

Prepared Testimony of

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Subcommittee on Federal Financial Management, Government Information,  
Federal Services, and International Security

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Chairman Carper, Senator McCain, members of the subcommittee:

Thank you for inviting me to testify before this subcommittee on behalf of the Congressional Research Service.

The subcommittee is interested in the cost-effectiveness of procuring a greater number of airlift aircraft than requested in the President's budget. As you know, the fiscal 2011 budget submission proposes to end procurement of the C-17 transport and retire 17 C-5As. In previous years, Congress has added C-17s beyond the number requested. So far, both authorizing committees and the full House have acted on the fiscal 2011 budget. Although neither C-17s nor additional C-5 modernizations have yet been added in the FY2011 defense authorization process, advocates have cited possible reasons for doing so, which will be described below.

## MCRS-16

The Air Force is using The Department of Defense (DOD)'s most recent study of airlift demand, Mobility Capability and Requirements Study 2016 (MCRS-16), to justify both ending C-17 procurement and further reductions in C-5 inventories. The Air Force intends to retire 17 C-5As in Fiscal 2011 and five in FY2012, provided Congress lifts the current statutory ban on reducing the C-5 inventory.<sup>1</sup>

MCRS-16 is classified, but its unclassified executive summary stated, "With few exceptions, MCRS found the Department's planned mobility capabilities sufficient to support the most demanding projected requirements." It went on to say that "The capacity of the Department's strategic airlift fleet exceeds the peak demand in each of the three MCRS cases."

In reading the details of the study, members may wish to examine how MCRS-16 arrived at that conclusion. Some relevant questions regarding MCRS-16 may include (but are not limited to):

- From what period were the demand figures for ground forces in irregular conflicts drawn? How well do those historical demand figures for ground forces represent current demand, or the demand likely to exist in 2016?
- How many of the airfields used in MCRS-16 scenarios are available to C-17s but not C-5s? In testimony, Defense Secretary Robert Gates stated, "I would just say, for the record, out of two hundred and some – 204,000 landings for strategic lift in – since 1997, 4 percent have been at airfields that a C-5 could not access, and half of those were in Iraq."<sup>2</sup> Is that ratio reflected in MCRS-16?

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<sup>1</sup> Testimony of Brigadier General Richard Johnston, Director, Strategic Planning, U.S. Air Force, at "Hearing on Air Mobility Programs," Air and Land Forces Subcommittee, House Armed Services Committee, April 8, 2010. See also Michael C. Sirak, "USAF Eyes Cutting 22 C-5As," *Airforce-Magazine.com*, April 9, 2010.

<sup>2</sup> U.S. Congress, Senate Committee on Armed Services, *Fiscal 2011 Budget Request for the Defense Department*, 111th Cong., 2nd sess., February 2, 2010.

- MCRS-16 explicitly assumed that combat and support force personnel will not exceed those in the DOD FY2010 program of record through 2016. Given Congress’s demonstrated interest in increasing end strengths, is this a reasonable assumption? What is the sensitivity of the analysis to increases in personnel end strength?
- Aircraft acquired today will be in service not just through the 2016 period studied, but likely into the 2050s. Even the upgraded C-5s are anticipated to be in service through at least 2040. Projecting a 2050 conflict in 2010 would be no easier than envisioning today’s operations in Iraq and Afghanistan in 1970. Looking so far into the future, is it possible to accurately project how airlift demand and the whole nature of America’s conflicts could differ from today or the period studied?
- Although MCRS-16 notes that the current airlift fleet is adequate to transport the required weight of cargo in each scenario, volume – what airlifters call “cube” – may be a greater constraint in some cases than weight. The MCRS-16 executive summary states that “the movement of O&O (over- and outsized) equipment early in the warfight drives the demand for strategic airlift.”<sup>3</sup> As C-5s can carry larger items than C-17s, how much of that O&O can be carried on C-5s but not C-17s? How would the Air Force reconcile prospective C-5 retirements with this demand for O&O?

## American Strategic Airlifters

When considering the methodology of MCRS-16, it may be helpful to recall the differences between the C-17 and C-5:

**C-17 and C-5 Characteristics**

Characteristic	C-17	C-5
Cargo	170,900 pounds	270,000 pounds
Troops	102	81
Unrefueled range	2,700 miles	6,320 miles
Minimum runway length	3,500 feet	6,000 feet
Speed	572 mph	518
Crew	3	7
Mission capable rate (2008)	86%	52%
Cost per flying hour (2008)	\$12,014	\$20,947

Source: Information taken from Figure 2 (page 27) of Government Accountability Office, *Defense Acquisitions[:] Strategic Airlift Gap Has Been Addressed, but Tactical Airlift Plans Are Evolving as Key Issues Have Not Been Resolved*, GAO-10-67, November 2009. GAO states that Figure 2 is based on GAO analysis of DOD data.

<sup>3</sup> “Oversized” cargo is too big to fit in a standard cargo container, but can be carried by most military and civilian cargo aircraft. “Outsized” cargo can only be transported on C-5 and C-17 aircraft.



In sum, the C-5 carries more cargo and flies farther, but with more limited access to airfields. Although it carries a higher cost per flight hour, the C-5A/B's greater capacity yields a comparable cost per ton-mile moved. The C-17 can perform both strategic and intratheater lift, which may minimize the need for moving cargo from one aircraft to another between takeoff and delivery to the field. Its smaller footprint results in some greater operational flexibility, and it is faster in the air.

The procurement of C-17s is programmed to end in FY2010, with actual production of USAF aircraft to continue into FY2013.<sup>4</sup> Two C-5 upgrade programs are underway, with 92 C-5Bs and Cs receiving avionics upgrades and 52 of those C-5Bs also receiving new engines and other upgrades to the C-5M specification to increase reliability, range, and payload.<sup>5</sup> Three initial C-5Ms are flying now; formal introduction into service is scheduled for FY2013.

## Cost-Effectiveness

Cost-effectiveness can be a difficult metric to calculate. Part of cost-effectiveness is easy to define: costs for mature systems are comparatively easy to determine, as the Department of Defense (DOD) sends Congress detailed budget data in many forms throughout the year. According to the most recent Selected Acquisition Reports, a new C-17 costs \$244.5 million; the upgrades to make a C-5 into a modernized C-5M total \$118.6 million.<sup>6</sup>

The effectiveness side of the equation is more difficult to quantify, because the purposes for which DOD requests certain systems and Congress's goals in approving and/or expanding on those requests may not be the same. To properly evaluate cost-effectiveness, one must first determine the range of goal(s) the unrequested systems are to be effective in meeting.

## DOD Goals

The highest level of strategic airlift demand modeled in MCRS-16 required the movement of 32.7 million ton/miles per day (MTM/D). This is the planning factor against which DOD is evaluating its need for further airlift capacity.

Flown at full payload capacity, the currently-programmed strategic airlift fleet of 223 C-17s and 111 C-5s provides a capacity of 35.9 MTM/D, or approximately 10% more than the highest level modeled. In actual operations, though, airlift aircraft are rarely loaded to their maximum capacity. I would defer to our Air Force witnesses to supply operational details should the Subcommittee be interested in them.

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<sup>4</sup> E-mail, Boeing to CRS, July 1, 2010.

<sup>5</sup> Lockheed Martin briefing to CRS, June 30, 2010.

<sup>6</sup> Avionics modernization (all C-5s) = \$8.6 million each; reliability and re-engining (52 C-5Bs) = \$110.0 million each. Average procurement unit costs from Office of the Secretary of Defense, *Selected Acquisition Report(s): C-17A; C-5 AMP; and C-5 RERP*, all dated December 31, 2009.

The Department also has a fiscal interest in the cost of delivering cargo. Given the flying hour costs and capacities of the C-17 and C-5, the more cost-efficient platform for delivering a given load depends on what is to be carried. If the demand is for one C-17 equivalent load of cargo delivered within the C-17's unrefueled range, flying a full C-17 is more cost-efficient than flying a partially-loaded C-5. If more than one C-17 load is required, flying a full C-5 is more cost-effective than flying two C-17s. The calculation becomes even more complicated at greater ranges, where the C-5 may be able to operate nonstop and unrefueled while the C-17 requires refueling and/or an enroute stop. The C-5Ms, when introduced, are expected to lower the C-5 cost per ton-mile even further, but as only 3 C-5M conversions have been completed, there is not sufficient operational data to provide a reliable metric.

And again, operational considerations other than pure cost per ton-mile – a desire to minimize transshipment, the size (as opposed to weight) of items to be shipped, the requirement to move some equipment as a set in a single shipment, and others – may factor into the selection of one aircraft over another.

System availability further complicates the calculation. Current C-5 mission-capable rates are significantly lower than C-17 rates, in part due to lower programmed readiness levels for the Reserve Component entities that operate most C-5s as opposed to the mostly-Active Component C-17s. (Again, C-5 mission-capable rates may be anticipated to be higher for the C-5Ms.)

## **Congressional Goals**

DOD, however, is not the only entity that creates goals against which system effectiveness can be measured. Article 1, Section 8 of the Constitution vests in Congress the responsibility to raise and equip the military. It is therefore relevant to evaluate whether it is cost-effective to acquire systems that are not included in the administration's budget submission to meet Congressional goals as well as DOD's.

Congress uses its Constitutional authority to add programs and/or unrequested funding for existing programs for many reasons. Some major ones follow, but this list is by no means exhaustive.

- One reason commonly believed to motivate additions to DOD's requests – even when it isn't the actual impetus – is **constituent benefit**. As members of the subcommittee know, constituent benefit can take many forms. Some members may represent districts or states where a particular system is made, or which is home to major suppliers. Others may vote to support a procurement in the hope or belief that the resulting systems will be based or maintained in their state or district. But members' own statements and press releases make clear that economic and employment benefits for a particular geographical area affect a number of Congressional procurement decisions.

That said, it would be simplistic and inaccurate to tar all votes for unrequested systems with the constituent-interest brush, as Congress has historically revised administration budget submissions for other reasons, such as the following.



- **Policy differences with the executive branch** are cited as motivating additions to the budget. The recent vote on the floor of the House on the alternate engine for the F-35 Joint Strike Fighter provides an interesting example. 231 members voted to keep unrequested engine funding in the bill, most of whom represented districts with little or no significant economic interest in the outcome.<sup>7 8</sup>

Policy considerations are also evident in the cognizant committees' annual solicitation of unfunded request lists from the military services. As members are aware, the committees recognize that DOD program decisions are made in an environment constrained by annual budgets. Statements by committee chairs and other members often display an interest in planning for a longer time horizon than that. Learning what items the services requested that did not make one year's budget cut, and re-prioritizing some of the resource decisions, is seen as a legitimate part of civilian control of the Defense Department, as "[T]he Constitution locates civilian control of the military in Congress as well as in the executive branch."<sup>9</sup>

Along these lines with regard to airlift, members have questioned the Administration's intention to reduce airlifter numbers below the 316-aircraft floor enacted into law as part of the FY2010 defense authorization bill.<sup>10</sup>

- **To maintain options for future policy changes.** For example, after the Carter Administration canceled the B-1 bomber in 1977, rival candidate Ronald Reagan declared that he would reinstate the program if elected in 1980. Numerous members of Congress argued that funding should be added to the budget above the President's request to maintain the B-1 production equipment and tooling, and even to retain part of the workforce, to preserve the option for the next President and thus leave the decision in voters' hands. Ultimately, Congress resurrected the program despite the cancellation.<sup>11</sup>
- **To maintain a viable industrial base.** Separate from the constituent-interest aspect of keeping production facilities open, maintaining national capabilities to design, develop, and manufacture certain defense items has been seen as a goal worthy of investment. For example, CRS has previously noted that "[S]ome programs, such as the Seawolf submarine, [were] pursued not to meet military requirements, but explicitly to preserve production capabilities."<sup>12</sup> The most efficient way to acquire a system might be to produce the required quantity rapidly, then close the production facility. Keeping design and production capabilities warm by acquiring at lower, less-efficient production rates can keep the industrial

<sup>7</sup> H.R. 5136, National Defense Authorization Act for Fiscal Year 2011, roll call vote number 316.

<sup>8</sup> Similarly, the existence of the V-22 Osprey is attributed to the efforts of members of Congress who differed with DOD's assessment that the aircraft's additional capability was not worth its cost. See, for example, Richard Whittle, *The Dream Machine: The Untold History of the Notorious V-22 Osprey* (New York: Simon & Schuster, 2010).

<sup>9</sup> H.R. McMaster, *Dereliction of Duty* (New York: Harper-Collins, 1997).

<sup>10</sup> For example, see the Chairman's opening statement and members' subsequent questions in "Hearing on Air Mobility Programs," Air and Land Forces Subcommittee, House Armed Services Committee, April 8, 2010.

<sup>11</sup> Nick Kotz, *Wild Blue Yonder: Money, Politics, and the B-1 Bomber* (New York: Pantheon Books, 1988).

<sup>12</sup> CRS Report 96-729F, *Defense Policy: Threats, Force Structure, and Budget Issues*, by Robert L. Goldich and Stephen Daggett

capabilities available for possible upgrades while reducing the cost of subsequent production should it be required.

- **To reduce risk.** Most requirements studies assign particular force structures or postures a corresponding level of risk. “Risk” is one of the less consistently-defined terms used in defense discussions, but it usually attempts to measure the probability that a particular military goal will not be met by a specified time. If a particular force posture is deemed “high risk” in a given scenario, Congress may add assets to reduce that risk.<sup>13</sup>

MCRS-16’s predecessor, the 2005 Mobility Capabilities Study, identified a strategic airlift force structure of 292 to 383 aircraft as providing a “moderate risk” capability to support the National Military Strategy.<sup>14</sup> This conclusion could be used by advocates to justify additional C-17 procurements or modernizing additional C-5s to increase the currently-programmed strategic airlift fleet beyond 334 aircraft in the interest of reducing risk.

- **To hedge against changes in requirements from current projections.** Budget requests are based on estimates of future challenges and threats, projections of U.S. national interests, and the likely capability requirements emerging from them. But these are projections, and even highly educated estimates may be – and have, at times, been – wrong. Sometimes, unforeseen challenges emerge. Sometimes, there are legitimate differences in the assumptions in or analytical process of an important study. One common observation regarding the post-Cold War world is that uncertainty is now the norm in defense planning. Adding unrequested systems can be seen as giving commanders flexibility in case the world declines to cooperate with DOD’s projections.

Also, as noted, the MCRS-16 peak demand projections are approximately 10% below current maximum airlift fleet capacity. Policymakers may believe that maintaining or increasing that margin is worth the price incurred by additional airlifter procurements or modernizations, or further curtailing retirements.

In determining the cost-effectiveness of a system, analysts may wish to account for its effectiveness in meeting one or more of these Congressional goals as well as those assigned to it by DOD.

It should also be noted that DOD itself sometimes requests the procurement of systems for reasons other than a formal requirement. For example, the E-2C Hawkeye Multi-Year Procurement II contract, which ran from FY2004-FY2007, was justified to Congress as an attempt to reduce industrial base costs by keeping a production line warm. In accordance with the approved budget program, the contractor was converting production from the E-2C to the advanced E-2D, which DOD intended to procure. Shutting down the line for the period needed to

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<sup>13</sup> Similarly, Congress adds money to programs to reduce the risk of failing to meet technological goals. See, for example, the discussion of the Ground-Based Interceptor program in H.Rept. 111-288, *National Defense Authorization Act For Fiscal Year 2010*: “The conferees believe such additional funding will help keep active vendors producing needed parts, and will reduce risk to the future production of GBIs for the test program.”

<sup>14</sup> CRS Report RL32887, *Strategic Mobility Innovation: Options and Oversight Issues*, by Jon Klaus.



perform the conversion would have entailed significant restart costs, with some question as to whether the idled workforce would remain in the area to await restart. Congress agreed that keeping the workforce occupied by funding continued production of the older model, even at a rate well below economic order quantities, would be a more sound solution and provide a smoother transition than allowing several years' gap in procurement.

Advocates of further C-17 procurement or modernizing additional C-5s do not always offer their own alternative planning scenarios that might lead to a different conclusion than MCRS-16 reaches. But they may argue that acquiring additional modern or modernized airlifters is a hedge – insurance, if you will – against the possibility that any or all of their reservations about MCRS-16 prove correct.

Mr. Chairman, members of the Committee, thank you again for the opportunity to appear before you today on behalf of the Congressional Research Service.