Force appeared fully aware throughout of the value of involving the Army in most aspects of the program. Although broadly accurate, this explanation avoids further examination.

There is a more obvious reason why the Air Force realized the need for Army involvement with the C-17 transport. During the 1970s, the Air Force did not include the Army in the AMST program. As a result, there was no Army support when problems arose. AMST terminated because of a lack of jointness or the Air Force sought to make a 180-degree turn.

While other factors such as personal initiative played a role, no evidence contradicts or adds to the AMST explanation of jointness in the C-17 program. Therefore it may be concluded that bureaucratic learning by the Air Force—resulting from self-interest and its AMST experience—was the primary cause.

As one defense analyst observed:

*There are no perfect weapons. There is no way to eliminate tensions between users and developers, or services and their various branches, in formulating weapons requirements or managing development. Nor is there any way to ensure a perfect balance between these competing demands as development proceeds.*¹⁴

That is correct, but effectiveness, not perfection, should be the criterion, and the C-17 procurement process meets that standard. No one indicated any major problems in the joint effort. Most of the difficulties mentioned are nearly unavoidable in a large bureaucracy. The Army and Air Force worked together effectively, if cautiously, to produce an aircraft which will meet the requirements of both services well into the next century. As one member of the Joint Staff remarked, "The C-17 fills all the holes." The aircraft does that because the acquisition program was joint.

JFQ



U.S. Air Force (E.H. Littlejohn)

Desert airstrip at National Training Center.



U.S. Air Force (E.H. Littlejohn)

NOTES

¹ This article is largely based on a series of confidential interviews conducted in 1993 and 1994.

² The Marines have also been represented. Their role has not been examined, however, since they play an identical but smaller role than the Army which, in any case, is much more reliant than the Marine Corps on airlift, and its involvement with the C-17 project is thus much more crucial.

³ U.S. Air Force, *Airlift and U.S. National Security: The Case for the C-17* (Washington: Government Printing Office, 1991), p. 1.

⁴ Jeffrey Record, *Beyond Military Reform: American Defense Dilemmas* (Washington: Pergamon-Brassey's, 1988), p. 50.

⁵ William H. Gregory, *The Defense Procurement Mess* (Lexington, Mass.: Lexington Books, 1989), p. 116.

⁶ Charles Johnson, *Acquisition of the C-17 Aircraft—An Historical Account* (Maxwell AFB, Ala.: Air Command and Staff College, 1986), p. 32.

⁷ Joint Chiefs of Staff, memorandum for the Secretary of Defense, February 23, 1984.

⁸ Johnson, *Acquisition*, p. 38.

⁹ U.S. Congress, Senate, Armed Services Committee, "Hearing on FY94 Defense Authorization," 103^d Cong., 1st sess., May 19, 1993.

¹⁰ Gordon R. Sullivan, letter to Ronald V. Dellums, chairman of the House Armed Services Committee, May 17, 1994.

¹¹ R.H. Barrow, E.C. Meyer, and Lew Allen, Jr., letter to John G. Tower, chairman of the Senate Armed Services Committee, November 25, 1981.

¹² Airlift Concepts and Requirements Agency, *Multi-Service C-17 Employment Concept* (Scott AFB, Ill.: U.S. Army Training and Doctrine Command and U.S. Air Force Military Airlift Command, December 12, 1990), pp. D1-D6.

¹³ Airlift Concepts and Requirements Agency, *C-17*, p. 1.

¹⁴ Thomas L. McNaugher, *Defense Management Reform* (Washington: The Brookings Institution, 1990), p. 178.