



Air Force C-17 Aircraft Procurement: Background and Issues for Congress

Ronald O'Rourke
Specialist in Naval Affairs

October 19, 2009

Congressional Research Service

7-5700

www.crs.gov

RS22763

Summary

A total of 213 C-17s have been procured through FY2009, including eight that were procured in the FY2009 supplemental appropriations act (H.R. 2346/P.L. 111-32 of June 24, 2009). The Administration's proposed FY2010 defense budget proposes to end C-17 procurement and does not request any funding for the procurement of additional C-17s. The Administration argues that enough C-17s have now been procured to meet future operational needs. Supporters of procuring additional C-17s in FY2010 believe additional C-17s will be needed to meet future operational needs. The issue of how much airlift capability will be needed in the future is currently being examined in a congressionally mandated study being done by the Institute for Defense Analyses (IDA) and in a separate Department of Defense (DOD) study called the Mobility Capabilities and Requirements Study 2016 (MCRS-16), which is due to be completed by the end of 2009.

FY2010 defense authorization bill: The conference report (H.Rept. 111-288 of October 7, 2009) on the FY2010 defense authorization bill (H.R. 2647) authorizes no funding for the procurement of additional C-17s. Section 137 of the bill prohibits the Secretary of the Air Force from proceeding with a decision to retire C-5As in any number that would reduce the active inventory of C-5s below 111 until certain conditions are met, and require the Secretary of the Air Force to submit a report to the congressional defense committees on the issue of C-5 retirement. Section 138 requires the Secretary of the Air Force, in coordination with the Director of the Air National Guard, to submit to the congressional defense committees, at least 90 days before a C-5 airlift aircraft is retired, a report on the proposed force structure and basing of C-5 and C-17 aircraft. Section 139 amends 10 USC 8062(g)(1) to state that the Secretary of the Air Force shall maintain a total inventory of not less than 316 C-5s and C-17s. If the current force of 111 C-5s were retained, this provision would support a C-17 force of not less than 205 C-7s—the number procured through FY2008.

FY2010 DOD appropriations bill: The House Appropriations Committee, in its report (H.Rept. 111-230 of July 24, 2009) on H.R. 3326, recommended \$762.6 million in procurement funding for the C-17 program, including \$674.1 million for the procurement of three C-17s. The paragraph in the bill that makes funding available for the procurement of Air Force aircraft states that the funds are made available, "*Provided*, That no funds provided in this Act for the procurement or modernization of C-17 aircraft may be obligated until all C-17 contracts funded with prior year 'Aircraft Procurement, Air Force' appropriated funds are definitized."

The Senate Appropriations Committee, in its report (S.Rept. 111-74 of September 10, 2009) on H.R. 3326, recommended \$2,588.5 million in procurement funding for the C-17 program, including \$2,500.0 million for the procurement of 10 C-17s. S.Amdt. 2558, proposed on September 29, 2009, would strike from H.R. 3326 funding for C-17 procurement in excess of the amount requested by administration (i.e., it would strike the \$2.5 billion in the bill for the procurement of 10 C-17s) and make that funding available instead for operation and maintenance in accordance with amounts requested by the administration, and for the Operation and Maintenance, Army account for overseas contingency operations. On September 30, the Senate considered S.Amdt. 2558. A point of order was raised with respect to the amendment. The Senate, by a vote of 34 to 64 (Record Vote Number 303), rejected a motion to waive the Budget Act with respect to the amendment, and the amendment was ruled out of order. On October 6, a new amendment—S.Amdt. 2580—was proposed to strike from H.R. 3326 funding for C-17 procurement in excess of the amount requested by the administration. This amendment was structured to avoid the point of order that was raised with respect to S.Amdt. 2558. On October 6, the Senate rejected S.Amdt. 2580 by a vote of 30 to 68 (Record Vote Number 312).

Contents

| | |
|--|----|
| Introduction | 1 |
| Background | 1 |
| C-17 Program | 1 |
| C-17 in Brief..... | 1 |
| Comparison with C-5 | 2 |
| Program Origin and Milestones | 2 |
| Procurement Quantities | 3 |
| Contractors, Employment, and Production Line Shutdown | 4 |
| FY2010 Procurement Funding Request | 6 |
| C-5 Modernization Program..... | 6 |
| C-5 Avionics Modernization Program (AMP)..... | 7 |
| C-5 Reliability and Re-engining Program (RERP)..... | 7 |
| Requirements for Strategic Airlift..... | 10 |
| Mobility Capabilities Study 2005 (MCS-05)..... | 10 |
| Congressionally Mandated Study of 2007..... | 11 |
| Evolution in Planned Mix of Airlift Aircraft, 2005-2008..... | 11 |
| Congressionally Mandated IDA Study of 2009 | 11 |
| Mobility Capabilities and Requirements Study 2016 (MCRS-16) | 15 |
| Prior-Year Legislation Relating to Airlift Force Structure..... | 16 |
| Section 132 of FY2004 Defense Authorization Act..... | 16 |
| Section 132 of FY2006 Defense Authorization Act..... | 17 |
| Issues for Congress | 17 |
| Introduction | 17 |
| Factors to Consider | 17 |
| Requirements for Airlift Capability | 17 |
| Cost-Effectiveness of C-5 Modernization Compared to C-17 Procurement | 19 |
| Legislative Activity in 2009 | 22 |
| FY2010 Defense Authorization Bill (H.R. 2647/S. 1390) | 22 |
| House | 22 |
| Senate..... | 24 |
| Conference..... | 25 |
| FY2009 DOD Appropriations Bill (H.R. 3326)..... | 28 |
| House | 28 |
| Senate (Committee Report) | 30 |
| Senate (Floor Consideration)..... | 31 |
| FY2009 Supplemental Appropriations Act (H.R. 2346/P.L. 111-32)..... | 32 |
| House | 32 |
| Senate..... | 32 |
| Conference..... | 33 |

Tables

| | |
|---|---|
| Table 1. C-17 and C-5 Characteristics | 2 |
| Table 2. C-17 Procurement Quantities | 3 |

| | |
|--|----|
| Table 3. Planned Mix of Strategic Airlift Aircraft, 2005-2008 | 11 |
| Table 4. [Table 3 in GAO report] Comparison of a Modernized C-5 and C-17 Equivalent Aircraft Capabilities | 19 |

Appendixes

| | |
|---|----|
| Appendix A. Section 1046 of FY2008 Defense Authorization Act | 34 |
| Appendix B. Lockheed Point Paper Commenting on November 2008 GAO Report | 38 |

Contacts

| | |
|----------------------------------|----|
| Author Contact Information | 44 |
|----------------------------------|----|

Introduction

Procurement of C-17 airlift aircraft began in FY1988, and a total of 213 have been procured through FY2009, including eight that were procured in the FY2009 supplemental appropriations act (H.R. 2346/P.L. 111-32 of June 24, 2009).

The Administration's proposed FY2010 defense budget proposes to end C-17 procurement and does not request any funding for the procurement of additional C-17s.¹ The Administration argues that enough C-17s have now been procured to meet future operational needs. Supporters of procuring additional C-17s in FY2010 believe additional C-17s will be needed to meet future operational needs. The issue of how much airlift capability will be needed in the future is currently being examined in a congressionally mandated study being done by the Institute for Defense Analyses (IDA) and in a separate Department of Defense (DOD) study called the Mobility Capabilities and Requirements Study 2016 (MCRS-16), which is due to be completed by the end of 2009.

The primary issue for Congress in FY2010 is whether to procure additional C-17s. An additional issue is whether to pass legislation relating to the airlift aircraft force structure. Congress's decisions on these issues could affect DOD capabilities and funding requirements and the U.S. military aircraft industrial base.

Background

C-17 Program

C-17 in Brief

The Air Force C-17, also known as the Globemaster III or simply the Globemaster, can transport equipment, supplies, and personnel over long distances, from one theater of operations to another, and can also land on austere airfields with shorter runways. The C-17 complements the Air Force's larger C-5 Galaxy airlift aircraft in the strategic (i.e., inter-theater) airlift role, and smaller C-130 Hercules airlift aircraft in the tactical (i.e., intra-theater) airlift role. DOD states that

The C-17 can perform the entire spectrum of airlift missions and is specifically designed to operate effectively and efficiently in both strategic and theater environments. Airlift provides essential flexibility when responding to contingencies on short notice anywhere in the world. It is a major element of America's National Military Strategy and constitutes the most responsive means of meeting U.S. mobility requirements. Specific tasks associated with the airlift mission include deployment, employment (airland and airdrop), sustaining support, retrograde, and combat redeployment. Not only can the C-17 deliver outsize cargo to austere tactical environments, but it also reduces ground time during airland operations. The C-17 will perform the airlift mission well into this century.²

¹ The budget submission refers to ending C-17 procurement at 205 aircraft, because the budget was submitted in May, prior to the enactment of the FY2009 supplemental appropriations act that funded eight additional C-17s.

² United States Air Force, *Committee Staff Procurement Backup Book, Fiscal Year (FY) 2010 Budget Estimates, Aircraft Procurement, Air Force, Volume 1*, May 2009, page 2-1 (Exhibit P-40, Budget Item Justification, C-17 [MYP], (continued...))

Comparison with C-5

The C-5 and the C-17 can carry outsized (i.e., large-dimension) cargo items, such as M-1 tanks.³ The C-5 can carry more cargo than the C-17 and has a longer unrefueled range than the C-17. Certain DOD cargo items are so large that they can be carried only by a C-5. The C-17, however, can deploy cargo and personnel directly into austere airfields with shorter runways.⁴ The C-17 also costs less to operate per flight hour than the C-5 and has a higher mission capable rate (MCR), which is a measure of aircraft reliability. **Table 1** compares some characteristics of the C-17 and C-5.

Table 1. 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 (2007) | 86% | 53% |
| Cost per flying hour (2007) | \$11,300 | \$23,100 |

Source: Information taken from Figure 1 (page 5) of Government Accountability Office, *Defense Acquisitions[:] Timely and Accurate Estimates of Costs and Requirements Are Needed to Define Optimal Future Strategic Airlift Mix*, GAO-09-50, November 2008. GAO states that Figure 1 is based on GAO analysis of DOD data.

Program Origin and Milestones

The C-17 program began in the early 1980s.⁵ Procurement of C-17s began in FY1988.⁶ The first C-17 was delivered to the Air Force in June 1993. The C-17 achieved Initial Operational

(...continued)

page 1 of 10).

³ Outsize cargo items have dimensions that exceed 1,090 inches in length, 117 inches in width, or 105 inches in height. Somewhat smaller cargo items that exceed 96 inches in height but do not exceed 1,090 inches in length, 117 inches in width, or 105 in height are referred to as oversize cargo. Oversize cargo can be carried not only by the C-5 and C-17, but by other DOD airlift aircraft as well, such as the C-130.

⁴ In addition to being able to land on shorter runways, the C-17 is more maneuverable on the ground than the C-5, which permits a larger number of C-17s to use an airfield simultaneously for loading and offloading equipment.

⁵ The source selection decision for the program was announced in August 1981. A contract for the program was awarded in July 1982. The program was given Milestone II approval, and Full Scale Engineering Development (FSED) began, in February 1985.

The C-17 program had a difficult time winning congressional support in the late 1970s, and C-17 development was delayed until initial funding was finally approved in FY1981. By 1982, DOD was concerned its airlift shortfall was too urgent to await development of a new plane and decided to purchase aircraft readily available for production. Congress approved funds in the FY1983 budget to purchase 50 additional C-5B cargo planes and 44 new KC-10 Extender aerial refueling aircraft to quickly bridge the airlift gap. Because DOD wanted to develop the C-17 and buy additional C-5s, Congress directed DOD to develop a comprehensive description of its future acquisition plans. The result was the Airlift Master Plan of September 1983, which compared several alternatives for modernizing the airlift fleet and (continued...)

Capability (IOC), with the delivery of 12 aircraft to a C-17 squadron, in January 1995. A full-rate production contract was awarded in February 1996. The C-17 program experienced development challenges and cost growth in its earlier years that were the subject of congressional oversight at the time.

Procurement Quantities

Table 2 shows annual C-17 procurement quantities, along with changes over time in the planned total number of C-17s to be procured. C-17s were procured under overlapping multiyear procurement (MYP) arrangements in FY1997-FY2003 and FY2003-FY2007.

Table 2. C-17 Procurement Quantities

| Fiscal Year | Annual quantity requested | Annual quantity procured | Cumulative quantity procured | Planned total number to be procured under that year's budget submission |
|-------------|---------------------------|--------------------------|------------------------------|---|
| 1988 | 2 | 2 | 2 | 210 |
| 1989 | 4 | 4 | 6 | 210 |
| 1990 | 4 | 4 | 10 | 120 |
| 1991 | 6 | 0 | 10 | 120 |
| 1992 | 4 | 4 | 14 | 120 |
| 1993 | 6 | 6 | 20 | 40 |
| 1994 | 6 | 6 | 26 | 40 |
| 1995 | 6 | 6 | 32 | 40 |
| 1996 | 8 | 8 | 40 | 120 |
| 1997 | 8 | 8 | 48 | 120 |
| 1998 | 9 | 9 | 57 | 120 |
| 1999 | 13 | 13 | 70 | 120 |
| 2000 | 15 | 15 | 85 | 120 |
| 2001 | 12 | 12 | 97 | 134 |
| 2002 | 15 | 15 | 112 | 137 |
| 2003 | 12 | 15 | 127 | 180 |
| 2004 | 11 | 11 | 138 | 180 |
| 2005 | 14 | 15 | 153 | 180 |

(...continued)

concluded that the C-17 was the most cost-effective.

⁶ The program was granted Milestone III approval, and low-rate initial production (LRIP) began, in January 1989. The first flight of a C-17 occurred in September 1991. Developmental test and evaluation began in September 1991 and was completed in December 1994; initial operational test and evaluation (IOT&E) began in December 1994 and was completed in June 1995.

| Fiscal Year | Annual quantity requested | Annual quantity procured | Cumulative quantity procured | Planned total number to be procured under that year's budget submission |
|-------------|---------------------------|--------------------------|------------------------------|---|
| 2006 | 15 | 15 | 168 | 180 |
| 2007 | 12 | 22 ^a | 190 | 180 |
| 2008 | 0 | 15 ^b | 205 | 190 |
| 2009 | 0 | 8 ^c | 213 | 190 |
| 2010 | 0 | TBD | TBD | 205 ^d |

Source: Prepared by CRS based on DOD data.

Notes: n/a = figures not available from online DOD budget data, and have been requested from the Air Force.

- a. Ten of these 22 aircraft were funded in Title IX of the FY2007 DOD appropriations act (H.R. 5631/P.L. 109-289 of September 29, 2006)—the title that provided additional appropriations associated with wartime operations.
- b. Procured in the FY2008 supplemental appropriations act (H.R. 2642/P.L. 110-252 of June 30, 2008).
- c. Procured in the FY2009 supplemental appropriations act (H.R. 2346/P.L. 111-32 of June 24, 2009).
- d. The FY2009 budget was submitted in May 2009, prior to the enactment of the FY2009 supplemental appropriations act (H.R. 2346/P.L. 111-32 of June 24, 2009), and consequently reflects only the 2005 aircraft procured through FY2008.

Contractors, Employment, and Production Line Shutdown

The prime contractor for the C-17 is Boeing Airlift and Tankers of Long Beach, CA. C-17s are the only aircraft made at Boeing's Long Beach production plant.⁷ A May 2009 press report states that the C-17 program, including supplier firms, employs a total of about 30,000 people in 43 states.⁸

The proposed FY2010 budget states that the 205th C-17 is scheduled to be delivered to the Air Force in September 2010. C-17s in recent years have been delivered at a rate of one or (occasionally) two per month. On that basis, the 213th C-17 might be delivered in the first half of 2011. As the final C-17 moves down the production line, the parts of the production line behind that aircraft will begin to shut down. Thus, if C-17 procurement ends at 213 aircraft, parts of the C-17 production line will begin to shut down prior to the delivery of that aircraft in the first half of 2011. Earlier parts of the production line, including suppliers who provide materials or make long leadtime items for the C-17, would be among the first parts of the line to shut down.

An August 28, 2009, press report states:

Boeing needs the lawmakers on Capitol Hill to insert 15 C-17 Globemaster IIIs in the Pentagon's fiscal year 2010 defense budget in order to prevent the company from beginning to shut down its cargo hauler production facility, according to a senior company official....

⁷ Amy Butler, "New C-17s Not Needed, DOD Analysis Shows," *Aerospace Daily & Defense Report*, May 18, 2009: 3.

⁸ John M. Doyle, "Senators Push Panel For 15 More C-17 Cargo Aircraft," *Aerospace Daily & Defense Report*, May 13, 2009: 3.

Lawmakers in the House and Senate did not insert funding in the FY-10 defense authorization bill for more C-17s, but they did include another eight aircraft in the FY-09 warfighting supplemental, which was signed by the president earlier this year.

Still, Boeing claims it needs an order of 15 airlifters in FY-10 to keep production humming along. Steve Gress, Boeing's vice president of Air Force systems, said the company has looked at ways to reduce cost and improve productivity on the C-17 production line—not just at the assembly facility in Long Beach, CA, but throughout the entire supply chain.

“The effort there is to try and reduce the sensitivity of the cost of C-17s to the rate that your producing” them, he said during an Aug. 21 interview in Arlington, VA. “Any change though, you may be able to hold the cost, but that doesn’t necessarily mean that you can keep that whole team together.

“Any change in the quantity is going to probably produce some sort of impact to the workforce,” Gress continued....

At the same time, Gress said Boeing is “aggressively” looking at potential international sales of the Globemaster III, however there is no predictability when those orders will come.

“We have a number of different pursuits out there that take us into the international market,” he said. “The challenge ... is you still need an open, ongoing production line to maintain an affordable product for many of the countries because, although they’re very interested in the C-17, the numbers [purchased] are small.”

Earlier this month, Boeing delivered the first of two C-17s to Qatar.⁹

A September 4, 2009, news report states:

A lack of international C-17 cargo hauler purchases in fiscal year 2010, the same year the Air Force is planning to end production of the aircraft, has placed defense giant Boeing in a near-term bind, *Inside the Air Force* has learned.

The shortage of overseas sales in FY-10, combined with only a smattering of secured Globemaster III foreign sales over the next five years, would leave 36 aircraft unaccounted for, according to internal Pentagon documents reviewed by ITAF. Boeing's C-17 economic order quantity estimates show the need for 12 purchases in FY-11; 10 in FY-12; and eight in FY-13 and FY-14 based on the anticipated timing of international purchases.

India is expected to purchase 10 C-17s between FY-11 and FY 14. While New Delhi could purchase all 10 aircraft at once, the documents show it would likely purchase three planes per year in FY-11 through FY-13 and the remaining aircraft in FY-14. Qatar, which is in the process of receiving its first two C-17s, is expected to buy two more in FY-12, and the United Arab Emirates is expected to buy four aircraft in FY-11.

In addition to these countries, a number of other nations are interested in the C-17, according to Air Force and industry sources. International buys could increase even more if the Airbus A400M cargo transport program is further delayed or canceled.

⁹ Marcus Weisgerber, “Boeing Claims It Needs Order For 15 C-17s to Prevent Shutdown,” *Inside the Air Force*, August 28, 2009.

While there are nine more potential C-17 customers, they are not solid, according to industry and military sources.

Boeing's projections show its Long Beach, CA, production facility churning out C-17s through FY-16, according to the documents. The aircraft orders would be submitted in FY-14.

The Chicago-based defense giant claims it needs lawmakers on Capitol Hill to insert 15 Air Force C-17s in the Pentagon's FY-10 defense budget in order to prevent the company from beginning to shut down its cargo hauler production facility (ITAF, Aug. 28, p5). However, the documents show the potential for one C-17 purchase by the United Kingdom in FY-10, meaning the company still needs a customer for 14 aircraft.

Boeing spokesman Jerry Drelling said the company has not officially projected production through 2014 and is focusing its efforts on securing 15 C-17 buys in FY-10. The company is expecting UAE to sign four its aircraft in the coming months.

"Certainly there is a lot of optimism that the U.K. will step up and fill its needs with additional C-17s," Drelling said of the potential Royal Air Force sales.

To maintain Boeing's projected schedule detailed in the documents, a customer would need to buy 36 more C-17s between FY-10 and FY-14. The company currently needs orders for 14 aircraft in FY-10, five in FY-11 through FY-13 and another seven in FY-14.

Based on current orders, the production line will remain open until July 2011, Drelling said.¹⁰

FY2010 Procurement Funding Request

Consistent with the Administration's proposal to end C-17 procurement, the proposed FY2010 defense budget does not request funding for the procurement of additional C-17s, and instead requests funding to shut down the C-17 production line. The budget requests \$88.5 million in procurement funding for the C-17 program, but the funding is for C-17 support equipment, spares, data, and training equipment.

C-5 Modernization Program

Decisions on how many C-17s to procure can be affected by decisions on how many C-5s are retained in the strategic airlift fleet, and by decisions on efforts to modernize C-5s.

The Air Force is implementing a two-phase program for modernizing its fleet of 111 C-5s, which includes C-5As procured between 1969 and 1974, and C-5Bs and Cs procured in the 1980s. The prime contractor for both phases of the modernization effort is Lockheed Martin of Marietta, GA. A key goal of the modernization effort is to improve the C-5 fleet's MCR.

¹⁰ Marcus Weisgerber, "Lack of Foreign C-17 Sales Putting Boeing Production in A Bind," *Inside the Air Force*, September 4, 2009.

C-5 Avionics Modernization Program (AMP)

The first phase of the modernization effort, the C-5 Avionics Modernization Program (AMP), began in 1999. The first flight of an AMP-modified C-5 occurred in December 2002. Operational test and evaluation of AMP began in September 2005 and was completed in July 2006. AMP-modified C-5s achieved initial operational capability (IOC) in February 2007.¹¹ Modernization of all 111 C-5s with AMP is scheduled for completion in 2015.

C-5 Reliability and Re-engining Program (RERP)

The second phase of the C-5 modernization effort, the C-5 Reliability Enhancement and Re-engining Program (RERP), began in 2000. C-5s that receive RERP modification do so after receiving AMP modification, and are redesignated C-5Ms. DOD states that:

RERP is a comprehensive modernization effort that will improve aircraft reliability, maintainability, and availability. RERP will enable the C-5M to achieve wartime mission requirements by increasing fleet availability (mission capable rates and departure reliability), reducing Total Ownership Costs (TOC), and improving aircraft performance. This effort centers on replacing the current TF-39 engine with a more reliable, Commercial Off-the-Shelf (COTS) General Electric (GE) CF6-80C2 (F138-GE-100 military designation) turbofan engine with increased takeoff thrust, stage-3 noise compliance, and Federal Aviation Regulation pollution compliance. In addition to new engines/pylons, C-5 RERP will provide upgrades to wing attachment fittings; new thrust reversers and Auxiliary Power Units (APUs); upgrades to the electrical, hydraulic, fuel, fire suppression, landing gear, and pressurization/air conditioning systems; and airframe structural modifications. These aircraft improvements increase payload capability and access to Communication, Navigation, Surveillance/Air Traffic Management (CNS/ATM) airspace. C-5 RERP also decreases aircraft time to climb, increases engine-out climb gradient for takeoff, improves transportation system throughput, and decreases engine removals.¹²

The RERP phase was originally intended for all 111 C-5s, like the AMP phase, but cost growth in 2007 that was sufficient to trigger a Nunn-McCurdy breach led to a DOD restructuring of the RERP phase in 2008 that limited RERP modifications to 52 C-5s.¹³ The first flight of a RERP-modified C-5 occurred in June 2006. Test and evaluation of RERP-modified C-5s began in June 2006 and, as of June 2008, was scheduled to be completed in April 2010. Initial operational capability of RERP-modified C-5s is scheduled for June 2013.¹⁴

The U.S. Transportation Command testified in February 2009 that:

¹¹ Department of Defense, *Selected Acquisition Report (SAR), C-5 AMP*, December 31, 2007, p. 6.

¹² Department of Defense, *Selected Acquisition Report (SAR), C-5 RERP*, June 30, 2008, pp. 3-4.

¹³ DOD states:

After notifying Congress of a Nunn-McCurdy breach on September 27, 2007, the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD (AT&L)) certified a restructured C-5 Reliability Enhancement and Reengining Program (RERP) on February 14, 2008. On March 14, 2008, the USD (AT&L) conducted a successful MS [Milestone] C Defense Acquisition Board (DAB) [review]. The USD (AT&L) signed the Acquisition Program Baseline (APB) reflecting the Nunn-McCurdy certification and the MS C approval on June 24, 2008.

(Department of Defense, *Selected Acquisition Report (SAR), C-5 RERP*, June 30, 2008, p. 4.)

¹⁴ Department of Defense, *Selected Acquisition Report (SAR), C-5 RERP*, June 30, 2008, p. 6.

the C-5's outsized and oversized cargo capability is essential to meeting our global mobility requirements. Unfortunately, low departure reliability and mission capable rates continue to plague the C-5 fleet. Modernizing all the C-5s with avionics upgrades is essential to allow access to international airspace and foreign airfields. New engines and other reliability enhancements for our C-5Bs and two C-5Cs are necessary to increase aircraft availability, reduce fuel consumption and significantly improve performance throughout their projected service life. We will modernize the C-5 fleet while closely managing the costs.¹⁵

The Air Force testified in May 2009 that:

The Avionics Modernization Program (AMP) provides modern, sustainable aircraft avionics, allowing the aircraft to efficiently access international airspace. This will allow the Air Force to more efficiently conduct peacetime operations and meet closure times for our Nation's war plans. All C-5B/Cs have entered or completed AMP modification and the first C-5A completed modification on 16 Feb 2009 and is assigned to Lackland AFB, Texas. Currently, the C-5 AMP effort continues at two modification centers at Dover AFB, Delaware and Travis AFB, California and will modify all 111 C-5 aircraft by 2015.

The Reliability Enhancement and Re-engining Program (RERP) builds upon the C-5 AMP modification. C-5 RERP replaces the propulsion system and improves the reliability of over 70 systems and components. Following a critical Nunn-McCurdy breach, the Defense Acquisition Executive (DAE) certified a restructured C-5 RERP modernization of the entire C-5B/C fleet. Since the certification, the program has completed a Milestone C Defense Acquisition Board as well as an Interim Program Review in January 2009, earning DAE approval to continue low rate initial production (LRIP).

The restructured program successfully completed developmental test and evaluation, meeting or exceeding all of its KPPs. As part of this testing, the fully modernized aircraft, known as the C-5M, accomplished a non-stop flight from Travis AFB, California to Mildenhall AB, United Kingdom via the polar route, without aerial refueling. The flight began at a gross weight of 807,000 pounds, well above the normal maximum of 769,000 pounds, established a continuous climb to an initial altitude of 33,000 feet, carried 120,000 pounds of cargo, and flew 4,770 nautical miles in approximately 11 hours. This is a vast improvement over legacy C-5A/B fleets, which would require aerial refueling to carry the same amount of cargo over the same distance.

The Air Force delivered the first C-5M to an operational unit on 9 February 2009, piloted by General Arthur Lichte (Commander, Air Mobility Command) with former Secretary John Young (USD (AT&L)) and former Secretary Sue Payton (Assistant Secretary of the Air Force for Acquisition) as proud passengers. The production program is delivering on cost and on schedule. These efforts will fully modernize 52 C-5s that meet the warfighters' requirements.¹⁶

The Government Accountability Office (GAO) reported in November 2008 that:

¹⁵ Statement of General Duncan J. McNabb, USAF Commander, United States Transportation Command, Before the House Armed Services Air & Land Forces and Seapower & Expeditionary Forces Subcommittees [Hearing] On the State of the Command, February 25, 2009, p. 7.

¹⁶ Department of the Air Force, Presentation to the House Armed Services Committee Subcommittee on Air and Land Forces, United States House of Representatives, Combined Statement of: Lieutenant General Daniel J. Darnell, Air Force Deputy Chief Of Staff For Air, Space and Information Operations, Plans And Requirements (AF/A3/5) Lieutenant General Mark D. Shackelford, Military Deputy, Office of the Assistant Secretary of the Air Force for Acquisition (SAF/AQ) Lieutenant General Raymond E. Johns, Jr., Air Force Deputy Chief of Staff for Strategic Plans And Programs (AF/A8), May 20, 2009, pp. 18-19.

The Air Force has cut the number of C-5s it plans to fully modernize by more than half because of substantial cost increases in the modernization effort.... All 111 C-5s will receive the avionics upgrade, while only 52 will receive the reliability enhancement and reengining upgrade. This mix may change again, based on the results of DOD's new mobility capabilities studies, possible C-5 retirements, and a revised cost estimate for C-5 modernization....

The costs to modernize C-5 aircraft have not been fully identified and are likely to increase. While the Air Force now estimates it will spend \$9.1 billion to modernize C-5s, the costs may be underestimated because DOD did not apply risk or uncertainty analysis to its reliability enhancement and reengining program major cost drivers. Moreover, that particular effort is underfunded by almost \$300 million and costs may escalate if the Air Force has to stretch the program schedule to stay within funding targets. At the same time, the Air Force has not fully priced or budgeted for a new C-5 upgrade program it plans to begin in fiscal year 2010 to address current avionics deficiencies and to add new capabilities. Some future costs, however, may be avoided should the Air Force justify retirement of some older C-5s and forego planned modifications.¹⁷

¹⁷ Government Accountability Office, *Defense Acquisitions[:] Timely and Accurate Estimates of Costs and Requirements Are Needed to Define Optimal Future Strategic Airlift Mix*, GAO-09-50, November 2008, p. 3. The report also stated on page 6 that:

Together, [the AMP and RERP] upgrades were expected to improve the fleet's mission capable rate to at least 75 percent, thereby increasing payload capability and transportation throughput, and to reduce total ownership costs over the life cycle by about \$14 billion in 2008 dollars.

DOD initially expected to spend about \$12 billion on the C-5 AMP and RERP efforts. However, both modernization efforts experienced cost problems. AMP development costs increased by approximately 20 percent and would have been higher had the Air Force not reduced requirements and deferred some development activities to other programs. Officials waived 14 operational requirements and deferred the correction of 250 deficiencies identified during testing, many of which will be addressed and funded in RERP or future efforts. In 2007, DOD reported that RERP average procurement unit costs grew more than 50 percent from the original baseline estimate.

The report also stated on pages 8-9 that:

C-5 modernization cost increases caused DOD to change its approach for meeting its strategic airlift requirements. DOD had planned to meet the requirements with 112 fully modernized C-5s—i.e., those receiving both the AMP and RERP modifications—and 180 C-17 aircraft. The cost for the C-5 modernization efforts was estimated to be approximately \$12 billion—about \$900 million for the AMP program and \$11.1 billion for the RERP program.

However, just prior to the RERP production decision in February 2007, the prime contractor, Lockheed Martin, indicated that RERP costs related to labor and supplier parts had significantly increased, prompting new cost estimates. The Air Force's estimate of \$17.5 billion was \$4.2 billion more than Lockheed Martin's estimate of \$13.3 billion at that time. The new estimate increased projected average procurement unit costs by more than 50 percent compared to the original baseline and triggered a statutory requirement for review and certification of the program.

Following notification to Congress of the cost increase, the Under Secretary of Defense for Acquisition, Technology and Logistics requested that the CAIG estimate the cost of various options for DOD to meet its strategic airlift mission. The CAIG analyzed 14 options covering a range of scenarios for the RERP program in three broad categories: modifying all C-5 aircraft, partially modifying the C-5 fleet, and canceling the C-5 RERP program. Each option also assumed that the department would have at least 203 C-17 aircraft, 14 more than the program planned to acquire at that time. The CAIG estimated the cost of providing the RERP modification to all 111 aircraft to be \$15.4 billion, halfway between the contractor's and the Air Force's estimates. Based on this analysis, the Under Secretary of Defense for Acquisition, Technology and Logistics concluded that the cost to RERP all C-5 aircraft was unaffordable and opted to limit full modification to 52 aircraft—47 C-5 Bs, both C-5 Cs, and 3 system development and demonstration aircraft. While the Air Force is expected to spend \$3.4 billion less under the restructured program, ultimately less than

(continued...)

Requirements for Strategic Airlift

DOD's requirements for airlift capability have evolved over the years. The discussion below summarizes developments in the situation since 2005.

Mobility Capabilities Study 2005 (MCS-05)

DOD's Mobility Requirements Study of 2005 (MCS-05) identified a requirement for between 292 and 383 strategic airlift aircraft. The bottom end of this range coincided with the Air Force's program of record at the time, which included a force of 292 aircraft—180 C-17s and 112 fully modernized C-5s.¹⁸ MCS-05 recommended a strategic airlift force structure of 292 aircraft, which the study said would meet national military strategy requirements with "acceptable risk."¹⁹ The 2006 Quadrennial Defense Review (QDR) subsequently stated a DOD goal of maintaining 292 strategic airlifters, including 180 C-17s and 112 fully modernized C-5s.²⁰

The unclassified executive summary of MCS-05 noted that unlike past mobility studies, MCS-05 did not recommend an airlift requirement expressed in millions of ton-miles per day (MTM/D) of airlift capacity.²¹

A previous DOD study of strategic airlift requirements, called the Mobility Requirements Study 2005 (MRS-05), was completed in 2000. The study established a requirement of 54.5 MTM/D.²² Some observers expected that MCS-05 would identify a new requirement closer to 60 MTM/D, while others speculated that MCS-05 would not increase the 54.5 MTM/D requirement because of DOD concerns about being able to afford a larger airlift fleet.²³

In September 2005, the Government Accountability Office (GAO) criticized the methodology that was being used for MCS-05.²⁴ A more detailed GAO criticism followed in September 2006, as MCS-05 was nearing completion.²⁵ Other observers criticized MCS-05 for not adequately addressing DOD intra-theater airlift needs, and for focusing on near-term capabilities rather than

(...continued)

one-half of the 111 aircraft will be modernized and at a much higher unit cost than originally estimated.

¹⁸ One C-5 was destroyed in a crash on April 3, 2006, leaving 111 in the inventory.

¹⁹ "Headquarters Air Mobility Command White Paper, KC-X: The Next Mobility Platform, The Need For A Flexible Tanker," p. 4.

²⁰ Government Accountability Office, *Defense Acquisitions[:] Timely and Accurate Estimates of Costs and Requirements Are Needed to Define Optimal Future Strategic Airlift Mix*, GAO-09-50, November 2008, p. 1.

²¹ A ton-mile is one ton of cargo transported one mile. Transporting 50 tons (112,000 pounds) of cargo over a distance of 2,000 miles equates to 100,000 ton miles.

²² Marc Selinger, "DoD Launching New Review of Transportation Needs," *Aerospace Daily*, March 11, 2004.

²³ John Tirpak, "Air Mobility in the Doldrums," *Air Force Magazine*, vol. 88, issue 8, August 2005, available online at <http://www.afa.org/magazine/aug2005/0805mobility.html>.

²⁴ Government Accountability Office, *Defense Transportation: Opportunities Exist to Enhance the Credibility of the Current and Future Mobility Capabilities Studies*, GAO-05-659R, September, 2005.

²⁵ Government Accountability Office, *Defense Transportation: Study Limitations Raise Questions About the Adequacy and Completeness of the Mobility Capabilities Study and Report*, GAO-06-938, September 2006.

taking a longer view.²⁶ The criticism regarding intra-theater airlift needs was particularly germane because the C-17 can be used in for intra-theater airlift operations.

In September 2006, it was reported that the Air Force’s Air Mobility Command was again studying DOD airlift needs. Some observers might have interpreted the Air Force’s initiation of another airlift study so soon after the completion of MCS-05 as tacit acknowledgment of flaws in the MCS and an attempt to ameliorate them.²⁷

Congressionally Mandated Study of 2007

To provide Congress with greater clarity into airlift requirements, Section 1034 of the FY2007 Defense Authorization Act (H.R. 5122/P.L. 109-364 October 17, 2006) required DOD to submit a report to Congress defining airlift requirements in terms of million-ton-miles per day. DOD delivered the report in classified form to the congressional defense committees on February 27, 2007.

Evolution in Planned Mix of Airlift Aircraft, 2005-2008

As shown in **Table 3**, which is taken from a November 2008 GAO report, the planned mix of C-17s and C-5s evolved between 2005 and 2008 due to continued procurement of C-17s, the restructuring of the C-5 modernization program to limit the RERP phase to 52 aircraft, and the crash in 2006 of one C-5 (which reduced the C-5 inventory from 112 to 111).

Table 3. Planned Mix of Strategic Airlift Aircraft, 2005-2008

| Aircraft type | December 2005 | July 2007 | February 2008 | September 2008 |
|-------------------------------|---------------|-----------|---------------|----------------|
| C-17s | 180 | 190 | 190 | 205 |
| C-5s (fully modernized) | 112 | 112 | 52 | 52 |
| C-5s (AMP modernization only) | 0 | 0 | 59 | 59 |
| Estimated MTM/D | 33.09 | 33.95 | 33.05 | 34.80 |

Source: Information taken from Table 2 (page 9) of Government Accountability Office, *Defense Acquisitions[:] Timely and Accurate Estimates of Costs and Requirements Are Needed to Define Optimal Future Strategic Airlift Mix*, GAO-09-50, November 2008. GAO states that Table 2 is based on GAO analysis of DOD data.

Notes: Fully modernized C-5s are those that have received both AMP and RERP.

Congressionally Mandated IDA Study of 2009

Section 1046 of the FY2008 defense authorization act (H.R. 4986/P.L. 110-181 of January 28, 2008—see **Appendix A** for the text of this provision) required the Secretary of Defense “to conduct a requirements-based study on alternatives for the proper size and mix of fixed-wing intratheater and intertheater airlift assets to meet the National Military Strategy for each of the

²⁶ John T. Bennett, “Influential DoD Mobility Study’s Focus on Intratheater Needs Questioned,” *Inside the Air Force*, April 7, 2006.

²⁷ Michael Fabey, “AF Formulating Mobility Plan,” *Aerospace Daily*, September 28, 2006.

following timeframes: fiscal year 2012, 2018, and 2024.” The study was conducted by the Institute for Defense Analyses (IDA) and completed in February 2009. The study summarized its findings as follows:

What are the airlift requirements?

The requirements for single or two concurrent MCO demands were based on those used in the Mobility Capabilities Study (MCS) from 2005. For the non-MCO demands, however, this study was able to take advantage of early versions of the more current Steady State Security Posture scenarios in order to derive demands outside the major theaters of war. Together, these constituted the requirements assumed for airlift.

Does the currently programmed fleet meet the requirements?

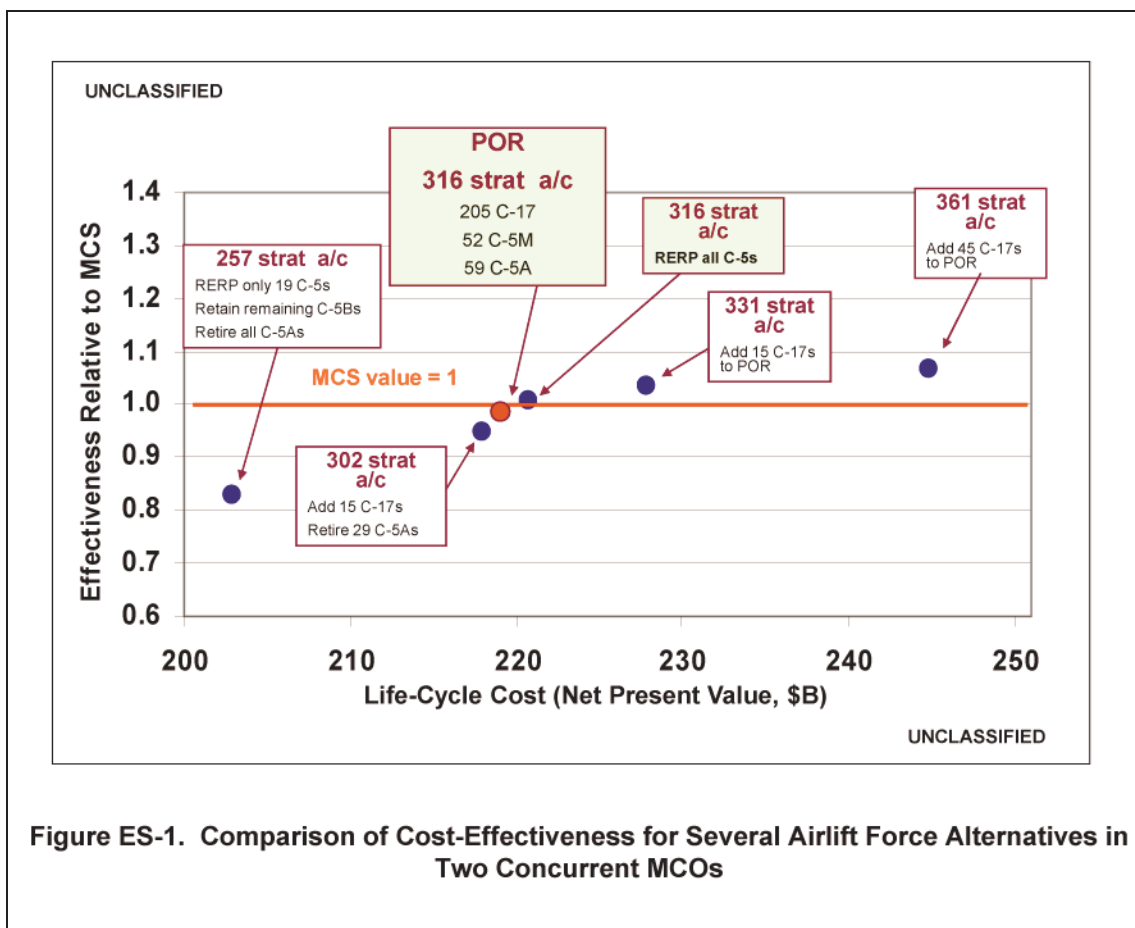
We found that the POR fleet is adequate in meeting the benchmark requirements identified in the MCS for moderate acceptable risk. Three different computer models used in this study produced somewhat different results for deliveries. The most pessimistic results matched MCS benchmark results, and with the other models, lower force levels than programmed also met the MCS benchmark level.

What programmatic alternatives might also be considered and how well do they meet these requirements? What are the life-cycle costs of these alternatives?

The study considered 36 alternative mixes and sizes and compared them both in cost and effectiveness with the POR. Figure ES-1 illustrates the relative capabilities of several alternative fleets that differ only in numbers or types of strategic lift aircraft (i.e., numbers and types of C-5s and C-17s). Results are shown relative to the capabilities that met the MCS moderate risk delivery demands for cargo. Similar analyses were performed for alternative fleets that differ in the numbers and types of intratheater airlift aircraft.

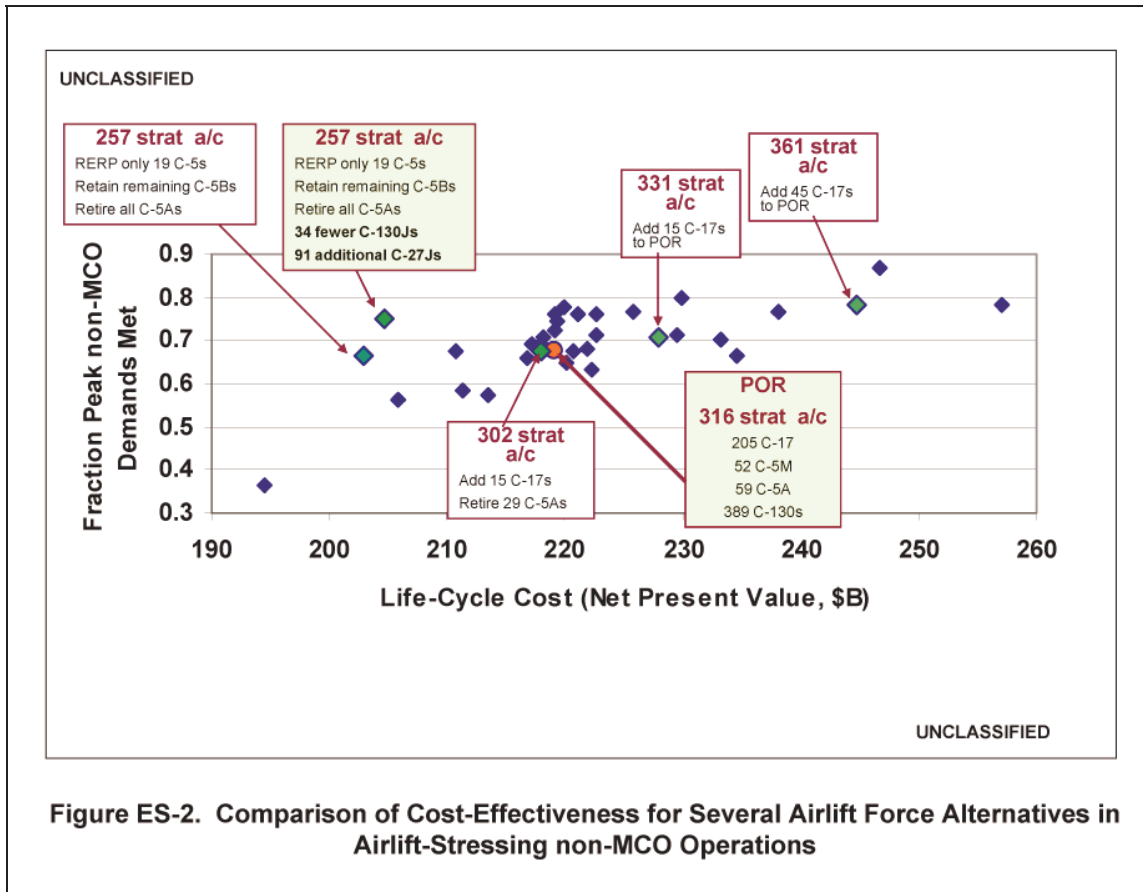
The study identified several relatively inexpensive ways of generating higher capability from existing forces, without procuring additional strategic airlifters beyond those already programmed. These include the following: use C-5s at Emergency Wartime Planning levels (adds 2-4 percent, depending on whether the extra weight carried is fuel or cargo); transport with CRAF²⁸ whatever oversize cargo that CRAF can carry, in addition to bulk cargo on pallets, in order to free up organic airlifters for the larger and heavier cargo (adds 10 percent); use host nation airlifters to the maximum extent possible (4 or 5 percent); and make use of tankers not involved in tanking missions to carry cargo in theater (adds about 4 percent). Use of these capabilities could also allow for a smaller strategic fleet that still meets MCS benchmark delivery requirements. Thus, our analyses using the MCR moderate risk benchmark suggest that an upper bound on the number of required strategic airlifters is 316, indicated by the two yellow boxes in Figure ES-1.

²⁸ This is a reference to the Civil Reserve Air Fleet, a group of commercial aircraft that U.S. airlines are committed by contract to make available to DOD to augment DOD’s military airlift capability in emergencies.



A small amount of additional capability could be achieved if all C-5s are converted through Reliability Enhancement and Re-engining Program (RERP) to C-5Ms. This alternative is at comparable life-cycle cost to that of the POR; near-term acquisition costs are almost repaid over time in later years by reduced operating and support (O&S) costs.

Traditionally, airlift and other force requirements are set by wartime demands (i.e., MCOs), not steady-state peacetime demands. Airlift is heavily used in both. If the appropriate acquisition planning scenarios are not MCOs but are high tempo non-MCO operations such as in Iraq and Afghanistan today, we find that some C-5As could be retired to save O&S costs with no loss in capability for those missions. This is illustrated in Figure ES-2. Moreover, a more cost-effective fleet than the POR is one that, in addition to having fewer C-5As, uses the smaller C-27Js instead of the larger C-130Js. These observations are driven by the need for numerous, geographically separated, but small loads during non-MCO operations, as currently anticipated in DoD planning scenarios.



Our assessment of the C-17 line shutdown and restart is that continued production, even at low rates, is expensive relative to restart costs. Moreover, under the scenarios and other assumptions considered in this study, additional C-17s were not needed to meet the MCS moderate-acceptable-risk delivery rates used as a benchmark by the analyses conducted here. We also found that retiring C-5As to release funds to buy and operate more C-17s is not cost-effective.

How do the alternatives differ in service life?

We projected aircraft service lifetimes based on planned flying hour and flying severity conditions. Excursions to the planned operating conditions were also examined. Our findings are that all airlifters except the C-130E have structural lifetimes that are beyond 2030. Virtually all the C-5s and C-17s have lifetimes beyond 2040. The C-130E is near its structural life limit and extensions to that life are not cost-effective by our analyses.

How well do CRAF aircraft contribute to wartime deliveries? At what specific organic fleet inventory would it impede the ability of CRAF participants to remain a viable augmentation option?

We included CRAF in the simulated airlift deliveries and find them to be useful for passenger and cargo delivery, especially in MCOs if CRAF aircraft are allowed to carry some oversize cargo. Nonetheless, fewer than half of the CRAF aircraft available for Stage III (during two MCOs) are actually used, so current incentives provide more than enough

CRAF for wartime demands. We also note that restructuring airline fleets should not significantly influence CRAF availability but may reduce numbers of charter passenger aircraft. A larger organic military fleet of airlift aircraft does not challenge passenger CRAF viability but could influence cargo CRAF because the organic fleet would be expected to shoulder a larger amount of the cargo movement required in peacetime. However, the cargo CRAF participates in a strong economic sector, does not strongly depend on CRAF in contrast to other commercial revenues, and is not likely to be significantly hurt by likely changes in DoD force levels.²⁹

Mobility Capabilities and Requirements Study 2016 (MCRS-16)

The Office of the Secretary of Defense (OSD) and the U.S. Transportation Command are currently examining future requirements for airlift capability in a study called Mobility Capability and Requirements Study 2016 (MCRS-16), which is expected to be completed by the end of 2009.³⁰ The U.S. Transportation Command testified in February 2009 that MCRS-16 and the congressionally mandated IDA study discussed in the previous paragraph “will aid decision makers in determining the mobility requirements necessary to defend the homeland, prevail in the war on terror, conduct irregular warfare and win conventional campaigns in the 2016 timeframe.”³¹

GAO reported in November 2008 that

According to Air Force officials, [MCRS-16] will take into account a variety of changes that have occurred since the last mobility study was completed in 2005, including the following:

- Addition of over 92,000 Marines and Army soldiers and their equipment that will need to be transported to locations across the United States and around the world.
- Establishment of a new African Command that will require the movement of troops and equipment to a variety of locations around the second largest continent in the world.
- Introduction of Mine Resistant Ambush Protected vehicles, which are being used in Iraq to provide enhanced protection for U.S. troops.
- Increase in weight of the Army’s Future Combat System vehicles, which makes it no longer possible to transport some vehicles with C-130 aircraft (DOD’s primary tactical airlifter).

The GAO report also stated:

²⁹ W. L. Greer, G. M. Koretsky, and J. P. Woolsey, *Study on Size and Mix of Airlift Force, Unclassified Synopsis*, Institute for Defense Analyses, IDA Paper P-4428, February 2009, pp. ES-1 to ES-4. A copy of this document was provided to CRS by Lockheed on October 2, 2009.

³⁰ Department of the Air Force, Presentation to the House Armed Services Committee Subcommittee on Air and Land Forces, United States House of Representatives, Combined Statement of: Lieutenant General Daniel J. Darnell, Air Force Deputy Chief Of Staff For Air, Space and Information Operations, Plans And Requirements (AF/A3/5) Lieutenant General Mark D. Shackelford, Military Deputy, Office of the Assistant Secretary of the Air Force for Acquisition (SAF/AQ) Lieutenant General Raymond E. Johns, Jr., Air Force Deputy Chief of Staff for Strategic Plans And Programs (AF/A8), May 20, 2009, p. 19.

³¹ ³¹ Statement of General Duncan J. McNabb, USAF Commander, United States Transportation Command, Before the House Armed Services Air & Land Forces and Seapower & Expeditionary Forces Subcommittees [Hearing] On the State of the Command, February 25, 2009, p. 6.

Some expect the [congressionally mandated IDA study and MCRS-16] will identify increased demands on airlift, particularly for the C-17 since it can perform both a strategic and tactical role. As Army equipment becomes heavier and/or bulkier, the C-17 may be the only aircraft capable of delivering major weapon systems to the front lines and to more austere bases in the theater of combat. The results of both studies, if done accurately and comprehensively, should provide the analytical foundation for the future airlift force structure.³²

A May 2009 press report stated:

Early indications from the Pentagon's Mobility Capabilities Requirements Study suggest no need for additional strategic airlift beyond the funded procurements of re-engined C-5s and 205 C-17s already planned, says U.S. Air Force Chief of Staff Gen. Norton Schwartz.

The 2005 Mobility Capabilities Study had suggested a requirement of roughly 300 strategic airlifters, and Schwartz says he sees "no major shift in the demand signal." The 2005 study, however, was discredited in much of Washington as a budget-driven formality under former Defense Secretary Donald Rumsfeld, and a new study has been eagerly awaited.

The new study is now under way, although official results are not expected until the fall. Unlike previous reviews, this study will take into account the requirements associated with increases in Army and Marine Corps end-strength, as well as the new U.S. Africa Command.

Even if more strategic airlift is ultimately needed, Air Force Secretary Michael Donley says an independent study³³ presents several options before considering a buy of additional C-17s, the only aircraft made at Boeing's Long Beach, Calif., plant.

These include leasing additional Civil Reserve Air Fleet capacity, as well as re-engining all 111 C-5s.³⁴

Prior-Year Legislation Relating to Airlift Force Structure

Section 132 of FY2004 Defense Authorization Act

Section 132 of the FY2004 defense authorization act (H.R. 1588/P.L. 108-136 of November 24, 2003) prohibits the Secretary of the Air Force from proceeding with a decision to retire C-5As from the active inventory of the Air Force in any number that would reduce the total number of C-5As in the active inventory below 112 (effectively now 111, following the crash in 2006 of a C-5 in 2006) until the Air Force has modified a C-5A aircraft to RERP configuration and DOD's Director of Operational Test and Evaluation conducts an operational evaluation of that aircraft and provides to the Secretary of Defense and the congressional defense committees an operational assessment.

³² Government Accountability Office, *Defense Acquisitions[:] Timely and Accurate Estimates of Costs and Requirements Are Needed to Define Optimal Future Strategic Airlift Mix*, GAO-09-50, November 2008, p. 10.

³³ This may be a reference to the congressionally mandated IDA study.

³⁴ Amy Butler, "New C-17s Not Needed, DOD Analysis Shows," *Aerospace Daily & Defense Report*, May 18, 2009: 3.

Section 132 of FY2006 Defense Authorization Act

Section 132 of the FY2007 defense authorization act (H.R. 5122/P.L. 109-364 of October 17, 2006) amended 10 USC 8062 to create a new subsection (g)(1) stating that, effective October 1, 2008, the Secretary of the Air Force shall maintain a total aircraft inventory of strategic airlift aircraft of not less than 299 aircraft. The provision defines strategic airlift aircraft as those with a cargo capacity of at least 150,000 pounds and a capability to transport outsized cargo over an unrefueled range of at least 2,400 nautical miles. The aircraft types that meet this definition are the C-5 and C-17.

Issues for Congress

Introduction

The primary issue for Congress in FY2010 is whether to procure additional C-17s. An additional issue is whether to pass additional legislation relating to the airlift aircraft force structure.

The Administration argues that enough C-17s have now been procured to meet future operational needs. Supporters of procuring additional C-17s in FY2010 believe additional will be needed to meet future operational needs.

Factors to Consider

In considering whether to procure additional C-17s in FY2010, Congress may consider a number of factors, including the total requirement for airlift capability and the cost-effectiveness of C-5 modernization compared to procuring additional C-17s. Additional factors to consider are constraints on total defense spending and the potential affect that procuring additional C-17s may have on reducing funding for other defense programs.

Requirements for Airlift Capability

Observers are now awaiting the results of the two current studies on the total requirement for airlift capability—the congressionally mandated IDA study and MCRS-16. GAO reported in November 2008 that:

We previously reported on shortcomings in the Institute for Defense Analysis' study plan that could make it difficult for decision makers to know how much strategic airlift is needed. For example, the study plan did not provide details on assumptions and the measures of effectiveness, or metrics, the command officials would be using in their evaluation. Measures of effectiveness are considered to be especially important when evaluating alternatives, such as comparing the results of two analyses that measure different airlift force mixes. We recommended in April 2008 that DOD take action to ensure that the final study plan included sufficient details to address all the elements specified in the law and needed to inform decision makers on airlift issues.³⁵ DOD concurred with our recommendation.

³⁵ The passage at this point contains a footnote citing the following GAO report: Government Accountability Office, *Defense Transportation[:]* DOD Should Ensure that the Final Size and Mix of Airlift Force Study Plan Includes (continued...)

We also identified shortcomings in DOD's 2005 mobility capabilities study approach that, if not addressed, could be repeated again in the current study. Unlike prior studies, the 2005 study did not recommend a specific airlift requirement expressed in million ton-miles per day—a common metric integral to prior capability studies that defines and quantifies airlift requirements as a basis for computing the size and optimal mix of airlift forces. Instead, DOD officials stated that it expressed its airlift requirement in terms of specific numbers and types of aircraft needed to meet the national defense strategy to take into account real-world operating parameters that may cause aircraft payloads to vary significantly from standard planning factors. Later, in response to congressional direction, DOD translated the requirements into a million ton-mile requirement. We also found the study did not identify the operational impact of increased or decreased strategic airlift on achieving warfighting objectives that would be associated with different mixes of C-5 and C-17 aircraft. As a result, we could not determine how the study concluded that the mix of C-5s and C-17s at that time was adequate for meeting mobility requirements and for supporting strategic airlift portfolio investment decisions. In 2006, we recommended that DOD include mobility metrics, along with warfighting metrics to determine air superiority, when completing future mobility capabilities studies. DOD concurred with this recommendation.³⁶

Although DOD concurred with the recommendation, a Transportation Command official stated that a decision has not yet been made on what specific metrics will be used to determine the number and mix of strategic airlifters in the current mobility capabilities study. At the time of this writing, the study plan had not been finalized and it is unclear whether a million ton-miles metric will be used, though it is being considered. DOD often uses the million ton-mile metric as an easy way to compare the capacity of different fleet mixes. For example, according to a DOD official, since C-130s, C-130Js, C-17s, C-5As, C-5Bs, and C-5Ms all have different capabilities when it comes to payload and range, it is difficult to compare different mixes of them without using this metric.³⁷

The report also stated:

The C-5 and C-17 provide complementary capabilities. However, DOD continues to struggle with identifying the specific quantities and determining the optimal mix of aircraft needed. Clarity is needed before committing additional billions of dollars to C-5 modernization programs, establishing C-5 retirement schedules, and/or acquiring additional C-17 aircraft. Careful planning is also important to avoid the costs of shutting down the C-17 line prematurely and later deciding to restart the production. The new mobility studies, if done correctly, could bring clarity to strategic airlift capabilities needed to support the future force and changed threats, as well as inform future tactical airlift requirements because of the C-17's dual role. Important metrics left out of the 2005 capabilities study—such as specific ton-mile mobility requirements and relative reliability rates—are considered critical factors in quantifying and analyzing cost-effective force mixes. DOD concurred with our prior recommendation to use mobility metrics to inform future mobility capabilities studies. However, at this writing, it is unclear whether DOD will use a million ton-mile metric in its current analysis to determine the cost-effective mix of aircraft and guide important investment decisions related to the expenditure of billions of dollars. Until comprehensive

(...continued)

Sufficient Detail to Meet the Terms of the Law and Inform Decision Makers, GAO-08-704R, April 28, 2008.

³⁶ The passage at this point contains a footnote citing the following GAO report: Government Accountability Office, *Defense Transportation: Study Limitations Raise Questions about the Adequacy and Completeness of the Mobility Capability Study and Report*, GAO-06-938, September 2006.

³⁷ Government Accountability Office, *Defense Acquisitions[:] Timely and Accurate Estimates of Costs and Requirements Are Needed to Define Optimal Future Strategic Airlift Mix*, GAO-09-50, November 2008, pp. 10-11.

requirements—supported by appropriate, quantifiable metrics—and the full costs for alternate courses of action are identified, DOD decision making on the future size and mix of strategic airlift is hampered, thus increasing the risk of incurring unnecessary costs and establishing a less than optimal mix of strategic and tactical airlift forces.³⁸

Cost-Effectiveness of C-5 Modernization Compared to C-17 Procurement

November 2008 GAO Report

Regarding the cost effectiveness of C-5 modernization compared to procuring new C-17s, GAO reported in November 2008 that:

if the cost for C-5 modernization continues to increase, Air Force officials may have to reconsider the mix within its airlift portfolio or request additional funding. Additional investments in C-17 aircraft may become more attractive. Currently, a new C-17 would cost about \$276 million compared to \$132 million to fully modernize a C-5. Each new C-17 potentially adds 100 percent of its cargo capacity toward meeting the total airlift requirement. Because the C-5s are already part of the operational force, each aircraft's current capacity is already counted toward the total requirement. Consequently, according to DOD data, the C-5 modernization programs only provide a marginal increase of 14 percent in capability over nonmodernized aircraft. Using DOD's million ton-mile per day planning factors, we, working in collaboration with DOD, calculated that DOD would need to fully modernize 7 C-5s to attain the equivalent capability achieved from acquiring 1 additional C-17 and the costs would be over 3 times more (see table 3).

Table 4. [Table 3 in GAO report] Comparison of a Modernized C-5 and C-17 Equivalent Aircraft Capabilities

| | Unit cost ^a | Aircraft needed to provide equivalent capabilities | Total Cost of equivalent capability |
|----------------------|------------------------|--|-------------------------------------|
| C-5 fully modernized | \$ 132 million | 7 | \$924 million |
| C-17 new | \$276 million | 1 | \$276 million |

Source: GAO analysis of DOD data.

a. Unit costs reflect procurement costs only. Data are rounded for presentation purposes.

The analysis does not include the life-cycle costs of adding more C-17s to DOD's airlift portfolio. However, previous DOD analysis indicated that the life-cycle costs would be approximately the same if DOD replaced 30 C-5s with 30 C-17s.

The Air Force has not fully identified the funding needed to modernize the C-5 aircraft, and costs are likely to increase. The current cost estimate is \$9.1 billion to AMP the entire fleet of 111 aircraft and RERP 52 aircraft. However, we believe this is understated. The current budget does not fully fund the revised RERP program and the CAIG's [the DOD Cost Analysis Improvement Group's] cost estimate does not adequately address risk and uncertainty. Further, the cost estimate does not include the costs for a new modernization

³⁸ Government Accountability Office, *Defense Acquisitions[:] Timely and Accurate Estimates of Costs and Requirements Are Needed to Define Optimal Future Strategic Airlift Mix*, GAO-09-50, November 2008, pp. 19-20.

upgrade program slated to begin in fiscal year 2010 that would fix AMP deficiencies and add new capabilities. Alternatively, some future modification costs may be avoided should the Air Force justify retirement of some older C-5s.

The current budget does not sufficiently fund the revised RERP program. According to the CAIG's analysis, the C-5 RERP is underfunded by about \$294 million across the Future Years Defense Plan for fiscal years 2009- 2013. Approximately \$250 million less is needed in fiscal years 2009 through 2011, and \$544 million more is needed in fiscal years 2012 and 2013. According to program officials, the Air Force is committed to fully funding the CAIG RERP cost estimate in the fiscal year 2010 President's budget yet to be submitted. However, program officials could not identify sources for the additional funding needed in fiscal years 2012 and 2013....

While our review of the CAIG's cost-estimating methodology found it generally well documented, comprehensive, and accurate, we found some weaknesses that impair the credibility and overall reliability of the C-5 cost estimate. Specifically, the CAIG did not take risk or uncertainty into account for some major cost drivers, in particular the propulsion system and labor. Because cost estimates predict future program costs, uncertainty is always associated with them. For example, there is always a chance that the actual cost will differ from the estimate because of a lack of knowledge about the future as well as errors resulting from historical data inconsistencies, assumptions, cost-estimating equations, and factors that are typically used to develop an estimate. Quantifying that risk and uncertainty is considered to be a cost estimating best practice because it captures the cumulative effect of risks and recognizes the potential for error.

In a memo documenting its independent cost estimate, the CAIG stated that the biggest risk to the cost estimate was the purchase agreement between Lockheed Martin and General Electric for the propulsion system that is conditioned on specific annual procurement quantities. The CAIG had estimated that the Air Force could save 18 percent by meeting the quantity and schedule identified in the revised RERP. However, CAIG officials stated that if the budget is not sufficient to meet these agreed-to quantities, then anticipated price breaks would not occur, resulting in increased costs of the C-5 RERP to the government. Despite this significant risk, the CAIG did not perform a risk/uncertainty analysis to determine the extent to which costs would increase should the buy quantity be cut. CAIG officials stated that they believe propulsion system procurement risk has been mitigated because they have identified the quantities necessary to meet the conditions of the purchase agreement and the Air Force plans to fully fund to this estimate. Despite these assurances, however, we have found that DOD often changes procurement quantities and there is a risk that quantities for the C-5 RERP program may change. For example, DOD's Selected Acquisition Report summary shows that of the 56 programs currently in production, 38 (or 68 percent), have experienced a quantity change since their production decisions.

In addition, the CAIG did not quantify or address uncertainty with its \$2.1 billion labor cost estimate associated with the installation of the RERP on C-5 production aircraft. The RERP program experienced a 29-month break in production between the last system development and demonstration unit and the first production unit. As such, the CAIG had to estimate inefficiencies due to loss of learning and how it would affect the costs of future production. The CAIG's assumptions differed from those used by the Air Force and Lockheed Martin, which caused the CAIG estimate to be about \$200 million more than Lockheed Martin's estimate and about \$400 million less than the Air Force's labor estimate. As a result of the weaknesses discussed above, the Air Force's basis for making strategic airlift portfolio investment decisions is impaired, and the RERP program is at increased risk of experiencing cost overruns.

Additional modernization efforts not yet budgeted will add to future C-5 costs. Air Force officials stated that a new C-5 upgrade program is slated to begin in fiscal year 2010. The initial funding requirement is \$65 million—\$40 million in research, development, test, and evaluation funds and \$25 million in procurement funds—to migrate all C-5s toward a standard software configuration, based on changes made in the AMP and RERP programs. Requirements previously waived on the AMP may also be addressed in the initial block of this program. Additional funding will be requested in 2012 and beyond to provide additional capabilities. According to a program official, the total requirements and funding needs for this modernization program have not been finalized. However, at this time it is not expected to be as costly as the C-5 AMP or RERP.

The eventual costs for modernizing C-5 aircraft hinge upon the decisions DOD officials make about the number and mix of strategic airlifters DOD needs in the future. If additional C-5 capability is needed, more C-5 aircraft may need to receive the RERP modification and costs will increase. On the other hand, if decision makers believe additional C-17 capability is needed in lieu of the C-5, the Air Force may be able to reduce the number of aircraft that need the AMP modification and additional modifications slated to begin in fiscal year 2010.³⁹

Lockheed Comment on November 2008 GAO Report

Lockheed, the maker of the C-5, found fault with the November 2008 GAO report, stating in a seven-page point paper that:

The GAO report adequately addresses some elements surrounding past C-5 modernization debate and C-17 alternatives, yet falls short of presenting a balanced discussion that advances a better public understanding of the complex strategic airlift debate. The GAO report selectively applies facts that detract from the merits of C-5 modernization while omitting current and relevant analysis that highlights the value of the program. Lockheed Martin concurs with the DoD's characterization that the GAO report contains misleading information and illustrations....

The GAO report does not represent a balanced discussion, but instead presents a rather one-dimensional perspective which leans toward C-17 advocacy while failing to acknowledge virtually any of the benefits of C-5 modernization. In its 2008 RERP recertification, the DoD reviewed 14 different airlift options and concluded that no other alternative provided greater or equal military capability at less cost than C-5 modernization. RERP delivers significant operational capabilities, meets all requirements, and pays for itself.⁴⁰

For the full text of this point paper, see **Appendix B**.

³⁹ Government Accountability Office, *Defense Acquisitions[:] Timely and Accurate Estimates of Costs and Requirements Are Needed to Define Optimal Future Strategic Airlift Mix*, GAO-09-50, November 2008, pp. 12-16.

⁴⁰ Lockheed point paper entitled "White Paper On Government Accountability Office (GAO) Report 'Defense Acquisitions: Timely and Accurate Estimates of Costs and Requirements Are Needed to Define Optimal Future Strategic Airlift Mix' (November 2008)," provided to CRS by Lockheed on October 2, 2009.

Legislative Activity in 2009

FY2010 Defense Authorization Bill (H.R. 2647/S. 1390)

House

The House Armed Services Committee, in its report (H.Rept. 111-166 of June 18, 2009) on H.R. 2647, recommends no funding for the procurement of additional C-17s in FY2010, and instead recommends approving the Administration's request for \$88.5 million in procurement funding for other C-17 program expenses. (Page 93)

Section 134 of H.R. 2647 would require the Secretary of the Air Force, in coordination with the Director of the Air National Guard, to submit to the congressional defense committees, at least 120 days before a C-5 is retired, a report on the proposed force structure and basing of C-5 and C-17 aircraft. The text of Section 134 is as follows:

SEC. 134. REPORTS ON STRATEGIC AIRLIFT AIRCRAFT.

At least 120 days before the date on which a C-5 aircraft is retired, the Secretary of the Air Force, in coordination with the Director of the Air National Guard, shall submit to the congressional defense committees a report on the proposed force structure and basing of strategic airlift aircraft (as defined in section 8062(g)(2) of title 10, United States Code). Each report shall include the following:

(1) A list of each aircraft in the inventory of strategic airlift aircraft, including for each such aircraft—

(A) the type;

(B) the variant; and

(C) the military installation where such aircraft is based.

(2) A list of each strategic airlift aircraft proposed for retirement, including for each such aircraft—

(A) the type;

(B) the variant; and

(C) the military installation where such aircraft is based.

(3) A list of each unit affected by a proposed retirement listed under paragraph (2) and how such unit is affected.

(4) For each military installation listed under paragraph (2)(C), any changes to the mission of the installation as a result of a proposed retirement.

(5) Any anticipated reductions in manpower as a result of a proposed retirement listed under paragraph (2).

(6) Any anticipated increases in manpower or military construction at a military installation as a result of an increase in force structure related to a proposed retirement listed under paragraph (2).

Section 135 of H.R. 2647 would amend 10 USC 8062(g)(1)—the subsection of 10 USC 8062 that was created by Section 132 of the FY2007 defense authorization act (H.R. 5122/P.L. 109-364 of October 17, 2006)—to state that, effective October 1, 2009 (rather than October 1, 2008), the Secretary of the Air Force shall maintain a total strategic airlift aircraft (i.e., C-5 and C-17) inventory of not less than 316 (rather than 299) aircraft. Assuming the retention of the current force of 111 C-5s, this provision would appear to support a C-17 force of 205 C-7s—the number procured through FY2008.

The committee's report states:

Strategic airlift force structure

The committee notes that the current Mobility Capabilities Study 2005 (MCS-05) identified a range of 292–383 strategic airlift aircraft to meet global mobility requirements with moderate risk. In testimony before the Subcommittee on Air and Land Forces and the Subcommittee on Seapower and Expeditionary Forces on February 25, 2009, the commander of the United States Transportation Command testified that a force structure of 205 C-17s, 52 [fully modernized] C-5Ms, and 59 C-5As modified with the avionics modernization program [AMP], a total of 316 strategic airlift aircraft, meets the requirement to transport 33.95 million ton-miles per day. Additionally, the committee notes that the previous commander of the United States Transportation Command and now current Air Force Chief of Staff, in his letter to the Chairman of the Senate Committee on Armed Services on November 6, 2007, also identified 316 strategic airlift aircraft as the “sweet spot” to meet global mobility requirements.

The committee further notes that MCS-05 did not consider the combined Army and Marine Corps increase of 92,000 soldiers and Marines, a potential increase in strategic airlift necessary to transport the Army's future combat systems, or the prospect that future strategic mobility aircraft would be utilized to conduct intra-theater airlift missions to move outsized and oversized equipment as they are now being used in Operation Iraqi Freedom, and believes that the results of MCRS-16 should more accurately identify the inventory of strategic airlift aircraft necessary to meet future strategic airlift mobility requirements.

Accordingly, the committee believes that the long-term strategic airlift force structure inventory required to meet global mobility requirements may be subject to future adjustment based on the results of the Mobility Capability Requirement Study 2016 (MCRS-16) scheduled for completion in December 2009, and encourages a continued dialogue between the Office of the Secretary of Defense, senior uniformed military officials, and the congressional defense committees. The committee also recommends a provision elsewhere in this title [Section 135] that would amend subsection (g)(1) of section 8062, United States Code, by striking “299” and inserting “316.” (Pages 101-102)

Section 1032 would require a report on the force structure findings of the 2009 Quadrennial Defense Review (QDR). The committee's report states:

The committee expects that the analyses submitted will include details on all elements of the force structure discussed in the QDR report, and particularly the following:...

(2) A description of the factors that informed decisions regarding strategic and tactical airlift force structure, including: the modeling, simulations, and analyses used to determine the

number and type of airlift aircraft necessary to meet the national defense strategy; the number and type of airlift aircraft necessary to meet the national defense strategy; the changes made, and supporting rationale for the changes made, to the airlift force structure from that proposed in Mobility Capabilities Study 2005 (MCS-05), including numbers of airlift aircraft necessary to meet additional demands for increased Army and Marine Corps personnel, airlift necessary to transport the Army's future combat systems, and the use of airlift aircraft in intra-theater airlift missions; the force sizing constructs used, including peak demand as measured in millions of ton-miles per day and force structure necessary to meet peak demand including the number of C-17s, C-5s, C-130s, C-27s, and civil reserve air fleet; and the operational risks associated with the planned strategic and tactical airlift aircraft fleet, based on requirements of combatant commanders, and measures planned to address those risks; ... (Pages 387-388)

Senate

Division D of S. 1390 as reported by the Senate Armed Services Committee (S.Rept. 111-35 of July 2, 2009) presents the detailed line-item funding tables that in previous years have been included in the Senate Armed Services Committee's report on the defense authorization bill. Division D recommends no funding for the procurement of additional C-17s in FY2010, and instead recommends approving the Administration's request for \$88.5 million in procurement funding for other C-17 program expenses. (Page 630 of the printed bill.)

Section 121 of S. 1390 would prohibit the Secretary of the Air Force from proceeding with a decision to retire C-5As until certain conditions are met, and require the Secretary of the Air Force to submit a report to the congressional defense committees on the issue of C-5 retirement. The text of Section 121 is as follows:

SEC. 121. LIMITATION ON RETIREMENT OF C-5 AIRCRAFT.

(a) Limitation- The Secretary of the Air Force may not proceed with a decision to retire C-5A aircraft from the active inventory of the Air Force in any number that would reduce the total number of such aircraft in the active inventory below 111 until—

(1) the Air Force has modified a C-5A aircraft to the configuration referred to as the Reliability Enhancement and Reengining Program (RERP) configuration, as planned under the C-5 System Development and Demonstration program as of May 1, 2003; and

(2) the Director of Operational Test and Evaluation of the Department of Defense—

(A) conducts an operational evaluation of that aircraft, as so modified; and

(B) provides to the Secretary of Defense and the congressional defense committees an operational assessment.

(b) Operational Evaluation- An operational evaluation for purposes of paragraph (2)(A) of subsection (a) is an evaluation, conducted during operational testing and evaluation of the aircraft, as so modified, of the performance of the aircraft with respect to reliability, maintainability, and availability and with respect to critical operational issues.

(c) Operational Assessment- An operational assessment for purposes of paragraph (2)(B) of subsection (a) is an operational assessment of the program to modify C-5A aircraft to the configuration referred to in subsection (a)(1) regarding both overall suitability and deficiencies of the program to improve performance of the C-5A aircraft relative to

requirements and specifications for reliability, maintainability, and availability of that aircraft as in effect on May 1, 2003.

(d) **Additional Limitations on Retirement of Aircraft-** The Secretary of the Air Force may not retire C-5 aircraft from the active inventory as of the date of this Act until the later of the following:

(1) The date that is 150 days after the date on which the Director of Operational Test and Evaluation submits the report referred to in subsection (a)(2)(B).

(2) The date that is 120 days after the date on which the Secretary submits the report required under subsection (e).

(3) The date that is 30 days after the date on which the Secretary certifies to the congressional defense committees that—

(A) the retirement of such aircraft will not increase the operational risk of meeting the National Defense Strategy; and

(B) the retirement of such aircraft will not reduce the total strategic airlift force structure below 324 strategic airlift aircraft.

(e) **Report on Retirement of Aircraft-** The Secretary of the Air Force shall submit to the congressional defense committees a report setting forth the following:

(1) The rationale for the retirement of existing C-5 aircraft and a cost/benefit analysis of alternative strategic airlift force structures, including the force structure that would result from the retirement of such aircraft.

(2) An assessment of the costs and benefits of applying the Reliability Enhancement and Re-engining Program (RERP) modification to the entire the C-5A aircraft fleet.

(3) An assessment of the implications for the Air Force, the Air National Guard, and the Air Force Reserve of operating a mix of C-5A aircraft and C-5M aircraft.

(4) An assessment of the costs and benefits of increasing the number of C-5 aircraft in Back-up Aircraft Inventory (BAI) status as a hedge against future requirements of such aircraft.

(5) An assessment of the costs, benefits, and implications of transferring C-5 aircraft to United States flag carriers operating in the Civil Reserve Air Fleet (CRAF) program or to coalition partners in lieu of the retirement of such aircraft.

(6) Such other matters relating to the retirement of C-5 aircraft as the Secretary considers appropriate.

(f) **Maintenance of Aircraft Upon Retirement-** The Secretary of the Air Force shall maintain any C-5 aircraft retired after the date of the enactment of this Act in Type 1000 storage until opportunities for the transfer of such aircraft as described in subsection (e)(5) have been fully exhausted.

Conference

The conference report (H.Rept. 111-288 of October 7, 2009) on the FY2010 defense authorization bill (H.R. 2647) authorizes no funding for the procurement of additional C-17s. (Page 948)

Section 137 of the bill prohibits the Secretary of the Air Force from proceeding with a decision to retire C-5As in any number that would reduce the active inventory of C-5s below 111 until certain conditions are met, and require the Secretary of the Air Force to submit a report to the congressional defense committees on the issue of C-5 retirement.

Section 138 requires the Secretary of the Air Force, in coordination with the Director of the Air National Guard, to submit to the congressional defense committees, at least 90 days before a C-5 airlift aircraft is retired, a report on the proposed force structure and basing of C-5 and C-17 aircraft.

Section 139 amends 10 USC 8062(g)(1) to state that the Secretary of the Air Force shall maintain a total inventory of not less than 316 C-5s and C-17s. If the current force of 111 C-5s were retained, this provision would support a C-17 force of not less than 205 C-7s—the number procured through FY2008.

Section 1052 requires a report on the force structure findings of the 2009 Quadrennial Defense Review (QDR). The House report on H.R. 2647 (H.Rept. 111-166 of June 18, 2009 – see discussion above), stated that this report is to include, among other things, a discussion of description of the factors that informed decisions regarding strategic and tactical airlift force structure.

Section 137 states:

SEC. 137. LIMITATION ON RETIREMENT OF C-5 AIRCRAFT.

(a) **LIMITATION.**—The Secretary of the Air Force may not proceed with a decision to retire C-5A aircraft from the active inventory of the Air Force in any number that would reduce the total number of such aircraft in the active inventory below 111 until—

(1) the Air Force has modified a C-5A aircraft to the configuration referred to as the Reliability Enhancement and Reengining Program (RERP) configuration, as planned under the C-5 System Development and Demonstration program as of May 1, 2003; and

(2) the Director of Operational Test and Evaluation of the Department of Defense—

(A) conducts an operational evaluation of that aircraft, as so modified; and

(B) provides to the Secretary of Defense and the congressional defense committees an operational assessment.

(b) **OPERATIONAL EVALUATION.**—An operational evaluation for purposes of paragraph (2)(A) of subsection (a) is an evaluation, conducted during operational testing and evaluation of the aircraft, as so modified, of the performance of the aircraft with respect to reliability, maintainability, and availability and with respect to critical operational issues.

(c) **OPERATIONAL ASSESSMENT.**—An operational assessment for purposes of paragraph (2)(B) of subsection (a) is an operational assessment of the program to modify C-5A aircraft to the configuration referred to in subsection (a)(1) regarding both overall suitability and deficiencies of the program to improve performance of the C-5A aircraft relative to requirements and specifications for reliability, maintainability, and availability of that aircraft as in effect on May 1, 2003.

(d) **ADDITIONAL LIMITATIONS ON RETIREMENT OF AIRCRAFT.**—

The Secretary of the Air Force may not retire C-5 aircraft from the active inventory as of the date of the enactment of this Act until the later of the following:

(1) The date that is 90 days after the date on which the Director of Operational Test and Evaluation submits the report referred to in subsection (a)(2)(B).

(2) The date that is 90 days after the date on which the Secretary submits the report required under subsection (e).

(3) The date that is 30 days after the date on which the Secretary certifies to the congressional defense committees that—

(A) the retirement of such aircraft will not increase the operational risk of meeting the National Defense Strategy; and

(B) the retirement of such aircraft will not reduce the total strategic airlift force structure below 316 strategic airlift aircraft.

(e) **REPORT ON RETIREMENT OF AIRCRAFT.**—The Secretary of the Air Force shall submit to the congressional defense committees a report setting forth the following:

(1) The rationale for the retirement of existing C-5 aircraft and a cost-benefit analysis of alternative strategic airlift force structures, including the force structure that would result from the retirement of such aircraft.

(2) An updated assessment to the assessment of the Under Secretary for Acquisition, Technology, and Logistics certified on February 14, 2008, concerning the costs and benefits of applying the Reliability Enhancement and Re-engining Program (RERP) modification to the entire the C-5A aircraft fleet.

(3) An assessment of the implications for the Air Force, the Air National Guard, and the Air Force Reserve of operating a mix of C-5A aircraft and C-5M aircraft.

(4) An assessment of the costs and benefits of increasing the number of C-5 aircraft in Back-up Aircraft Inventory (BAI) status as a hedge against future requirements of such aircraft.

(5) An assessment of the costs, benefits, and implications of transferring C-5 aircraft to United States flag carriers operating in the Civil Reserve Air Fleet (CRAF) program or to coalition partners in lieu of the retirement of such aircraft.

(6) Such other matters relating to the retirement of C-5 aircraft as the Secretary considers appropriate.

Section 138 states:

SEC. 138. REPORTS ON STRATEGIC AIRLIFT AIRCRAFT.

At least 90 days before the date on which a C-5 aircraft is retired, the Secretary of the Air Force, in consultation with the Director of the Air National Guard, shall submit to the congressional defense committees a report on the proposed force structure and basing of strategic airlift aircraft (as defined in section 8062(g)(2) of title 10, United States Code). Each report shall include the following:

(1) A list of each aircraft in the inventory of strategic airlift aircraft, including for each such aircraft—

(A) the type;

(B) the variant; and

(C) the military installation where such aircraft is based.

(2) A list of each strategic airlift aircraft proposed for retirement, including for each such aircraft—

(A) the type;

(B) the variant; and

(C) the military installation where such aircraft is based.

(3) A list of each unit affected by a proposed retirement listed under paragraph (2) and how such unit is affected.

(4) For each military installation listed under paragraph (2)(C), changes, if any, to the mission of the installation as a result of a proposed retirement.

(5) Any anticipated reductions in manpower as a result of a proposed retirement listed under paragraph (2).

Section 139 states:

SEC. 139. STRATEGIC AIRLIFT FORCE STRUCTURE.

Subsection (g)(1) of section 8062 of title 10, United States Code, is amended—

(1) by striking “2008” and inserting “2009”; and

(2) by striking “299” and inserting “316”.

FY2009 DOD Appropriations Bill (H.R. 3326)

House

The House Appropriations Committee, in its report (H.Rept. 111-230 of July 24, 2009) on H.R. 3326, recommended \$762.6 million in procurement funding for the C-17 program, including \$674.1 million for the procurement of three C-17s. (Page 187)

The report recommends a \$152.6 million reduction in the amount of procurement funding requested for the modification of in-service C-17s, mostly for “Excess Install[ation] funding” for certain pieces of equipment, and a \$91.4 million reduction (a 100% reduction) in the amount of procurement funding requested for C-17 post-production support for “Program Reduction.” (Pages 188 and 189).

The paragraph in the bill that makes funding available for the procurement of Air Force aircraft states that the funds are made available, “*Provided*, That no funds provided in this Act for the procurement or modernization of C-17 aircraft may be obligated until all C-17 contracts funded with prior year `Aircraft Procurement, Air Force’ appropriated funds are definitized.”

The report recommends approving the requests in the Overseas Contingency Operations (OCO) part of the budget for \$132.3 million in procurement funding for the modification of in-service C-17s⁴¹ and for \$11 million in procurement funding for C-17 post-production support. (Page 358)

The committee’s report states:

C-17 AIRCRAFT

The C-17 Globemaster III aircraft has been the supply and logistics workhorse of the ongoing overseas conflicts. This platform has been responsible for the airlift of more cargo and personnel than any other platform. In recognition of the platform’s contributions to the Nation’s security, the Committee provides an additional \$674,100,000 for the procurement of three C-17 aircraft. The Committee recognizes that this is well below the minimum sustaining rate required for the production line. In an effort to avoid the extremely high costs associated with small production lots, the Committee’s intent is that these aircraft be absorbed into the fiscal year 2009 production run that was funded from the Supplemental Appropriations Act, 2009, to create a full production run funded over a two year period. The Committee intends that the pricing for these aircraft be consistent with the 2009 aircraft, using methods such as a fixed price option to the fiscal year 2009 production contract. (Page 191)

The report also states:

UNDEFINITIZED CONTRACT ACTIONS

The Committee has become aware of the excessive use of undefinitized contract actions (UCA’s) by the Air Force. Based on information obtained by the Committee, it is apparent that the Air Force has not provided the proper oversight of contracting activities within various programs. Specifically, the C-17 aircraft program has billions of dollars in undefinitized contracts. The Defense Federal Acquisition Regulations (DFAR) very clearly stipulate in subpart 217.74 that UCA’s are to be used as the exception not as the rule for urgent needs. It is common practice for the C-17 program to place all of its funding on a UCA and then immediately obligate up to 50 percent of the not-to-exceed price at the award which is a disincentive to definitize the contract. Further, the DFAR requires that the contract must be definitized within 180 days after the issuance of initial undefinitized action unless it is extended by another 180 days after the contractor submits a qualifying proposal. The C-17 program has numerous contracts well in excess of these timelines with proposal times for fiscal year 2007 funds ranging from 373 to 975 days and on average 688 days to definitize. This use of UCA’s places the taxpayer at a severe disadvantage when negotiating contracts since the contractor has little incentive to control costs while performing work under a UCA.

Even more concerning to the Committee, is that this excessive use of UCA’s is not just isolated to procurement and modernization programs but has migrated to operation and maintenance programs. Based on information supplied by the Air Force, a Deputy Assistant

⁴¹ The report of the Senate Appropriations Committee on H.R. 3326 (see discussion below) states that the requested figure was \$120.7 million.

Secretary of the Air Force for Contracting memorandum dated 28 November 2001 authorized the waiver of the limitations in the DFAR for definitization schedule and obligations for UCAs that support overseas operations. With this memorandum as justification, the Air Force has placed the fiscal year 2009 C-17 depot funding on a UCA which is still not definitized in the fourth quarter of the fiscal year even though the Air Force has obligated 89.7 percent of the \$1,118,679,167 not-to-exceed price. This rationale for the use of a undefinitized contracts for routine activities is abusive. The Committee directs the Secretary of the Air Force to address this situation within 30 days of enactment of this Act to include the cancellation of the November 2001 memorandum. The Committee further directs the Air Force to provide a detailed report to the congressional defense committees of all undefinitized UCA's in excess of \$50,000,000 within 30 days of enactment of this Act. The report shall include the date the UCA was initiated, the not-to-exceed price, the amount obligated on the UCA, and the planned date for definitization.

While the Committee understands the need at times for programs to use this type of contracting mechanism, it appears that the Air Force has grossly abused it with respect to volume, value, and time to definitize. The Committee insists that the Air Force finalize all existing undefinitized contract actions in an expedited manner and to minimize the use of UCA's the future. To encourage a sense of urgency, the Committee has included a new proviso in the Aircraft Procurement, Air Force appropriating paragraph which specifies that for C-17 procurement and modernization efforts funded with Aircraft Procurement, Air Force the obligation of fiscal year 2010 procurement funds is prohibited until the existing UCA's are definitized. The Committee further directs the Undersecretary of Defense, Acquisition, Technology and Logistics (USD(AT&L)) to review contracting procedures within the Air Force and provide a report to the congressional defense committees within 90 days of enactment of this Act detailing a strategy to reduce current and minimize future undefinitized contracts in the Air Force. (Pages 190-191)

Section 8041 of the bill as reported would rescind certain FY2009 appropriations for DOD programs. The committee's report states that the funds that would be rescinded include \$70 million in FY2009 research and development funding for the C-17 program. (Page 324)

A July 28, 2009, statement of administration policy on H.R. 3326 as reported in the House states:

C-17 Transport Aircraft. The Administration strongly objects to the addition of \$674 million in funding for three unrequested C-17 airlift aircraft. Analyses by DOD have shown that the 205 C-17s in the force and on order, together with the existing fleet of C-5 aircraft, are sufficient to meet the Department's future airlift needs, even under the most stressing situations.⁴²

Senate (Committee Report)

The Senate Appropriations Committee, in its report (S.Rept. 111-74 of September 10, 2009) on H.R. 3326, recommends \$2,588.5 million in procurement funding for the C-17 program, including \$2,500.0 million for the procurement of 10 C-17s. (Page 133)

The report recommends a \$45.3 million reduction in the amount of procurement funding requested for the modification of in-service C-17s for "Funding requested ahead of need," and a

⁴² Statement of Administration Policy: H.R. 3326—Department of Defense Appropriations Act, 2010, July 28, 2009 (House), available online at <http://www.presidency.ucsb.edu/ws/index.php?pid=86466>.

\$91.4 million reduction (a 100% reduction) in the amount of procurement funding requested for C-17 post-production support for “Funding requested ahead of need.” (Page 133)

The report recommends approving the requests in the Overseas Contingency Operations (OCO) part of the budget for \$120.7 million in procurement funding for the modification of in-service C-17s⁴³ and for \$11 million in procurement funding for C-17 post-production support. (Page 261)

Section 8040 of the bill as reported would rescind certain FY2008 and FY2009 appropriations for DOD programs. The committee’s report states that the funds that would be rescinded include \$22.4 million in FY2009 research and development funding for the C-17 program. (Page 230)

The report “directs that the National Guard and Reserve Equipment program shall be executed by the heads of the Guard and Reserve components with priority consideration given to” several items, including Large Aircraft Infrared Countermeasures (LAIRCM) systems for C-17s. (Page 151)

A September 25, 2009, statement of administration policy on H.R. 3326 as reported in the Senate states:

C-17 Transport Aircraft. The Administration strongly objects to the addition of \$2.5 billion in funding for 10 unrequested C-17 airlift aircraft. Analyses by DOD have shown that the 205 C-17s in the force and on order, together with the fleet of C-5 aircraft, are sufficient to meet the Department’s future airlift needs, even under the most stressing situations.⁴⁴

Senate (Floor Consideration)

Senate Amendment 2558

S.Amdt. 2558, proposed on September 29, 2009, would strike from H.R. 3326 funding for C-17 procurement in excess of the amount requested by administration (i.e., it would strike the \$2.5 billion in the bill for the procurement of 10 C-17s) and make that funding available instead for operation and maintenance in accordance with amounts requested by the administration, and for the Operation and Maintenance, Army account for overseas contingency operations.

On September 30, the Senate considered S.Amdt. 2558. A point of order was raised with respect to the amendment. The Senate, by a vote of 34 to 64 (Record Vote Number 303), rejected a motion to waive the Budget Act with respect to the amendment, and the amendment was ruled out of order.

Senate Amendment 2580

On October 6, a new amendment—S.Amdt. 2580—was proposed to strike from H.R. 3326 funding for C-17 procurement in excess of the amount requested by the administration. This amendment was structured to avoid the point of order that was raised with respect to S.Amdt.

⁴³ The report of the House Appropriations Committee on H.R. 3326 (see discussion above) states that the requested figure was \$132.3 million.

⁴⁴ Statement of Administration Policy: H.R. 3326—Department of Defense Appropriations Act, 2010, September 25, 2009 (Senate), available online at <http://www.presidency.ucsb.edu/ws/index.php?pid=86689>.

2558. On October 6, the Senate rejected S.Amdt. 2580 by a vote of 30 to 68 (Record Vote Number 312).

FY2009 Supplemental Appropriations Act (H.R. 2346/P.L. 111-32)

House

The House Appropriations Committee, in its report (H.Rept. 111-105 of May 12, 2009) on the FY2009 supplemental appropriations bill (H.R. 2346), recommended \$2.2452 billion for the procurement of eight additional C-17s. (Page 21) The report stated:

C-17 GLOBEMASTER III

The Committee recommendation includes \$2,245,200,000 for the procurement of eight C-17 Globemaster III aircraft. The C-17 is the workhorse of the theater, flying fifty percent of all sorties for the United States Transportation Command over the last 24 months. These missions range from airdrops for troops in forward locations to aeromedical evacuation of servicemembers from theater back to the United States. While the aircraft is designed to fly 1,000 hours per year over 30 years, over the last ten years the C-17 fleet has averaged 1,250 hours per aircraft with some aircraft flying in excess of 2,400 hours in a single year. This heavy usage is reducing the expected service life of the aircraft. The aircraft included in the recommendation will alleviate some of these issues by introducing new aircraft into the inventory.

Further, the Committee is concerned that a decision on the continuation of the C-17 program was announced prior to the completion of the Mobility Capability and Requirements Study (MCRS), which will address the needs of the Department of Defense in 2016. Since the last MCRS in 2005, several changes have occurred that would change previous requirements to include the growth of ground forces, the increased size and use of Special Operations Forces, additional use of the C-17 in an intra-theater role, and the stand up of a new combatant command—United States Africa Command. It seems more prudent to continue the C-17 program until the results of the study are announced later this year.

Additionally, the Air Force is encouraged to work with Congress and the reserve component to replace aging C-5A aircraft with C-17 aircraft. While there are concerns that reserve component aircraft are not utilized at the same rate as aircraft assigned to Air Mobility Command, the Committee believes that the Air Force can develop plans to work with the reserve component to address some of these issues (i.e. active association with Guard units). (Pages 24-25)

Senate

The Senate Appropriations Committee, in its report (S.Rept. 111-20 of May 14, 2009) on the FY2009 supplemental appropriations bill (S. 1054), recommended no funding for the procurement of additional C-17s, and instead recommended rejecting a request that the Administration had made for \$230.2 million in FY2009 supplemental funding to cover other C-17 program expenses. (Page 43)

Conference

The conference report (H.Rept. 111-151 of June 12, 2009) on H.R. 2346 provided \$2.172 billion for the procurement of eight additional C-17s. (Page 93)

Appendix A. Section 1046 of FY2008 Defense Authorization Act

The text of Section 1046 of the FY2008 defense authorization act (H.R. 4986/P.L. 110-181 of January 28, 2008) is as follows:

SEC. 1046. STUDY ON SIZE AND MIX OF AIRLIFT FORCE.

(a) Study Required- The Secretary of Defense shall conduct a requirements-based study on alternatives for the proper size and mix of fixed-wing intratheater and intertheater airlift assets to meet the National Military Strategy for each of the following timeframes: fiscal year 2012, 2018, and 2024. The study shall—

(1) focus on organic and commercially programmed airlift capabilities;

(2) analyze the full-spectrum lifecycle costs of the various alternatives for organic models of each of the following aircraft: C-5A/B/C/M, C-17A, KC-X, KC-10, KC-135R, C-130E/H/J, Joint Cargo Aircraft; and

(3) incorporate the augmentation capability, viability, and feasibility of the Civil Reserve Air Fleet during activation stages I, II, and III.

(b) Use of Ffrdc- The Secretary shall select, to carry out the study required by subsection (a), a federally funded research and development center that has experience and expertise in conducting similar studies.

(c) Study Plan- The study required by subsection (a) shall be carried out under a study plan. The study plan shall be developed as follows:

(1) The center selected under subsection (b) shall develop the study plan and shall, not later than 60 days after the date of enactment of this Act, submit the study plan to the congressional defense committees, the Secretary, and the Comptroller General of the United States.

(2) The Comptroller General shall review the study plan to determine whether it is complete and objective, and whether it has any flaws or weaknesses in scope or methodology, and shall, not later than 30 days after receiving the study plan, submit to the Secretary and the center a report that contains the results of that review and provides any recommendations that the Comptroller General considers appropriate for improvements to the study plan.

(3) The center shall modify the study plan to incorporate the recommendations under paragraph (2) and shall, not later than 45 days after receiving that report, submit to the Secretary and the congressional defense committees a report on those modifications. The report shall describe each modification and, if the modifications do not incorporate one or more of the recommendations, shall explain the reasons for not doing so.

(d) Elements of Study Plan- The study plan required by subsection (c) shall address, at minimum, the following:

(1) A description of lift requirements and operating profiles for airlift aircraft required to meet the National Military Strategy, including assumptions regarding the following:

- (A) Current and future military combat and support missions.
 - (B) The planned force structure growth of the military services.
 - (C) Potential changes in lift requirements, including the deployment of the Future Combat Systems by the Army.
 - (D) New capability in airlift to be provided by the KC(X) aircraft and the expected utilization of such capability, including its use in intratheater lift.
 - (E) The utilization of intertheater lift aircraft in intratheater combat mission support roles.
 - (F) The availability and application of Civil Reserve Air Fleet assets in future military scenarios.
 - (G) Air mobility requirements associated with the Global Rebasing Initiative of the Department of Defense.
 - (H) Air mobility requirements in support of worldwide peacekeeping and humanitarian missions.
 - (I) Air mobility requirements in support of homeland defense and national emergencies.
 - (J) The viability and capability of the Civil Reserve Air Fleet to augment organic forces in both friendly and hostile environments.
 - (K) An assessment of the Civil Reserve Air Fleet to adequately augment the organic fleet as it relates to commercial inventory management restructuring in response to future commercial markets, streamlining of operations, efficiency measures, or downsizing of the participant.
- (2) An evaluation of the state of the current airlift fleet of the Air Force, including assessments of the following:
- (A) The extent to which the increased use of airlift aircraft in on-going operations is affecting the programmed service life of the aircraft of that fleet.
 - (B) The adequacy of the current airlift force, including whether or not a minimum of 299 strategic airlift aircraft for the Air Force is sufficient to support future expeditionary combat and non-combat missions, as well as domestic and training mission demands consistent with the requirements of meeting the National Military Strategy.
 - (C) The optimal mix of C-5 and C-17 aircraft for the strategic airlift fleet of the Air Force, to include the following:
 - (i) The cost-effectiveness of modernizing various iterations of the C-5A and C-5B/C aircraft fleet versus procuring additional C-17 aircraft.
 - (ii) The military capability, operational availability, usefulness, and service life of the C-5A/B/C/M aircraft and the C-17 aircraft. Such an assessment shall examine appropriate metrics, such as aircraft availability rates, departure rates, and mission capable rates, in each of the following cases:

(I) Completion of the Avionics Modernization Program and the Reliability Enhancement and Re-engining Program.

(II) Partial completion of the Avionics Modernization Program and the Reliability Enhancement and Re-engining Program, with partial completion of either such program being considered the point at which the continued execution of each program is no longer supported by the cost-effectiveness analysis.

(iii) At what specific fleet inventory for each organic aircraft, to include air refueling aircraft used in the airlift role, would it impede the ability of Civil Reserve Air Fleet participants to remain a viable augmentation option.

(D) An analysis and assessment of the lessons that may be learned from the experience of the Air Force in restarting the production line for the C-5 aircraft after having closed the line for several years, and recommendations for the actions that the Department of Defense should take to ensure that the production line for the C-17 aircraft could be restarted if necessary, including—

(i) an analysis of the methods that were used and costs that were incurred in closing and re-opening the production line for the C-5 aircraft;

(ii) an assessment of the methods and actions that should be employed and the expected costs and risks of closing and re-opening the production line for the C-17 aircraft in view of that experience.

Such analysis and assessment should deal with issues such as production work force, production facilities, tooling, industrial base suppliers, contractor logistics support versus organic maintenance, and diminished manufacturing sources.

(E) Assessing the military capability, operational availability, usefulness, service life and optimal mix of intra-theater airlift aircraft, to include—

(i) the cost-effectiveness of procuring the Joint Cargo Aircraft versus procuring additional C-130J or refurbishing C-130E/H platforms to meet intra-theater airlift requirements of the combatant commander and component commands; and

(ii) the cost-effectiveness of procuring additional C-17 aircraft versus procuring additional C-130J platforms or refurbishing C-130E/H platforms to meet intra-theater airlift requirements of the combatant commander and component commands.

(3) Each analysis required by paragraph (2) shall include—

(A) a description of the assumptions and sensitivity analysis utilized in the study regarding aircraft performances and cargo loading factors; and

(B) a comprehensive statement of the data and assumptions utilized in making the program life cycle cost estimates and a comparison of cost and risk associated with the optimally mixed fleet of airlift aircraft versus the program of record airlift aircraft fleet.

(e) Utilization of Other Studies- The study required by subsection (a) shall build upon the results of the 2005 Mobility Capabilities Studies, the on-going Intra-theater Airlift Fleet Mix Analysis, the Intra-theater Lift Capabilities Study, the Joint Future Theater Airlift Capabilities Analysis, and other appropriate studies and analyses, such as Fleet Viability Board Reports or special aircraft assessments. The study shall also include any testing data collected on modernization, recapitalization, and upgrade efforts of current organic aircraft.

(f) Collaboration With United States Transportation Command- In conducting the study required by subsection (a) and preparing the report required by subsection (c)(3), the center shall collaborate with the commander of the United States Transportation Command.

(g) Collaboration With Cost Analysis Improvement Group- In conducting the study required by subsection (a) and constructing the analysis required by subsection (a)(2), the center shall collaborate with the Cost Analysis Improvement Group of the Department of Defense.

(h) Report- Not later than January 10, 2009, the center selected under subsection (b) shall submit to the Secretary and the congressional defense committees a report on the study required by subsection (a). The report shall be submitted in unclassified form, but shall include a classified annex.

Appendix B. Lockheed Point Paper Commenting on November 2008 GAO Report

This appendix presents the text of a Lockheed point paper that comments on the November 2008 GAO report, quoted elsewhere in this CRS report, on the strategic airlift mix.⁴⁵ The text of the Lockheed white paper is reprinted below.

**[Lockheed] White Paper On
Government Accountability Office (GAO) Report
“Defense Acquisitions: Timely and Accurate Estimates of Costs and Requirements Are
Needed to Define Optimal Future Strategic Airlift Mix” (November 2008)**

Background: At the request of the House Armed Services Committee (HASC), Subcommittee on Air and Land Forces, the GAO was asked to identify the impact C-5 modernization cost increases have had on the mix of aircraft; assess the current C-5 modernization cost estimate; and identify C-17 production plans and issues related to production line shutdown.

Discussion: The GAO report adequately addresses some elements surrounding past C-5 modernization debate and C-17 alternatives, yet falls short of presenting a balanced discussion that advances a better public understanding of the complex strategic airlift debate. The GAO report selectively applies facts that detract from the merits of C-5 modernization while omitting current and relevant analysis that highlights the value of the program. Lockheed Martin concurs with the DoD’s characterization that the GAO report contains misleading information and illustrations. The full report can be found at: <http://www.gao.gov/new.items/d0950.pdf>.

Below are examples of GAO report shortcomings.

| Item | GAO Report Comment | Lockheed Martin Response |
|------|---|---|
| 1 | p.1: “...determining current and future airlift requirements—and the specific numbers and optimal mix of aircraft needed to meet those requirements—has become increasingly challenging given affordability concerns and changes in threats, missions, and future force structure.” | Determining future airlift requirements has not necessarily become more challenging. While there are legitimate fiscal concerns, funding constraints to support identified requirements, and emerging force structure considerations, the core debate tends to center around how to extend the C-17 production line. Multiple studies have repeatedly failed to identify the need for additional C-17s. Consequently, proponents for additional C-17 production either challenge the credibility of those studies or disparage other platforms to create a need for replacement of existing capability. |
| 2 | p.2: “...the Department of Defense (DOD) is | Report fails to attribute or cite a source for this |

⁴⁵ Lockheed point paper entitled “White Paper On Government Accountability Office (GAO) Report ‘Defense Acquisitions: Timely and Accurate Estimates of Costs and Requirements Are Needed to Define Optimal Future Strategic Airlift Mix’ (November 2008),” provided to CRS by Lockheed on October 2, 2009. Emphasis as in original.

| | | |
|---|---|--|
| | currently rethinking its strategic airlift plans, due in part to significant cost growth for modernizing C-5 aircraft and a subsequent scaling back of modernization efforts.” | comment. DoD’s strategic airlift program of record is clear: 205 C-17s + 52 fully modernized C-5s (AMP+RERP) + 59 partially modernized C-5s (AMP only). Based on GAO report (table 2), this fleet mix appears to generate <u>more</u> organic national airlift capability (as measured in MTMs) than any time in history. This capability exceeds MCS, QDR, and JROC established requirements to meet national security requirements at “acceptable” risk. |
| 3 | p.3: “The Air Force has cut the number of C-5s it plans to fully modernize by more than half because of substantial cost increases in the modernization effort...” | This is only partially true and an over simplification. As a result of the AF’s RERP Service Cost Position estimate, a Nunn McCurdy breach was declared on Sep 27, 2007 (notably the same day Senators’ Carper/Coburn hosted a hearing on Cost Effective Airlift for the 21 st Century). LM Aero had previously submitted the Air Force a firm fixed price proposal that was executable within the FYDP with a total program value that would not trigger a Nunn-McCurdy notification. While the AF’s Nunn McCurdy declaration triggered the need to recertify the program, it was the determination by OSD AT&L that “.....re-engining of the C-5A aircraft is not necessary to meet projected airlift requirements” (Feb 14, C-5 RERP ADM). Consequently, while cost increases triggered the need for RERP recertification, it was not simply the GAO’s noted “substantial cost increases” that resulted in C-5As being removed from RERP. The JROC established a minimum organic strategic airlift capability of 33.95 MTMs which could be met without the operational benefits derived from C-5A RERP. C-5As were removed from RERP because there was no additional MTM requirement. It is also important to note that AT&L determined that there was no need for additional C-17s either (a fact omitted by the GAO in their report) |
| 4 | p. 3: “The costs to modernize C-5 aircraft have not been fully identified and are likely to increase. While the Air Force now estimates it will spend \$9.1 billion to modernize C-5s, the costs may be underestimated because DOD did not apply risk or uncertainty analysis to its reliability enhancement and reengining program major cost drivers” | Speculation. The GAO report fails to acknowledge that LM already has signed purchases orders in place to protect propulsion system pricing and that the contracting mechanism is firm/fixed price for all production lots. LM bears the preponderance of risk, not the DoD. While the GAO raises concerns about C-5 modernization costs, it fails to note the very substantial costs (beyond simple acquisition) for the C-17 fleet (including past/future mod and sustainment program investments). |
| 5 | p. 3: Regarding RERP “.....is underfunded by | GAO fails to note that this is purely an |

| | | |
|----|--|--|
| | almost \$300 million and costs may escalate if the Air Force has to stretch the program schedule to stay within funding targets” | administrative issue which was already addressed in AT&L’s Acquisition Decision Memorandum. It is our understanding that the AF intends to support the production profiles and funding requirements as directed by OSD. |
| 6 | p. 3: “At the same time, the Air Force has not fully priced or budgeted for a new C-5 upgrade program it plans to begin in fiscal year 2010 to address current avionics deficiencies and to add new capabilities” | LM is unaware of any “new” C-5 upgrade program”. See p.28 DoD comments. GAO appears to confuse this initiative with AMP/RERP software improvements being contemplated for the future. |
| 7 | p.3: “Some future costs, however, may be avoided should the Air Force justify retirement of some older C-5s and forego planned modifications. | Speculation and illogical. Program of record does not call for any C-5A retirements. If the AF were to retire any C-5A, the inherent capability of the jet (MTMs) would have to be recovered through acquisition of additional C-17s. Consequently, future net costs to the AF would significantly rise. It is also important to note that C-5A AMP is based on legitimate CNS/ATM requirements for future GATM access. All strategic airlifters require these capabilities for global operations. Without AMP, the AF could potentially be faced with having to procure \$275M+ C-17s to replace the capability provided by a \$5M C-5 AMP installation in order to fly in global airspace. This is a false dilemma and a poor investment choice. |
| 8 | p.3 “...potential C-5 retirements could lead to decisions to extend C-17 production...” | Speculation. Any C-5A retirement requires acquisition of C-17s on ~1:1 basis to replace comparable capability. What business case analysis suggests this is a desirable course of action? The unit cost for installing RERP on a C-5A is approximately 1/3 the cost of acquiring a new C-17. The modernized C-5 will carry almost 2x the cargo of a C-17, carry it farther, faster, and with less air refueling tanker dependency. Modernized C-5As have decades of service life remaining (2040+) |
| 9 | p. 6 “...two upgrades were expected to improve the fleet’s mission capable rate to at least 75 percent, thereby increasing payload capability and transportation throughput, and to reduce total ownership costs over the life cycle by about \$14 billion in 2008 dollars | To clarify – C-5 RERP generates \$15B (BY00\$s) in savings and a Reduced Total Ownership Cost of \$8.9B (BY00\$s). RERP pays for itself. The RERP R-TOC is even sufficient to pay for C-5A RERP at no net cost to the AF if they should chose to do so in the future. Additionally, <u>fleet</u> RERP generates the equivalent of 2.73 MTMs (22 C-17 equivalent, \$6.072B) at no additional cost to the AF. |
| 10 | p.6 “In 2007, DOD reported that RERP average procurement unit costs grew more than 50 percent from the original baseline estimate.” | In the interest of balanced reporting, it is appropriate to note that C-17 program acquisition costs (SAR summary, Dec 07) have grown 55 percent after adjustments for quantity. |
| 11 | p.7 “C-5 modernization cost increases prompted DOD to reduce the number of C-5s it plans to fully modernize.” | See LM item #3 response |

| | | |
|----|---|--|
| 12 | p.7 “Subsequently, Congress provided additional funding that the Air Force is using to procure more C-17s, which would offset the loss in capability of modernizing fewer C-5s.” | Source for this remark? 10 C-17s were congressionally added in 2007 to compensate for excessive OIF/OEF utilization rates. These aircraft were added prior to any decision having been made regarding fewer modernized C-5s. An additional 15 C-17s were congressionally added in 2008. LM is unaware that any added C-17s were justified as “offset for loss in capability of fewer” modernized C-5s. See AT&L C-5 ADM for rationalization for C-5 modernization decision. |
| 13 | p.8 “...just prior to the RERP production decision in February 2007, the prime contractor, Lockheed Martin, indicated that RERP costs related to labor and supplier parts had significantly increased, prompting new cost estimates.” | GAO report fails to note that there were many <u>shared</u> reasons (LM, DoD, unforeseen commodity price increases, etc) for program cost growth including material cost growth (18.2%), estimation errors (16.5%), labor cost growth (12.3%), and production rate changes (5.7%). It was not just LM labor and supplier parts that were in play. |
| 14 | p.8 “Based on this analysis, the Under Secretary of Defense for Acquisition, Technology and Logistics concluded that the cost to RERP all C-5 aircraft was unaffordable and opted to limit full modification to 52 aircraft...” | GAO report fails to note that AT&L also rejected procuring additional C-17 aircraft as not meeting requirements, more costly to the taxpayer, and unaffordable in the FYDP. |
| 15 | p.9 Table 2 | It is worth noting that the current program of record projects MTM capabilities above national requirements identified by MCS (2005), QDR (2006), or JROC (2008) recommendations. The GAO report fails to acknowledge C-5 modernization meets all requirements without the need for additional C-17s. |
| 16 | p.10 “The fiscal year 2009 National Defense Authorization Act authorizes procurement of 6 more C-17s, which will bring the total number to 211 aircraft.” | While the FY09 NDAA did authorize 6 additional C-17s, there were no corresponding appropriations provided. It remains to be seen if C-17 total numbers grow to 211. |
| 17 | p.10 “...DOD’s ability to make sound strategic airlift portfolio decisions, including the number of C-5s to retire and the number of additional C-17s that should be procured...” | This is recurring theme in the report. GAO repeatedly brings up the notion of C-5 retirements (without citing sources) while suggesting the need for additional C-17s to replace the lost capability those C-5 retirements would generate. |
| 18 | p.10 “As Army equipment becomes heavier and/or bulkier, the C-17 may be the only aircraft capable of delivering major weapon systems to the front lines and to more austere bases in the theater of combat” | Speculation. C-5s are exceptional aircraft in the heavy long-haul equipment role and have a lighter foot print (LCN, CBRs, etc) than C-17s. C-5s have an inherent tactical capability not exploited by the AF to include airdrop, special operations, austere runway ops, intra-theater distribution, etc. The primary concern regarding C-5s is reliability, not inherent capability. RERP is designed to restore aircraft reliability to mitigate employment risks/concerns of the warfighter. |
| 19 | p.11 “...according to a DOD official, since C- | Regarding C-5As and Bs, this statement is |

| | | |
|----|--|---|
| | 130s, C-130Js, C-17s, C-5As, C-5Bs, and C-5Ms all have different capabilities when it comes to payload and range,... | incorrect. Both aircraft have the same payload and range capability. |
| 20 | p.11-12 “Congressional legislation would allow the Air Force to begin to retire some C-5s , if appropriate, beginning October 1, 2008, as long as the Air Force maintains a strategic airlift fleet of 299 aircraft” | This is not LM’s understanding of the language. NDAA 2007 section 132 merely states “(g)(1) Effective October 1, 2008, the Secretary of the Air Force shall maintain a total aircraft inventory of strategic airlift aircraft of not less than 299 aircraft.” This section provides no authority to retire any C-5s. NDAA FY04 section 132 details conditions for any future C-5A retirement considerations. |
| 21 | p. 12 “...the Air Mobility Command will consider retiring C-5s, as the law and requirements allow, on a one-for-one basis after 205 C-17s have been procured to ensure the right combination of aircraft and capability is balanced against cost and risk.” | It this is correct, why would a fiscally responsible congress appropriate additional C-17s that would force the AF to retire C-5A on a 1:1 basis? C-5A are structurally sound and can serve for decades without replacement (AF Fleet Viability Board). OSD has already certified the current program of record as most cost effective and dismissed the need for additional C-17s as unnecessary and unaffordable. |
| 22 | p. 12 “Currently, a new C-17 would cost about \$276 million compared to \$132 million to fully modernize a C-5.” | Basis for price – flyaway, APUC, PAUC, TY\$s, BY\$s, etc? Also, the discussion of cost should be more appropriately focused on RERP vs C-17s and not include AMP. |
| 23 | p. 12 “Consequently, according to DOD data, the C-5 modernization programs only provide a marginal increase of 14 percent in capability over non-modernized aircraft.” | Misleading remark. Based solely on AMC MTM factors, RERP (C-5M) delivers a 35% MTM improvement over C-5As, a 14% MTM improvement over C-5Bs and 11% MTM improvement over C-17s. The report omits AF analysis which confirmed that C-5 RERP generates \$15B (BY00\$s) in savings and a Reduced Total Ownership Cost of \$8.9B (BY00\$s). The fact that C-5 RERP pays for itself is omitted by the report while it tries to characterize acquiring additional strategic airlift capability via C-17 acquisitions as more cost effective. This is simply incorrect. |
| 24 | p. 12 “Using DOD’s million ton-mile per day planning factors, we, working in collaboration with DOD, calculated that DOD would need to fully modernize 7 C-5s to attain the equivalent capability achieved from acquiring 1 additional C-17 and the costs would be over 3 times more (see table 3).” | Misleading remark and an oversimplification. The GAO comparison chart only reflects procurement costs and selectively excludes the life cycle O&S implications of a decision. Had the GAO based its chart on Reduced Total Ownership Costs (i.e. the net effect of a decision) it would have shown C-5 unit cost to have been -\$170M per aircraft (or more appropriately -\$1.2B for 7 C-5Ms) compared to a C-17 of +\$276M per aircraft acquisition cost (+ an undefined life cycle O&S cost). Lockheed Martin traditionally views C-5 modernization ~1/3 the cost of acquiring a C-17. The C-5M will also carry almost 2x the amount of cargo, over farther distances, at higher speed, and with less air refueling tanker |

| | | |
|----|--|--|
| | | dependency. The GAO report also fails to acknowledge that <u>fleet</u> C-5 modernization would generate 2.73 MTMs (22 C-17 equivalents, ~\$6B) at no additional expense. The reduced total ownership from the current program of record (~\$9B) is sufficient to pay for fleet RERP program if desired. |
| 25 | p. 13, Table 3 (and p9, Table 2) | Many factors go into how MTMs are calculated, including aircraft average payload, utilization rate, blockspeed, productivity factors, and whether an aircraft is designated as a primary mission assigned aircraft (PMAI) or is part of backup aircraft inventory (BAI). PMAI aircraft generate MTMs while BAIs do not. Were the 10 congressionally added C-17s (~\$2.4B) in 2007 PMAI or BAI aircraft? Similarly, will the 15 C-17s (\$3.6B) added in 2008 become PMAI or BAI. If the aircraft are PMAI, then they add MTM capability. If they are BAI, they do not. |
| 26 | p. 13, “....previous DOD analysis indicated that the life-cycle costs would be approximately the same if DOD replaced 30 C-5s with 30 C-17s” | The “30/30” proposal (retire 30 C-5As and replace with 30 C-17s) was not been publically released by the AF and is believed to have deficiencies. Based on LM analysis conducted in 2007, the “30/30” option results in additional financial burdens for the USAF and loss of operational capability. It is also important to note that the “30/30” option has it genesis in an AF assertion that there are “30 bad actors” in the C-5 fleet that need to be replaced. LM does not subscribe to that theory. See Congressional Research Service studies (Strategic Airlift Modernization: Analysis of C-5 Modernization and C-17 Acquisition Issues) for more details. OSD also examined the 30/30 option as part of the RERP recertification program and rejected it. |
| 27 | p. 13 “The current budget does not sufficiently fund the revised RERP program. According to the CAIG’s analysis, the C-5 RERP is underfunded by about \$294 million across the Future Years Defense Plan for fiscal years 2009- 2013.” | GAO report fails to note that this is purely an administrative issue which was already addressed in AT&L’s Acquisition Decision Memorandum. The GAO report correctly notes AF commitment to fully support CAIG directed funding and production profiles. |
| 28 | p. 14 “ ... the CAIG did not take risk or uncertainty into account for some major cost drivers, in particular the propulsion system and labor.” | GAO report fails to acknowledge that LM already has signed purchases orders in place to protect propulsion system pricing and that the contracting mechanism is firm/fixed price for all production lots. LM bears the risk, not the DoD |
| 29 | p. 15 “Additional modernization efforts not yet budgeted will add to future C-5 costs. Air Force officials stated that a new C-5 upgrade program is slated to begin in fiscal year 2010” | See LM response #6. |
| 30 | p. 16 “The eventual costs for modernizing C-5 aircraft hinge upon the decisions DOD officials | This is an oversimplification of a complex issue and draws incorrect conclusions. If |

| | | |
|--|--|--|
| | make about the number and mix of strategic airlifters DOD needs in the future. If additional C-5 capability is needed, more C-5 aircraft may need to receive the RERP modification and costs will increase. On the other hand, if decision makers believe additional C-17 capability is needed in lieu of the C-5, the Air Force may be able to reduce the number of aircraft that need the AMP modification and additional modifications slated to begin in fiscal year 2010” | decision makers believe that additional C-5 capability is desired, it is most likely that the O&S savings (and improved MTM productivity measured against C-17 equivalents) of those modernized C-5s will more than offset the investment required. If C-17 capability is needed in lieu of C-5s (i.e. replacement), there is no possible way such a scenario could be revenue neutral. See OSD’s analysis of the 14 different airlift options reviewed during the course of C-5 RERP recertification. |
|--|--|--|

Conclusion: The GAO report does not represent a balanced discussion, but instead presents a rather one-dimensional perspective which leans toward C-17 advocacy while failing to acknowledge virtually any of the benefits of C-5 modernization. In its 2008 RERP recertification, the DoD reviewed 14 different airlift options and concluded that no other alternative provided greater or equal military capability at less cost than C-5 modernization. RERP delivers significant operational capabilities, meets all requirements, and pays for itself.

Author Contact Information

Ronald O'Rourke
Specialist in Naval Affairs
rorourke@crs.loc.gov, 7-7610