



**STRATEGY  
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**ASYMMETRIC WARFARE – CAN THE CIVIL RESERVE  
AIR FLEET MEET THE CHALLENGE?**

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**ASYMMETRIC WARFARE—CAN THE CIVIL RESERVE AIR FLEET MEET THE CHALLENGE?**

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## ABSTRACT

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From the beginning of the use of airpower as a means to transport men and material, commercial airlines have provided the necessary augmentation to allow military operational planners to incorporate additional civil lift as part of it's warfighting capability. This concept of commercial airline augmentation of military lift was formalized in 1952 and called the "Civil Reserve Air Fleet" or CRAF program. Conventional U.S. military strategy saw CRAF flying safely into allied airfields far from enemy lines and the physical risk to commercial air carriers was considered low. Yet, as was seen during Operation DESERT SHIELD and DESERT STORM, it was necessary for CRAF to fly directly into Saudi Arabian airbases under the threat of surface-to-surface missile and chemical attacks, a situation that CRAF aircrews were unprepared to face. Future conflicts may constitute a greater threat to CRAF than in the case of the Gulf War. Proactive initiation of programs to mitigate known asymmetric threats to commercial carriers employed in either a voluntary or activation mode will go a long way in strengthening carrier confidence in the CRAF program. In addition, it will ensure that this important strategic asset will not be degraded when it is needed most.



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## ASYMMETRIC WARFARE—CAN THE CIVIL RESERVE AIR FLEET MEET THE CHALLENGE?

"The commercial air carrier industry will be relied upon to provide the airlift capability required beyond that available in the organic military airlift fleet. It is therefore the policy of the United States to recognize the interdependence of military and civilian airlift capabilities in meeting wartime airlift requirements, and to protect those national security interests contained within the commercial air carrier industry".<sup>1</sup>

—National Airlift Policy, 1987

The United States military has never had a sufficient organic airlift capability to sustain forces in any protracted conflict. The cost to maintain a large transport-specific air fleet in case of potential use was simply too prohibitive. Therefore, from the beginning of the use of airpower as a means to transport men and material, commercial airlines have provided the necessary augmentation to allow military operational planners to incorporate additional civil lift as part of its warfighting capability.<sup>2</sup> This concept of commercial airline augmentation of military lift was formalized in 1952 and called the "Civil Reserve Air Fleet" or CRAF program.<sup>3</sup>

Conventional U.S. military strategy saw CRAF flying safely into allied airfields far from enemy lines and the physical risk to commercial air carriers was considered low.<sup>4</sup> Yet, as was seen during Operation DESERT SHIELD and DESERT STORM, due to the great distances between appropriate airports in the region, it was necessary for CRAF to fly directly into Saudi Arabian airbases under the threat of surface- to-surface missile (referred to as "Scuds") and chemical attacks, a situation that CRAF aircrews were unprepared to face.<sup>5</sup>

Future conflicts may constitute a greater threat to CRAF than in the case of the Gulf War. U.S. opponents, i.e., state and nonstate actors such as drug lords, terrorists, and foreign insurgents, will not want to directly engage American military superiority. Instead, they will choose political and military strategies designed to dissuade the United States from using force, or, if the U.S. does use force, to exhaust American will. They will focus their efforts to circumvent or minimize U.S. strengths, and exploit perceived American weaknesses. Asymmetric challenges can arise across the spectrum of conflict and will likely involve rear-area attacks.

Ballistic surface to surface missiles (SSM), chemical/biological agents, and infra-red guided surface to air missiles utilized by special operations forces (SOF) or terrorists are all examples of an asymmetric threats that can expand a zone of combat and deny or degrade the use of a critical airfield by commercial aircraft carrying troops and military supplies. Most countries in the world have more airfields than ports, thereby resulting in the concentration of cargo and passenger debarkation operations at vulnerable choke points.

CRAF is extremely dependent upon the availability of maintenance and fuel support structures at foreign commercial airfields and access to them is critical for strategic mobility success. Commercial aircraft are designed to carry large payloads over long distances at the least cost, but they are not as flexible as military aircraft. They cannot perform an airdrop mission nor are they designed to operate out of small austere airfields. They require longer runways to take off and land than military airplanes. CRAF airlift can lift all bulk and some oversized cargo, but not outsized cargo due to the structural size and floor strength limitations. They also require specialized ground handling equipment, one that elevates cargo in order to reach the side-mounted loading door.<sup>6</sup> Ignoring the impact of attacks on commercial, rear-area airports, could delay the movement of forces as long as crews refuse to fly and companies refuse to allocate aircraft until the threat is eliminated or negligible.

There are legal and political ramifications associated with sending commercial crews and aircraft into hostile environments. Airlines are not expected to accept even moderate risks to their aircraft, and civilian crews are not obligated to volunteer to put themselves in active areas of combat. In addition, civilian aircrews are not fully trained nor do they possess the special equipment required to operate in chemical and biological areas or from airfields where they may be subject to hostile fire.<sup>7</sup>

The elimination of the CRAF program is not an option. CRAF is an essential element of the U.S.'s post cold-war power projection strategy, of rapidly moving forces to regional hot spots rather than relying on forward-based units. CRAF augmentation provides 50% of our strategic lift, 100% of our strategic aeromedical capability, 91% of our passenger, and 41% of cargo in a long-range and sustained international role.<sup>8</sup> CRAF frees U.S. Transportation Command (USTRANSCOM) organic lift for military unique missions involving rapid response, outsized cargo, and combat operations. Without CRAF, it would cost over 50 billion dollars for the U.S.

military to procure the equivalent number and types of aircraft and one to three billion dollars annually to operate.<sup>9</sup>

CRAF carriers continue to participate voluntarily in carrying troops, refugees and cargo in smaller military operations, such as Somalia, Bosnia, Rwanda, Panama, Philippines, and Haiti, without activation of their fleets.<sup>10</sup> In case of a major theater war, CRAF's wide array of assets, in conjunction with active duty, guard and reserve airlift assets, create the linchpin to the successful execution of U.S. national security strategy abroad.

Since CRAF is an integral component of our strategic airlift capability, how can this commercial component, to which we are so dependent, be protected in the face of asymmetric threats? If not, how will CRAF withdrawal or reduction impact military airlift requirements as part of our global strategy, and hence, our warfighting options?

### **THE CRAF PROGRAM STRUCTURE**

The Department of Transportation (DOT), through the Federal Aviation Administration (FAA), provides operational support to CRAF aircraft, monitors flight times for CRAF crews, issues non-premium Title XIII hull and liability insurance coverage for activated aircraft, and ensures that carriers meet operations and safety standards.<sup>11</sup>

Since CRAFs inception, participating carriers have been covered by the Aviation War Risk Insurance Program, which is administered by the FAA. The program is designed to reimburse carriers for losses due to causes such as war, capture, hijacking, strikes, or vandalism. Private insurance companies can increase premiums substantially or cancel coverage for air carriers operating in a war zone.

Once the Department of Defense (DOD) determines the size and composition of CRAF, DOT allocates aircraft to Air Mobility Command (AMC), taking into consideration civil airlift requirements. AMC continues to coordinate the CRAF plans with commercial carriers and award contracts. The exact size and composition of CRAF fluctuates as carriers adjust the number of participating aircraft due to maintenance and equipment sales or acquisitions.<sup>12</sup> All

major U.S airlines are CRAF participants. In addition, many major cargo firms, such as Federal Express, United Parcel Service and Emery Worldwide are members of CRAF. <sup>13</sup>

CRAF participants must use U.S.-registered aircraft, must maintain at least four full crews (US citizens only, no reservists), commercial pallets, navigation route kits and commit a specified number of aircraft meeting the requirements of a given CRAF segment. <sup>14</sup>

Carriers are rewarded for participating in the CRAF program by obtaining a share of DOD's peacetime business of carrying passengers and cargo, such as medical supplies, retail goods for base exchanges, and classified shipments. <sup>15</sup> This business provides an additional source of revenue for the domestic commercial air carrier industry.

Airlines participating in CRAF voluntarily commit passenger and cargo aircraft as requested by DOD under a three-stage call-up plan. The three stages are used to provide a tailored response to lift requirements and no more aircraft are called up as necessary. Aircraft numbers for the three stages are cumulative and are changed monthly.

Stage I can be mobilized by the Commander-in-Chief of Air Mobility Command within 24 hours of mission notification as a response to minor regional crises. <sup>16</sup> Stage 1 consists of one segment only, the long-range international (LRI). A Stage I activation would have little impact on the commercial sector since a low percentage, 9%, is culled from the commercial sector. <sup>17</sup>

Aircraft assigned to Stage I is automatically assigned to Stage II to support a major regional contingency. Stage II can only be activated by the Secretary of Defense and includes four segments: Alaskan, Domestic, Short-Range International (SRI) and LRI. As in Stage I, crews and aircraft must report for duty within 24 hours of mission notification. <sup>18</sup> Stage II begins to create some hardship on the carriers, with 22% of its carriers involved. Stage II activation will most likely affect some service depending on the duration of the activation. <sup>19</sup>

Stage III can only be called by the Secretary of Defense after the President or Congress authorizes a national defense emergency. Stage III will create an adverse effect on the market with nearly half, 48%, of the capacity of the air carriers in the CRAF removed from commercial sector. <sup>20</sup> This segment involves the aeromedical segment with crews and aircraft having 48 hours to report to the designated onload site. <sup>21</sup>

Besides the three CRAF Stages, AMC assigns aircraft to one of the three mission segments: international, domestic and aeromedical. The international segment consists of long-range and short-range aviation. The long-range international aircraft makes up the largest category and represents critical strategic lift capability. These aircraft will transport passengers and cargo from one theater to another or across oceans, to at least 3,500 nautical miles and for at least 10 hours. This includes aircraft such as the Boeing 747, 757 and 767, Douglas DC-10 and Airbus A310.<sup>22</sup>

The short-range segment supports operations from CONUS out to 1,500 nautical miles, reaching the Caribbean, Central America, Greenland and Iceland. Aircraft include the Boeing 727 and 737.<sup>23</sup>

The national segment is made up of domestic and Alaskan sections. Carriers must be capable of carrying 75 passengers or 32,000 pounds of cargo. The domestic segment supports continental U.S. passenger, cargo and aircrew movements, using such aircraft as the Boeing 737. The Alaskan segment supports Pacific Commands area of operations and flying in severe weather conditions.<sup>24</sup>

The aeromedical evacuation segment assists in the evacuation of casualties from operational theaters to hospitals in the U.S. These aircraft are also used to return medical supplies and medical crews to the theater of operations. Kits containing litter stanchions, litters and other aeromedical supplies are used to convert civil B-767 passenger aircraft into ambulances.<sup>25</sup>

## **CRAF: HISTORICAL DEVELOPMENT AND UTILIZATION**

"The power projection capability that airlift supplies is vital since it provides the flexibility to get rapid reaction forces to the point of crises with minimum delay. Accordingly, airlift is viewed as the foundation of U.S. national security at the national level.... Airlift also supports overall U.S. national policy by projecting American power and influence in a wide range of non-lethal applications of airpower."<sup>26</sup>

—U.S. Air Force Doctrine on Airlift Operations

The concept of augmenting military transport requirements with commercial airlines had its genesis with the expansion of aviation in the early 1920's. Although the United States Army Air Corps modified civilian airliners and bombers into transport aircraft, it was decided that in case in war, it would be much easier and more cost-effective to requisition civilian airliners for that particular period of time than maintain a stand-by fleet. <sup>27</sup>

Prior to United States involvement in WWII, the United States Army Aviation Corps and the commercial industry formed the Air Corps Ferrying Command (ACFC) that contracted with commercial airlines to ferry aircraft to Europe under the Lend Lease program. When the United States entered the war in December 1941, ACFC had only 11 four-engine airplanes that could be used for long-range operations while commercial airlines possessed over 400 aircraft of various engine capabilities. Several carriers did sell all of their four-engine aircraft to the military after the U.S. entered WWII, but that was still not enough to meet the demand. On December 13, 1941, President Roosevelt signed an executive order permitting the expropriation of any portion of any civilian airline needed for the war effort. Accordingly, several hundred civilian DC-3's, but not the pilots, became part of ACFC's operations. <sup>28</sup>

During WWII, commercial airlines voluntarily ferried aircraft and provided air transport services to various worldwide destinations. Since the military was in dire need of pilots, schools run by civil carriers trained most of the military pilots. At its peak in July 1943, 9,000 men were in pilot training. <sup>29</sup>

American commercial carriers made a significant contribution to allied efforts in overcoming the Soviet blockade of Berlin. On June 24, 1948, Great Britain and the United States began immediate airlift of relief supplies to Berlin that included the use of commercial carriers to replace Military Air Transport Service and Troop Carrier Command aircraft on important domestic and international logistics routes. This action freed military aircraft to fly the final segment into Berlin, and by the end of the blockade, commercial carriers flew more than 600 transatlantic flights into Europe. <sup>30</sup>

When North Korean forces invaded South Korea in June 1950, commercial airlines became immediately available to fly troops and equipment from the United States to Japan, thereby freeing military aircraft to fly directly into South Korea. By the armistice, commercial

airlines flew 40% of the missions on the U.S.-Japan shuttle that included 67% of the passengers, 50% of the cargo, and 70% of the mail.<sup>31</sup>

The recognized need for a rapid airlift response capability and a more permanent structure for the incorporation of the civilian airline industry in conflicts led President Truman to issue Executive Order 10219 in 1952. This Executive Order directed the Department of Commerce (DOC) and DOD to establish a joint plan to incorporate commercial aircraft in times of national emergency.<sup>32</sup>

This relationship was formalized in 1952 with the creation of the CRAF program that delineated lines of responsibility between DOD and DOC and their various sub-agencies. The program was patterned after the relationship that developed between air carriers and the military during WWII and was seen as the answer to airlift problems that had occurred during WWII and mitigate new ones at the start of the Korean War.<sup>33</sup> In 1969, the Department of Transportation (DOT) took over CRAF responsibilities from the DOC.<sup>34</sup>

CRAF was never formally activated during the Cold War. However, airlines did contract out some of their aircraft during the Vietnam and the Mid-East wars.<sup>35</sup> During the Vietnam War, CRAF carriers transported more than 11 million passengers and 1.3 million tons of cargo over a ten-year period.<sup>36</sup>

CRAF Stage I was activated for the first time on August 17, 1990 to support Operation DESERT SHIELD which began on August 2, 1990. CRAF Stage II was activated on January 17, 1991 on the advent of Operation DESERT STORM.<sup>37</sup> As to be expected, there were some glitches integrating CRAF into an active military operation. Delays occurred in offloading supplies due to a shortage of commercially-configured ground support equipment and airline officials concern over adequate insurance coverage.<sup>38</sup> More ominously, however, Saddam's use of Scuds, and potential use of chemical weapons, negatively impacted CRAF flights into Saudi Arabian airbases. The lack of adequate protection for the aircrews from chemical contamination and inadequate intelligence and communications support while flying into Saudi Arabia during Operation DESERT STORM illustrate CRAF's vulnerability during combat.

## ASYMMETRIC THREATS TO CRAF OPERATIONS DURING THE GULF WAR

The consensus was that the activation of CRAF during the Persian Gulf War was a success. This was an airlift with no historical comparison. From August 1990 through May 1991, 76 commercial air carriers completed more than 5,000 missions. CRAF carried more than 60% of the passengers or 291,000 people, and 25% of the cargo or 110,000 tons. Overall, it contributed one-fifth of all airlift missions and provided the United States with the means to complete its force buildup in time to meet objectives.<sup>39</sup> Nevertheless, Operation DESERT STORM provides a good case study of the unpreparedness of CRAF and the potential for mission degradation when faced with an asymmetric threat.

There was no threat to commercial airlines when CRAF Stage I was activated on August 17, 1990. This stage was mobilized to move troops to "marry-up" with prepositioned cargo and provided a capability that would otherwise have not been available. Seventeen long-range international aircraft gave USTRANSCOM a daily airlift capacity of 1,920 passengers and 490 tons of cargo.<sup>40</sup>

On the eve of Operation DESERT STORM on January 17, 1991, United States Secretary of Defense Richard Cheney activated CRAF Stage II to eliminate the lingering backlog of cargo at Dover Air Force Base, Delaware. Stage II activated an additional 58 aircraft that provided USTRANSCOM with a combined total of 76 airframes and 40 cargo aircraft to meet requirements.<sup>41</sup>

Although Operation DESERT STORM was primarily fought on conventional terms, Saddam Hussein did launch Scuds against coalition forces located in rear areas in Saudi Arabia and against Israel. During these attacks, there was tremendous concern that these Scuds would be filled with chemical munitions. Due to limited infrastructure capabilities within Saudi Arabia, CRAF aircraft had to fly directly into Dhahran or Riyadh to offload their cargo, and airfields became primary SCUD targets once the air campaign started.

There were several instances where CRAF aircraft were on the ground or about to land when the red alert would go off, indicating an incoming SCUD. One Pan Am Boeing 747, facing

a SCUD alert in Dhahran, left hurriedly with half of its passengers still on-board, only to encounter a second alert in Riyadh.<sup>42</sup>

The wake of the SCUD attacks introduced a new risk that some air carriers and aircrews declined to take. Note that air carriers did not refuse to fly at all, but CRAF aircrew volunteerism did fall and deliveries were delayed until concerns about the lack of chemical protection gear and safer flight times was addressed by the U.S. Air Force. In other words, CRAF expected that the military would reduce the threat to its crews by employing certain measures. The Air Force responded by having CRAF aircraft land mainly during daylight hours (since most SCUD attacks occurred at night) and arranging for chemical warfare protection suits for the crews, although most did not receive sufficient training on the proper wearing of the suits.<sup>43</sup>

Another sore point with commercial air carriers during the Gulf War was the lack of information and untimely updates on the threat situation. Crews described en-route communications as "poor". Crews believed that too little information was supplied, and what they were told in Europe did not always correspond to actual conditions in theater.<sup>44</sup>

During the operation, airlines were responsible for developing contingency plans in case the military declared an emergency in the theater and called for a mission diversion. Although each airline drew up alternate routes for the crews, it was the military's responsibility to get that message to the airborne crews. Intelligence briefers told CRAF aircrews that if a threatening situation developed while they were airborne, the military would notify them and vector them to a safe area.<sup>45</sup>

However, encrypted, secure communications did not exist between CRAF and theater commands, therefore all military messages sent to CRAF were in the clear, across civilian radio frequencies. Although crews were given frequencies to use to communicate in-flight with military controllers, in many instances, CRAF didn't not receive responses when they tried to communicate, since concern over unsecured communications remained high.<sup>46</sup> For example, enroute communications for flights crossing the Mediterranean Sea were often assigned to navy ships in these waters. To avoid giving away their position, vessels could not respond to a crew, except in case of emergency, and not all calls were acknowledged depending on the level of activity for a given station.<sup>47</sup>

As a result, many CRAF crews were uncomfortable with news blackouts between their last stop in Europe and their final destination in Saudi Arabia, as they did not receive in-flight threat updates and therefore had difficulty assessing the potential hazards at their destinations. The difficulty some CRAF crews experienced in receiving inflight information pertaining to the threat and to their mission led some crews to abort missions early in the war and divert to Cairo, thereby disrupting the flow of material into Saudi Arabia. On a few occasions, updated information on frequency changes were not uniformly received at premission briefings in Europe.<sup>48</sup>

Despite CRAF's tremendous showing during Operation DESERT SHIELD/DESERT STORM, airline executives felt that their continued participation in CRAF would result in long-term losses in both passenger and cargo business's and began to question their future participation in it. This activation enabled airlines to get a real understanding of the impact of activation to profits and hazards posed to aircraft and crews.<sup>49</sup>

### **ASYMMETRIC THREATS AND THE CHANGING GLOBAL ENVIRONMENT**

Another issue that may interfere with CRAF operations in the future is not one that was borne out of the Persian Gulf War, but has been created as a result of the changing nature of the airline business environment. This trend is one of foreign investment and partnerships with U.S. carriers. Since airline deregulation, there has been a shift towards foreign ownership of formerly U.S.-only owned airlines. The result has been Northwest entering a partnership with the Dutch airlines KLM, U.S. Air entering a partnership with British Airways, and Delta, United, and American engaging in various types of joint ventures with foreign carriers.<sup>50</sup>

Although U.S. law limits foreign investment of U.S. airlines only up to 49.9% of its total equity, there is a concern that foreign investors may influence the extent of CRAF participation.<sup>51</sup> This fear has not yet been borne out, since CRAF membership means receiving peacetime business from DOD's coffers and no conflict since Operation DESERT SHIELD/STORM has consumed CRAF assets to any extent warranting investor attention.

Although foreign investment was not a factor in hampering CRAF utilization during Operation DESERT STORM, one of our allies, Germany, did place restrictions on U.S. airlift

activities at Rhein Main Airbase due to concern over terrorist attacks. Germany restricted night operations, limited the number of aircraft on the ground at any one time, limited the amount of explosives a plane could carry, and restricted arrival and departure times. These restrictions created some delays in delivering troops and supplies to the Persian Gulf. <sup>52</sup>

This 'benign neglect' may change to intense interest if CRAF support of a military operation becomes politically or commercially contentious. If U.S. military activity creates a potential threat from ballistic missiles or terrorists upon the investor's homeland, heightens the risk that an aircraft may be lost, or reduces profits by losing routes to competitors, foreign political and business pressure may mount to limit CRAF involvement. Constraints or denial of services by nations concerned with the possibility of asymmetric attacks upon their country due to CRAF transit of their commercial airports could further complicate U.S. planning efforts. The end result will undoubtedly complicate unilateral U.S. flexibility in conducting strategic lift operations.

This could become extremely problematic during Stage III. In addition to providing aircraft, civil carriers are also contractually obligated to provide aircrews, parts, maintenance and fuel. During Stage III, up to 500 commercial aircraft may be flying in and out of one or two foreign stations that may only service 100 aircraft during non-surge operations. <sup>53</sup> Lack of enroute support facilities not only reduces rapid deployment capabilities, it also limits the options of the U.S. military during crises. For example, if the U.S. had lost access to Lajes (Azores), Torrejon (Spain) and Rhein Main (Germany), during Operation DESERT SHIELD/DESERT STORM, it would have reduced throughput to the Persian Gulf by 46% and increased force closure time by 48%. <sup>54</sup>

## CONCLUSION

"Unfortunately, we had decided that we wouldn't give the carriers chemical gear prior to their flight, but rather we would give it to them when they landed in the AOR (USCENTCOM area of responsibility). Several times we dropped the ball, and...normally it was when we were going into a potentially dangerous airfield. Looking back, I should have initiated such procedures early in the deployment."  
<sup>55</sup>

—Commander, Military Airlift Command

CRAF crews need to enjoy a measure of personal protection commensurate with the risk the nation asks them to assume. Patriotism aside, commercial airlines are in business to make money. Concerns will always remain about the impact of future CRAF activation on airlines finances, risk to aircraft and crews, foreign investment, and lost market shares when aircraft are diverted to support military operations. If being a participant in CRAF will cost them money, business, loss of airplanes or crews, there will be a corresponding reluctance to participate.

Making CRAF more like the military is not the answer. It is simply too costly, time-consuming, and operationally unfeasible to modify commercial airliners with active self-protection measures or train pilots in the ways of creative flying or escape and evasion techniques. Threats to CRAF operations posed by SOF, terrorist, or SSM attacks upon airfields can be minimized by ensuring that CRAF is incorporated into already established force-protection measures and by providing up-to-date threat data to the pilots.

Some priority issues that need to be addressed in order for CRAF to meet the challenges posed by asymmetric threats are:

***Issue:** The lack of clothing to shield against chemical and biological exposure could adversely interrupt CRAF participation for future operations. **Recommendation:** Chemical warfare protection suits and training for all CRAF crews needs to be a part of the CRAF activation process if the protagonist or its allies are determined to have a chemical/biological weapons capability.*

***Issue:** The issue of CRAF communications with theater command and control applies to future wartime scenarios; especially since asymmetric threats exist in a very dynamic environment that requires constant updates in order to proactively reduce consequences. Not providing in-flight threat updates to the crews will force them to take matters into their own hands, either aborting the mission or refusing to fly at all. **Recommendation:** Secure, compatible communications systems between CRAF and the military need to be standard equipment. In addition, procedures need to be established where CRAF pilots will receive consistent and timely threat updates at regular intervals.*

**Issue:** Increase CRAF flight safety. **Recommendation:** Vary CRAF flight schedules, routes and billeting arrangements. Use Terrorist Assessment and Awareness Teams to provide force protection and anti-terrorist training at airfield ports of embarkation/debarkation.

**Issue:** The time to review potential foreign impact on CRAF operations is not when a foreign partner begins to pressure a United States carrier. **Recommendation:** The War Risk Insurance Program and all related legislation need to be reviewed for loopholes that can exacerbate unwarranted interference from foreign interests.

Although the United States will maintain a strong technological edge in its conventional military forces, state and nonstate adversaries may avoid direct engagements with the U.S. military by devising strategies, tactics, and weapons that would mitigate United States strengths and exploit perceived weaknesses.

Therefore, asymmetric threats will be a defining challenge for U.S. strategy, operations, and force development. Prospects will grow that more sophisticated weaponry, including weapons of mass destruction and chemical/biological agents indigenously produced or externally acquired, will get into the hands of state and nonstate belligerents, some hostile to the United States.

Proactive initiation of programs to mitigate known asymmetric threats to commercial carriers employed in either a voluntary or activation mode will go a long way in strengthening carrier confidence in the CRAF program. In addition, it will ensure that this important strategic asset will not be degraded when it is needed most.

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## ENDNOTES

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<sup>20</sup> Ibid.

<sup>21</sup> Mary Chenoweth, The Civil Reserve Air Fleet and Operation DESERT SHIELD/DESERT STORM (Santa Monica, CA: RAND Corporation, 1993), 7.

<sup>22</sup> USAF, "Civil Reserve Air Fleet," May 1999; available from [http://www.af.mil/news/factsheets/Civil\\_Reserve\\_Air-Fleet.html](http://www.af.mil/news/factsheets/Civil_Reserve_Air-Fleet.html); INTERNET; accessed 16 December 2000.

<sup>23</sup> Ibid.

<sup>24</sup> Ibid.

<sup>25</sup> Ibid.

<sup>26</sup> John R. Stafford, "Dominant Manuever and Focused Logistics In Airlift: A Look at the Mid-21<sup>st</sup> Century," Air Mobility Symposium; 1947 to the Twenty-First Century, Government Printing Office: 1998), 228.

<sup>27</sup> . Robert C. Owen, "The Airlift System—A Primer," Air Power Journal (Fall 1995): 6.

<sup>28</sup> . Ronald N. Priddy, "U.S. Civil Aviations Contribution to Improved Air Mobility," Air Mobility Symposium; 1947 to the Twenty-First Century, Government Printing Office: 1998), 173.

<sup>29</sup> Ibid.

<sup>30</sup> Ibid., 174.

<sup>31</sup> Ibid.

<sup>32</sup> Ibid., 175.

<sup>33</sup> Ibid., 173.

<sup>34</sup> Roger K. Coffey and F. Ronald Frola, The Civil Reserve Air Fleet: Trends and Selected Issues (McLean, VA: Logistics Management Institute, 1996), A-1.

<sup>35</sup> "Cut Rates May Spread to Military Charters," Business Week, 21 August 1978, 29.

<sup>36</sup> Congressional Budget Office, Moving U.S. Forces: Options for Strategic Mobility (Washington D.C.: U.S. Government Printing Office, 1997), 82.

<sup>37</sup> U.S. General Accounting Office, Military Airlift: Changes Underway to Ensure Continued Success of Civil Reserve Air Fleet (Washington, DC: U.S. Government Printing Office, 1992), 4.

<sup>38</sup> Mary Chenoweth, The Civil Reserve Air Fleet and Operation DESERT SHIELD/DESERT STORM (Santa Monica, CA: RAND Corporation, 1993), 37.

<sup>39</sup> *Ibid.*, 1.

<sup>40</sup> John W. Leland, "Air Mobility in Operation DESERT SHIELD/STORM: An Assessment, in Air Mobility Symposium; 1947 to the Twenty-First Century, Government Printing Office: 1998), 153.

<sup>41</sup> *Ibid.*

<sup>42</sup> Lester Reingold, "CRAF a Qualified Success," Air Transport World 8 (August 1991): 25.

<sup>43</sup> Mary Chenoweth, The Civil Reserve Air Fleet and Operation DESERT SHIELD/DESERT STORM (Santa Monica, CA: RAND Corporation, 1993), 45.

<sup>44</sup> *Ibid.*, 47.

<sup>45</sup> *Ibid.*, 45.

<sup>46</sup> *Ibid.*, 47.

<sup>47</sup> *Ibid.*, 46.

<sup>48</sup> *Ibid.*

<sup>49</sup> James K. Matthews and Cora J. Holt, So Many, So Much, So Far, So Fast (Joint Chiefs of Staff and United States Transportation Command, 1996), 81.

<sup>50</sup> William G. Palmby, Enhancement of the Civil Reserve Air Fleet: An Alternative for Bridging the Airlift Gap, Thesis. (U.S. Air War College, June 1995) 50.

<sup>51</sup> James Ott, "Foreign Ownership of U.S. Carriers Feared as Limit to Future Military Airlifts," Aviation Week and Space Technology, 22 April 1991, 96.

<sup>52</sup> Mary Chenoweth, The Civil Reserve Air Fleet and Operation DESERT SHIELD/DESERT STORM (Santa Monica, CA: RAND Corporation, 1993), 51.

<sup>53</sup> Brooks L. Bash, "CRAF: The Persian Gulf War and Implications for the Future," (Alexandria: DTIC, 1992), 11.

<sup>54</sup> Congress, House, Armed Services Committee, Subcommittee on Readiness, Statement of General Ronald R. Fogleman, USAF, Commander-in-Chief, United States Transportation Command, 106<sup>th</sup> Congress, 2<sup>nd</sup> sess, 26 April 1994.

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