

NOT FOR PUBLICATION  
UNTIL RELEASED BY  
HOUSE ARMED SERVICES COMMITTEE

**STATEMENT OF**  
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**BEFORE THE**

**HOUSE ARMED SERVICES COMMITTEE**  
**AIR & LAND FORCES SUBCOMMITTEE**

**HEARING ON AIR FORCE AND ARMY AIRLIFT AND AERIAL RE-FUELING**  
**FIXED-WING AIRCRAFT PROGRAMS**

**MARCH 7, 2007**

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Mr. Chairman, distinguished members of the subcommittee, thank you for inviting me to speak with you today about Army and Air Force fixed-wing airlift and aerial refueling programs. As requested, I will address the potential oversight issues that these programs present for Congress that might be addressed during the current or future legislative cycles.

Taken as a whole, the programs you wish to examine in this hearing could represent more than \$3 billion in FY08 and \$23 billion over the Future Years Defense Plan. The macro-level questions these programs raise for Congress are:

- How sustainable are these investment plans considering increasing cost of personnel, plans to add almost 100,000 soldiers and marines to the active force, and cost growth in major weapon programs of up to 300%?
- Considering the large sums to be invested, and the pressures to constrain such expenditures, are these programs being considered holistically?
  - Are these airlift and aerial refueling programs being developed, planned and executed in a joint, interdependent way that considers all the potentially overlapping mission areas (e.g., aerial refueling, long-range airlift, intra-theater airlift) ?
  - will this result in the most cost effective means of satisfying the warfighter's requirement?

With these questions as a backdrop, the programs you requested I examine can be grouped into three overlapping categories:

- 1) Tanker recapitalization
- 2) Strategic, long-range airlift
- 3) Intra-theater airlift.

## **Issue 1: Tanker Recapitalization**

FY 2002 DOD Appropriations Act (P.L. 107-117) Section 8159 provided the Air Force with statutory authority to begin a long anticipated recapitalization of the KC-135 fleet by leasing 100 Boeing KC-767 aircraft. This pilot program proved controversial, and tanker recapitalization was postponed following legislative action in the 107<sup>th</sup> Congress, 2<sup>nd</sup> Session. Many argued that tankers should be procured, not leased, and that the procurement contract should be let on a competitive basis.

The KC-135 recapitalization process appeared to be on-track in September 2006, when the Air Force's Aeronautical Systems Center (ASC) released to industry a draft Request for Proposal (RFP) for the KC-X program. The Boeing Company and a team composed of Northrop Grumman and Airbus have stated they will compete for this contract.<sup>1</sup>

Some in industry questioned the fairness of some of the draft RFP's conditions, and the

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<sup>1</sup> Airbus is a subsidiary of the European Aeronautic, Defense and Space Company (EADS). For simplicity and ease of presentation the term "Airbus" will be used.

document was modified to address industry concerns, and re-released on December 15, 2006. At the time, Air Force officials called the RFP a “full and open, best value competition for the KC-X Program.”<sup>2</sup> Objections to this version of the draft RFP were voiced, however, and revisions to this document were again considered. A final version of the RFP was re-issued on January 30, 2007, reportedly unchanged from the December 2006 version.<sup>3</sup>

Much is at stake in this competition. Aerial refueling is seen as a foundation of U.S. military power projection capability. The winner of the KC-X competition is to supply up to 179 new tankers over 15 years for a total estimated value of \$30 billion to \$40 billion. The winner of this competition also may enjoy a significant advantage in winning two potential follow-on tanker contracts. Three questions appear to dominate Congressional oversight of DoD’s proposed aerial refueling recapitalization:

- 1) It is fair?
- 2) Is it affordable?
- 3) Will it produce what is needed?

### **Is it fair?**

Over the past six months, there has been much dialogue in the media that the first draft of the tanker RFP was biased toward the capabilities apparent in the KC-767. Close review of this RFP is understandable in light of the controversy surrounding past tanker recapitalization efforts. It is important to note within this context, that the driving force behind DoD’s weapon acquisition system is designed to be warfighter requirements, not what is most profitable to company x or company y. Northrop Grumman and Airbus reportedly complained that the original KC-X RFP did not adequately address how the candidate aircraft’s airlift capability would be evaluated, and they feared that the Air Force might not look upon the airlift capabilities of their aircraft (the larger KC-30) as favorably as it should.

In the absence of detailed airlift evaluation information, however, Airbus could have offered a smaller aircraft, such as its A300/A310 class, which it might believe corresponded more closely to Air Force requirements.<sup>4</sup> Similarly, if Boeing believed the Air Force desired a larger aircraft with more airlift capability, it could have conceivably offered its 777 aircraft.

Reduced demand of defense-unique systems and the resulting consolidation of the defense industrial base has frequently reduced the number of companies available to provide

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<sup>2</sup> MEMORANDUM FOR INDUSTRY. SUBJECT: Executive Summary to the KC-X Program Draft Request for Proposal (dRFP) FA8625-07-R-6470.

<sup>3</sup> Carlo Munoz. “Air Force Nixes Criteria Change for Airlift Final Tanker RFP.” *Inside the Air Force*. February 2, 2007.

<sup>4</sup> The last A300/A310 class aircraft are estimated to be produced in July 2007. The A300/A310 production line is currently in the process of being terminated. However, if Airbus believed that a medium sized tanker was more compatible with Air Force requirements and therefore more competitive than a larger A330-class aircraft, Airbus could have taken steps to keep the line open so this aircraft could compete in the KC-X program. A comparison of these aircraft can be found in Appendix I.

a given defense article, which adversely affects competition. Therefore, some compromise between a warfighter's "perfect world" requirements and real world industrial capabilities is inevitable. However, substantially modifying warfighter requirements or Key Performance Parameters (KPPs) to jibe with what industry wants to offer, would appear to reflect an imbalance between perfect world requirements and real world capabilities.

After an initial review, CRS found that *as DoD defines its tanker requirement*, there appears to be nothing obvious in the KC-X RFP or the supporting System Requirements Document (SRD) that would inherently bias the contract award in favor of any platform that could be offered by the competitors. The SRD makes clear, however, that the aircraft's primary mission is refueling DoD and allied aircraft with the flying boom mechanism. Any passenger or cargo carrying capability is deemed a "secondary mission." The SRD does contain a KPP for airlift, but it provides little substantive detail. Thus, if they were to lose the competition, the company offering the aircraft with greater airlift capability (the Northrop Grumman/Airbus team) could, conceivably, argue that the competition is still biased toward the smaller KC-767, which has less airlift capability, and might be offered at a lower price than the KC-30. If this scenario does occur, Northrop Grumman's arguments could be undercut by recent media reports stating that Northrop and Airbus find the RFP to be fair and responsive to their expressed concerns.

One of the functions of the Government Accountability Office (GAO) is to adjudicate contract award protests, such as the one recently lodged by Sikorsky and Lockheed Martin regarding the Air Force's award of its CSAR-X contract to Boeing. This agency may have useful observations on this matter.

### **Is it affordable?**

DoD's Aerial Refueling Analysis of Alternatives (AR AOA) found that purchasing new commercially-derived tankers was the most cost effective means of *initially* recapitalizing the fleet.<sup>5</sup> This conclusion appears to be widely shared among defense analysts. However, this course of action is also capital intensive when compared with other potential courses of action, and the AR AOA noted that "affordability (annual budget outlays)" was an important factor that should "drive the acquisition schedule for tanker recapitalization."<sup>6</sup>

At one time, the KC-X program was described as a 540-aircraft effort. The recent Air Force description of the 179-aircraft KC-X program, however, portrays it as the first of three potential efforts – followed by the KC-Y and KC-Z, which combined, would add up to approximately 540 new tanker aircraft. This new conceptual framework may indicate implicit Air Force recognition that 540 new aircraft are likely unaffordable: Air Force staff have described the KC-Y and KC-Z programs as budgetary "off ramps."<sup>7</sup> Therefore, Air Force leaders might conceivably be more receptive to Congressional or DoD direction on other potential recapitalization options for the KC-Y and KC-Z programs.

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<sup>5</sup> KC-135 Recapitalization Analysis of Alternatives (AoA). Briefing to Congress. January 26-27, 2006. U.S. Department of Defense (USD AT&L).

<sup>6</sup> *Ibid.* p.5.

<sup>7</sup> Meeting between CRS and SAF/AQQ April 4, 2006, and follow-on interviews.

The 2004 Defense Science Board (DSB) Task Force on Aerial Refueling Requirements was an early proponent of examining less capital-intensive recapitalization options. The DSB recommended that DoD give “serious consideration” to purchasing surplus commercial aircraft such as the DC-10, re-engining some fraction of the KC-135E fleet, and expanding its use of commercial Fee-For-Service aerial refueling (FFS AR).

The Air Force has consistently argued against re-engining KC-135Es and purchasing surplus commercial aircraft. However, the AR AOA appears to agree with the DSB – although with distinct caveats – that purchasing used aircraft may merit additional study. The AR AOA found that purchasing used aircraft as tankers is “generally not as cost effective” (as purchasing new aircraft), but “...close enough in estimated cost to not exclude it from competition.”<sup>8</sup> Surplus DC-10 aircraft, in particular, might offer attractive means of acquiring aerial refueling capabilities for less money up-front, and since the Air Force already operates KC-10 aircraft, significant additional investments may not be required in operations, maintenance, and supply.

Similarly, the AR AOA did not rule out re-engining some number of KC-135Es. The study found that re-engining the “E” models was “not a favorable return on investment unless operated into late 2030s.”<sup>9</sup> In an earlier study, the Air Force concluded that the KC-135E fleet is “structurally viable until 2040.”<sup>10</sup> A 2005 Air Force Study estimated, with numerous caveats, that KC-135E aircraft upgraded to the “R” configuration would remain viable until 2030.<sup>11</sup> When trying to weigh these various projections of the likely lifespan of KC-135s, it may be useful to review the findings of a third party. The Defense Science Board found that KC-135 corrosion problems (a major determinant of maintenance costs and life span) were more manageable than Air Force statements led some to believe, and that current and projected KC-135 operations and support costs were also less than Air Force projections. If the DSB is correct, this may lend credence to a longer life-span for KC-135 aircraft.

For FY08, the Air Force proposes to retire the final 85 KC-135E aircraft in its inventory, in essence, giving Congress one last opportunity to assess the pros and cons of investing approximately \$45 million per aircraft to re-engine some number of “E” models. If Congress believed that the Air Force’s aerial refueling budget was unsustainable, re-engining 10 KC-135E aircraft for \$450 million and operate them until 2040 might appear more favorable than acquiring some number of new tankers at a procurement cost of \$120 - \$150 million each.

The KC-X RFP, “Part B” addresses Fee-for-Service aerial refueling (FFS AR), but many have questioned the strength of the Air Force’s commitment to this recapitalization approach.<sup>12</sup> At one point the Air Force planned to complete a FFS AR Business Case Analysis (BCA) in December 2006, and to let an RFP in January 2007 “if merited.” (A CRS

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<sup>8</sup> AOA Briefing to Congress. *OpCit.*

<sup>9</sup> AOA Briefing to Congress. *OpCit.*

<sup>10</sup> *KC-135 Economic Service Life Study*. Technical Report. February 9, 2001.

<sup>11</sup> *KC-135 Assessment Report*. Air Force Fleet Viability Board. Wright-Patterson AFB. September 2005.

<sup>12</sup> CRS interviews with congressional staff, Air Force personnel, industry representatives, and defense journalists. (October 2006 to February 2007).

assessment of the proposed BCA methodology and assumptions can be found in Appendix 2 to this statement.) The current status of FFS AR is unclear.

### **Will DoD's plans produce what is needed?**

It is difficult to objectively evaluate DoD's approach to recapitalizing the aerial refueling fleet, because there is no current or clear tanker requirement study. The last comprehensive tanker requirement study performed by DoD was the Tanker Requirements Study 2005, or TRS-05, which was completed in 2001. TRS-05 concluded that to meet the National Military Strategy, DoD required 500-600 KC-135R -equivalents, with an 85% Mission Capable Rate, and 900-1,000 aircrews, for a crew ratio of 1.66 crews per aircraft to 1.92 aircrews per aircraft. The Mobility Capabilities Study reportedly recommended the acquisition of 520 - 640 KC-135R model equivalents.<sup>13</sup>

Because DoD's last tanker requirements study is outdated, and because subsequent analyses failed, for many, to provide increased insight into tanker and airlift requirements, many significant acquisition and force structure questions remain unclear. One question was alluded to earlier in this testimony: "how much airlift capability should the aerial refueling fleet provide?"

It appears that some within DoD believe that the KC-X program should provide for more airlift capability than it currently does. Last spring, DoD's top military transportation commanders expressed a strong preference for a multi-role tanker. Gen. Norton Schwartz, Commander U.S. Transportation Command (TRANSCOM) testified that

What we need is a multi-mission tanker that can do both boom and basket refueling, that can do passenger lift, some cargo lift, and have defensive systems that allow the airplane to go wherever we need to take it....if we're going to war with Iran or Korea or over Taiwan or a major scenario, the first 15 to 30 days are going to be air refueling intensive. But what I'm talking about is the global war on terrorism, sir, for the next 15 or 20 or 25 years. That is not an air refueling intensive scenario and that's why a multi-mission airplane to me makes sense.<sup>14</sup>

The Defense Science Board agreed with Gen. Schwartz's opinion on refueling requirements and the availability of tankers to provide airlift missions. "The major driver for future aerial refueling needs is the number and type of nearly simultaneous "major" operations. Demands on aerial refueling are particularly stressed when time is of the essence for the mission and when local infrastructure is immature."<sup>15</sup>

The amount of airlift ultimately to be provided by the tanker fleet could have important implications for other programs under this subcommittee's purview. The Air Force's 59 KC-10 *Extender* aerial refueling aircraft currently represent approximately 3% of DoD's organic

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<sup>13</sup> LtCol Brian Jonasen. "KC-135 Tanker Replacement (KC-X) Program. SAF/AQQM. FY08 Staffer Brief. February 2007.

<sup>14</sup> "Senate Armed Services Subcommittee on Seapower Holds Hearing on FY2007 Budget: Transportation Command." *CQ Congressional Transcripts*. April 4, 2006

<sup>15</sup> Defense Science Board Task Force on Aerial Refueling Requirements. Office of the Under Secretary of Defense For Acquisition, Technology, and Logistics. May 2004. p. vi.

airlift capability. The procurement of larger KC-X aircraft could increase the percentage of airlift capacity provided by the tanker fleet, and could potentially reduce the number of dedicated airlifters such as C-5s and C-17s. The procurement of smaller KC-X aircraft could potentially have the opposite effect. Gen. Schwartz testified to the relationship between the amount of airlift provided by tankers and the strategic airlift fleet: “If I had an airplane that could carry passengers there with defensive systems, like a new tanker, I would use that instead, and we would be able to better manage the workload on the C-17 fleet and apply it against the things that it does exceptionally well, moving cargo.”<sup>16</sup>

## **Issue 2: Long-range, or Strategic Airlift**

The second, and related, issue facing the committee is whether DoD’s plans to maintain and modernize its long-range airlift fleet will meet the national military strategy, and if so, whether they will do so cost-effectively.

### **Airlift Requirements to Meet the National Military Strategy**

The number of C-17s that should be procured, and the number of C-5s to be modernized is related to the overall airlift requirement, which is typically measured in millions of ton-miles per day (MTM/D). In March 2001, the Air Force announced the findings of its Mobility Requirements Study 05 (MRS-05). MRS-05’s principal finding was that the goal set by the previous mobility study for an airlift fleet capable of moving 49.7 MTM/D of personnel and cargo was inadequate to meet the national military strategy. MRS-05 recommended an airlift fleet capable of 54.5 MTM/D. At that time, DOD’s strategic airlift capability was approximately 44.7 MTM/D, nearly 10 MTM/D short of the MRS-05 goal.

The terror attacks of September 11, 2001, and the subsequent operation in Afghanistan led many to believe that the findings of the MRS-05 were outdated. Significant changes in the National Military Strategy were required, and a different strategy would likely require different airlift capabilities. In June 2004 DOD began its first “post 9/11” review of transportation requirements. This Mobility Capabilities Study (MCS), once scheduled for completion in March 2005, was completed and briefed to Congress in February 2006.

Unlike past mobility studies, the MCS did not provide an estimate of airlift requirements in MTM/D. Instead, the MCS assessed the capabilities of the current and projected force (180 C-17s, 112 C-5s), and found that force to be sufficient to meet the National Military Strategy with “moderate” or “acceptable” risk. The terms “moderate” and “acceptable” are subjective, and subject to interpretation. A close examination of this classified study, and the acknowledgment that the projected force now includes 190 C-17s, could lead some to view the risk as “low.”

The MCS caught many observers by surprise, who expected the study to project a growth in airlift needs, perhaps a requirement closer to 60 MTM/D than the 2000 estimate of 54.5 MTM/D.<sup>17</sup> Others speculated, however, that the MCS would not increase the 54.5 MTM/D requirement, because planners know that DoD cannot afford to purchase enough

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<sup>16</sup> Seapower Subcommittee Hearing on FY2007 Budget. *OpCit.*

<sup>17</sup> Marc Selinger, “DoD Launching New Review of Transportation Needs,” *Aerospace Daily*, Mar. 11, 2004.

aircraft to provide this amount of airlift.<sup>18</sup> An “acceptable” risk does not argue for more aircraft as strongly as “high” or “unacceptable” risk. Those who hold this perspective imply that the MCS is not an unbiased study of requirements, but a compromise between what is needed and what can be achieved.

Many have criticized the MCS. In a September 14, 2005, letter to Defense Secretary Rumsfeld, for example, the GAO documented a number of shortcomings in the MCS’ methodology.<sup>19</sup> Others criticized the study for not assessing intra-theater lift needs, and for focusing on “near term” capabilities rather than taking a longer view.<sup>20</sup> Some have called on DoD or an independent agency to conduct another mobility study to rectify the MCS’ perceived shortcomings. DoD appears to be responding to these criticisms by executing a follow-on, “MCS-2006 study.”<sup>21</sup>

How significant is a potential shortfall in airlift? Does it jeopardize current and future force projection capabilities? The actual U.S. airlift capabilities have met the stated MTM/D requirement only twice in the past 19 years.<sup>22</sup> During this time, the United States has successfully conducted military operations in Afghanistan, South West Asia, Bosnia and Kosovo. It can thus be argued that the airlift requirement set by MRS-05 and other studies is greater than is really needed, and less airlift is acceptable. A counter-argument is that airlift requirements are designed to satisfy a worst case scenario: executing two “near simultaneous” major combat operations. Adherents to this perspective say the 54.5 MTM/D requirement is justified, and the United States has been fortunate over the last 19 years not to have faced the worst-case scenario.

It may be difficult for Congress to evaluate DoD’s airlift recapitalization plans because objective answers in MRS-05 and the MCS are either dated, unclear, or classified. Questions include: How much outsize/oversize airlift capacity is required, now that major state-on-state conventional warfare appears less likely than it did in the past (but for which DoD must still plan)? How many aircraft are required now that irregular warfare – which can occur less predictably, and frequently in theaters with limited infrastructure – appears more likely?

In attempt to provide Congress with greater clarity into airlift requirements, P.L. 109-364 Sec. 1034 requires DoD to submit a report to Congress no later than February 1, 2007 defining airlift requirements in terms of million ton miles per day. In response to this requirement, DoD delivered a classified report to the congressional defense committees on February 27, 2007.

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<sup>18</sup> John Tirpak. “Air Mobility in the Doldrums.” *Air Force Magazine*. August 2005.

<sup>19</sup> *Defense Transportation: Opportunities Exist to Enhance the Credibility of the Current and Future Mobility Capabilities Studies*. Government Accountability Office. September 14, 2005. William M. Solis, Director Defense Capabilities and Management.

<sup>20</sup> John T. Bennett. “Influential DoD Mobility Study’s Focus on Intratheater Needs Questioned.” *Inside the Air Force*. April 7, 2006.

<sup>21</sup> *Defense Transportation: Study Limitations Raise Questions about the Adequacy and Completeness of the Mobility Capabilities Study and Report*. Government Accountability Office. (GAO-06-938) September 2006. p.1.

<sup>22</sup> Presentation by Brig. Gen. Robert Bishop to congressional staff, *Airlift Portion of MRS-05*, Mar. 28, 2001.



## Budget Pressures and Cost-Effective Solutions to Airlift Modernization

Although the metrics needed to objectively evaluate the number of C-17s or C-5s required are not clear, it is clear that C-17 procurement and C-5 modernization are directly competing for the same budget authority. Senior DoD officials have implicitly recognized this competition. For example, when DoD officials defended the FY06 budget decision to end C-17 procurement, they argued that keeping the C-17 production line open “would be a smart thing to do” from a pure risk perspective, but, “the cost would be prohibitive” given the other airlift procurement programs that the Air Force plans.”<sup>23</sup>

At issue in this year’s budget is how many C-17s to purchase and how many C-5As to modernize. As it did last year, the Air Force is proposing not to procure any C-17s in FY08; although two C-17s are on the Air Force’s Unfunded Priority List (UPL). Boeing representatives say that depending on their success in negotiating near-term international sales of the C-17, it will require funding for between 14 and 18 Globemasters in FY08 or the production line will begin to shut down in January or February 2008 toward a complete shutdown in mid-2009.<sup>24</sup> The Air Force’s stated plan is to modernize both C-5A and C-5B fleets with the Avionics Modernization Program (AMP), and Reliability Enhancement and Re-Engining Program (RERP). There has been speculation that as budgets become tighter, the Air Force may opt not to RERP the C-5A fleet. Recent press reports about RERP cost increases have added to this speculation.<sup>25</sup>

Some argue that C-17 procurement should be increased at the C-5A’s expense because of the growing need to engage terrorists and insurgents in theaters with limited aviation infrastructure. The Cold War paradigm of using strategic cargo aircraft to move large amounts of materiel to forward U.S. bases, then moving it a second time to the theater of operations on smaller airlift aircraft is not efficient, they argue. The C-17 can do the job of both the C-5 (strategic airlift) and the C-130 Hercules (intra-theater airlift) and move war materiel directly from the United States into combat, if need be. As a more modern aircraft, the C-17 also potentially offers more opportunity for upgrades and modifications than the C-5.

On the other hand, the C-5’s unique capabilities argue for its continuation, potentially at the expense of additional C-17s. In a period where DoD’s force posture is moving from forward basing to expeditionary, it may be unwise to prematurely retire aircraft in today’s inventory. Although the C-5 is not as modern as the C-17, the Air Force’s Fleet Viability Board found that the C-5A fleet — with appropriate investments — has at least 25 years of

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<sup>23</sup> Michael Sirak. Senior DoD Officials Defend Decision To Halt C-17 Production At 180.” *Defense Daily*. February 10, 2006.

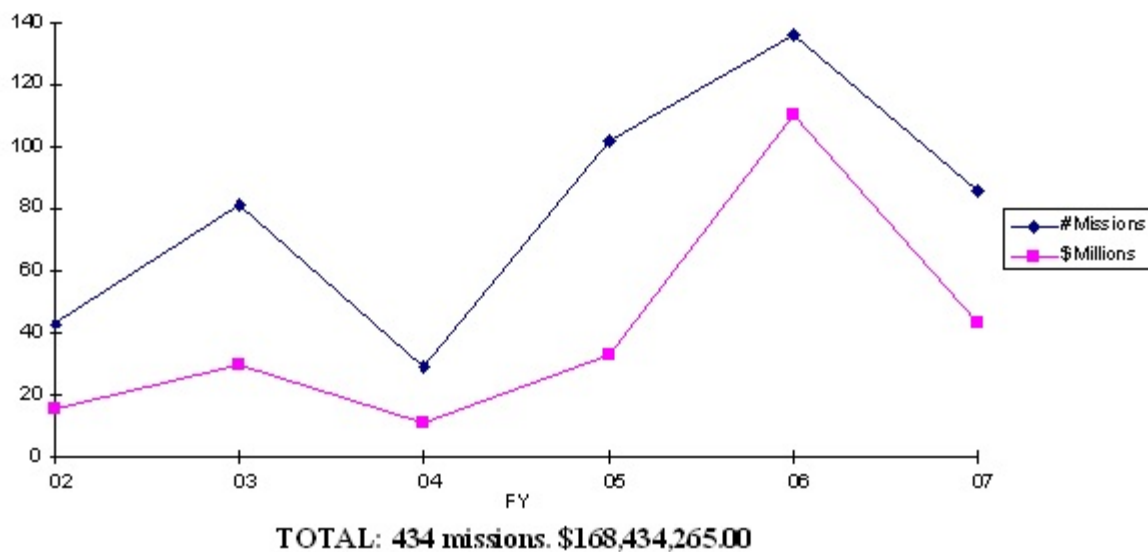
<sup>24</sup> Telephone conversation between CRS and Boeing officials. February 26, 2007. “Boeing Announces C-17 Line May End in mid-2009; Stops Procurement of Long-lead Parts.” *News Release*. Boeing Integrated Defense Systems. March 2, 2007.

<sup>25</sup> See, for example, Carlo Munoz. “Air Force Mulling Future of Dueling C-5 Modernization Programs.” *Inside the Air Force*. December 16, 2006. Amy Butler. “C-5 Reengining Cost Could Alter Program Course.” *Aviation Week & Space Technology*. February 19, 2007.

life remaining.<sup>26</sup> Thus, today's investments could potentially be recouped for decades. Current estimates of the per-aircraft cost of AMP and RERP are expected to be approximately one-third that of a new C-17, and the C-5 will carry twice the C-17's payload. The C-5 also has superior load/offload capabilities. The upgraded aircraft (called the C-5M), is also expected to have greatly improved mission capable rates.<sup>27</sup> It may be noteworthy that during Operations Enduring Freedom and Iraqi Freedom, DoD leased Russian An-124 aircraft to carry outsize and oversize cargo because not enough C-5 aircraft were available.

The An-124 *Condor* is a strategic lift aircraft larger than, but comparable to the C-5. As Figure 1 below illustrates, the Air Force has spent \$170 million since FY2002 for An-124 missions. It also appears that the number of An-124 missions is accelerating. FY07 figures already are on par with FY05 figures, and the fiscal year is not yet half over. While the C-5 may not be as modern as the C-17, or able to operate from as many runways, the fact that DOD has to outsource missions to Russian aircraft indicates that the C-5 still offers important capabilities that other U.S. aircraft may not be able to satisfy. (A description of the An-124 can be found at Appendix 3.)

**Figure 1: Number and Cost of An-124 Missions Contracted by Air Mobility Command**













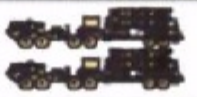



Source: USAF Air Mobility Command. International Airlift Procurement Branch. Feb. 23, 2007.

<sup>26</sup> Tech. Sgt. David A. Jablonski. "Air Force Fleet Viability Board releases C-5A Assessment," *Air Force Print News*, July 15, 2004. Amy Butler, "With a Little Help — And Cash — C-5As Can Fly For 25 More Years, Panel Says," *Defense Daily*, July 19, 2004.

<sup>27</sup> David Hughes, "C5 Avionic and Engine Upgrades Rolling," *Aviation Week & Space Technology*, Oct. 25, 2004. *C-5 Galaxy Modernization*, FY2006 Point Paper, Lockheed Martin Corp, Jul. 2005.

When evaluating the future of the C-5 and C-17 fleets, the factors described in the figure and table below may be worth considering.

**Figure 2 Comparison of C-5 & C-17 Capabilities**

	C-5 34,795 ft <sup>3</sup>	C-17 20,900 ft <sup>3</sup>
Cargo Space		
M1A1		
M2/M3 Bradley		
AH-64 Helicopter		
Multiple Launch Rocket System		
Patriot Missile Launcher		
HMMWV TOW	 X 14	 X 10
Pallets	36	18
Max Payload	261,000 lb	164,900 lb

Source: *FY06 Congressional Overview (C-5, C-130J)*. "C-5 Operations During Iraqi Freedom." Lockheed Martin Aeronautics Company. p.18.

<b>Table 1: C-5 Modernization Vs C-17 Procurement</b>		
	<b>Modernize C-5 Fleet</b>	<b>Buy More C-17s</b>
Average Procurement Unit Cost <sup>28</sup>	\$97 Million*	\$280 Million
Est. Flying Hour Cost <sup>29</sup>	\$23,075**	\$11,330
Production Rate	~12 aircraft/ year	~15 aircraft/year
Aircraft Life Remaining	26,000 hours	30,000 hours
Mission Capable Rate	75%	78.6 - 85.9%
Austere Runways	No	Yes

<sup>28</sup> *Selected Acquisition Report (SAR)* Department of Defense OUSD(AT&L). Defense Acquisition Management Information Retrieval (DAMIR). C-17A, C-5AMP, C-5RERP.

<sup>29</sup> *Aircraft Reimbursement Rates (per Flying Hour) FY2007*. Air Force Cost Analysis Agency, Cost Factors Branch. Table A15-1.

Notes

\* These costs have and will likely fluctuate over time. The procurement cost of future C-17s will likely be lower than the average, as learning increases and fixed costs are amortized over a longer production run.

\*\* Aircraft Reimbursable Rates (per Flying Hour) reflect amortization of modernization programs, but not procurement costs. Because the C-5 AMP and RERP modernization programs are in their early phases, these costs strongly affect the hourly cost to operate the C-5. The C-17 is not implementing a modernization plans on the scale of AMP and RERP.

As mentioned at the beginning of this section of testimony, acquisition decisions on the amount of airlift capability to be procured on the KC-X may affect strategic airlift modernization. Similarly, decisions on the number of C-17s to be procured – due to *Globemaster's* ability to operate from short and austere runways – could affect acquisition choices in intra-theater airlift.

### **Issue 3: Short-Range Airlift**

Many factors illustrate that, as in the mobility mission areas described above, Congressional oversight of potential investments and tradeoffs in intra-theater airlift is hampered by incomplete, or competing visions of what the warfighter requires.

As mentioned earlier in my statement, DoD's most authoritative mobility study has been criticized for failing to adequately address intra-theater airlift. Further, in late 2004, DoD Program Budget Decision (PBD) 753 proposed terminating C-130J production in the FY06 budget. This action would have terminated the first C-130J multiyear contract of 62 aircraft prior to completion, and prior to the negotiation of two follow-on multiyear contracts that the Air Force had hoped to use to procure over 100 more C-130Js. After receiving negative responses from many in Congress, DoD reversed its decision in a May 10, 2005 letter to Congress and reinstated FY06 funding. Many noted that the decision to cancel, then reinstate DoD's principal intra-theater airlifter, was made with little explanation of the potential impact on mobility requirements and capabilities.<sup>30</sup>

There has also been fluctuation in the requirements for short-range end of the intra-theater air lift. At one point, the Army believed it needed approximately 47 aircraft to replace its aging short-range airlifters. Presently, however, DoD sees a wider shortfall in this mission area – one that requires 145 aircraft. This requirement could grow pending further Air Force analysis.

### **Potential Intra-theater Investment Options and Tradeoffs**

There are a number of potential options which Congress and DoD might consider. Purchasing more C-130Js would add capacity to DoD's airlift fleet. Purchasing additional C-17s would also add intra-theater airlift because of the *Globemaster's* ability to use short and austere runways. Some may favor purchasing more C-17s at the expense of C-130 aircraft, because the larger aircraft is something of a "twofer": it can conduct both long-range

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<sup>30</sup> See for example, Jonathan Karp. "Rumsfeld Restores Lockheed's C-130 To Defense Budget." *Wall Street Journal*. May 12, 2005.

and intra-theater lift. A simple cost comparison – such as the one in the table below – illustrates however, that the C-17’s increased capability comes at a high price relative to the C-130J. Purchasing more C-17s primarily to fly intra-theater lift missions does not appear to be a cost effective option.

<b>Table 2: Illustrative C-17 and C-130J Costs</b>		
	<b>C-17</b>	<b>C-130J</b>
Average Procurement Unit Cost (Then-year\$M)	\$280.0	\$91.0
Average Annual Direct O&S Cost (Constant \$M) <sup>31</sup>	\$13.5	\$1.8
Est. Flying Hour Cost <sup>32</sup>	\$11,330	\$3,650

There appears, however, to be inherent friction between making investments in the C-130J program and the modernization of legacy C-130 aircraft. First deployed in 1999, the C-130J was intended to replace C-130E models (first deployed in 1962) offering greater capability at reduced operating costs. The C-130J experienced development and production cost growth, and received criticism during the test and evaluation process.<sup>33</sup> Secretary Rumsfeld’s proposal to end C-130J procurement in FY06 reflects DoD’s loss of interest in the C-130J and its view that investments in C-130 modernization could be offset by reduced C-130J purchases. Secretary Rumsfeld was reported to have said that “‘at \$66.5 million, this aircraft (the C-130J) has become increasingly expensive to build and maintain,’ especially compared to simply modernizing older C-130 models.”<sup>34</sup> To many, the C-130J’s average procurement cost of \$91 million per aircraft, may give increased weight to Secretary Rumsfeld’s statement that procuring C-130Js compared unfavorably to modernizing legacy C-130s.

While DoD supported increased C-130E/H modernization over C-130J procurement in the FY06 budget, it appears to have reversed its course this year. In FY08 the Air Force proposed to purchase nine C-130Js and two KC-130Js.<sup>35</sup> Conversely, the Air Force plans to reduce the number of C-130 aircraft to receive the Avionics Modernization Program (AMP) upgrade from 434 aircraft to 270 aircraft. Implementing AMP on fewer legacy C-130 aircraft would make available more funds for C-130J procurement, and likely facilitate accelerated retirement of older C-130 models. The Air Force’s declining enthusiasm for C-130 upgrades may be caused in part by cost growth in the AMP program, resulting in the reporting of Acquisition Program Baseline (APB) and “Nunn-McCurdy” violations.

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<sup>31</sup> *Selected Acquisition Report (SAR)* Department of Defense OUSD(AT&L). Defense Acquisition Management Information Retrieval (DAMIR). C-17A, C-130J. Costs expressed in terms of O&S costs per 12 aircraft C-17 squadron and 79 C-130J fleet. Per-aircraft costs derived by CRS.

<sup>32</sup> *Aircraft Reimbursement Rates (per Flying Hour) FY2007. OpCit.*

<sup>33</sup> Elizabeth Rees. “Christie: 2003 Testing Shows C-130J Hercules Not Operationally Suitable.” *Inside the Air Force*. January 30, 2004.

<sup>34</sup> Leslie Wayne. “The Flawed Plane Congress Loves.” *New York Times*. March 24, 2005

<sup>35</sup> 29 additional C-130J and KC-130J aircraft are requested in DoD’s FY07 and FY08 emergency supplemental spending requests.

DoD's apparent support for C-130J procurement versus C-130AMP in the FY08 budget may also be tied to the Air Force's plan to recapitalize its aging special operations C-130 models (MC-130 and HC-130) with 115 new aircraft. According to Air Force budget documents, a specific aircraft model has not yet been selected to replace these older C-130s, but the C-130J and Airbus A-400M (which has not yet been fielded) are leading options.

The military services generally would prefer to invest in new aircraft rather than modernize older aircraft. They often argue that new aircraft will be cheaper to operate and maintain than the aircraft they will replace. Frequently, this has not proven to be the case. Newer aircraft are often more complex than those they replace, and cost more to operate. The estimated flying hour cost of the F-22, for example, is \$22,284.00. The estimated flying hour cost of the F-15C/D it will replace is \$14,139/\$13,524.

It is also argued that operations and support costs are growing, and purchasing new aircraft will reduce this trend. Outside agencies, however, have not found that aging aircraft are what increases operations and maintenance budgets.<sup>36</sup> There is no consensus on when it is more cost-effective to invest in new aircraft than in old aircraft, which complicates Congressional oversight of decisions such as whether intra-theater airlift capabilities would be best met by funding C-130J or C-130 AMP.

The final intra-theater airlift option I will address today is the Joint Cargo Aircraft, or JCA. On an intuitive level, modernizing and increasing the inventory of short-range airlift aircraft makes sense. The 2006 Quadrennial Defense Review and other governmental and non-governmental studies point to a growing need for U.S. forces to be prepared to operate in remote, and potentially austere environments as it prosecutes irregular warfare and counter-insurgency operations. The C-130 may be too big to adequately support these operations as it generally requires 3,500 - 5,000 feet of runway to operate.<sup>37</sup> In South America and Central America, for instance, only 5% of all airstrips are 5,000 feet or longer. In Africa, only 15% of all airstrips meet this criterion.<sup>38</sup> While the Air Force C-130 community is rightly proud of its ability to operate from unprepared surfaces such as roads or even fields, such operations are the exception, and not the norm. The Army proposes to use the JCA to move supplies "the last tactical mile" in theater, as close to the warfighter as operationally feasible. This goal suggests the *regular* use of unprepared runways by fixed-wing aircraft, something that the Army does not do today.

In a sense, the JCA program is the result of a "shotgun wedding." The Army's Future Cargo Aircraft (FCA) program was a relatively mature development program, and was near issuing an RFP, when DoD mandated it merge with the Air Force's nascent Light Cargo

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<sup>36</sup> See for example, *The Effects of Aging on the Costs of Operating and Maintaining Military Equipment*. Congressional Budget Office. August 2001, and Raymond Pyles. *Aging Aircraft*. RAND. 2003.

<sup>37</sup> The actual length of required runway depends on a number of factors such as elevation, weather and payload. 5,000 feet is a general rule of thumb.

<sup>38</sup> Wray Johnson. "The 6<sup>th</sup> Special Operations Squadron and the Icarus Syndrome." *Air & Space Power Chronicles*. January 12, 2000. Air University. Maxwell, AFB. P.8.

Aircraft (LCA) program.<sup>39</sup> Despite the disparity in the maturity of the joined programs, the JCA is moving forward in its acquisition approach, and a Defense Acquisition Board (DAB) meeting on the program is scheduled for May 2, 2007.<sup>40</sup> The Air Force, however, has not fully defined its requirements for the JCA.<sup>41</sup> An issue for Congress is whether the Army could move forward with JCA acquisition only to find that the final results of the Air Force's Analysis of Alternatives (AoA) adds requirements to the program that are not easily met by the aircraft chosen. Sufficient deviation between the chosen aircraft and the Air Force's final requirements could force costly retrofits or, in the worst case, acquisition of a different aircraft.

Increased use of small, intra-theater airlifters raises questions. First, while aiming to improve the distribution of men and materiel, increased use of small airlifters could create its own logistical challenges. The Marine Corps notes that "Where small air units are maintained and operated on outlying auxiliary fields, the problem of supplying fuel, ammunition, bombs, and other supplies becomes a considerable task."<sup>42</sup> If JCAs are remotely based, what fraction of their airlift capabilities will be consumed supplying and re-supplying their own operations and support needs?

As described earlier, the Army and Air Force are engaged in a negotiation of sorts over this program, including the specific capabilities to be acquired. Air Force officials have informally suggested that a short version of the C-130J could perform the JCA mission, while the Army favors smaller, two-engine aircraft options. Does the Air Force's desire for a larger, four-engine aircraft suggest that it does not intend to regularly employ unprepared runways? If so, then this operational concept would not appear to provide new capabilities in terms of rapidly re-supplying ground forces. Conversely, if the Army does not regularly employ its C-23 Sherpas and C-12 Hurons from unprepared runways today, what is new about their vision of the JCA that will make this more feasible in the future?

Finally, there may be other options for this mission area. The Army, Air Force, Marine Corps, and U.S. Special Operations Command are in different stages of exploring the efficacy of fielding battlefield UAVs to conduct tactical airlift of small, but valuable payloads such as blood plasma, night vision devices, ammunition, or communications equipment. UAVs may be able to precisely and quickly deliver these kinds of critical payloads to forces remotely located or isolated by enemy action.<sup>43</sup> Pilots remotely operating

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<sup>39</sup> Ashley Roque. "OSD Tells Army, Air Force To Work On Joint Intratheater Air capability." *Inside the Air Force*. January 20, 2006.

<sup>40</sup> Telephone conversation between CRS and Army OLA. February 28, 2006.

<sup>41</sup> In a June 20, 2007 MOA, the Air Force accepts the Army's existing analysis to articulate the *initial* capability gaps and JCA KPPs. Army representatives express confidence that the Air Force's requirements will be easily accommodated.

<sup>42</sup> *Small Wars Manual*. United States Marine Corps. (GPO: Washington: 1940). Chapter IX, Aviation.

<sup>43</sup> Gail Kaufmann. "USAF to Test Cargo UAV." *Defense News*. September 15, 2003. Jefferson Morris. "Army Considering Using UAVs for Medical Supply Drops." *Aerospace Daily*. January 8, 2003. Jim Garamone. "SnowGoose: UAVs Enter the Airlift Business." *American Forces Press Service*. July 16, 2003. Joshua Kucera. "Marines eye UAV 'Mule.'" *Jane's Defence Weekly*.

(continued...)

such platforms would not require Survival, Evasion, Resistance and Escape training, and the aircraft would likely have less need for air defense countermeasures. Questions include: How feasible is employing UAVs for this mission area? At what juncture might a pilot program begin to evaluate whether UAVs could augment the Army's C-23 and C-12 force, and potentially reduce the requirement for JCA aircraft?

The V-22 might be another platform that could perform the JCA mission. The table below compares estimated V-22 capabilities with current JCA requirements. Although not a perfect match, the V-22 capabilities appear to overlap considerably with what the Army said it required to perform this mission. BG Stephen Mundt, Director of the Army Aviation Task Force, is reported to have said that tilt-rotor aircraft are a potential JCA platform.<sup>44</sup> If the V-22 were judged to be capable of performing this mission, acquiring 145 of these aircraft beyond the current program of record might reduce average procurement unit cost of the Osprey considerably.

<b>Table 3: Comparison of FCA Requirement and V-22 Capabilities</b>		
<b>Parameter</b>	<b>FCA Requirement</b>	<b>V-22<sup>45</sup></b>
IOC	2010	2007
Self-Deploy	X	2100 nm
Airdrop Capable	X	X
Reconfigurable	X	X
Mission Radius	400-600nm	306nm max
Airspeed	250-300 kts	272 kts (cruise speed)
Payload	436L pallets, CDS bundles, Troops	24 troops, ½-sized 436L pallets, 20,000 lbs
Unimproved runways	Sod, Clay, Gravel	No runway required
Maximum airstrip	2,000ft @ 6,000-ft PA & 95°F	No runway required
Day/Night adverse weather, IFR/VFR	X	X
GATM Compliant	X	X
Modern Integrated ASE suite	X	X
NVG compatible	X	X

<sup>43</sup> (...continued)  
November 17, 2004.

<sup>44</sup> Kevin O'Brien. "Future Cargo Aircraft Gets 'Jointed.'" *Aero-news.net*. February 20, 2006. [Http://www.aero-news.net/news/military.cfm](http://www.aero-news.net/news/military.cfm)

<sup>45</sup> Sources: Selected Acquisition Report (SAR), Briefing to CRS by USMC PMA-275 DPM (August 2005), telephone conversation with retired CV-22 program officials.



Pressurized	X	No, but on-board Oxygen
<p><b>Key</b>  X = Parameter required, no quantification or qualification of requirement provided  N/A = not addressed in document  nm = nautical miles  kts = knot, true airspeed  PA = pressure altitude (reading on a barometric altimeter)  IFR = Instrument flight rules  VFR = Visual flight rules  GATM = Global Air Traffic Management  ASE = Aircraft Survivability Equipment  NVG = Night vision goggles</p>		

Mr. Chairman, this concludes my remarks. I appreciate the opportunity to appear before you, and look forward to any questions you or the other subcommittee members may have. Thank you.

## Appendix 1

### Specifications and Costs of Comparable Aircraft<sup>46</sup>

Only two manufacturers worldwide currently produce transport aircraft: The Boeing Company and Airbus Industrie. The closest comparable Airbus airplanes to the Boeing 767 are the A300-600, which is somewhat smaller and the A330-300, which is slightly larger. The table below provides a comparison of key dimensions, features, performance specifications, and costs of these aircraft. In discussing cost, it is important to note that negotiated costs for aircraft are dependent on many factors, such as how many firm orders are placed, how many options to buy are included in the order, and aircraft configuration and equipment options.

#### Comparison of Boeing 767- and Airbus A300-600, and A330 Airplanes<sup>47</sup>

	<b>767-400ER</b>	<b>A300-600</b>	<b>A330-300</b>
Length	201' 4"	177' 5"	208' 1"
Wingspan	170' 4"	147' 1"	197'10"
Max. Takeoff Weight (pounds)	450,000	363,800	507,000
Engines <sup>48</sup>	2 PW 4062 or GE CF6-80C2B8F	2 GE CF6-80C2 or PW4000	2 GE CF6-80E1 or PW 4000 or RR Trent 700
Maximum Range (nautical miles)	5,645	4,050	5,600
Maximum Operating Speed (Mach)	0.86	0.82	0.86
Cost (\$ million)	120-132.5*	100**	124-131*

\* Source: Flug Revue Online ([www.flug-revue.rotor.com](http://www.flug-revue.rotor.com)). Prices for 767-400ER were as of mid-2000, whereas prices for A330-600 were as of mid-1998.

\*\* In January 2001, UPS Airlines placed a firm order for 60 Airbus A300-600 cargo airplanes at a total cost of \$6 billion, or \$100 million per airplane.

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<sup>46</sup> Table and text provided by Bart Elias. Specialist in Aviation Safety, Security, and Technology Resources, Science, and Industry Division. Congressional Research Service.

<sup>47</sup> Source (unless otherwise noted): Airbus Industrie and The Boeing Company.

<sup>48</sup> GE: General Electric, PW: Pratt & Whitney, RR: Rolls Royce.

## Appendix 2

### CRS Assessment of USAF KC-X “Part 2” Business Case Analysis (BCA) Briefing to Congressional Staff October 11, 2006

Detailed analysis of the Air Force’s proposed Business Case Analysis (BCA) of Fee-for-Service aerial refueling (FFS AR) is somewhat limited by the briefing’s lack of detail. Based on the information provided, a number of factors in the proposed Air Force study appear likely to understate the benefit of this potential course of action. A summary of potential questions for Air Force officials on the proposed BCA follows.

#### Approach and Scope of Study

- One of the strongest arguments in favor of FFS AR is that this approach to aerial refueling is less capital-intensive than purchasing an equivalent number of aircraft. Reducing up-front investments in aerial refueling may be attractive to the Air Force as its total budget authority increasingly comes under pressure. However, the BCA does not appear to include any analysis of the potential budgetary implications of investing in FFS AR versus *X* number of KC-X aircraft.
- The U.S. Navy currently exploits FFS aerial refueling. The Air Force BCA contains no analysis of potential benefits of expanding the Navy’s FFS AR arrangements to include the Air Force and other Services. Expanding the Navy’s current FFS aerial refueling capability might achieve savings through economies of scale that would not be considered in the BCA as currently designed.

#### Study Assumptions and Methodology

- In at least three places in the BCA briefing, it appears that the Air Force may be making premature assumptions regarding FFS that could artificially reduce the scope of the analysis and potentially bias the study against FFS aerial refueling. For example, the Air Force asserts that “FFS AR will cover niche market.” This may be true, but the analysis has not yet been completed. Therefore, it is unknown how big this “niche” may be. The briefing also suggests that a “niche” set of aerial refueling missions for FFS AR have been predetermined. A more appropriate first step may be to define and document restrictions applicable to this commercial service and then perform mission analysis to determine the reasons for the application of such restrictions. It may also be useful to include at least a brief summary of the origin and purpose of the restrictions.
- The briefing indicates that the potential costs of FFS would be compared to the actual costs of the current AR fleet: the KC-135 and KC-10. Fee for Service aerial refueling, however, is being evaluated as a potential complement to the KC-X. It appears irrelevant to compare the costs of FFS AR to the current fleet. Some may wonder whether the KC-X is being excluded from a cost comparison with the FFS AR because the KC-X costs are expected to be higher than the current fleet, and potentially higher than FFS AR.
- The Air Force proposes to use recent Air Force flying hour costs and demands from

June 1, 2005 to May 31, 2006 as a baseline for comparing potential FFS AR costs and demands to costs and demands of the existing tanker fleet. As a matter of study design, it appears well advised to choose at least two different time periods to serve as this comparative baseline. The chosen period is one in which the Air Force has experienced a very high operations tempo (OPTEMPO). The KC-X and any potential FFS AR will over time experience periods of both high and low OPTEMPO, and different types of high OPTEMPO. Choosing only one time period for a cost and usage comparison appears to risk skewing the results of the analysis.

- The briefing describes how the BCA will estimate the costs of the various potential alternatives to FFS AR (e.g., purchasing new aircraft). The costs to be considered appear to be incomplete. They include RDT&E, Procurement, O&M, and MILPERS, but do not include MILCON, and National Guard and Reserve costs. Underestimating these costs would make alternatives to FFS AR appear artificially less expensive.
- The proposed BCA appears to include a number of assertions and assumptions that are of questionable accuracy. For example, it notes that the BCA will assume that no FFS AR will operate “in theater.” If by, “in theater” the BCA is describing a theater of wartime operations, this ground rule appears inconsistent to today’s reality. Commercial aircraft such as the civil reserve air fleet (CRAF) operate in theaters of military operations today. Also, it is unclear exactly how this theater is defined. If, for example, a war was being fought in Iraq, would Kuwait or Saudi Arabia be considered “in theater?” If so, this broad definition may artificially limit the applicability of FFS AR. Also the Air Force notes that the “CRAF delta is not addressed. Currently no assurance of set level of business in CRAF (must compete for work).” This statement appears to be incorrect. While some CRAF contracts are awarded on a competitive basis, there is also a set level of guaranteed minimum business for CRAF participants.

## **Appendix 3**

### **Description of An-124 *Condor* Heavy Lift Aircraft<sup>49</sup>**

Country of Origin	Russia
Builder	Antonov
Wing Span	240 ft, 5 in (73.3 m)
Length	226 ft, 3 in (69 m)
Height	68 ft 2 in (20.78 m)
Empty Weight	385,000 lbs
Engine	4 - Lotarev D-18T, 229.9 kN thrust each
Cruising speed	430 kts
Range	2,900 nm
Service Ceiling	35,000 ft
Payload	88 passengers or approximately 330,000lbs cargo
Cargo Bay	36.5 m x 6.4 m x 4.4 m (1027.8 cu. m)
Crew	Six--seven with loadmaster

#### **AN-124 Condor**



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<sup>49</sup> Sources: FAS.org, Jane's All the World's Aircraft. Flight International, 3-9 October 2006.