



## **ABSTRACT**

### **ENHANCING THE ARMY'S STRATEGIC DEPLOYABILITY**

by MAJ Wilson A. Shoffner, Field Artillery, 48 pages.

Since the end of the cold war, the US Army has become a force-projection Army with reduced forward basing. With increased overseas commitments, the Army's ability to conduct strategic deployment is more important than ever. In the next decade, the Army will deploy "interim" forces that are more deployable because they are lighter and require a reduced logistical tail as compared to heavy forces. While there is no question that these medium "interim" forces are more deployable than Force XXI units; they lack the firepower and protection that the Army's heavy forces provide. The Army's inclusion of medium weight units in the force does not obviate the need for heavy forces. Heavy forces, combined with interim forces, will remain a critical part of the Army's power projection force.

This monograph examines a range of possible actions the nation could take in the effort to improve strategic deployability to include: expanding/optimizing the use of CRAF; modifying the Army's equipment pre-positioning system; increasing the procurement of strategic airlifters; modifying the strategic sealift procurement; and Army force structure modifications.

This monograph concludes that the assumptions concerning the requirements for strategic lift should be re-examined in light of the current global environment and US strategic lift capabilities. As the C-17 replaces the C-141, there may exist a capabilities gap in the military strategic airfleet. Modified civilian passenger aircraft could fulfill this role for the military. There is also reason for concern with strategic sealift. The Merchant Marine's ability to crew the RRF is suspect and they may soon be incapable of filling the estimated 4000 billets required in a prolonged conflict. Aside from lift assets, the Army is making some significant internal changes which should enhance deployability. The Army's concept for transformation is consistent with the goals established in Joint Vision 2010 and, if successful, should result in greater deployability while retaining lethality.

This monograph recommends that the DOD conduct a holistic full-scale examination of its transportation system. This examination would re-assess planning assumptions concerning strategic lift requirements and capabilities and also give the DOD a much more realistic idea of commercial transportation capabilities. These commercial capabilities are significant and in the arena of air cargo transport are growing rapidly. With near-term military strategic lift capability remaining relatively flat, the DOD could benefit significantly by exploiting this rapidly expanding capacity. A similar opportunity may exist in the development of high speed transport ships. A DOD investment in high speed ship design now could prove very useful in the future. Similarly, as new commercial passenger and cargo aircraft are produced, the DOD should consider programs to build military features into these aircraft so that they could easily be converted for future military use. Army transformation should result in enhanced deployability for the Army, but this transformation is in jeopardy due to insufficient funding.

# **Enhancing The Army's Strategic Deployability**

**A MONOGRAPH  
BY  
Major Wilson A. Shoffner  
United States Army**



**SCHOOL OF ADVANCED MILITARY STUDIES  
UNITED STATES ARMY COMMAND AND GENERAL STAFF COLLEGE  
FORT LEAVENWORTH, KANSAS**

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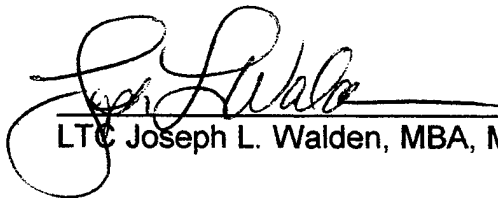
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MONOGRAPH APPROVAL

Major Wilson A. Shoffner

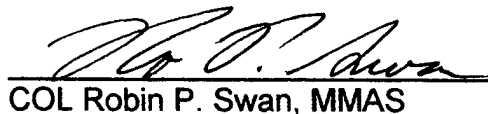
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Approved by:



LTC Joseph L. Walden, MBA, MS

Monograph Director



COL Robin P. Swan, MMAS

Director, School of Advanced  
Military Studies



Philip J. Brookes, Ph.D.

Director, Graduate Degree  
Program

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## I. INTRODUCTION

*The United States has one of the largest collections of advanced military equipment and some of the best trained troops in the world. But that military strength means little if the nation cannot deploy its forces quickly wherever they are needed.<sup>1</sup>*

Congressional Budget Office, February 1997

Since the end of the cold war, the Army has become largely a force-projection Army with reduced forward basing. During this period, overseas commitments have increased and the Army's ability to conduct strategic deployment is more important than ever. In the next decade, the Army will deploy "interim" forces that are more deployable because they are lighter and require a reduced logistical tail as compared to heavy forces. These medium "interim" forces are designed to be more deployable than Force XXI units, but they lack the firepower and protection that the Army's heavy forces provide. The Army's inclusion of medium weight units in the force does not obviate the need for heavy forces. Heavy forces, combined with light and interim forces, will remain a critical part of the Army's power projection forces.

The Army's plan for modernization through 2015 envisions the fielding of "interim" brigades in the short term. By 2015, the force will consist of Rapid Response Divisions (such as the 82d or 101st Airborne Divisions), Force XXI Divisions (digitized heavy forces) and Dominant Maneuver Divisions, which will be a combination of Force XXI and "interim" forces.

The U.S. currently plans to deploy its heavy and "interim" forces overseas in three ways: by air, by sea, or by flying troops to link-up with pre-positioned equipment. Air transport of combat vehicles is by far the fastest method. The limited number of strategic

airframes and the tremendous size and weight of heavy equipment and the associated logistical support means that only a small number of heavy vehicles can be deployed in this manner making this an infeasible method for the vast majority of the force. The fastest method of deploying significant numbers of heavy forces is by flying troops to pre-positioned heavy equipment. Some of this equipment is pre-positioned on land {Army Pre-Positioned Sets Land (APSL)} while the bulk of the pre-positioned equipment is on ships at sea {Army Pre-Positioned Sets Afloat (APSA)}.

The current inventory of strategic airlift includes the C-5, C-17 and C-141. The C-141 fleet is in the midst of deactivation while the Air Force is procuring C-17s as a replacement. C-141 decommissioning is continuing, but the procurement of C-17s has slowed somewhat in recent months due to DOD directed foreign aircraft sales. In order to augment the military strategic airfleet, the U.S. maintains an agreement known as the Civil Reserve Air Fleet (CRAF) which requires civilian air carriers to provide aircraft in time of war or national emergency.

Sealift ships, which will transport the bulk of the Army's equipment overseas, are a combination of active and mothballed US Navy vessels. Many of these ships are to be crewed by the US Merchant Marine Fleet. However, because the pool of available merchant mariners has steadily declined in recent decades there is reason to suspect that the US may not have sufficient numbers of mariners on the roles to crew ships in the event of a large-scale deployment. The insufficient availability of merchant marines and other concerns indicate that the US may not be capable of deploying its current inventory of heavy forces overseas as US National Military Strategy dictates, despite current efforts to procure additional Fast Sealift Ships (FSS) and more modern strategic airframes.



Furthermore, although "interim" forces are lighter and demand less lift than heavy forces, they will still depend upon ship transport for a large portion of their equipment and logistical support.

Since the end of the cold war, the Army has shifted from a forward deployed, European focused force to a CONUS-based, power projection force. This change has made it increasingly dependent on sister services, the Air Force and the Navy for assets to deploy anywhere it might be needed. Unfortunately for the Army, these lift assets are funded via the Navy and Air Force budgets - - two sources of funds over which the Army has little direct influence. Given this reality, coupled with the fact that the Army's relationship with members of congress is less than optimum, the Army is in a poor position to influence the procurement and management of strategic lift assets. Possible solutions to this particular dilemma are beyond the scope of this monograph, instead, this monograph will focus on relatively low-cost changes the Army and the DOD could make to increase the deployability of the current force and the forces that will be fielded in the coming decade.

This monograph will examine a range of possible actions the nation could take in the effort to improve strategic deployability to include:

1. CRAF. Expanding/optimizing the use of CRAF to deploy heavy equipment and/or the supporting logistics tail.

2. APSL and APSA. As heavy brigades convert to interim brigades, could their equipment be pre-positioned in an overseas site to enhance strategic deployability? Could we position our APSL/APSA stocks in smaller, yet more numerous locations?

3. Strategic Air. What is the cost/feasibility of procuring additional C5s/C17s versus buying interim forces? What is the impact of the reduction in C17 acquisitions?

4. Sealift. Does the current procurement plan for sealift match the requirement for deployment of interim and heavy forces? What is the cost of procuring additional FSS? How many would make a difference? Is the Merchant Marine Fleet ready to crew the nation's strategic sealift fleet?

5. Commercial Air Cargo. Will examine commercial air cargo as a potential model for air transport of heavy logistics requirements and will explore the possibility of a "CRAF" style arrangement with the commercial air cargo fleet.

6. Internal Changes. Are there force structure modifications the Army could make that would increase its deployability?

This monograph includes an examination of the various options listed above to assess their feasibility. The feasibility of each option will be assessed by considering the following measures of effectiveness:

(a) Does the method result in significantly reducing the response time for heavy and "interim" force deployment in an OCONUS theater?

(b) Is the method acceptable given future budget expectations?

(c) Is the method technologically possible?

(d) Does the method require an increase or change in force structure?

(e) Does the method fit with joint doctrine?

(f) Would the method require a change to service roles and responsibilities?

(g) Does the method support the requirement for strategic lift to support two major theaters of war (MTWs)?

## II. REQUIREMENTS FOR STRATEGIC DEPLOYABILITY

*"Any assessment of present and future US strategic lift requirement and capabilities...must start from a recognition that the United States has never, in peacetime or in wartime, possessed the necessary lift to meet its lift requirements."*<sup>2</sup>

The National Security Strategy requires that the US military be capable of no-notice, rapid force-projection. Furthermore, this force must possess the full spectrum of capabilities. For the Army this translates to global deployment of a combination of heavy, "interim," and light forces. "...effective global power projection...is key to the flexibility demanded of our armed forces and provides options for responding to crises and conflicts even when we have no permanent presence or a limited infrastructure in a region."<sup>3</sup> For the National Command Authority (NCA) this capability translates to numerous possibilities in applying force outside the continental United States. The National Security Strategy (NSS) identifies strategic mobility as a key element of the nation's strategy:<sup>4</sup>

It is critical for allowing the United States to be first on the scene with assistance in many domestic or international crises, and is a key to successful American leadership and engagement. Deployment and sustainment of US and multinational forces requires maintaining and ensuring access to sufficient fleets of aircraft, ships, vehicles and trains, as well as bases, ports, pre-positioned equipment and other infrastructure.

National Military Strategy (NMS), based on National Security Strategy, identifies four key strategic concepts which serve to govern our use of military force: Strategic Agility, Overseas Presence, Power Projection and Decisive Force. Strategic Agility is defined as "the timely concentration, employment, and sustainment of US military power anywhere at our own initiative, at a speed and tempo that our adversaries cannot match."<sup>5</sup> Power Projection is defined as: "the ability to rapidly and effectively deploy and sustain US forces in and from multiple dispersed locations."<sup>6</sup> NMS further defines Power

Projection as "being able to act even when we have no permanent presence or infrastructure in a region."<sup>7</sup> The latter part of this definition demands that the US have sufficient mobility assets to deploy the required elements of military power from the continental United States (CONUS) or forward bases.

The NMS directs the military to prepare for two nearly simultaneous major regional conflicts: "it is imperative that the United States be able to deter and defeat nearly simultaneous, large-scale, cross-border aggression in two distant theaters in overlapping time frames...."<sup>8</sup> In its periodic Bottom-Up Review, the Department of Defense (DOD) has focused on a scenario in which the US fights these two conflicts on the Korean Peninsula and the Arabian Gulf.<sup>9</sup> In 1995, the DOD conducted an analysis known as the Mobility Requirements Study Bottom-Up Review Update (MRS BURU). MRS BURU is based on the same two-war planning assumptions as the Bottom-Up Review.<sup>10</sup> Like any estimate, this analysis was based on several assumptions. In broad terms, these assumptions centered in three major areas: the nature of the foe(s) that the US might face; which US forces would be sent to these conflicts; and whether military and commercial planes and ships would be available.<sup>11</sup> Since so many assumptions are required in this analysis, it is difficult to definitively predict how much and what combination of mobility assets will be required. Some sort of subjective judgement is required in determining the problem set for the analysis, making it very difficult to determine the optimum mixture of strategic mobility assets.

In addition to the requirement to deploy assets in the event of two near-simultaneous major regional conflicts, the DOD must maintain the flexibility to deliver cargo and equipment to smaller, regional operations and to support special missions. The

plans for most smaller, regional conflicts do not involve the activation of CRAF or the Voluntary Intermodal Sealift Agreement (VISA)<sup>12</sup> and rely largely on airlift. These regional contingencies include: peacekeeping missions, humanitarian operations, non-combatant evacuation operations (NEO) and peace enforcement operations.

Other special missions include the Strategic Brigade Airdrop (SBA), intra-theater movement of outsize and oversize cargo, and direct battlefield delivery of outsize and oversize cargo. In 1980, the Joint Chiefs of Staff established a Division Ready Brigade (DRB) requirement for the Army. The DRB directive requires the Army to maintain a combat-ready light infantry brigade capable of deployment via SBA within eighteen hours of notification.

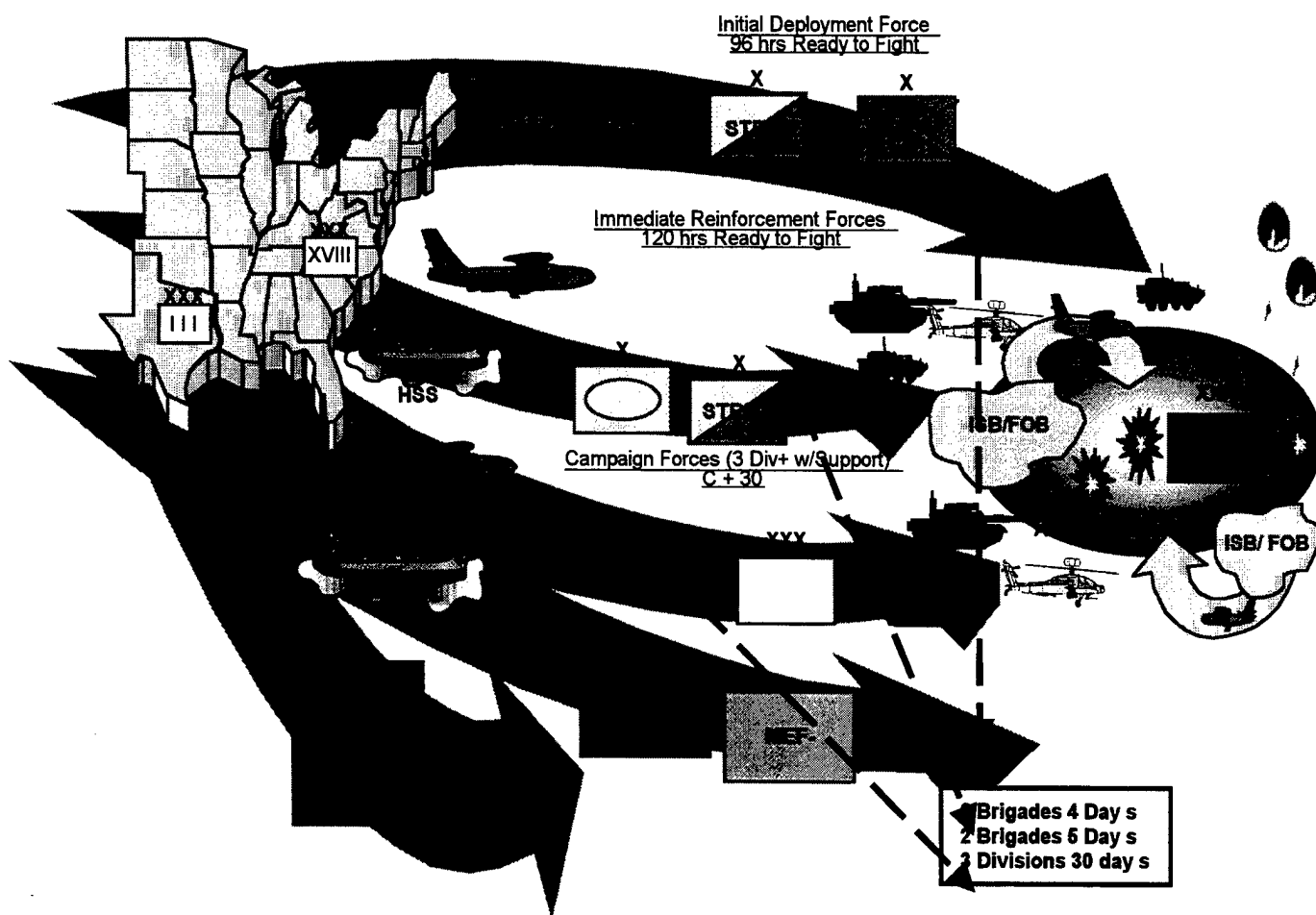
In addition to the SBA, the Army is concerned with how to rapidly deploy its CONUS-based forces overseas and defines its part of the DOD's power projection effort as "strategic maneuver:"

Strategic Maneuver is the ability to project military power rapidly from all points of the globe to converge simultaneously with overwhelming land, air, space and maritime forces that paralyze and dominate the enemy. The objective is to wrest the operational initiative, achieve dominance, and prevent or terminate conflict by defeating the enemy or setting the conditions for sustained decisive operations of follow-on campaign forces if they are necessary.<sup>13</sup>

The Army Science Board has produced a concept of what this strategic maneuver would look like in the year 2010:<sup>14</sup> Within 96 hours of notification, two brigades, the initial deployment force, would deploy (mostly via strategic air) to an overseas area of operations (AO). 120 hours after notification, two additional brigades, the immediate reinforcement forces, would deploy via strategic air and high speed ships from CONUS and from forward operating bases (FOBs) or intermediate staging bases (ISBs). In the 30 days following notification, three divisions, the campaign forces, would deploy via strategic sealift.

Figure 1 below graphically depicts this deployment from CONUS, through ISBs and FOBs and into an overseas AO.<sup>15</sup>

**Figure 1**  
**Strategic Maneuver in 2010**



The Army Science Board's concept for 2010 is consistent with the Chief of Staff of the Army's (CSA's) vision, published in 1999. When he assumed duties as the Chief of Staff in June 1999, General Eric K. Shinseki issued a statement of intent. He further articulated an overall goal for the Army and stated six objectives. The first two of these objectives underscore the importance of strategic deployability in the CSA's vision: (1) increasing strategic responsiveness and (2) developing a clear long-term strategy to improve operational jointness and to implement the goals of Joint Vision 2010.<sup>16</sup> To accomplish these objectives, General Shinseki stated this concept: "Heavy forces must be more strategically deployable and more agile with a smaller logistics footprint and light forces must be more lethal, survivable and tactically mobile."<sup>17</sup> In order to achieve these goals, the Army is in the process of a transformation. Once this transformation process is complete, the Army will be capable of deploying a combat-capable brigade anywhere in the world in 96 hours; a division in 120 hours; and five divisions within 30 days of notification.<sup>18</sup> This transformed Army, with its emphasis on global mobility, is increasingly dependent on strategic lift assets.



### III. CAPABILITIES

"With fewer US forces permanently stationed overseas, we must increase our capability to project forces abroad.... Our ability to rapidly project power worldwide depends on four strategic mobility enhancements: increased airlift capacity, additional pre-positioning of heavy equipment afloat and ashore, increased surge capacity of our sealift, and improved readiness of the Ready Reserve Fleet."<sup>19</sup>

General John Shalikashvili, US Army, Ret., Former Chairman, Joint Chiefs of Staff

#### *Strategic Airlift*

The nation's strategic airlift fleet is comprised of two elements: military strategic airlift and CRAF. In a scenario that involves two near-simultaneous MTWs, the DOD estimates it will require the capability to transport 49.7 million ton-miles per day (MTM/D).<sup>20</sup> In order to achieve that amount of lift, the Air Force estimates that CRAF can be counted on to provide 20.5 MTM/D while military aircraft would provide the remaining 29.4 MTM/D.<sup>21</sup> In the event of full mobilization, CRAF could theoretically provide 27.8 MTM/D, but Air Force planners believe the lower number is more realistic.

CRAF currently provides a maximum of 678 aircraft to transport both military cargo and personnel. During the Persian Gulf War, CRAF II (the second of three stages of CRAF activation) was activated and during the conflict civilian aircraft transported two-thirds of the personnel to the region and one-third of the cargo.<sup>22</sup> The use of CRAF during the Gulf War is widely considered a success and demonstrates the utility of the program in transporting large numbers of personnel. One significant limitation of CRAF, however, is the inability of most civilian airliners to carry what the military refers to as "outsized" cargo. Outsize cargo are those loads which, due to their size and weight, can be transported only by the two largest military aircraft in the inventory, the C-5 or C-17.<sup>23</sup> The most useful civilian aircraft in terms of cargo capacity is the wide-body Boeing 747-

400, which is capable of carrying bulk and oversize cargo. Another limitation of CRAF aircraft is that they generally require long, improved runways whereas the C-17 requires only a 3000-foot dirt airstrip.

Military strategic airlift provides the capability to fly the critical, early arriving troops and cargo for overseas deployments.<sup>24</sup> In addition to the 56 C-17s that have been procured to date, the military strategic airfleet consists of 162 C-141s, 126 C-5s, 59 KC-10s and 547 KC-135 tanker aircraft. The DOD also maintains a large fleet of C-130s, but this aircraft is considered a tactical or intra-theater transportation asset. The aging C-141 has been the workhorse of the Air Force's strategic lift fleet for several decades, and the 162 C-141s currently flying constitute slightly less than one-third of the DOD's total strategic lift capability. The C-141 fleet is currently being replaced by the C-17, but C-17 production has dropped from the original plan to procure 210 of the aircraft. The Clinton Administration plans to ultimately procure a total of 120 C-17s. Meanwhile, the C-141 retirement schedule has been accelerated. Recent inspections of the fleet have found significant cracks in the wings and in some wingboxes that secure the wings to the fuselage.<sup>25</sup> Due to these concerns, the Air Force has decided to bring the plane out of service faster than they had originally intended. The Air Force plans to retire the last active duty C-141 in 2003 and the last reserve aircraft by 2007.<sup>26</sup>

Though aging, the C-141 is well suited to perform the DOD's other special missions. The C-17 can perform most special missions at least as well as the C-141 and has the added advantage of being able to land on relatively short, unimproved airstrips. Unlike the C-141, however, the C-17 can provide tactical and intra-theater airlift as well.

Because it can land on 3000 foot unimproved airstrips, the C-17 is nearly as versatile in the tactical role as the much smaller and cheaper C-130 Hercules.

The DOD has been criticized recently for a decision to delay the acquisition of a portion of the C-17 fleet. In February 2000 the DOD announced that it plans to buy only twelve of the original 15 aircraft it had planned to buy in 2001.<sup>27</sup> The decision was made to allow the United Kingdom to buy the aircraft, if it desires. Although the British are planning to buy four strategic lift aircraft, they are considering purchasing either the C-17 or the European-made Airbus. The US Airforce maintains that this change (reduction in C-17 procurement) "should not affect Air Force strategic airlift plans."<sup>28</sup>

The military's largest strategic lift aircraft, the C-5, constitutes 50% of the military's strategic airlift capacity. Two variants of the C-5 are currently flying, the C-5A and the C-5B. Seventy-six C-5As were procured in the early 1970 and these were retrofitted with a modified wing in the mid-1980s. In the late 1980s, the Air Force procured fifty C-5Bs. The C-5Bs have performed reliably over the last decade and a half, but the C-5As have not. In fact, during Operation Desert Storm, more than thirty percent of the C-5 fleet was unavailable due in large part to maintenance problems and spare-parts shortages in the C-5As.<sup>29</sup> According to Air Force records, the C-5A requires about 56 hours of maintenance for every hour of flight, whereas the C-5B requires 29.<sup>30</sup> Due to the aircraft's low availability rate, the Air Force had planned to begin a premature retirement of the C-5A fleet in 2007.<sup>31</sup> However, the Air Force has reversed itself and has begun a ten-year program to extend the life of the C-5A fleet.

Most defense analysts agree that there exists an enormous gap between US strategic airlift capabilities and requirements.<sup>32</sup> In 1983, one prominent defense analyst concluded:

"Lack of enough strategic mobility is probably the greatest single flaw in our conventional force posture.... We have today in the continental United States more ready active forces than we can deploy rapidly enough to meet immediate strategic needs - a seriously unbalanced force posture."<sup>33</sup>

Since that time the nation has reduced forward basing and become a CONUS "force projection" force - - relying more on strategic lift than ever before.

### ***Strategic Brigade Airdrop***

The 82d Airborne Division fulfills the Joint Chiefs of Staff (JCS) requirement for a Division Ready Brigade (DRB) capable of deployment within eighteen hours of notification. The DRB has historically deployed via C-141, but C-130 aircraft have also been used in short-range contingencies such as Panama in 1989 and Grenada in 1983. Although one of the requirements for the C-17 was precision airdrop of both cargo and personnel, the C-17 has proved to be unsuitable for airdrop of personnel. Due to a wing-tip vortex problem, the C-17 cannot be used effectively for the strategic airdrop mission. The problem is caused by a descending swirling column of air (or vortex) which is generated by the C-17's unique upswept high-performance wing. In a strategic airdrop, several aircraft are flown over the intended drop-zone in a serial. Jumpers from the first aircraft in the serial are unaffected by the phenomenon, but jumpers from the second and successive aircraft may encounter a wing-tip vortex from the preceding aircraft. This encounter, called an "interaction" by the Air Force, can cause canopy oscillation or worse, total canopy collapse. The Air Force's solution is to increase the interval between aircraft in the serial, but the Army maintains that a modification of this nature makes the strategic

brigade airdrop infeasible because the element of surprise is lost as the length of time for the serial to pass is greatly increased.<sup>34</sup> The Army estimates that with the increased separation, a C-17 airdrop will require four times as much time as with the C-141.<sup>35</sup> Strategic airdrop of cargo, however, remains a feasible mission for the C-17. Besides conducting a strategic airdrop, the DRB can airland instead of parachuting. The C-17 is ideally suited for this type of mission since it is capable of "direct delivery" of troops and equipment virtually anywhere. Whether it is deployed via airdrop or airland, the DRB remains a significant Flexible Deterrence Option (FDO) for the NCA.

### ***Strategic Sealift***

In the event of an overseas conflict, ships will transport approximately 90 percent of all dry cargo required to sustain the deploying force.<sup>36</sup> Four different categories of shipping support the DOD in time of crisis, each with a different mission and response time. The first ships to respond in any crisis will be the vessels in the Afloat Prepositioning Force. All of these ships are in full operating status with full crews and are strategically located at near critical locations.<sup>37</sup> The ships have the ability to be underway within four hours of notification. Currently, the Army has equipment of one heavy brigade afloat (APSA) and the Marines have three Maritime Prepositioning Squadrons with the equipment to support a Marine Expeditionary Brigade. Also, the Army is in the process of putting to sea the equipment for an additional heavy brigade.

In addition to the afloat pre-positioning ships, are the Military Sealift Command's (MSC) eight FSSs. These ships are maintained in a reduced operating status with partial crews and are capable of activation within 96 hours of notification.<sup>38</sup> These ships are 946 feet in length and are capable of sustained speeds of thirty knots. All eight ships combined

can transport the equivalent of a complete Army mechanized division.<sup>39</sup> A significant characteristic of these vessels is that they require a port with a relatively deep draft - at least 39 feet in the case of the FSS. This means that only a limited number of ports worldwide are capable of receiving a FSS.

The ships that serve the Afloat Prepositioning Force will soon be replaced by eight new large, medium-speed, roll-on/roll-off (LMSR) vessels. LMSRs are capable of sustained speeds of 24 knots and have a climate-controlled cargo hold which protects vehicles and cargo from the corrosive effects of the sea environment. Nineteen such ships are currently being procured and built for the Navy. The other eleven ships will be deployed to strategic locations in the United States and will be kept in a reduced operating status.<sup>40</sup> The response time for these ships will be approximately the same as for the FSS.

The remainder of strategic shipping will be provided by the Ready Reserve Fleet (RRF). The RRF is a fleet of government owned mothballed commercial vessels that are activated in time of war and crewed by merchant marines. RRF ships are maintained in a readiness status such that they can be activated in 4, 5, 10 or 20 days after they are requested by the DOD.<sup>41</sup> During the Persian Gulf War, however, 75 percent of the RRF ships could not be made ready within these specified times due to maintenance problems and unavailability of merchant mariners. Since Operation Desert Storm (ODS), the Maritime Administration (MarAd) has made significant progress in improving RRF readiness.

The RRF currently consists of 96 vessels maintained in a readiness status of four to twenty days. These 96 consist of 31 RO-RO ships, 43 breakbulk ships, 10 tankers and a

variety others vessels. In 1999, the MarAd Administrator, John E. Graykowski, testified that the RRF is now operating with reliability rating of 90% for the fleet overall.<sup>42</sup>

All of these ships rely on the US Merchant Marines to crew them. Historically, in peacetime, merchant marines have served in the US flag merchant fleet. In recent decades, however, the US flag fleet has declined from a high of 5000 ships at the end of World War II to the current level of only 319.<sup>43</sup> These 319 account for less than four percent of all waterborne trade travelling to and from US shores despite the fact that the amount of cargo being imported and exported from US ports has increased from 117 million tons in 1950 to 967 million tons in 1996.<sup>44</sup>

The reasons for the decline of the number of ocean-going merchant marine billets are many but a complete examination of the various causes is beyond the scope of this monograph. The bottom line for strategic sealift is that the nation's capability to crew its strategic vessels is waning.

#### **IV. OPTIONS FOR ENHANCING DEPLOYABILITY**

##### ***Optimizing CRAF***

Activated for nine months during Operations Desert Shield and Desert Storm, CRAF performed as well or better than anyone in the US government expected.<sup>45</sup> US civilian air carriers flew 5188 missions from the US to Europe and the Arabian Gulf. CRAF deliveries accounted for 21 percent of all strategic missions flown, 64 percent of the passengers and 27 percent of the cargo during the deployment.<sup>46</sup> During the redeployment, CRAF's contribution was even greater, providing 28 percent of all missions flown to include 84 percent of all passengers and 40 percent of the cargo.<sup>47</sup> These redeployment numbers highlight just how significant CRAF aircraft can be in a crisis.

As previously stated, CRAF aircraft have some limitations in the strategic lift role. Most notably, they require long runways and cannot accept outsized cargo. Given these limitations, it is unreasonable to expect CRAF aircraft to replace C-17s or C-5s in carrying outsized cargo. However, since the majority of cargo transported in any conflict is either in bulk or oversize loads, CRAF aircraft can still transport a significant amount of cargo and a high percentage of the required personnel. The Boeing 747-400 is particularly suited for the role of bulk and oversize cargo transport.

It is in personnel transport that CRAF aircraft can make the largest contribution. As demonstrated during Operations Desert Shield and Desert Storm, CRAF aircraft can be depended upon to reliably transport the bulk of the personnel for any conceivable deployment. By providing most, if not all, of the personnel transport requirement, the use of CRAF would significantly reduce the burden on military strategic lift, allowing military aircraft to focus solely on transport of cargo. This option is especially attractive since it is



a means to increase strategic lift without procuring and having to maintain additional aircraft. Increasing the CRAF participation requires no technological change and no change to existing force structure. Service roles and doctrine would not be affected by this action.

This alternative appears feasible given the expected increase in commercial lift capacity over the next several years. Currently, the US commercial air freight throughput capacity is twice that of military lift. By 2025, analysts believe that the commercial capacity will be six times that of the military. This is an opportunity that should not be ignored.

All analysts agree that CRAF is absolutely essential in fulfilling the requirement to support to near-simultaneous MTWs. If a capabilities gap does in fact exist in meeting this requirement, maximizing CRAF's contribution to the strategic airlift effort would be a low-cost, high-payoff option.

Recent changes in the DOD logistics transportation system highlight the importance of utilizing the nation's tremendous air cargo capacity. The DOD has transitioned to a more responsive logistics system that attempts to leverage commercial cargo transport efficiency. The program allows commercial vendors engaged in military logistics support to determine the transportation mode and carrier, much as the commercial sector does.<sup>48</sup> This strategy has transformed the DOD logistics system into one that is increasingly dependent on commercial air carriers for transport of spare parts, supplies and essential products.<sup>49</sup> Since commercial air cargo capacity is expected to increase substantially while military cargo capacity will remain relatively flat, this system may provide a model for the future.

In the event of CRAF activation, one single carrier, Federal Express, would contribute the vast majority of all wide-body aircraft. As previously discussed, it is the wide-body aircraft, those capable of transporting both bulk and oversize cargo, that are most useful to DOD in terms of cargo transport. Some have argued that the DOD may be "creating an 'Achilles' heel' in its logistics infrastructure" since the department has become increasingly dependent upon civilian carriers.<sup>50</sup> Although DOD's reliance on a single carrier for a particular type of aircraft may be a legitimate point of concern, increased dependence on commercial air cargo transport may be unavoidable. Given the tremendous capacity of the commercial air cargo system, the DOD cannot ignore this opportunity. Furthermore, such policies are consistent with the DOD's attempt to outsource where possible.

The idea of optimizing CRAF is not new. Since the early 1970s, the DOD has studied the idea of a CRAF Enhancement Program which would have provided a "cost-effective means of increasing the capacity of the National Airlift System."<sup>51</sup> Originally labeled "CRAF Modification," this program was based on a 1973 Emergency Cargo Airlift Capabilities Study which recommended three actions: (1) the C-5 wing modification; (2) stretching the C-141 to increase cargo capacity; and (3) improving the cargo capacity of the CRAF.<sup>52</sup> The basic idea behind this program was to create a "cargo-convertible" passenger aircraft. The modification process called for four major structural changes to a passenger aircraft: (1) the addition of a large side cargo door; (2) strengthening of the floor to allow it to support oversized cargo; (3) the addition of a cargo-roller system; and (4) additional equipment to ensure interoperability when functioning in support of the military.<sup>53</sup> Ultimately, however, the program failed because the DOD did not provide an

adequate incentive program for participating carriers and because Congress never provided adequate funding to implement the program. Although originally supportive, civil air carriers had two significant concerns with the program: (1) concerns about the profitability of the program and (2) concerns over the government's long-term support of the program.<sup>54</sup> These concerns are certainly valid and underscore the need for an acceptable incentive program supported with adequate funding by Congress.

### ***Increased Use of APSA and APSL***

Since it is apparent that the nation's merchant marines may be incapable of crewing the strategic vessels currently at sea, it is infeasible to assume that the same pool of merchant marines could also crew additional APSA ships. Even if the Army could produce the equipment to store on these additional ships, the unavailability of crews makes this a problematic option.

Expanding the APSL program, however, may be a better option. Although the Army is currently positioning a second heavy brigade set in the Arabian Peninsula, additional heavy equipment may soon become available. Between 2000 and 2002, the Army will convert a heavy brigade at Fort Lewis, Washington to an "interim" force equipped with medium-weight combat vehicles instead of Abrams tanks and Bradley fighting vehicles. The heavy equipment from this brigade would presumably be available for further service as a pre-positioned brigade set. Such a move would yield obvious benefits in the Army's effort to more effectively project power. This is a relatively cheap option in comparison to purchasing new equipment, however the cost of maintaining the vehicles would not be a trivial matter. In fact, some of the Army's equipment in the pre-positioned program has not been maintained to standard. A General Accounting Office

Report in 1997 found that approximately 25 percent of pre-positioned equipment did not meet the Army's readiness standards.<sup>55</sup> Further investigation revealed that most of the maintenance issues were with Army equipment in the APSA program, not APSL<sup>56</sup> Through the use of exercises such as Intrinsic Action, the Army has routinely drawn, inspected and utilized APSL equipment. In addition to the deterrent effect of Intrinsic Action, the exercises have ensured that this equipment is maintained and mission-capable.

A change to the APSA program that would enhance the overall force projection effort would be to pre-position and increased the number of support assets beyond those normally in the support slice for a brigade combat team. Some Army equipment such as helicopters, MLRS launchers, Patriot Missile systems and target acquisition radar are not normally included as part of the APSA equipment set due to their maintenance requirements and the corrosive environment aboard the ships. Although this is not likely to change, support vehicles and equipment, generators, trailers, supply trucks, etc., for these types of equipment could be pre-positioned in addition to, or in lieu of, equipment already in the APSA program. This would not be a significant increase in terms of floor space in APSA ship, but would significantly reduce the strategic airlift requirement for these types of unit. For example, the bulk of the weight in an Aviation unit comes from support assets, not the helicopters themselves. By pre-positioning the heavy portion of these units in APSA vessels, the Army could dramatically reduce the time required to deploy these critical units.

The Army's recent experience with Task Force Hawk in Albania highlights the importance of rapid deployment of Army Aviation, Aviation support, air defense and long-range fire support assets. Ironically, in this experience, it was those assets that are not

normally pre-positioned afloat (Apache helicopters and MLRS launchers) that were most urgently needed in Albania. The Task Force Hawk experience also reveals how little strategic airlift may be available to support a particular deployment when other competing demands, in this case Operation Allied Force, are on-going. Typical of many smaller airports around the world, Tirana airport had a relatively small airport that could accommodate only C-130s and C-17s. Larger strategic airlifters, C-5s, C-141s, and Boeing 747s required a much longer runway than was available at Tirana. The fact that Tirana airport had a relatively small maximum-on-the-ground (MOG) capacity, further complicated the problem. This MOG became the limiting factor in logistics and force flow via strategic air.

Another shortcoming of the APSA and APSL system is the Army's inability to conduct rapid off-load operations at a Sea Port of Debarkation (SPOD) which has austere off-load support equipment and inadequate host-nation transportation infrastructure. Getting pre-positioned equipment to an SPOD is only part of the problem. Rapid off-load and intra-theater transport via rail or heavy equipment transport (HET) is the other part. The Army and Marine experience in Saudi Arabia during Operation Desert Shield should be viewed with skepticism as far as its utility as an example for future deployments that involve introduction of forces at a foreign SPOD. Saudi Arabia has excellent deep-water ports with modern cranes and support equipment. This allowed the US to rapidly move equipment off ships and out of the ports. Units were air-landed at the modern airports at Ad Damman and Riyadh and rapidly linked-up with their vehicles. Future deployments to countries with more austere ports and infrastructure will be more challenging. The Army

would benefit from the inclusion of port support equipment and heavy vehicle transports in the either the APSA or APSL program.

This method easily satisfies all other criteria examined in this monograph: it is low-cost, it does not require a force-structure, service role or doctrine change and it can be done without an investment in future technology.

### ***Improving the Military Strategic Aircraft Fleet***

The Air Force is currently engaged in a study to determine how to best sustain and improve the strategic airlift fleet. This study is examining four major areas: re-engining the C-5, increasing the procurement of C-17s, re-fitting commercial airframes and fixing spare parts shortages and maintenance problems.<sup>57</sup> Each of these efforts is certainly worthy of exploration and debate, yet it is evident that some efforts are much more costly than others. The most expensive of the options currently being considered, increasing the C-17 buy to a total of 140 versus the current plan to produce 120, would result in a significant increase in rapidly deployable lift -- and this lift is sorely needed. Due to the high cost of procuring strategic airlifters, this option is probably infeasible given budget constraints. Also, such a decision would probably result in a decrease of money available for other strategic lift efforts, such as LMSR ship procurement.

A much less costly option for improving strategic lift capability is the effort to improve the C-5 spare parts program and to reprioritize the fleet's modernization. As previously stated, C-5 mission readiness has historically fallen well below the Air Force goal of 75% for the fleet overall. When compared to other strategic airlifters, the C-5's performance is discouraging. During the Army's recent deployment to Albania, the C-17 flew 72% of all Allied Force's strategic sorties and did so with a mission readiness rate of

96%.<sup>58</sup> In contrast, the C-5 fleet's mission readiness rate dropped to an all-time low of 61% for 1999.<sup>59</sup> The Air Force has plans to modernize the C-5A fleet over the next ten years through a two-stage process known as the Service Life Extension Program (SLEP). The first stage has already begun and involves overhaul of the aircraft's avionics, communications and navigation systems. Although urgently needed, the program has been under-funded in recent years, causing the Air Force to delay installation of the Traffic Collision Avoidance System (TCAS) and other critical upgrades by at least a year.<sup>60</sup>

Even if it is fully funded, SLEP has been criticized as having priorities that are out of synch with the program's purpose. Figure 2 illustrates the impact of the top 10 proposed modifications to the C-5A.

**Figure 2**

**Impact of Top 10 Proposed Modifications to the C-5 Aircraft**

PRIORITY	MODIFICATION	COST	INCREASE IN MCR*
1	Autopilot replacement	\$263.2	0.5
2	Engine turbine improvement	355.0	0.7
3	Engine vapor barrier	5.0	0
4	Floor corrosion prevention	6.2	0
5	Courier compartment flooring	86.1	0
6	Cabin outflow drain pan	1.3	0
7	D-sump lube line	0.6	0.1
8	Smart engine diagnostics	9.0	0.3
9	Nose landing gear door	0.3	0.1
10	Hydraulic valve replacement	2.2	1.1

\* MCR = mission capability rate

From these figures it is evident that the Air Mobility Command (AMC) has not prioritized their modernization program with respect to the expected effect on the fleet's mission readiness. The one modification that would result in the greatest increase in mission readiness, hydraulic valve replacement, is tenth in priority.

In addition to re-thinking C-5 modernization, C-5 mission readiness could be dramatically improved by solving the fleet's spare parts problem. Lack of spare parts has been consistently cited as one of the major reasons for the fleet's poor reliability. A study of C-5 reliability from 1992 through 1995 found that between 25 and 50 percent of all mission readiness problems were attributable to a lack of spare parts.<sup>61</sup> According to the Air Force, spare parts for the C-5 has always been an issue because of the way spare parts are procured and budgeted.<sup>62</sup> Funding for C-5 spare parts is based on the number of programmed flying hours for the aircraft, projected flying hours have been consistently underestof this practice has resulted in an acute problem for the fleet.

There is a precedent for fixing spare parts shortages. In 1994, the National Defense Authorization Act directed the Air Force to determine if the B-1B bomber fleet could sustain a readiness rate of 75 percent, which was approximately 18 percent higher than it was achieving at the time. The Air Force Operational Test and Evaluation Center (AFOTEC) was contracted to conduct the assessment at a cost of \$2.2 million.<sup>63</sup> AFOTEC found that by better managing spare parts repair cycles and making better use of existing spares the Air Force could achieve the goal of 75% mission readiness. AFOTEC's findings were validated by the DOD Operational Test and Evaluation Agency. After the assessment was completed, one bomber wing was chosen to implement the new procedures and soon achieved a mission readiness rate of 84 percent while mission readiness rate for the fleet rose to 66 percent.<sup>64</sup>

In addition to physical improvements in the strategic airlifter fleet, it may be appropriate to revise certain assumptions concerning strategic lift assets. The DOD makes an assumption concerning the role of the C 130 aircraft that may need reconsideration.



Since it is considered a tactical, or intra-theater lift asset, the C 130 is not normally considered as a strategic lift asset. In many overseas scenarios, this is a valid assumption. However, in operations near the continental US, it has functioned in a strategic role. The invasions of Grenada in 1983, Panama in 1989 and the aborted invasion of Haiti in 1994 demonstrate the utility of the C-130 as a strategic lift asset in scenarios that do not exceed the range of the C-130. While these were not MTWs, these operations were conducted largely by C130, thus minimizing the demand for strategic airlift. What is needed is a change in the way we calculate strategic lift requirements and a more realistic assessment of what can be conducted using those aircraft normally thought of as only "tactical" assets.

#### ***Changes in Sealift Procurement***

The Clinton Administration is in the midst of a plan to procure a total of 19 LMSRs. Eleven of these ships will be used to surge equipment from US ports to overseas destinations while the remaining eight will become part of the APSA program, replacing interim RO-ROs. Thus far, Congress has approved funding for thirteen of these nineteen vessels. Once complete, this effort will result in a significant increase in US surge sealift capability. According to the DOD, this capability will be sufficient to deploy two Army armored or mechanized divisions and the follow-on echelon for a Marine amphibious task force.<sup>65</sup> LMSRs are not without drawbacks, however. The most significant limitation of the vessels is that they require large, deep ports due to their length (954 feet) and deep draft when loaded. An example of this limitation was the deployment to Somalia during Operation Restore Hope. Because the port of Mogadishu had only one berth capable of docking large ships, the six SL-7s carrying Army equipment had to unload one at a time whereas smaller ships could have unloaded simultaneously.

Beyond the LMSR modernization plan, the congress and the DOD have different ideas concerning how to proceed with strategic sealift modernization. The DOD prefers an option to buy and reflag used foreign-built ROROs.<sup>66</sup> This course of action is attractive because it can be accomplished quickly without having to wait for ships to be built from scratch at US shipyards. The most significant drawback, however is that these ships, once they become part of the military fleet, must be crewed by the merchant marines. As previously discussed, the merchant marines may be incapable of crewing the US fleet as it exists today. By adding additional ships to the fleet the DOD would be adding additional strain on the already over-tasked merchant marines. Until the US resolves its problem with crewing strategic sealift vessels, any option that involves the purchase of additional shipping appears infeasible.

Some members of Congress favor an option known as the National Defense Features Program. This program is similar to CRAF, however, it would have the DOD pay commercial carriers to modify automobile carrying ships so that they could also accommodate tanks and other heavy, outsized equipment. The ships would then continue to operate as commercial carriers until called upon for service by the DOD. The DOD would pay annual subsidies in order to offset increased operating costs incurred by carrying the extra weight. The most attractive aspect of this program is its relatively low cost. DOD analysis of this option concluded that over a 40 year period, the cost per square foot of cargo capacity on such a modified commercial ship would be one-half to two-thirds that of a reflagged RORO.<sup>67</sup> In addition to low cost, another attractive aspect of this alternative is that it would not require merchant marine crews. US civilian crews would continue to operate these ships in wartime, as they had in peacetime. Another consequence

of this option is that it would increase business for US shipbuilders. This option satisfies all the criteria examined in this monograph. In fact, like the CRAF option, it requires only a minimum amount of effort by the DOD to manage the program in peacetime and requires no force structure, doctrine, or role changes. It can be executed quickly and should not exceed future budget outlays.

Instead of purchasing or building more of the same types of ships already in existence, the Navy might consider a technological solution to strategic sealift. Some US shipbuilding companies have begun work on new multi-hulled vessels powered by powerful gas turbine and water jet engines. These ships appear to be capable of maintaining speeds in excess of forty knots -- approximately double that of current large container ships. Until recently, shipbuilders have been reluctant to challenge traditional hull designs or propulsions systems.<sup>68</sup> This problem is not new. In the early 1800s, William Froude, a British naval architect, deduced that the maximum speed of any ship is approximately proportional to the square root of its length, but that this maximum velocity also varies with the volume of the hull.<sup>69</sup> Therefore, for any particular ship, there exists a *ne plus ultra*, a speed beyond which that ship cannot safely sail.<sup>70</sup> For a typical modern container ship 700 feet in length, this equates to a maximum speed of 23 knots on calm seas. Rough seas would dictate a much slower maximum safe speed, thus increasing delivery time. LMSRs, Commercial ROROs and FSSs all utilize conventional hull design. Not surprisingly, these ships can sustain maximum speeds of only 20 to 25 knots (30 knots in the case of the FSS) on calm seas. An added advantage to the multi-hull design is that such a ship is much less affected by rough seas compared to a ship with a traditionally designed hull. In a strategic sealift role, such a multi-hulled vessel could reliably complete

its missions without the now common weather delays. Although shipbuilders expect the first of these new high speed ships to be expensive, the first ones produced will probably be auto-carriers.<sup>71</sup> This may present the DOD an opportunity to enter into an agreement similar to the National Defense Features Program even as these ships are being built. Multi-hulled fast ships have already been built, but only as smaller naval and passenger craft.<sup>72</sup> However, the work is already underway to build the first of these high speed ships. A US shipbuilder, FastShip Atlantic, hopes to provide high speed freighter service between Europe and Philadelphia beginning in 2000.

In analyzing this option against the criteria for this monograph, this option appears to be very similar to that of the Defense Features Program. Two notable exceptions are that since none of the high speed ships have yet been built, the DOD would not gain an immediate increase in capability with this option. Furthermore, the cost of such ships is yet unknown so it is difficult to predict what the cost to the DOD would be to modify these vessels for military purposes. But such drawbacks should not eliminate this option from consideration. This exciting technology represents a paradigm shift in how the shipping industry currently views intercontinental shipping. The DOD would be wise to invest itself early in this effort.

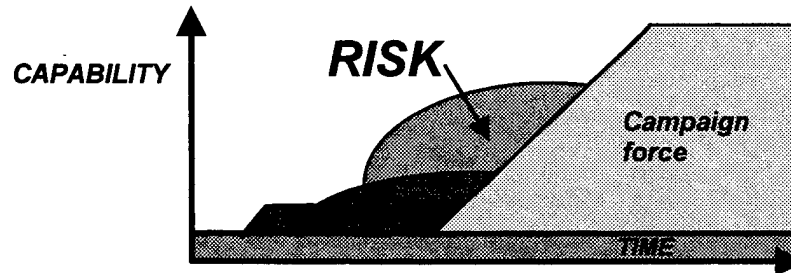
### ***Army Force Structure Changes***

Instead of focusing on how to modify strategic lift assets to better deploy Army assets, it is worth considering what the Army could do with existing equipment to make the units in its current force structure more deployable and make the rapid deployment units more lethal. Increasing the lethality of early-entry forces would essentially buy time for the Army's heavy forces to arrive. As the figure below illustrates, in a forced entry

operation there is a significant period of risk following an initial assault and lasting until sufficient combat power is built up in the theater.<sup>73</sup>

**Figure 2**

**Early Entry Forces  
Capability versus Time**



In 1996, the Army Chief of Staff (CSA) made the decision to cancel the Armored Gun System (AGS). The AGS was to be a light-weight armored vehicle that would take the place of the Army's aging light armored vehicle, the M551 Sheridan. Shortly after the AGS program was canceled, the Army deactivated the last of its Sheridans - - those that comprised the one air-droppable armored battalion of the 82d Airborne Division. Thus the 82d Airborne, which fulfills the JSC requirement to maintain a strategically deployable DRB, lost significant lethality. In any forced entry operation, the Army now relies on the Immediate Ready Company (IRC), provided by the 3d Infantry Division, to add lethality to the assault force. The IRC consists of four Abrams tanks, four Bradley fighting vehicles and a logistic support package and is capable of deployment via eight C-17s in less than eighteen hours. The IRC represents a tremendous strategic capability, but it cannot get on the ground until an airfield is secure and the surface-to-air missile threat is neutralized, whereas the Sheridans were immediately available because they were deployed via parachute.

In order to reduce the bubble of risk as depicted in figure 2, the Army could increase the lethality of its light assault forces. This could be done in a number of ways, some of which are currently under review by the Army. Several off-the-shelf weapons systems exist which would fulfill this role. One is the LOSAT (Line of Sight Anti-Tank). The LOSAT is a highly lethal missile that can be mounted on a HMMWV, air-dropped or transported in a C-130. In fact, the lethality delivered by the LOSAT far exceeds that of the 120mm gun on the Abrams tank. In terms of kinetic energy (KE), the LOSAT missile delivers approximately 50 mega joules whereas the Abrams tank's most lethal munition, the 120mm sabot, delivers only nine mega joules.<sup>74</sup>

Another system that would provide a significant increase in lethality for the light forces is the High Mobility Artillery Rocket System (HIMARS). The HIMARS is essentially a Multiple Launch Rocket System (MLRS) launcher mounted on a 5-ton truck. Although it cannot be air-dropped, it can be transported and air-landed via C-130 or C-17. With the extended range rocket, the HIMARS would extend the indirect fire capability of an initial entry force to 45km - - far greater than the 19km range provided by the 105mm howitzers of the Army's light division artilleries. In March 2000 the HIMARS demonstrated its capability in a live-fire exercise at Fort Bragg, NC that included C-130 air delivery of the system. After the successful demonstration, an army spokesman at the Pentagon, Maj. Bill Bigelow, underscored HIMARS potential contribution: "HIMARS is an extremely valuable piece of the (Army transformation)... It fully embodies the Army vision of becoming more lethal, highly deployable and flexible."<sup>75</sup> While the platoon of four launchers at Fort Bragg are prototypes, they are fully functional and could be deployed in time of crisis. Fielding of the first HIMARS unit is scheduled for 2004.

An option that would involve no new system procurement is one that involves a change in the role and responsibility of certain Army National Guard units. The concept would be to reconfigure the equipment of certain Army National Guard units that are stationed near high capacity, deep-water ports on the US coasts. With the exception of the 3d Infantry Division, located near the port of Savannah, GA, one of the Army's weaknesses is its ability to quickly move heavy combat units to ports for sea deployment. Given that commercial cargo delivery is relying more and more on air delivery versus rail and truck methods, the existing rail infrastructure will not likely improve in coming years. By taking advantage of ARNG units already near ports, the Army could mitigate this weakness. This option would involve configuring a mechanized or armored Army National Guard division into brigade combat team sets stored in humidity controlled warehouses and configured in such a manner that they could be quickly loaded onto strategic sealift vessels.<sup>76</sup> In time of crisis, Army National Guard soldiers would outload their equipment at the port and soldiers from a similar CONUS-based Active Duty heavy brigade would fly to the appropriate overseas SPOD to receive the equipment. Obvious candidates for this conversion might be the Pennsylvania Army National Guard, some of which could be positioned near the port of Philadelphia, and the New Jersey Army National Guard's 50th Armored Division which is already positioned near the port of Newark. While this solution would involve some obvious changes to positioning and storage of National Guard units, the cost for the conversion is relatively small. The Army would also have to readjust its overall modernization plan with the inclusion of Army National Guard equipment.<sup>77</sup> While some policy changes might be required regarding relationships between the National Guard Bureau and the Active Army, this method should be appealing to members of

congress. This action would support the CSA's "Division Partnership Program" between the Active Army and the National Guard and would include the Guard as part of the nation's power projection effort.<sup>78</sup>

A related change that the Army might consider is to reconfigure its deployable CONUS based units so that they can be more easily loaded on to commercial sealift vessels. Currently, heavy Army brigades are not configured in such a way that facilitates rapid on-load and off-load onto commercial ships.<sup>79</sup> By repackaging Army units to facilitate this type of deployment, the Army could exploit commercial shipping assets and dramatically reduce on-load and off-load times. Again, this would be a relatively low-cost modification with a potential high payoff in time of deployment. It would not involve changing force structure, doctrine or policy, and could be completed rapidly.

Over the next decade, the commercial air cargo capacity will grow at an incredible rate while the military's strategic lift capacity will remain essentially constant. This growth presents an opportunity that the DOD and the Army cannot ignore. In its development of the "interim" brigade and in its work on the Army's Future Combat System (FCS), most planners have placed tremendous importance on ensuring that whatever system is selected or developed is transportable via C-130. While this appears to be a prudent requirement, it may drive the Army to make some assumptions that may not prove valid in the future.

Two of the most severe restrictions encountered when attempting to make a vehicle "C-130 transportable" are size -- particularly width, and weight. With a maximum cargo width of only 8 feet, the C-130 can accept only a small range of available combat vehicles. Perhaps even more limiting is the maximum weight restriction. While the wartime maximum load for a C-130 is 22 tons, the Air Force prohibits peacetime flight if the load exceeds 17 tons.



Thus if the Army procured a 20 ton vehicle, it would be able to deploy via C-130 during war, but would not be able to train using C-130s in peacetime.

The Army would be wise to consider requiring that all future vehicles be compatible with commercial aircraft as well. The potential cost savings if the Army capitalizes on this opportunity are tremendous. It costs the Army absolutely nothing to specify a requirement for a future system, and the cost of programs such as the Defense Features Program, if applied to portions of the commercial air cargo fleet, is relatively small when compared to the cost of modifications of existing aircraft or combat vehicles if in the future the Army determines that a mismatch exists between transport assets and outsized vehicles.

## V. CONCLUSIONS

National Security Strategy directs the military to be capable of flexible, responsive strategic mobility. The National Military Strategy further defines this requirement for the military by establishing the standard of being able to support OCONUS deployment to two near-simultaneous major theater engagements. The NMS further articulates Power Projection as one of the key tenets of military strategy. But, beyond the language included in the NMS, the requirements for strategic mobility are subject to legitimate debate because so many assumptions are required to analyze any possible scenario. There exists a great danger in making these assumptions because policy makers might erroneously conclude that some capabilities are no longer required. Regarding the issue of the C-17 wing-tip vortex problem, one argument is that the problem is a moot point because it is unlikely that the US will conduct a strategic brigade airdrop in the future and therefore we should not view the C-17 as a platform for strategic airdrop of personnel. Such assumptions by lower-level officials may be considered short-sighted because by abandoning the C-17 as a platform for airdrop, the nation could forever lose that capability. Furthermore, to do so would be to deny the NCA the ability to employ a credible FDO.

Another dangerous assumption in analysis of strategic airlift is the exclusion of the C-130 in such discussions. This exclusion is normally intentional because the C-130 was designed for short-range intra-theater transport. In some scenarios, however, especially those in the SOUTHCOM area of responsibility (AOR), this exclusion may not be valid since C-130s can easily range this AOR from bases in the southern United States.

Beyond the need to carefully think through these necessary assumptions, it is clear that some combination of the various modes of strategic airlift will be necessary in the

future. No single platform is suitable for the range of missions the military will be called upon to perform. Some combination of C-17s, C-5Bs, C-33s and CRAF aircraft will fill this role. As C-141 retirement has been accelerated while C-17 procurement has slowed, there exists the possibility that the nation may face a capabilities gap with its military strategic airfleet. Add to this possibility the fact that the C-5A fleet is notoriously unreliable, and the capability gap becomes potentially greater. The prospect of using 747-400s either converted to C-33s or through CRAF may be a means to fill this gap.

Fortunately for the Navy, ODS highlighted significant deficiencies in the nations strategic sealift fleet. To their credit, the Navy and the Maritime Administration have made significant progress in procuring badly needing shipping resources and ensuring that the fleet is maintained as required. Despite the progress made in procuring new ships, the nation is approaching a crisis in its ability to crew strategic sealift vessels. If current trends continue, the merchant marines will soon be incapable of filling the estimate 4000 billets required in a prolonged crisis.<sup>80</sup>

Despite popular misconceptions, the Army's move toward a lighter medium "interim" force does not necessarily translate to increased reliance on strategic air and less reliance on strategic sealift for transport of combat equipment. Although an "interim" combat vehicle that weighs less than 30 tons might seem to be easier to transport than a 60-ton M1A2 tank, the reality is that most of these vehicles will most likely be transported via ship. Since the capacity of the C17 is 45 tons while the capacity of the C-5 is 65 tons, the number of aircraft required to transport an "interim" unit will not be substantially different from the number required to transport an equivalent heavy unit. The great advantage in

deploying "interim" versus heavy units is that the "interim" forces require drastically less POL for sustainment.

## VI. RECOMMENDATIONS

Rapid change is occurring in the nation's commercial cargo shipping industries. Reliance on rail and sea transport is declining while truck transportation is becoming more important and use of air transport is increasing geometrically. The DOD should conduct a holistic examination of the strategic transportation system in light of this new environment. Assumptions based on commercial air cargo transportation capabilities of the mid-1990s will soon become invalid as the capacity of these carriers is expected to double every four years. The future is air cargo transport.

The DOD has not conducted a holistic full-scale examination of its transportation system in twenty years.<sup>81</sup> In 1978, the DOD conducted an exercise known as Nifty Nugget that simulated an unexpected attack by the Warsaw Pact on NATO. This exercise was extremely valuable because it revealed significant inadequacies in the DOD's mobilization and transportation systems. Based on lessons learned from Nifty Nuggett, the DOD instituted important acquisition and transportation changes that helped make mobilization for the Gulf War a success.<sup>82</sup> In light of the rapid change occurring in the commercial air cargo system, the DOD would be wise to conduct another Nifty Nugget type of exercise to validate or revise the myriad of assumptions on which the DOD bases its strategic airlift plans.

The DOD and Congress can significantly improve the nation's strategic lift capability without procuring additional aircraft or ships. Some of these actions are investments in future systems and platforms. The opportunity to become involved in high speed ship design, is one example. Recent developments in high speed ship design are exciting. The DOD should capitalize on the opportunity to partner with industry and

explore the feasibility of implementing a system such as the Defense Features Program. Such a program would ensure that when high speed ocean transport vessels are built, at least some will have the capability to transport military equipment. A DOD investment now, in the research and development phase, could prove much less expensive than retrofitting high speed ships for military service once they are built.

Although a focus on future sealift is essential, there are also some immediate concerns with strategic sealift. The current state of the Merchant Marines is such that their dependability in time of crisis is in question. In evaluating its concept for strategic deployability, the DOD should re-assess its expectation of the Merchant Marines' ability to crew the RRF. The Cold War models for RRF activation may be no longer valid. The DOD must consider how this deficiency will be overcome. The National Defense Features Program may be a feasible option. The DOD should consider this and other possibilities.

DOD involvement in the design and production of civilian transportation assets should not be focused on sealift alone. As new passenger aircraft are designed and produced, the DOD could become involved in designing these aircraft so that they are built in such a way as to facilitate future conversion for military use. Such a program would achieve the objectives of the CRAF Enhancement Program of the 1970s, but at relatively low cost since expensive conversions would be avoided.

Although it is much more capable than the C-141 it is replacing, the C-17 has one glaring deficiency: its inability to fulfill the SBA role. The nation will lose its ability to conduct a Strategic Brigade Airdrop by 2007 if a solution is not found to the C-17 wingtip vortex problem. The NCA may decide to accept the assumption that the chance of conducting a Strategic Brigade Airdrops in the future is so unlikely that this loss in

capability is inconsequential or not worth the cost of a solution. However, this decision should be left to the NCA, the JCS and Congress. As planners, we cannot blindly assume that the NCA will forgo this option.

In addition to DOD wide exercises, the Army should consider exercises that emphasize commercial airlift and sealift. An exercise in which an Army brigade or division conducted a deployment to an overseas location, using only commercial airlift and sealift assets, would yield invaluable lessons learned and assist strategic planners in validating their many necessary assumptions. If these exercises were conducted at overseas APODs and SPODs where reception facilities and infrastructure are immature, the Army would be forced to think through issues which will undoubtedly arise when we attempt to introduce forces into inhospitable environments in the future. We need not learn the hard lessons from deployments to Somalia and Albania again.

In his concept, General Shinseki stated that "Heavy forces must be more strategically deployable...and light forces must be more lethal...."<sup>83</sup> By doing so, the Army aids in solving the overall strategic lift problem. General Shinseki has it right, buying more strategic lift assets is only part of the solution to increasing strategic deployability. The Army must do what it can to increase its own deployability. The Army's transformation process is part of this effort, but transformation alone will not solve the problem. The Army must invest in the technology required for the FCS and field other weapon systems that will give the light forces increased lethality. Obviously, Congressional support and funding will be essential in making this goal a reality.

Finding the funds for this transformation is more than just an issue between the DOD and Congress. Another poignant issue is that the DOD has sharply curtailed the

Army's modernization budget while sustaining relatively high modernization outlays for the other services. Between 1998 and 2001, the Army received \$57 billion for modernization. During the same period, the Navy/Marine Corps received \$116 billion and the Air Force \$137 billion.<sup>84</sup> Representative Curt Weldon, Chairman of the House Armed Services research and development subcommittee, recently said: "...there is one small problem with the effort to transform the Army into a lighter, more lethal and tactically transportable force: The funding is not there."<sup>85</sup>

Joint Vision 2010 asserts that the DOD should focus on ways to capture lessons learned from civilian counterparts.<sup>86</sup> Business practices that have proved successful in civilian transportation efforts are worth examining to determine their utility for military application. The 1997 Air Mobility Symposium identified several key business practices that could be emulated in the air mobility system: focus on core competencies, focused span of control, partnerships, and an effective interface for handoff of task.<sup>87</sup> Similarly, the Army Science Board is currently studying ways in which the Army can learn from the civilian air-freight industry. Since Desert Storm, companies such as Federal Express, Airborne Express, UPS and others have greatly increased their volume of cargo delivered while decreasing delivery times.

Many positive changes have occurred and are occurring in the triad of US strategic lift assets since Desert Storm. Despite this progress, the Army faces a significant obstacle in its transformation effort due to grossly inadequate funding. If this transformation does not occur, the Army will not become appreciably more deployable nor more lethal. The DOD and congress should not expect the Army to pay for transformation out of its already austere budget. The DOD budget for Army modernization is unrealistic, runs counter to the



goals set forth in Joint Vision 2010, and is inconsistent with the modernization programs of the other services. Supporters of the Army, including industry, unions, veterans, lawmakers and Army leadership should rise up and demand appropriate funding.<sup>88</sup>

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## ENDNOTES

<sup>1</sup> United States Congress, Congressional Budget Office Report, *Moving US Forces: Options for Strategic Mobility*, (Washington: US Government Printing Office, 1997) 19.

<sup>2</sup> Jeffrey Record, *US Strategic Airlift: Requirements and Capabilities*, (Cambridge, MA: Institute for Foreign Policy Analysis) 13.

<sup>3</sup> The White House, US National Security Strategy, *A National Security Strategy for a New Century*, (Washington: US Government Printing Office, 1999) 11.

<sup>4</sup> Ibid.

<sup>5</sup> United States Department of Defense, *National Military Strategy*, (Washington, US Government Printing Office, 1999) 1.

<sup>6</sup> Ibid.

<sup>7</sup> Ibid.

<sup>8</sup> United States Department of Defense, *National Military Strategy*, (Washington, US Government Printing Office, 1999) 1.

<sup>9</sup> United States Congress, Congressional Budget Office Report, *Moving US Forces: Options for Strategic Mobility*, (Washington: US Government Printing Office, 1997) 4.

<sup>10</sup> Ibid, 9.

<sup>11</sup> Ibid.

<sup>12</sup> Similar to CRAF, VISA is a government-sponsored incentive program in which commercial shipping companies are compensated for the use of their vessels in time of national emergency.

<sup>13</sup> Joseph Braddock, Michael Krause, and David Maddox, "Enabling Strategic and Decisive Maneuver for the Army Beyond 2010," *Army Science Board, FY 1999 Summer Study Final Report*, (August 1999) 2.

<sup>14</sup> Ibid.

<sup>15</sup> Ibid.

<sup>16</sup> Association of the United States Army, "Strategic Mobility and Responsive Power Projection," *Institute of Land Warfare Report*, (August, 1999) 14.

<sup>17</sup> Ibid.

<sup>18</sup> Ibid., 16.

<sup>19</sup> David G. Harris and Richard D. Sweat, "US Surge Sealift Capabilities: A Question of Sufficiency," *Parameters*, (Spring, 1998) 1.

<sup>20</sup> United States Congress, Congressional Budget Office Report, *Moving US Forces: Options for Strategic Mobility*, (Washington: US Government Printing Office, 1997) 31.

<sup>21</sup> Ibid.

<sup>22</sup> Ibid, 35.

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<sup>23</sup> Outsize cargos are those which can be transported only by C-17 and C-5. Oversize cargos are those loads that can be transported by C141, Boeing 747-400 or larger aircraft. Bulk cargos are those loads that can be transported by C130 or larger aircraft.

<sup>24</sup> United States General Accounting Office, Letter Report NSIAD 96-43, *Strategic Airlift: Improvements in C-5 Mission Capability Can Help Meet Airlift Requirements*, (Washington: US Government Printing Office) 3.

<sup>25</sup> United States Congress, Congressional Budget Office Report, *Moving US Forces: Options for Strategic Mobility*, (Washington: US Government Printing Office, 1997)34.

<sup>26</sup> Ibid.

<sup>27</sup> John A. Butler, *Sailing on Friday: The Perilous Voyage of America's Merchant Marine*, (Washington: Brassey's, 1997) 1.

<sup>28</sup> Ibid.

<sup>29</sup> United States Congress, Congressional Budget Office Report, *Moving US Forces: Options for Strategic Mobility*, (Washington: US Government Printing Office, 1997)34.

<sup>30</sup> Ibid.

<sup>31</sup> Ibid.

<sup>32</sup> Record, *US Strategic Airlift: Requirements and Capabilities*, 17.

<sup>33</sup> Ibid.

<sup>34</sup> Erin Q. Winograd, "USAF Study Says C-17 Airdrop Goals Can Be Met, Army Still Concerned," *Inside the Army* (February 7, 2000) 2.

<sup>35</sup> Ibid.

<sup>36</sup> United States General Accounting Office, Letter Report NSIAD 95-24, *Ready Reserve Force: Ship Readiness Has Improved, but Other Concerns Remain*, (Washington, US Government Printing Office, 1995) 2.

<sup>37</sup> Harris and Sweat, "US Surge Sealift Capabilities: A Question of Sufficiency," *Parameters*, (Spring, 1998) 2.

<sup>38</sup> Ibid.

<sup>39</sup> United States Transportation Command, "Strategic Sealift," *US Transportation Command Web Site*, (2000).

<sup>40</sup> Harris and Sweat, "US Surge Sealift Capabilities: A Question of Sufficiency," *Parameters*, (Spring, 1998) 2.

<sup>41</sup> United States General Accounting Office, Letter Report NSIAD 95-24, *Ready Reserve Force: Ship Readiness Has Improved, but Other Concerns Remain*, (Washington, US Government Printing Office, 1995) 3.

<sup>42</sup> United States Transportation Command, *Department of Transportation Statement of Acting Maritime Administrator John E. Graykowski Before the Oversight Panel on the Merchant Marine of the Committee on National Security, US House of Representatives: In Support of the Fiscal Year 1999 Authorization for the Maritime Administration*, (1999) 3.

<sup>43</sup> Harris and Sweat, "US Surge Sealift Capabilities: A Question of Sufficiency," *Parameters*, (Spring, 1998) 2.

<sup>44</sup> Ibid.

<sup>45</sup> Ronald A. Priddy, Air Mobility Symposium Final Report, *US Civil Aviation's Contribution to Improved Air Mobility*, (Washington: US Government Printing Office, 1998) 180.

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- <sup>46</sup> Ibid.
- <sup>47</sup> Ibid.
- <sup>48</sup> Dan Schroeder, "Focused Logistics and CRAF," *Defense Transportation Journal*, (2000) 1.
- <sup>49</sup> Ibid.
- <sup>50</sup> Ibid., 2.
- <sup>51</sup> William G. Palmby, "Enhancement of the Civil Reserve Air Fleet: An Alternative for Bridging the Airlift Gap," *School of Advanced Airpower Studies Thesis*, (Maxwell Air Force Base, Alabama: Air Unive 13
- <sup>52</sup> Ibid.
- <sup>53</sup> Ibid., 15.
- <sup>54</sup> Ibid.
- <sup>55</sup> United States General Accounting Office, Letter Report NSIAD 97-169, *Afloat Prepositioning: Not All Equipment Meets Army's Readiness Goal*, (Washington: US Government Printing Office, 1997) 1.
- <sup>56</sup> Ibid., 4.
- <sup>57</sup> United States Senate, Press Statement No. 133, S11084, *Protecting Our Strategic Airlift*, (September 29, 1998) 1.
- <sup>58</sup> Nathan Perry, "Competitors or Partners? Deconstructing the Myth of Duplication," *Northrup Grumman Web Site*, (2000) 1.
- <sup>59</sup> Ibid.
- <sup>60</sup> United States Senate, Press Statement No. 133, S11084, *Protecting Our Strategic Airlift*, (September 29, 1998) 1.
- <sup>61</sup> United States General Accounting Office, Letter Report NSIAD 96-43, *Strategic Airlift: Improvements in C-5 Mission Capability Can Help Meet Airlift Requirements*, (Washington: US Government Printing Office) 5.
- <sup>62</sup> Ibid.
- <sup>63</sup> Ibid., 6.
- <sup>64</sup> Ibid.
- <sup>65</sup> United States Congress, Congressional Budget Office Report, *Moving US Forces: Options for Strategic Mobility*, (Washington: US Government Printing Office, 1997) 3-7.
- <sup>66</sup> Ibid., 3-10.
- <sup>67</sup> Ibid., 3-9.
- <sup>68</sup> David A. Giles, "Faster Ships for the Future," *Scientific American*, (October 1997) 2.
- <sup>69</sup> Ibid.
- <sup>70</sup> Ibid.
- <sup>71</sup> Ibid., 3.
- <sup>72</sup> Ibid., 4.
- <sup>73</sup> Braddock, Krause, and Maddox, "Enabling Strategic and Decisive Maneuver for the Army Beyond 2010," *Army Science Board, FY 1999 Summer Study Final Report*, (August 1999) 26.
- <sup>74</sup> Source: Lockheed Martin Missiles and Fire Control.

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<sup>75</sup> Stella M. Hopkins, "Weapons System Test Offers a Glimpse of Army's Future," *Charlotte Observer*, (March 22, 2000) 1.

<sup>76</sup> Braddock, Krause, and Maddox, "Enabling Strategic and Decisive Maneuver for the Army Beyond 2010," *Army Science Board, FY 1999 Summer Study Final Report*, (August 1999) 16.

<sup>77</sup> Ibid.

<sup>78</sup> Ibid.

<sup>79</sup> Ibid., 18.

<sup>80</sup> Harris and Sweat, "US Surge Sealift Capabilities: A Question of Sufficiency," *Parameters*, (Spring, 1998) 4.

<sup>81</sup> Schroeder, "Focused Logistics and CRAF," *Defense Transportation Journal*, (2000) 3.

<sup>82</sup> Ibid.

<sup>83</sup> Association of the United States Army, "Strategic Mobility and Responsive Power Projection," *Institute of Land Warfare Report*, (August, 1999) 14.

<sup>84</sup> Curt Weldon, "Army Underfunded," *Defense News*, (April 18, 2000) 18.

<sup>85</sup> Ibid.

<sup>86</sup> Randy A. Kee, Air Mobility Symposium Final Report, *Air Mobility Entering the 21st Century: Integrating Efforts for Rapid Global Mobility*, (Washington: US Government Printing Office, 1997) 220.

<sup>87</sup> Ibid.

<sup>88</sup> Weldon, "Army Underfunded," *Defense News*, (April 18, 2000) 18.

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