

Although the September 11 terrorist attacks and the 2001 Quadrennial Defense Review (QDR) have led the Department of Defense (DoD) leadership to change its terms of reference for sizing and planning its force, these events have not changed the dual objectives of U.S. peacetime air mobility operations: to meet peacetime demand and to maintain wartime readiness. This study compares the peacetime tempo of air mobility operations in the Cold War (the 1980s) with that of the post-Cold War period (the 1990s)<sup>1</sup> and examines the factors and associated trends that can affect the Air Mobility Command's (AMC's) ability to meet these dual objectives in a cost-effective manner. Does AMC have the flexibility to generate enough flying hours for pilot training when flying demand is low? Can AMC man flying operations with the number of pilots Congress has authorized? How well does the actual ratio of copilots (CPs) to aircraft commanders (ACs) match what is authorized? Comparing peacetime operations in the 1980s with those of the 1990s, did pilots get less hands-on training during flights in the latter period? Was AMC less able to project airlift demand accurately in the latter than in the former period? Did AMC have to fly more missions with shorter advance notice? Has AMC been successful in using reimbursements from its customers to defray its operating expenses? We will first report our findings on these factors and trends and will then suggest measures to correct the problems we have identified.

The aircraft examined herein are the key AMC platforms: strategic airlifters (the C-5, C-141, and C-17), tactical airlifters (the C-130), and tankers (the KC-135 and KC-10). We used data that either appeared in AMC official documents or were provided to us by AMC offices. Although the bulk of this research was completed just prior to the September 11 attacks, we have discussed in this report how postattack activities have affected air mobility operations and have

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<sup>1</sup>Generally, whether a year is fiscal or calendar will be made evident in this report. Where neither is specified, fiscal year is intended. The peacetime period in the 1990s does not include the Gulf War-affected years, FY 1990 and FY 1991, or 1994, a unique year in which many C-141s were grounded because of possible weep-hole cracks in their wings.

found that the new emphasis on counterterrorism does not change our recommended corrective measures.

## **POTENTIAL PROBLEMS IDENTIFIED**

Using a number of measures to analyze the historic data over the past two decades, we found problems that have the potential to hinder AMC's ability to conduct air mobility operations in a cost-effective fashion.

### **Flying-Hour Shortages Occurred in FY 2000 and FY 2001 and Are Likely to Recur**

During FY 2000 and FY 2001, the CPs of all airlifters and tankers encountered a flying-hour shortage because the international situation was relatively calm and there were fewer U.S. missions that called for airlift support. To combat this shortage, AMC cut back on commercial expansion buys and flew organic (AMC-owned) aircraft more frequently but with smaller loads. These measures reduced but did not eliminate the shortage during those years. During FY 2000, actual CP flying hours fell short by 13 percent, 17 percent, 21 percent, 16 percent, 1 percent, and 4 percent for the C-5, C-141, C-17, C-130, KC-135, and KC-10, respectively. Even with stronger corrective action by AMC, the shortages during FY 2001 were still 6 percent, 14 percent, 9 percent, 27 percent, 6 percent, and 24 percent, respectively.

Operation Enduring Freedom (OEF) ended the flying-hour shortage, as has been the case with all previous high-airlift-demand contingencies. When OEF ends, however, the demand will return to peacetime levels, during which shortages are likely to recur from time to time. Moreover, wartime mobility requirements continue to trend higher. For example, the Air Force recently committed to buying 60 more C-17s and will likely buy even more later. Having more aircraft requires more pilots and more flying hours for training during peacetime.

We also found that annual flying hours per aircraft for the C-5, C-141, C-130, KC-10, and KC-135 were not higher during the post-Cold War era than during the Cold War. In other words, these aircraft did not fly more in the 1990s as many thought.

### **The Actual Number of Copilots and Aircraft Commanders Exceeded That Authorized**

Since 1986, the actual number of CPs and ACs at AMC has consistently exceeded what Congress has authorized—a trend that increased at an average rate of 1 percent per year from 1982 to 2001.

## **The Actual Copilot-to-Aircraft Commander Ratio Deviated from That Authorized**

During the 1980s and 1990s, the actual CP/AC ratios for airlifters and tankers deviated significantly from those authorized. During 2001, the actual ratios of all four airlifters were above those authorized, while those of the two tankers continued to be well below their authorized numbers.

## **Less Piloting Occurred During Training**

The current AMC rule for meeting training requirements credits all aircraft flying hours toward every member of an aircrew, regardless of whether a pilot is controlling the aircraft from a pilot seat or merely observing others piloting elsewhere in the aircraft. An increase in the average number of pilots per flight means that pilots are getting less actual piloting opportunity and experience.

During the 1980s and 1990s, all airlifters had an increasing number of pilots per flight. The number of pilots per C-5 flight, for example, increased an average of 2 percent per year, while that per C-141 flight rose by 3.2 percent. The C-17 showed a large upward trend of 9.6 percent per year, but the trend for this aircraft, which was newly deployed at the time, should level off as its operations mature. The C-130 showed an upward trend of 0.6 percent per year.

## **Deviations from the Flying Plan Increased**

The actual flying hours of the C-5, C-141, and C-130 showed an increasing annual deviation<sup>2</sup> from the current plan, although that plan was adjusted every few months throughout each fiscal year to better match demand. By the late 1990s, these annual deviations were roughly double those of the early 1980s. A rise in short-notice flights can make the scheduling of flights and maintenance more complicated and can negatively affect pilots' quality of life.

Two other measures were used to study these deviations. In any given year, there can be months in which actual flying hours exceed those planned only a few months before. The month with the largest excess is that with the peak (monthly) greater-than-planned (GTP) flying level for the year. During the 1980s and 1990s, the C-5, C-141, and C-130 showed an increasing peak GTP flying level from one year to the next. The larger the GTP flying level, the greater the number of aircraft and personnel that must be quickly gathered together to meet the peak monthly demand of the year. The peak GTP flying level for C-5s

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<sup>2</sup>The annual deviation is the sum of the absolute values of both positive and negative monthly deviations in a given fiscal year.

and C-141s in the late 1990s was double that of the early 1980s, while the peak level for C-130s was three times that of the previous period.

A third measure was used to estimate the length of time the actual monthly flying level had exceeded what was planned. For example, if actual monthly flying hours exceeded those planned for four months in a row, the length was considered to be four months. A longer length of time increasingly burdens the air mobility system, which must sustain the effort of gathering extra aircraft and personnel for a longer period of time. We found, however, that this length changed little during the 1980s and 1990s for any of the four airlifters, remaining at two to three months.

### **Engagement Missions Accounted for a Growing Share of Missions**

Engagement missions such as banner operations (presidential support), humanitarian relief operations, and special assignment airlift missions (SAAMs) contain more short-notice flights than do channel missions or operation and maintenance (O&M) missions. Short-notice flights are more difficult and costly to schedule than routine, planned missions and have a more negative effect on pilots' quality of life. Engagement missions for each of the airlifters were found to account for a growing share of flying hours during the periods studied. For the C-5, these missions accounted for only 11 percent of all missions flown in 1981 but represented 68 percent by 1999. For the C-141, this share increased from 26 percent in 1981 to 38 percent in 1999, while that of the C-17 increased from 9 percent in 1995 to 46 percent by 1999. Finally, the share for the C-130 increased from 21 percent in 1981 to 40 percent in 1999.

### **Fewer of AMC's Flying Expenses Were Reimbursed by Customers**

AMC was less able to recoup its training and operating expenses in the 1990s than in the 1980s because the reimbursable Transportation Working Capital Fund (TWCF) share of AMC's operating budget declined during that period. Specifically, TWCF constituted 70 percent of the budget in 1984, but by 1999 this figure had been reduced to 51 percent. Further, commercial air carriers took a rising proportion of the TWCF, leaving even less money for AMC; overall, commercial carriers' share rose from 23 percent in 1981 to 32 percent in 1999. This increasing commercial penetration was particularly prominent in channel cargo, AMC's favorite mission category for pilot training, where the commercial share rose from 24 percent in 1981 to 46 percent in 1999. Moreover, commercial providers continued to dominate channel passenger miles, capturing 90 percent of this business since 1981. Allowing commercial providers to assume a greater portion of airlift service during peacetime is acceptable only if AMC has

the flexibility to increase and decrease its commercial buy in any particular year to accommodate its organic flying capacity and requirement.

We also found that the percentages of channel passengers riding free on both organic and AMC-chartered commercial flights continued to be significant, standing at 65 percent and 29 percent, respectively, in FY 1999. This represented a further loss of revenue to AMC.

### **SUGGESTED CORRECTIVE MEASURES TO DEAL WITH THE RECURRING FLYING-HOUR SHORTAGE AND REVENUE LOSS**

Corrective measures should first address the most difficult problem, AMC's recurring flying-hour shortage. However, we review the measures already implemented by AMC to correct this shortage before we suggest additional ones. Once this problem of shortage is resolved, the often-associated issue of loss of revenue as well as other problems will become easier to remedy. Overall, our corrective measures are designed to be flexible so that even an excessive flying demand—which is also likely to occur from time to time—can be handled.

#### **Offer Measures Beyond Those Taken by AMC**

Since FY 2000, AMC has been taking measures to combat its flying-hour shortage. First, AMC cut \$89 million from its international cargo buy during the first eleven months of FY 2001 prior to the September 11 attacks and retained more flying for its own pilots.

Second, AMC has been considering the possibility of reducing the flying-hour requirement for C-130 CPs from 29 hours to 24 or 25 hours per month and the total hours required for promotion to AC from 1000 hours to 900 hours. However, AMC needs to show how this requirement can be reduced without affecting training and qualification.

Third, AMC decided not to correct the flying-hour shortage for C-141 CPs because C-141s will soon be retired. However, this can present a problem in that C-141 CPs will be transferred to fly other aircraft such as C-17s, and their earned flying hours will count toward the requirement for promotion to AC regardless of the aircraft to which they are assigned. Thus, reducing CP flying hours will delay CPs' promotion. In any case, AMC needs to show that a flying-hour reduction will still result in adequate training and will not affect flight safety in C-141 and other aircraft types.

Fourth, during FY 2001, AMC was able to reduce but not eliminate the flying-hour shortage for the CPs of C-5s and C-17s by flying channel cargo missions more frequently and carrying less. Had AMC completely eliminated this short-

age, the extra flights throughout FY 2001 would have cost it approximately \$70 million, or 11 percent of the C-5 and C-17 flying-hour cost. Had AMC used the same approach to eliminate the flying-hour shortage for the CPs of its other airlifters (C-141s and C-130s) and for those of its tankers (KC-135s and KC-10s), it would have incurred an additional annual cost of \$144 million for a future year that happened to have an airlift demand as low as that of FY 2001. Moreover, the shortage could worsen from time to time in the future and cost AMC even more.

Fifth, although the aircrew for many strategic airlifters (the C-5, C-141, and C-17) has consisted of two ACs and one CP, AMC encouraged wing commanders to replace the second AC with a CP on these flights. However, wing commanders often consider it risky to do so given that C-17s are still new and their CPs relatively inexperienced. Moreover, the C-17 flight crew has neither a flight engineer nor a navigator. Even for C-5s and C-141s, two ACs are considered necessary to handle flights involving complicated operations despite the fact that two flight engineers are also on board. We believe that the replacement of the second AC with a CP is a corrective measure that is both attractive and readily available and, as such, should be used whenever it does not affect flight safety and the CPs have insufficient flying hours.

Sixth, AMC has developed a new initiative, Channel Door to Door (CD2), in which it retains the option to use its airlifters for the flying segment and contracts Civil Reserve Air Fleet (CRAF) participants for the ground segment. CD2 allows AMC to fly more whenever it needs to do so to meet its pilot training requirements. CD2 commenced on October 1, 2001, and was expected to replace \$10 million, or one-fifth of the buys from the Commercial Air Line of Communications (COMALOC), during FY 2002. In addition to CD2, AMC has been attempting to fold many air cargo tenders into the Military Air Line of Communications (MILALOC). While a tender is not under TWCF, a MILALOC is. Commercial international tenders account for \$25 million to \$30 million per year, and retaining any part of those funds through MILALOC will result in more flying hours as well as more revenue for AMC. On the other hand, CD2 and cutbacks in tenders, while beneficial and worthy of development, are insufficient to eliminate a shortage similar in size to that which appeared during FY 2000 and FY 2001.

Worse, the flying-hour shortage may become even more severe from time to time because AMC will be increasing its number of pilots. Moreover, although AMC has taken measures to alleviate the flying-hour shortage, such measures can be expensive and, even when combined, are insufficient to resolve a severe shortage. The paragraphs below suggest additional measures that can help alleviate even a severe shortage.

### **Further Reduce the International Cargo Buy**

We suggest that the international cargo buy be further reduced when a flying-hour shortage recurs. During peacetime years in which flying-hour shortages are of magnitude similar to those that occurred in FY 2001,<sup>3</sup> the international cargo buy would have to be reduced by another \$90 million (out of \$200 million) in order to completely eliminate the shortage for the C-5 and C-17 CPs alone at the current level. AMC will have to cut to a bare minimum not only its expansion buy but also its fixed buy. We suggest that a cancellation fee be paid to the affected commercial carriers if their incentives to stay in CRAF become insufficient because of the cut. This fee arrangement would still be cheaper than flying organic aircraft more frequently but with less cargo.

### **Add an Organic, Dedicated Passenger-Carrying Capability**

AMC needs to increase its flexibility in meeting fluctuating demand, both high and low, without sacrificing readiness. Gaining flexibility is consistent with the 2001 QDR's new "basis of defense planning from a 'threat-based' model that has dominated thinking in the past to a 'capabilities-based' model for the future."<sup>4</sup> Because the United States cannot predict when and how often war might occur, it is important that AMC acquire this flexibility.

The international cargo buy, which has long served as a flying-hour reservoir, might run low when a shortage recurs. AMC can double its flexibility by creating another flying-hour reservoir from the international passenger buy, which is the planeload charter on commercial aircraft. Its volume is about \$350 million a year and is even larger than the international cargo buy. There is sufficient traffic for AMC to carry planeloads of passengers economically. Currently, however, AMC does not have dedicated long-range passenger carriers with which to carry passengers by the planeload.

Rather than acquire passenger aircraft, AMC would find it much cheaper to convert an airlifter or a tanker from carrying cargo to delivering passengers. The conversion set should, however, be designed to be installed and uninstalled quickly and cheaply.

AMC is already considering buying palletized seats for 34 C-17s and storing them for wartime use. It would be more cost-effective, however, for AMC to use

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<sup>3</sup>Because we are interested in peacetime demand that is not driven up by high-airlift demand contingencies, we refer here to the size of demand in FY 2001, with a small adjustment of excluding the added activities for the aftermath of September 11 attacks during September.

<sup>4</sup>See *Quadrennial Defense Review Report*, Washington, D.C.: U.S. Department of Defense, September 30, 2001, p. iv.

these seats during peacetime to generate some needed flying hours as well. A conversion set would cost roughly \$300,000 per C-17, and eliminating the flying hour shortage experienced in FY 2001 and possibly recurring in the future for C-17 CPs would require a dozen C-17s carrying passengers. The capital outlay for a dozen C-17 conversion sets would be only \$3.6 million. Moreover, if AMC decided to buy those palletized seats for 34 C-17s for other purposes but agreed to use a dozen of them to carry passengers during peacetime, even this \$3.6 million outlay would be a sunk cost that should not be double-counted. A dozen conversion sets would allow AMC to reduce the international passenger buy by \$50 million a year. This conversion could thus be cost-effective by allowing strategic airlifters to generate both flying hours and revenue at the same time as opposed to flying empty to generate flying hours only.

It would be even more advantageous to use KC-10s as dedicated passenger carriers because C-17s are better suited to carrying cargo, while KC-10s have a larger passenger-carrying capacity. KC-10s are currently flown 5000 hours per year for cargo delivery. In times of shortage, AMC should switch C-17s to this cargo-flying role and equip some KC-10s to spend those 5000 hours carrying passengers instead.

In a separate study, we found that CRAF, being untrained and unequipped for protection, will be unable or unwilling to fly to airfields that are threatened by chemical, biological, or even high-precision conventional weapons. Some potential U.S. adversaries, such as Iraq and North Korea, have now developed these weapons and are likely to have more and better ones in the future. We proposed that CRAF fly to the nearest safe airfields and transload its cargo and passengers to organic assets, which would then fly the last leg into the conflict area. This plan calls for organic, dedicated passenger-carrying aircraft both tactical and strategic, for wartime use. Moreover, immediately after the September 11 attacks, civil aircraft were grounded. If AMC had aircraft that could carry a large number of passengers, they could be useful for urgent travel, including that of rescue personnel.

### **Make Nonpaying Passengers Pay**

Military service personnel and their dependents currently fly free on military and AMC-chartered commercial flights when empty seats are available. This fringe benefit should be borne by the individual services, not by AMC alone. Nonpaying passengers should be charged a fare of, say, \$100 on average per one-way trip. If the services reimbursed their personnel and dependents, the load factor would be unchanged and AMC would still receive \$24 million a year for carrying these previously nonpaying passengers. Even if nonpaying passengers had to pay the fare themselves, the load factor and revenue might not be

greatly affected, as most of these flights are overseas trips for which a \$100 fare is still a bargain. If AMC were allowed to sell these seats to non-DoD government personnel as well, its revenue could be further increased.

### **Decide Whether to Allow AMC Limited Participation in Commercial Air Delivery**

The need to conduct cost-effective air mobility operations for national security purposes could justify limited AMC participation in the commercial air delivery of cargo and passengers. AMC often flies organic assets partially or totally empty, particularly during return flights. It would help AMC financially to be able to deliver commercial cargo and passengers for a fee whenever its organic or chartered commercial flights were not full. Because of AMC's restricted route structure and service-quality considerations, the commercial airlift industry is unlikely to lose much business to AMC. To ensure that that is the case, the U.S. government could set an upper limit—say, \$100 million to \$200 million per year—on AMC commercial business.

AMC should examine its route structure and competitiveness to determine where and how often it can offer commercial services on its existing flights. On the other hand, letting the military participate in commerce, even if highly restricted, is a drastic step both politically and philosophically. We do not recommend such a program at this time. Rather, the government should estimate the program's benefit and decide whether AMC should be allowed to participate in the commercial air delivery business in such a restricted manner.

### **Competitively Price Organic Services**

Staying competitive would confer two advantages. First, AMC customers would have fewer incentives to bypass AMC and seek airlift services elsewhere. A stable customer base would help AMC generate enough flying hours for its own pilots. Second, even under competitive pricing, AMC would continue to show an annual loss for its operations because it has large but legitimate "war readiness" costs that commercial air carriers do not. Yet the change in this annual operating loss over time becomes an effective measure of cost containment and quality improvement. AMC needs such an objective measure for improving the cost-effectiveness of its operations.

AMC should price certain airlift services low to be competitive even when its reimbursements do not fully cover its marginal or variable expenses in providing those services. Offering services that afford valuable training experience, albeit with only partial reimbursement, is less costly to AMC than arranging dedicated training missions without any reimbursement at all. AMC should

continue to improve its quality of service. In the meantime, when certain services are still inferior in terms of on-time delivery or passenger comfort, prices should be lowered to stay competitive.

Competitive pricing would also allow AMC to charge customers a higher price to recoup the full cost (both fixed and variable) of unique and valuable services such as airlifting outsize cargo that commercial carriers cannot accommodate. This is an avenue for increasing airlift revenue to support AMC operations.

AMC should also charge one single, competitive price for the same service. It should eliminate the price differentials among the current three categories of customers: DoD, non-DoD U.S., and non-U.S. customers.

### **SUGGESTED CORRECTIVE MEASURES TO DEAL WITH PROBLEMS OTHER THAN THE FLYING-HOUR SHORTAGE AND REVENUE LOSS**

The measures described above will not only help address AMC's flying-hour shortage and revenue loss but also mitigate the other problems it faces.

#### **Congress Should Allow AMC to Vary the Number of Authorized Pilots**

The actual number of CPs during FY 2001 exceeded the authorized number by only 49 out of a total of 948, while the number of ACs exceeded those authorized by 29 out of a total of 949. The salary savings that would accrue from eliminating these positions would be about \$5.1 million per year. This is not a large sum, especially considering the toll it would take on morale if these pilots were reassigned or laid off. Congress should thus allow AMC some flexibility in deviating from the number of pilots authorized provided that AMC makes compensatory adjustments in other budgetary items to keep its overall operational expenses within the bounds of congressional authorizations.

#### **Congress Should Formally Allow AMC to Vary the Mix of Authorized Copilots and Aircraft Commanders**

Bringing actual CP/AC ratios into accord with those authorized for airlifters would amount to replacing 66 CPs with ACs. This would result in an annual salary-cost increase of \$1 million. On the other hand, a CP is required to fly many more hours per month than is an AC. Because a flying-hour shortage will recur from time to time, replacing 66 CPs with ACs would significantly reduce the flying-hour need. The flying-cost savings for just one hour per month for 66 CPs would be \$2.7 million, which exceeds the \$1 million annual salary cost. Thus, lowering the CP/AC ratios for airlifters to those authorized will give AMC added flexibility in managing the required number of flying hours.

For tankers, whose actual CP/AC ratios for FY 2001 were below those authorized, the salary savings in matching actual with authorized ratios would be \$800,000 a year. However, just one extra flying hour per month for all of the 55 additional CPs would cost \$2.1 million, which exceeds the \$800,000 salary savings. Therefore, AMC might not want to meet authorized ratios for tankers.

Instead of generally not enforcing the authorized mix of CPs and ACs, Congress should formally allow AMC to vary the mix as long as the variation does not increase total authorized operational expenses, including salaries and training. AMC is in a better position than Congress to optimize this mix.

### **Flying-Hour Shortage Corrective Measures Would Increase Piloting During Training**

Once the measures suggested above return AMC to plentiful flying hours even during lean-demand years, the number of pilots per flight can be reduced so that each will have more opportunity to pilot as opposed to merely observing others piloting.

### **AMC Should Reduce and Adapt to Deviations from Flying Plan**

To reduce deviations from the flying plan, AMC should improve its projection capability and more frequently update this plan. It can also decrease commercial fixed buys and increase commercial expansion buys in its plan for the fiscal year. When AMC is running short on flying hours during a given fiscal year, it can reduce expansion buys and fly more itself for the remainder of the year. Equally important, AMC should accept deviation as a viable means of training for quick responses.

### **AMC Should Contract Out and Adapt to More Engagement Missions**

AMC can contract out more of its engagement missions. At the same time, however, it should treat these missions as training for quick responses.

### **Recommended Measures Would Increase Reimbursement for Training**

Competitive pricing and improved service quality will help AMC retain customers and halt the decline in the reimbursable share of its operating and training expenses. Competitive pricing adjusted for service quality establishes clear incentives for AMC to reduce costs and retain business. Moreover, once AMC makes equitable arrangements with commercial air carriers for reduced commercial buys when flying-hour shortages occur and uses its dedicated pas-

senger-carrying capability for new business, it can retain more reimbursable cargo and passenger business in house.

## **TOWARD COST-EFFECTIVE AIR MOBILITY OPERATIONS**

The peacetime demand for air mobility operations continues to exhibit wide fluctuation, sometimes too high and at other times too low for organic flying. Moreover, the wartime requirement for air mobility is on the rise, generating more asymmetry in wartime and peacetime demand. This asymmetry makes a flying-hour shortage even more likely, as an increase in the number of pilots needed for wartime will necessitate more flying hours for training during peacetime. Although AMC has been taking action to meet fluctuating airlift demand during peacetime, we have proposed additional corrective measures for generating new business and flying for AMC when shortages recur and for gaining flexibility in using commercial air carriers to smooth the demand for organic assets. These measures also include some that would make AMC services more competitive with commercial services. Such corrective measures should help AMC meet peacetime demand and maintain wartime readiness in a cost-effective manner.