



CRS Report for Congress

Strategic Airlift Modernization

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Summary

There is a consensus among policy makers that the Department of Defense (DOD) must maintain a robust and effective airlift fleet. There is disagreement, however, over how many aircraft are required, and of what type. DOD's latest mobility study finds that the Air Force's plans for its C-5 and C-17 airlift aircraft are sufficient to meet the national military strategy. Many outside observers, including some in Congress, argue that more airlift capability is required. This report will be updated.

Background

The ability to project military power over great distances is a central tenet of the U.S. national military strategy and the massive military buildup before Operation Desert Storm (the 1991 war with Iraq) highlighted the value of strategic airlift. U.S. aircraft moved over 500,000 troops and 543,548 tons of cargo.¹ Strategic airlift has also played a key role in recent conflicts. On April 10, 2003, the U.S. Transportation Command reported that it had exceeded its Operation Desert Storm airlift operations by flying 16,213 missions for the most recent war in Iraq, Operation Iraqi Freedom (OIF). Air mobility sorties made up the majority of the 28,500 total sorties that have been flown during OIF,² and C-17s executed a much publicized airdrop of the 173rd Airborne Brigade into northern Iraq. Other transportation modes, such as sealift, can deploy troops and equipment. The strongest argument for using airlift instead of other modes is speed.

Despite its importance, today's U.S. strategic airlift system is under stress. Over the past 10 years, the United States has reduced its Cold War infrastructure and closed two-thirds of its forward bases. Therefore, to maintain the same level of global engagement, U.S. forces must deploy more frequently and over greater distances. Even prior to the September 11, 2001, terrorist attacks and resulting conflicts, the Air Force estimated that it deployed four times more frequently than when it enjoyed the larger, Cold War

¹ *Gulf War Air Power Survey*, vol. V, (Washington: GPO, 1993), p. 76.

² Chuck Roberts, "C-130 Crews Keep The Supplies Coming," *Air Force News*, Apr. 16, 2003.

infrastructure.³ General Charles T. Robertson, former Commanding General of the U.S. Transportation Command, testified that “Bottom line: This nation’s number one defense transportation shortfall is its ailing and numerically inadequate strategic airlift fleet.”⁴

Strategic Airlift Platforms. The U.S. strategic airlift force includes the C-5 Galaxy, and the C-17 Globemaster. Aerial refueling aircraft also contribute to airlift missions. The **C-5**, made by Lockheed Martin, is typified by its payload and range. One of the largest aircraft in the world, the C-5 can carry 160,000 lbs of cargo up to 3,730 nautical miles and has a maximum payload of 291,000 lbs. The C-5 can carry large and irregularly shaped cargo, such as the Army’s 74-ton mobile scissors bridge, that no other U.S. aircraft can hold. Both ends of the C-5 open, facilitating rapid loading and off-loading. The C-5 has been plagued by reliability problems; its mission capable rate for 2000 was 58%. The Air Force operates 109 C-5s in the active, reserve, and national guard forces.⁵ The C-5A was first deployed in 1969, and the C-5B, in 1980.

The **C-17**, made by Boeing, is DOD’s most modern strategic airlifter. Because it can use short and unfinished runways and has high maneuverability on the ground, the C-17 can operate in environments traditionally confined to smaller airlifters. Thus, the C-17 can deliver its payload from the United States directly to forward bases near the battle. Like the C-5, the C-17 can carry outsize and oversize cargo like helicopters and missile launchers. Its maximum payload is 160,000 lbs, which it can carry up to 2,400 nautical miles. Current DOD plans call for the acquisition of 190. Modest international sales of the C-17 may keep the production line open for an additional year. The future of the C-17 production line is in jeopardy without Air Force purchases.

Strategic Airlift Requirements

DOD periodically studies the global threat environment, its military strategy, and the status of its airlift fleet, to determine the amount of future airlift that is required and to judge whether airlift modernization programs are sufficient. In June 2004 DOD began its first “post 9/11” review of transportation requirements. This Mobility Capabilities Study (MCS), was completed and briefed to Congress in February 2006.

The unclassified executive summary of the MCS notes that unlike past mobility studies, the MCS did not recommend an airlift requirement expressed in million ton miles per day (MTM/D). Instead, the MCS assessed the capabilities of the current and currently projected force. The MCS’ principal finding was that the Air Force’s program of record (180 C-17s and engine and avionics upgrades for the entire C-5 fleet) was sufficient to meet the National Military Strategy with acceptable risk.

The MCS findings caught many observers by surprise, who expected the study to project a growth in airlift needs — perhaps a requirement closer to 60 MTM/D — from

³ Maj. Gen. Howie Chandler, *Basic Air Force Structure and Expeditionary Aerospace Force (EAF) Operations*, Briefing to Congressional Air Force Caucus, Mar. 23, 2001, Bolling AFB.

⁴ Gen. Charles T. Robertson Jr., USTRANSCOM. Senate Committee on Armed Services, Subcommittee on Seapower. Apr. 26, 2001, p. 21.

⁵ U.S. Air Force Fact Sheet. *C-5 GALAXY*. [<http://www.af.mil/factsheets/>]

the previous estimate. The mobility study immediate prior to the MCS, the Mobility Requirements Study 2005 (MRS-05), which was completed in 2000, set the airlift requirement at 54.5 MTM/D.⁶ 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 aircraft to provide this amount of airlift.⁷ 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 likely be achieved.

Many have criticized the MCS. In September 2005 for example, the GAO documented a number of shortcomings in the MCS' methodology.⁸ GAO followed-up this letter with a more detailed criticism in September 2006.⁹ Others criticized the study for not assessing intra-theater lift needs, and for focusing on "near term" capabilities rather than taking a longer view.¹⁰ Some have called on DOD or an independent agency to conduct another mobility study to rectify the MCS' perceived shortcomings. In September 2006 it was reported that the Air Force Air Mobility Command was again studying DOD's airlift needs. Some may interpret the Air Force's initiation of an airlift study so soon after the completion of the MCS as tacit acknowledgment of flaws in the MCS, and might be an attempt to ameliorate them.¹¹

Some Options

At least five approaches have been suggested that might be pursued to address DOD's airlift capabilities and needs. Each option has strengths and weaknesses. These options are not mutually exclusive, and some might be pursued concurrently.

Option 1: Modernize C-5s and Purchase Additional C-17s. At issue is how many more C-17s to purchase and how many C-5s to upgrade. The current Air Force plan is to upgrade all C-5s. Some have argued that only the C-5Bs should be upgraded and the C-5As should be retired.

Cost is an important factor to consider when choosing between these alternatives, as is performance. The table above summarizes some of the factors to be weighed. Five additional factors merit discussion. First, the C-17 is the only U.S. strategic airlifter still in production. Purchasing additional aircraft beyond what is currently programmed would extend the production line's life, and may offer industrial base benefits. Second, purchasing additional C-17s and allowing the C-5 fleet to atrophy would lead to a

⁶ Marc Selinger, "DoD Launching New Review of Transportation Needs," *Aerospace Daily*, Mar. 11, 2004.

⁷ John Tirpak. "Air Mobility in the Doldrums." *Air Force Magazine*. Aug. 2005.

⁸ *Defense Transportation: Opportunities Exist to Enhance the Credibility of the Current and Future Mobility Capabilities Studies*. Government Accountability Office. Sept., 2005.

⁹ *Defense Transportation: Study Limitations Raise Questions About the Adequacy and Completeness of the Mobility Capabilities Study and Report*. GAO. Sept. 2006.

¹⁰ John T. Bennett. "Influential DoD Mobility Study's Focus on Intratheater Needs Questioned." *Inside the Air Force*. Apr. 7, 2006.

¹¹ Michael Fabey. "AF Formulating Mobility Plan." *Aerospace Daily*. Sept. 28, 2006.

homogeneous fleet. Some voice concern that a fleet composed entirely of one model of aircraft is less robust than a fleet composed of two types of aircraft. If one type of aircraft is grounded, the other can still fly. Others argue that homogeneous fleets offer potentially significant savings in operations and maintenance costs, and that the U.S. theater lift fleet has been almost entirely composed of one type of aircraft, the C-130, for years. Third, while the C-5 may have many hours of life remaining, it is an older aircraft than the C-17. Proponents of purchasing additional C-17s point out that this aircraft exploits newer technology that will make it easier and cheaper to maintain than the C-5, and offers greater opportunities for future upgrades and modernization. Fourth, the C-5's unique ability to carry very large equipment such as engineering equipment and Patriot missile batteries must be considered. DOD's C-5 inventory has not met demands to transport outsize/oversize cargo. Therefore, between 2003 and 2004, DOD contracted with Russia to provide the AN-124 heavy lift aircraft to fly over 200 missions.¹² Finally, the C-5 carries almost twice the payload of the C-17. Eliminating the 109 C-5s from the inventory removes the capacity of roughly 196 C-17s.

	Modernize C-5 Fleet	Buy More C-17s
Average Procurement Unit Cost ¹³	\$97 Million	\$280 Million
Est. Flying Hour Cost ¹⁴	\$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%
Max. Payload	261,000 lbs	164,900 lbs
Austere Runways	No	Yes

Option 2: Increased Use of Commercial Aircraft. DOD may wish to consider increased use of commercial aircraft, which offer many advantages over dedicated military aircraft. They are numerous, tend to have longer range, and they are less expensive than military aircraft. However, civilian aircraft also have limitations. They cannot carry oversize or outsize cargo, they cannot conduct special missions like airdrops, or support special operations. Also, they tend to congest airfields due to longer ground times, cargo handling equipment requirements, lack of roll on/roll off capability, and less ramp maneuverability.

It may be that DOD is already exploiting commercial aircraft to the maximum potential benefit. The Air Force indicates in the MRS-05 study that they could not use the 20.5 MTM/D of civilian airlift capability assigned for most of the halt phase of the wartime scenarios studied, due to the limitations listed above. Also, enemy use of

¹² Gene Rector, "Russian Aircraft Getting U.S. C-5 Work," *Macon Telegraph*, Dec. 21, 2003. Cynthia Di Pasquale, "Russian Planes Expand U.S. Airlift Capability Strained During OIF, OEF," *Inside the Air Force*, Apr. 2, 2004.

¹³ *Selected Acquisition Report (SAR)* Department of Defense OUSD(AT&L). Defense Acquisition Management Information Retrieval (DAMIR). C-17A, C-5AMP, C-5RERP.

¹⁴ *Aircraft Reimbursement Rates (per Flying Hour) FY2007*. Air Force Cost Analysis Agency, Cost Factors Branch. Table A15-1.

weapons of mass destruction, such as chemical weapons, effectively deters civilian crews from entering conflict areas. One civil aircraft initiative that may have some utility for the military is the effort by Boeing, with the Air Force's endorsement, to market a civilian version of the C-17. Adding this aircraft to the Civil Reserve Air Fleet would address the shortcomings listed above. Whether there is a sufficient market for these aircraft to be commercially viable remains to be seen.

Option 3: Pursue Airships or Hybrid Airships. DOD is exploring the development and use of airships, or hybrid airships, to carry very large military payloads long distances. Airships, also called blimps, typically use helium to achieve lift and often resemble the elongated, cigar-shaped *Goodyear* blimp seen at major sporting events. Hybrid airships also use gas buoyancy for much of their lift, but are shaped like an aircraft wing to generate additional lift from aerodynamic forces. The airships currently being explored could potentially carry payloads on the order of 500 tons to intercontinental distances at speeds up to 100 miles per hour.

In addition to their very large payloads and long range, airships and hybrids may offer additional advantages applicable to the strategic airlift mission. They may not require as expensive and as specialized infrastructure as aircraft, and may be able to deliver their payloads near the conflict, rather than at ports or airfields miles to the rear, thus overcoming logistic choke points and mitigating the effects of limited forward basing. Airships and hybrids may be able to land on water, which could prove valuable in realizing the Department of the Navy's sea basing concept.

Option 4: Reduce the Airlift Demands. Another method for addressing current and forecast airlift shortfalls is to reduce the size, weight or amount of equipment to be moved. As part of their efforts to achieve a military transformation, all four services are exploring ways to become lighter, leaner, or more deployable.

A key facet of the Army plan is the Stryker Brigade Combat Team. It is composed of a mechanized infantry brigade of 3,500 personnel, 327 Stryker vehicles, 600 wheeled vehicles, field and air defense artillery, and engineering equipment. The Army wants to be able to move one Stryker Brigade anywhere in the world in 96 hours. It also wants to deploy one division in 120 hours and five divisions in 30 days. Presumably, a variety of pre-positioning and transportation modes would be exploited to meet this goal.

The Air Force's principal effort in organizational innovation is the Expeditionary Air Force Concept, or EAF. The purpose of the EAF is provide a structured and more responsive way to deploy capabilities. The EAF will organize much of the Air Force into 10 Aerospace Expeditionary Forces (AEF) that will include combat and support forces. Each AEF includes about 175 aircraft, 20,000 people, and 6,000 tons of equipment. The goal is to deploy one AEF anywhere in 48 hours and five AEFs in 15 days.

Although both of these organizational initiatives may have merit, it is not clear that either will reduce demands on the strategic airlift fleet. The amount and weight of equipment in a Stryker brigade, for example, may be less than in current Army organizations, but the desired speed of delivery is greater. Air Force analysts estimate that the early delivery of a Stryker Brigade and an AEF would require more airlift than moving legacy forces during over a longer period of time. Also, moving five Army divisions in 30 days may require more airlift than currently planned for the halt phases of two

MTWs.¹⁵ The net effect the Service's plans to become lighter, leaner and more deployable may have on airlift may merit increased attention.

Option 5: Accept less Strategic Airlift Capability. The final option that may be considered is to operate within the current and projected airlift capabilities. There appear to be at least three arguments for this approach. First, there is some debate over the realism of MRS-05's plan for supporting two nearly simultaneous MTWs. General Ryan, for instance, was quoted saying "We will never have enough for two MTWs. I don't think we can afford it. We have a one-major theater war airlift force."¹⁶ General Walter Kross, former commander of the Transportation Command also said "the airlift force available for the next decade will be one that can handle a single major regional contingency."¹⁷ Furthermore, the actual U.S. airlift capabilities have been short of the stated MTM/D requirement for 11 of the last 13 years.¹⁸ During this time, the United States has successfully conducted operations in 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 required. A counter argument is that airlift requirements are designed to satisfy a worst case scenario. Adherents to this perspective say the 54.5 MTM/D requirement is justified, and the United States has been fortunate over the last 13 years not to have faced the worst case scenario.

Second, it is argued that the MTM/D requirement can be lowered because strategic airlift capacity is not the limiting deployment factor. Instead, the ability to move forces may be limited by too few airfields and inadequate airfield infrastructure. Therefore, acquiring more strategic airlifters might not only fail to satisfy airlift shortcomings but employing them could actually exacerbate deployment problems. In Operation Allied Force, for instance, "there were not enough air bases in the area immediately around Kosovo to support all the aircraft..."¹⁹ This finding is significant because this theater contains numerous airbases relative to other regions. Also, a study by the Army's Military Traffic Management Command found that the biggest roadblock to achieving the service's deployment goals is the limited infrastructure at forward airfields.²⁰ Examples of infrastructure shortfalls include limited ramp space and loading/unloading equipment.

¹⁵ Conversation with Air Mobility Command, SAF (LLW) and Deputy Chief of Staff for Plans and Programs, Global Mobility Division, Apr. 5, 2000.

¹⁶ Linda de France, "Ryan: We Will Never Have Enough Lift for Two Regional Wars," *Aerospace Daily*, June 22, 2000.

¹⁷ John Tirpak, "New Boss at Air Mobility Command," *Air Force Magazine*, Mar. 1997, p. 36.

¹⁸ Presentation by Brig. Gen. Robert Bishop to congressional staff, *Airlift Portion of MRS-05*, Mar. 28, 2001.

¹⁹ *Kosovo After Action Review*. Secretary of Defense William S. Cohen and Gen. Henry H. Shelton, Chairman of the Joint Chiefs of Staff. Senate Armed Services Committee, Oct. 14, 1999.

²⁰ Kim Burger, "Army Study: Poor Forward Airfields Jeopardize Deployment Goals," *Inside the Army*, Aug. 21, 2000.