FORCE PROTECTION OF STRATEGIC AIRLIFT FORCES IN THE OPERATIONS OTHER THAN WAR ENVIRONMENT

A Monograph
By
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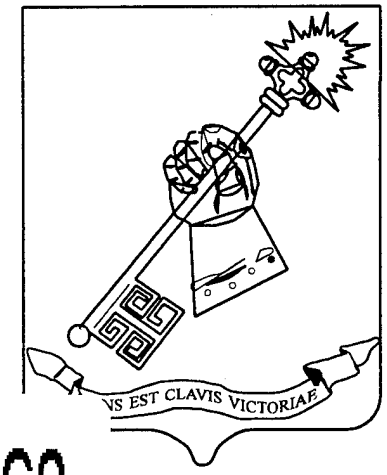

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ABSTRACT

FORCE PROTECTION OF STRATEGIC AIRLIFT FORCES IN THE OPERATIONS OTHER THAN WAR ENVIRONMENT by MAJ James N. Hanley

This monograph examines the U. S. military capability to defend strategic airlift aircraft against current and projected threats in an humanitarian assistance operations. The size of the Joint Task Force (JTF) is frequently restricted by political, material, and environmental considerations. Consequently, the JTF commander must consider developing a Time Phased Force Deployment Data List that provides force protection for the airlift force that meets the possible threats and responds to mission constraints. Recent studies suggest two trends: (1) the military airlift aircraft are not equipped to handle the threat, and (2) the JTF must also provide protection to those aircraft flown by Non-Governmental Relief Organizations (NGOs) and the CRAF.

This monograph is divided into five sections. Section one, the introduction, establishes the purpose of the study and the significance of the research question to the US military: Are planned air defense measures adequate to defend airlift forces against hostile threats during OOTW? Section two examines the present threat to strategic airlift aircraft in the OOTW environment and concludes that the man-portable surface-to-air missile is the ideal weapon to attack the airlift bridge at the airfields. Section three analyzes current National, Service and Joint doctrines for their force protection requirements and responsibilities of the airlift force in the humanitarian assistance environment. Doctrine recognizes the importance of airlift, but does not provide air defense to the entire airlift force, civilian aircraft are not included in this protection. Section four reviews recent military experiences during Operations RESTORE HOPE, in Somalia, and SUPPORT HOPE, in Rwanda. The force protection lessons learned during Somalia were ignored in Rwanda. Relying on only self-defense assets of strategic airlift aircraft is not the correct approach during humanitarian assistance missions. The final section answers the research question and offers recommendations for improving protection for airlift forces for future humanitarian relief operations.

The U.S. currently does not provide adequate measures to defend all the airlift forces against man-portable surface-to-air missiles during humanitarian relief missions. Each service views the threat differently and offers separate approaches to handle the threat. Joint doctrine provides guidance to the Joint Task Force but explains neither how to follow the doctrine with the constraints and limitations imposed on the force during a relief mission nor how to protect the NGO's aircraft.

However, there are available some reasonable means to correct this situation. The Air Force must create an integrated electronic warfare master plan, to include airlift forces for relief missions. JTFs should employ unmanned aerial vehicles with EW pods to provide continuous protection for all airlift forces in the theater. And Joint doctrine should be followed in establishing base defense operations centers and patrols to secure the APODs and their air LOCS from attack.

TABLE OF CONTENTS

I. Introduction

20 December 199x, RELIEF AIRCRAFT SHOT DOWN

> AP/UPI/Reuters// A United States cargo plane was shot down while on final approach to Bujumbura, the capital city of Burundi. The aircraft was on a UN mission delivering personnel and equipment for Operation SHARE HOPE, to help end the famine and disease in this region. None of the factions involved in the civil war has claimed responsibility for the attack.

Although the situation above is hypothetical, it is probable. Armed conflict such as occurred in Rwanda continues in Sub-Sahara Africa and Burundi could be next.[1] The threat to relief aircraft will also remain. The greatest threat to aircraft is the man-portable surface-to-air missile (MANPAD SAMs). MANPAD SAMs are simple to operate, easy to hide, and available throughout the world. Consequently, even humanitarian assistance missions must address force protection. However, Service and Joint doctrine treat force protection differently. Air Force and Joint Doctrine address aircraft survivability and force protection. Army Doctrine does not cover this area. Despite the Army's reliance on strategic airlift to deliver personnel and equipment, FM 100-5, Operations, does not mention force protection concerning the OOTW environment.

The force protection needs of humanitarian missions are predictable. Most humanitarian crises unfold in a similar manner. Strategic airlift transports the initial forces to a theater; follow-on forces travel by sea.[2] The initial airlift force must be large enough to deliver rapidly both humanitarian aid and the assistance forces. Usually, the United States cannot deploy a sizeable force to a country without producing some

noticeable effect on the domestic political situation. Consequently, the United States frequently keeps its assistance forces small.

U.S. Transportation Command's (USTRANSCOM) strategic airlift capability is limited by two factors. First, USTRANSCOM uses both military and Civilian Reserve Airlift Fleet (CRAF) aircraft to move personnel and equipment. Not all these aircraft have self-defense capabilities and will fly into threatened areas.[3] The available aircraft are the C-5, C-17, C-141, and various commercial aircraft in the CRAF.[4] Even in peacetime Air Mobility Command (AMC) regularly charters civilian airlines as part of CRAF to move passengers and cargo for humanitarian assistance missions.[5] CRAF contributes 72% of the projected passenger need, and 41% of the cargo requirement for AMC.[6] These assets must transport aid and assistance forces in a crisis and they require protection.

The second factor limiting USTRANSCOM's airlift capability is the limited number of airfields in an undeveloped theater. The number and type of airfields determine the method by which the air bridge is established. During a humanitarian assistance mission airlift usually transports the personnel and equipment using the steady flow method. The steady flow method flies aircraft at specific intervals over a dedicated flight corridor into the aerial ports of debarkation (APODs). Coordination of this type of air bridge is the simplest, in regards to diplomatic clearances, Maximum On the Ground (MOG)[7] limitations, and flow control restrictions through international airspace. This type of simple coordination is especially required when there is little time available to prepare and plan for a humanitarian assistance mission. The steady flow method also

delivers the most cargo over an extended period.[8] Because there are only a few aircraft and airfields, they are easily targeted by warring indigenous factions in an undeveloped environment.

The Service staffs and Joint Task Forces (JTF) make certain assumptions concerning a humanitarian assistance mission that differ from wartime planning assumptions. These assumptions make the strategic aircraft vulnerable to attack by MANPAD SAMs. First, the JTF commander and the Services are restrained by political, material, and environmental factors that limit the size and type of combat force used in the theater. The United States' government usually demands quick efficient operations directed to resolve immediate crises. The United States usually limits the objective to bringing relief to the disaster area, and then quickly turning operations over to UN or non-governmental organizations. Consequently, the United States deploys only a small force with limited combat power to handle the crisis.

Secondly, planning assumes there is no threat of attack from air-to-air missiles exists or the United States has air superiority in the area of operations (AOR). Only strategic airlift assets deploy because it is not a wartime mission. No combat or specialized electronic warfare assets, SEAD aircraft, are sent to the theater.[9] Lastly, it is assumed that the areas around the airfields are protected from crew-served antiaircraft guns and missiles by the JTF ground forces.

The planning assumptions lead directly to other planning considerations. Because the United States limits the size of the deployed force, experience teaches us that the few combat forces will be barely large enough to secure the APODs.

Additionally, portions of the airlift will include NGOs.[10] The NGOs' aircraft operate from the same APODs. The JTF commander is responsible for ensuring the delivery of the humanitarian aid they are transporting. Therefore, the civilian aircraft fall under the protection of the US base commander. NGO aircraft are usually chartered commercial planes, similar to those flown by CRAF airlines. They do not have aircraft defensive systems (ADS) to protect them from the MANPAD SAM threat. Therefore, because civilian aircraft operate in the theater they too must be protected from MANPAD SAM attacks.

To meet the need for force protection it is necessary to develop tactics, techniques, and procedures that address the vulnerabilities of cargo aircraft and the constraints and limitations US Joint Task Force commanders face in performing humanitarian assistance missions. The best way to develop the tactics and techniques is to explore current air defense doctrine to determine whether the established tactics can be readily adapted to the humanitarian assistance environment. In particular, we must explore the MANPAD SAM threat and possible responses to it. Next, we must examine existing force protection requirements and doctrine to determine whether current procedures inadvertently impede protection of airlift or dictate methods unsuitable for humanitarian missions. This inquiry must also consider recent military experience to discover any operational guidance issued in humanitarian crises that might make force protection difficult, or field expedient practices that were effective but which doctrine has not captured. Lastly, we must consider how best to provide force protection in future humanitarian assistance missions using lessons learned from previous operations and any

other tactics, techniques, and procedures available to the JTF.

II. The Threat

As previously stated the greatest threat to strategic airlift aircraft during humanitarian missions is the man-portable surface-to-air missile. According to Joint Pub 3-10.1, Joint Tactics, Techniques, and Procedures (JTTP) for Base Defense MANPAD SAM attacks by agents, saboteurs, sympathizers, and terrorists are a Level I threat. This weapon threatens the airlift bridge because they must be defeated by base self-defense measures.[11] The MANPAD SAM threat to strategic airlift aircraft has already been recorded in numerous DOD studies. The C-17 Defensive Study, the Military Airlift Survivability Study, the Military Airlift Command Electronic Warfare Study, and the Joint Airlift Combat Operations Study all cite the MANPAD SAM threat as a hazard to strategic airlift forces.[12] The best means to understand the MANPAD SAM threat is to understand first how the weapon is used to attack aircraft. In particular, knowledge of the weapon's basic system, characteristics and capabilities explains the MANPAD SAM's ability to acquire, track and strike the aircraft. Next, we must examine the airlift aircraft's mission and design to observe how these hamper the ability to defend the aircraft from the threat. Lastly, an examination of the proliferation of MANPAD SAMs details how the increased use of this weapon in the humanitarian relief environment presents a threat to airlift aircraft.

A MANPAD SAM consists of three subsystems. These are the propulsion, warhead, and guidance/seeker subsystems. The propulsion design is a simple, self-

propelled, solid rocket fuel. It provides both rapid fire and a quick accelerating boost to the missile. The missile reaches the target in less than fifteen seconds, even when the aircraft is at the maximum range of the missile. The brief flight time, combined with a rapid reload time, also allows the launcher to fire another MANPAD SAM at the aircraft and escape before discovery of the launch site. The MANPAD SAMs short time of flight allows the missile to reach the target virtually undetected by the human eye. Hence, the aircraft's crew cannot detect and avoid the missile without an automatic detection and suppression device.

The warhead is the second subsystem of the MANPAD SAM. Most warheads are high explosive types with time-, proximity-, or contact-fusing mechanisms used to detonate the warhead to damage the aircraft. If the MANPAD SAM has not reached its target in fifteen seconds it will self-destruct. Another type of warhead combines the kinetic energy of the propulsion system with a high explosive warhead. The high speed warhead(4+ MACH) first penetrates and damages the target then the warhead detonates, destroying the aircraft.[13] Since most airlift aircraft are thin-skinned, lacking armor protection, even proximity-fused warheads easily can damage the aircraft.

Of all the subsystems in the MANPAD SAM weapon the guidance/seeker mechanism is the most important. It produces the capability to acquire, track and guide the missile to the target. The guidance mechanism is the first major part of this subsystem. It acquires the target and provides initial aircraft position to the seeker mechanism for final tracking to the target. The guidance mechanism has two radar systems: acquisition and tracking. Acquisition radars acquire and monitor the aircraft's

initial movements. This radar does not directly threaten the aircraft, but should be jammed to block information used to acquire the aircraft.[14] If the acquisition radar does not locate the aircraft, the missile will not realize an aircraft is near its location. Tracking radars provide initial guidance information to the missile's seeker mechanism. The missile must have this data before it can successfully engage and launch. Therefore, this radar is a high-priority threat to the aircraft. If the aircraft can lose or break the radar's contact, either by evasive tactics or jamming the radar signal, the missile cannot effectively attack the aircraft.

The second major part of the guidance/seeker subsystem is the seeker mechanism. The seeker mechanism provides final guidance to the missile to track and strike the aircraft. Seeker mechanisms use one of three basic modes to track the target: IR, anti-radiation, or laser. First is the IR seeker mechanism. They are the most prevalent form of seeker used in MANPAD SAMs. IR seekers close on a heat source, either engine emissions or air-conditioning units. It is possible to reduce the aircraft's heat signature by shielding or retarding engine power, and turning off the air-conditioning units. However, strategic airlift aircraft carry their engines outboard and are not readily shielded like fighter type aircraft. Also, the air-conditioning units provide life sustaining power to the passengers and cannot be completely shut down. IR seekers are passive devices and do not radiate a warning signature.[15] Consequently, the aircraft's crew cannot detect the missile until after its launch. The other two seeker modes are not as common but are just as great a threat to strategic airlift aircraft.

The second tracking mode uses an anti-radiation seeker. Anti-radiation seekers

home on radar navigation, radar altimeters, or jamming signals. Transport aircraft operate both radar navigation and radar altimeters during landing and takeoff phases. These systems are necessary, especially in the Third World's regions, because ground control systems at these airfields lack radar systems capable of guiding the aircraft to the APODs. Therefore, MANPAD SAMs with anti-radiation seekers are potentially effective in the humanitarian assistance environment.

The last type of seeker is the newest one, the laser seeker. It has the shortest range of all the MANPAD SAMs' seekers. However, currently the laser seeker cannot be effectively jammed. So, once a MANPAD SAM with a laser seeker has launched, it will track directly to the target. The disadvantage is that the attacker must use his laser to continuously illuminate the target aircraft.

The guidance/seeker mechanism combined with the other systems are all elements of the MANPAD SAM threat to the strategic airlift fleet. First, the weapon provides no warning until the missile is launched on its short flight to the target. Second, it is not possible or practicable to reduce or eliminate the aircraft's heat and electromagnetic signature that MANPAD SAM guides on. Lastly, the crew has little or no room to maneuver to evade the missile in the takeoff and landing phases. To be effective an ADS must overcome the human and physical obstacles to provide an effective MANPAD SAM defense.

MANPAD SAM capabilities and characteristics enable them to attack the airlift bridge where it is most vulnerable, the takeoff and landing phases. The weapons are easily transportable. Because they are small, mobile, and numerous, MANPAD SAMs

may be fired from anywhere. General capabilities and characteristics of the MANPAD SAMs are shown in Table 1. These were drawn from a compilation of specific MANPAD SAM weapons' data, listed in Appendix B.

Table 1.
MANPAD SAM Capabilities and Characteristics

Range: minimum	300 meters
maximum	7,000 meters
Altitude: minimum	0 meters
maximum	6,000 meters
Sensor type:	Infrared
Speed:	1.7 to 4+ MACH (580m/s @ sea level)
Time to Target:	<15 seconds to maximum range
Time to Reload:	6 seconds
Time to Acquire Target:	60 seconds maximum due to battery life
Weight:	13 to 176 lbs.
Length:	1.3 meters

Newer MANPAD SAM capabilities are more difficult to defeat by tactics or equipment. They use laser seekers to track and guide the missile to the target. The guidance/seeker system allows front and rear shots on the target. This permits the missile to fire as the aircraft approaches the launching position, rather than wait for the aircraft to pass the launch site first. The newest MANPAD SAM also has an infrared signal processor to defeat the aircraft's flare suppression system. The flare suppression system is meant to defeat rear attacks from IR seeker missiles.[16] In comparison many

older developed MANPAD SAM's guidance/seeker systems only permit rear attacks on the aircraft. This is because the missile's IR seeker closes on the aircraft's heat sources. The combined elements of the MANPAD SAM enable the weapon to effectively engage the strategic airlift aircraft during humanitarian relief operations.

During the humanitarian assistance mission strategic airlift aircraft are very vulnerable to the MANPAD SAM threat for three reasons. The first two reasons are derived from the aircraft's mission, the last reason stems from the aircraft's design. First, the aircraft cannot avoid flying into the APODs to deliver the JTF troops and relief supplies. The aircraft must land to download their cargo. Unlike tactical airlift aircraft they cannot land on unimproved runways. The strategic transports are tied to the major airfields in the AOR. Since there are few airfields in the AOR enemies can concentrate MANPAD SAMs at these points. With a limited number of personnel the JTF cannot secure the APODs from these attacks. Therefore, the aircraft are always open to MANPAD SAMs attack.

The second reason strategic airlift aircraft are vulnerable to the MANPAD SAM threat is the airlift bridge follows a predictable pattern. The airlift aircraft maintain a set schedule, using the steady flow method, to maximize the cargo throughput to the AOR. Strategic transports fly specific routes into and out of the airfields based on the runway pattern. Consequently, this predictability makes it easier for the MANPAD SAM to acquire and track the aircraft.

The third, and last reason strategic airlift aircraft are vulnerable to MANPAD SAM attack is the aircraft's design. These aircraft require full power during the takeoff

phase. This provides the MANPAD SAM an excellent IR source for their missile's seeker. Next, the aircraft's flight configuration removes the possibility of evasive action during takeoff and landing. The aircraft cannot maneuver during these phases to avoid the missile, if detected. Their flight path takes them easily within the MANPAD SAMs range and altitude of fire. At any other phase of flight the aircraft are outside the MANPAD SAM's capability to attack. Because of their mission, design and lack of onboard defensive systems, neither threat warning or threat suppression systems, strategic airlift aircraft are very vulnerable to MANPAD SAM attacks.

International arms sales have helped to increase the MANPAD SAM threat. Since the end of World War II the United States has sent more than $100 billion worth of arms and associated support overseas to Third World nations. Between 1974 and 1977, the Soviet union shipped 1,100 MANPAD SAMs to Sub-Sahara Africa, and an additional 1,075 MANPAD SAMs from 1978 to 1981. This is exactly where we can expect further humanitarian assistance missions to go.[17] It was estimated in the mid-1980s the Soviets had one tactical MANPAD SAM system for each NATO aircraft![18] Countries such as the United States, Russia, China, Egypt, Ukraine, France, the United Kingdom, Sweden and other Western states continue to build sophisticated Air Defense (AD) and MANPAD SAM systems and export them on the international market.[19] Third World nations, where humanitarian assistance missions are sent, can be expected to acquire MANPAD SAMs.

The proliferation of the MANPAD SAM weapon has led to many successful attacks on transport aircraft. Most of these attacks occurred during civil wars in Third

World countries. During the Vietnam War, although MANPAD SAMs were relatively new and unsophisticated, the missile destroyed aircraft flying as low as 25 meters, and as high as 2,600 meters.[20] Since 1978 the skies over Angola and Sudan have been the scene of 11 MANPAD SAM attacks on civilian aircraft.[21] Other successful attacks include those on Rhodesian and Georgian airliners during their civil wars.[22] Most recently, on 6 April 1994, a transport aircraft carrying the presidents of Rwanda and Burundi crashed while on final approach to Kigali airport, Rwanda. The probable cause of the crash was a MANPAD SAM.[23] Civilian aircraft markings provide no immunity from attack. What this means is relief organizations cannot depend on their neutrality to protect them from attack during a relief mission. Because MANPAD SAMs have proliferated and have been used to attack transport aircraft in the past similar attacks can be expected in the future.

In summary, the threat to strategic airlift aircraft operating in the humanitarian assistance environment is the MANPAD SAM. The subsystems, characteristics, capabilities, and numbers of MANPAD SAMs available make it an ideal weapon to attack the aircraft in their most vulnerable phases--takeoff and landing. The weapon has been used many times during civil wars. This is the same environment the United States sent its previous two humanitarian relief missions and should expect to go in the future. The JTF must provide force protection from the MANPAD SAM threat for all the strategic airlift aircraft during humanitarian missions. National, Service and Joint doctrine should provide force protection guidance to defeat the threat. At this point the question is whether doctrine provides adequate guidance for force protection.

III. Force Protection Requirement

Although the manportable surface-to-air missile has some unique characteristics, air defense is not a new concept. Existing policy and doctrine recognizes the need to protect the airlift force. Strategic airlift has a vital role in the National Security Strategy and National Military Strategy (NMS). Strategic airlift is viewed as a limited resource that must be protected at the national level.[24] The strategic airlift force requires force protection in times of war and peace to ensure the United States achieves its goals. By analyzing National, Service, and Joint doctrine requirements for airlift protection we can decide whether doctrine adequately addresses the MANPAD SAM threat in the humanitarian assistance environment.

National Requirements

The National Military Strategy considers airlift protection in its discussion of Crisis Response.[25] Regarding the area of Crisis Response, the Secretary of Defense (SEC DEF) said the "capability to respond to regional crises is one of the key demands of our NMS."[26] The Secretary of the Air Force concurred and said

> our national security strategy calls on us to be able to deploy substantial forces and sustain them in parts of the world where prepositioning equipment may not always be feasible. . . .[27]

Offering humanitarian assistance is in the national interest of the United States. Humanitarian assistance preserves the survival of large populations and global economics that, if destroyed, would have an immense impact for decades to come.[28] In any crisis strategic airlift delivers the initial combat force and relief supplies.

Consequently, protecting the airlift bridge is an early and essential element of crisis response.

National policy guidance recognizes the importance of strategic airlift, but does not recognize the parallel need for air defense. In the 1995 annual report to the President and Congress the SEC DEF said the use of armed forces to provide humanitarian assistance is appropriate when "the need for relief is urgent and only the military has the ability to respond quickly" with its unique capabilities, and with least risk to American troops. And the Chairman of the Joint Chiefs of Staff stated recently "we should do all we can to protect our people and to avoid civilian casualties, (NGOs and host nation)."[29] These statements clearly show strategic airlift will bring equipment and personnel to areas requiring humanitarian assistance, and that force protection is a requirement for this mission. Without this protection American troops and civilians are put at risk, and this is not the goal of US national strategy.

The most basic goal of the United States is "to protect the lives and personal safety of Americans, both at home and abroad."[30] Hostile forces in a potential crisis areas have a significant MANPAD SAM capability. Airlift forces must be capable of countering a broad range of threats throughout their operating envelope.[31] Therefore, to achieve the basic goal of the United States, and satisfy the national requirements, force protection must be provided to the airlift forces.

There is nothing at the national level that impedes the Services from developing force protection for airlift aircraft. In fact, protection is required to carry out the NMS. The Air Force, Army and Joint doctrine each developed their own means to provide force

protection to airlift assets during relief missions. These are the next areas to examine for any obstacles to this requirement.

Service's Requirements

The Air Force's capstone doctrine contained in AFM 1-1, Basic Aerospace Doctrine of the United States Air Force states:

> Air Force units should be organized to enhance self-defense capabilities and self-sufficient operations . . . The range, endurance, payload, precision, and survivability of AF platforms are key factors in the ability to project power effectively. [Emphasis mine][32]

The Air Force achieves force protection primarily through Electronic Warfare (EW) means, both active and passive measures.[33] Active means of force protection includes: Anti-Radiation Missiles, directed energy weapons, electromagnetic jamming and deception, expendables, and tactics. EW passive means of force protection includes: Emission control (EMCON), camouflage, IR shielding, warning receivers, and material design features.[34] The Air Force attempts to place a self-defense capability in all of its aircraft, including strategic airlift aircraft.

Survivability via self-defense is required in all Air Force aircraft. Recently, AMC designed ADS into the newest airlift aircraft, the C-17. AMC also started to add ADS to older military strategic airlift aircraft, the C-5 and C-141 to include missile warning receivers and chaff/flare dispensers. However, these aircraft are not receiving ADS equipment at a pace equivalent to the amount of work they accomplish in the airlift mission.

The ADS aboard the current military strategic airfleet consists of the AN/AAR-

47 missile warning receiver integrated with the AN/ALE-40 decoy dispenser. The AN/AAR-47 warns the aircrew of missiles launched against the aircraft. It processes the aircraft's movement and missile's flight path in real time and informs the aircrew of the type and location of the threat. This allows the aircrew to avoid the threat and ensure that the decoy dispenser is operating.

The AN/ALE-40 dispenses chaff or flares to decoy the missile away from the aircraft. It consists of four dispensers. Each dispenser holds either thirty chaff cartridges or fifteen flares. Normally, transport aircraft use flares. The AN/ALE-40 has three modes of operation, automatic, semiautomatic and manual. In the automatic mode the ADS evaluates the threat, selects an appropriate response, and initiates the countermeasure with no action required by the aircrew. In the semiautomatic mode the evaluation and selection are the same as the automatic mode, but the aircrew must activate the countermeasure. The manual mode has six preprogrammed, aircrew-selectable responses, that the aircrew can choose once the warning system detects a threat.[35] Additional specifics on the ADS aboard strategic airlift aircraft is listed in Appendices C and D.

None of the CRAF aircraft have any ADS equipment, even though a 1982 Science Board Study recommended that Radar homing and warning (RHAW) receivers be placed on all strategic airlifters to reduce the effectiveness of MANPAD SAM attacks.[36] The CRAF Enhancement Program (CEP) allows the CRAF aircraft to have ADS installed but no contract has been allocated for this additional capability.[37] This means the Air Force has failed to equip the strategic airlift aircraft with any means of self-defense.

Therefore, airlift aircraft must use means, other than technology, to defeat the MANPAD SAM threat in the humanitarian assistance environment.

Strategic airlift aircraft must use tactics as the primary means of self-defense since ADS equipment is not available. Airlift can reduce their vulnerability by flying the most secure routes into and out of the threat areas. Air routes are normally secured by achieving air superiority. However in humanitarian assistance missions, air superiority is assumed, not achieved. Consequently, fighter aircraft or specialized SEAD planes are not sent to secure the airlift bridge from the air. What this means is aircraft, without any ADS equipment, fly into unsecured APODs on predictable routes. These procedures increase the threat of MANPAD SAM attacks in the humanitarian relief environment.

To summarize, Air Force doctrine requires the strategic airlift aircraft to avoid the threat as the primary means of self-defense during a relief mission. Clearly, this is not practicable since the MANPAD SAM threat to the air bridge is concentrated at the APODs, and the aircraft must fly into the airfields. The Air Force's assumption of air superiority and its shortage of ADS for military and CRAF aircraft hinder the protection of the transport aircraft. Because air superiority is assumed, the Air Force relies on the Army to secure the routes into the APODs.

The Chief of Staff of the US Army said that in the "1990s and beyond, the United States will have to rely even more heavily on the rapid deployment of Army forces from the United States to guarantee its security.[38] His Deputy Chief of Staff for Logistics confirmed this in saying, "Army's airlift requirements . . . are crucial to a stateside-based power projection Army."[39] Because strategic airlift is crucial to the Army for rapid force

projection the Army has the implied mission to protect the airlift aircraft at the APODs.

Unfortunately, force protection to the Army does not directly correlate with the Air Force's concepts of survivability and protection of the strategic airlift fleet. The only mention of force protection in the capstone document, FM 100-5, is under "Combat Functions, Air Defense." This part of Army doctrine is primarily concerned with defending Army units from air-to-ground threats. There is no mention of providing protection for any air assets from ground threats. Also, no mention is made for protecting airlift aircraft in the OOTW environment. The Army is responsible for Short-Range Air Defense (SHORAD) but it does not recognize the need in the humanitarian environment because SHORAD is oriented at air threats.[40] Although the Army does not emphasize a requirement to protect the air bridge, it relies on this means of transportation to deploy from CONUS to the crisis region. Joint Doctrine provides the guidance for force protection to the Services.

In review, both Air Force and Army doctrine fail to address the need to protect the strategic airlift force in the humanitarian assistance environment. The Air Force does not provide the needed equipment, and the Army does not directly recognize the protection requirement in this type of environment. The Air Force and Army do not deploy all of their assets during a humanitarian relief mission to provide adequate protection to the airlift forces. Therefore, both Services rely on Joint doctrine to provide a connection for force protection in this type of environment.

Joint Requirements

Joint doctrine specifies how the Army can support the Air Force to increase the survivability of the transport aircraft. Joint publications details specific responsibilities for force protection, starting with the JTF commander and continuing down to the tenant commanders. Joint doctrine recognizes the component directly affected by the threat has assumed the immediate responsibility for providing force protection and suppression of enemy AD. However, during humanitarian assistance missions the Air Force does not deploy any SEAD aircraft. Also, the Air Force security forces deployed are not large enough to provide force protection in the theater.[41] Since it is not possible to avoid flying into the APODs during a crisis, and not all aircraft have an ADS capability, the Air Force relies on the Army to provide this capability.

Joint Pub 3-0, Doctrine for Joint Operations, warns, "JTF commanders should not be lulled into believing that the nonhostile intent of their mission does not put the force at risk."[42] The forces must be able to rapidly change from peace to combat operations. Any future JTF commander should recognize that previous humanitarian relief missions were accomplished in regions of civil war. The risk to the strategic airlift aircraft can be avoided by providing a large force in theater early via airlift. Meanwhile, the combat force must be protected from disruption as it deploys into the theater, and it must meet the force limitations imposed on it. The JTF commander must plan on airlift assets avoiding potential threats. Considerable intelligence support concentrated on the potential enemy's antiaircraft systems and political circumstances in which the airlift force will be required to operate in is essential according to Joint Pub 4-01.1, Airlift Support to Joint Operations.[43] This concurs with Air Force doctrine. However, in a crisis

region, with limited APODs available, this is not possible. This causes the JTF commander to reduce the risk of the MANPAD SAM threat by these three options: employing only airlift aircraft with ADS, securing an area around the APODs, or bringing in specialized SEAD or fighter aircraft.

The first option is not possible since there are not enough strategic airlift aircraft equipped with ADS equipment to accomplish the task. Additionally Joint Pub 3-10.1 directs the JTF commander to protect civilian aircraft. Joint doctrine states:

> The commander must establish command and control measures to integrate the defensive capabilities and defense requirements of civilian agencies of the US and host nation governments. Private contractors, (NGOs), also may require security.[44]

This means the security and force protection, during the humanitarian assistance mission, for the NGOs are the responsibility of the JTF commander. To meet this force protection requirement, the JTF commander might need to reduce the overall effectiveness of the disaster relief operation to bring in more combat forces to provide the necessary security.[45] Unfortunately providing greater security conflicts with the urge to mitigate the suffering, the humanitarian assistance goal and the force limitation imposed on the JTF. Therefore, this option is not practicable.

The second option for securing the APODs is also not feasible. To eliminate the MANPAD SAM threat, the JTF commander could establish a wide security area. The secure area would need to extend to seven kilometers from the APOD. With the constant flow of aircraft through the APODs the patrols would need to remain in place constantly to protect the airlift bridge. Securing such an area, however, requires more troops than

are usually available to the JTF. Hence, establishing a wide security zone is not practicable.

The third option of bringing in specialized SEAD or fighter aircraft is possible, but cannot be relied on for all humanitarian missions. Fighter aircraft equipped with anti-radiation missiles (ARMs) or electronic jammers can defeat the MANPAD SAM threat. Fighter aircraft cannot, however, continuously cover the APODs. They must periodically leave to refuel from tanker aircraft or return to another secure base. The fighter and tanker aircraft cannot operate from the same APODs used by the cargo aircraft. If they did, these aircraft would decrease the number of transport aircraft operating from the airfield, reducing the relief cargo throughput. Fighter aircraft might also send the wrong message during a humanitarian relief mission. Fighter aircraft are only readily available for use in a humanitarian crisis when they launch from an aircraft carrier. An aircraft carrier is a secure operating platform and does not decrease the MOG at the APODs. But, aircraft carriers can only be used when the crisis area and APODs adjoin the sea. Therefore, carriers are only a partial solution. Another means must be found to provide the JTF commander with force protection for the airlift fleet operations.

The JTF commander's subordinates also have force protection responsibilities for the strategic airlift aircraft. The Joint Rear Area (JRA) Commander is responsible for maintaining secure lines of communication (LOCs) with active participation and coordination by the respective component commanders. Component commanders, with area responsibilities, are responsible for the defense of bases located in their area.[46] In a humanitarian assistance mission there is no rear area. The front is the entire AOR.

Therefore, it falls on the base commander specifically to provide the required force protection for the airlift bridge.

It is the base commander's responsibility to provide force protection for the strategic airlift aircraft. They are responsible for base defense. Base defense includes the air LOCS leading into the bases. Protecting the LOCS connecting the military forces with the theater base of operations is part of the security requirement. The base commander is responsible for establishing the Base Defense Operations Center as the focal point for security operations. These facts mean that Joint doctrine assigned additional duties to the base commander during humanitarian assistance missions. To meet these responsibilities the base commander must rely on the tenant unit commanders for assistance.

Tenant unit commanders have the responsibility to advise the base commander on defense matters peculiar to their units.[47] For strategic airlift, the Airlift Mobility Element (AME) commander is the responsible tenant commander. To support the base commander the AME commander needs to know the intent of the local factions. This information is difficult to acquire in the time allotted for planning the humanitarian mission. With reduced forces, AMC has drawn down the number of station managers operating overseas. Thus, it has fewer direct contacts to obtain this critical data. Therefore, to avoid losing vital strategic airlift assets, the AME commander should insist that only those aircraft with an ADS capability initially deploying to the theater. After a thorough analysis of the threat and the different factions' intents, other aircraft may be fitted into the flow dependent on the situation. Overall, this provides the best

survivability too only the US strategic military airlift aircraft in the humanitarian relief environment. Unfortunately, it may not be feasible to avoid using the CRAF in a crisis, and these aircraft do not have any ADS. Also, it does not address the JTF commander and base commanders' responsibility to protect the civilian aircraft flown by relief agencies.

In summary, National, Service and Joint doctrine all recognize the importance of strategic airlift. Strategic airlift has a vital role in the United States' forward projection strategy, both in times of war and peace. However, current doctrine does not recognize the requirement to provide air defense to the entire airlift force, civilian aircraft included, during humanitarian relief missions, though there is a potential threat of a MANPAD SAM attack. By examining two recent humanitarian relief missions we can observe how the JTF commanders used doctrine or developed their own methods to provide protection to the strategic airlift aircraft.

IV. Current Responses

Before Service or Joint doctrine can be changed to protect the strategic airlift forces better, we should consider how recent JTF's have managed this problem. Some guidance in our current doctrine might have worked in the humanitarian assistance environment and need not change. Some techniques used by the JTFs and Services during Operations RESTORE HOPE and SUPPORT HOPE might need to be added to current doctrine. First, we will review the operational environment and the actual vice potential threats to the airlift bridge during these operations. Then we will analyze how

each JTF addressed the force protection requirement. This may reveal what parts of Service and Joint doctrine were adequate and what needs altering. The Air Force, Army and Joint doctrines must all work together to provide protection to the airlift forces.

Operation RESTORE HOPE

Operation RESTORE HOPE was conducted under UN authority in Somalia between 3 December 1992 and 4 May 1993. It was a multinational humanitarian assistance operation involving more than 38,000 troops; twenty-one coalition nations with nine more nations participating in some other type of aid; and over forty-nine NGOs.[48] According to the International Community of the Red Cross, Somalia was the largest relief operation since the end of World War II. The United States delivered over 20,000 tons of food per month to Somalia. Twenty-six percent of these supplies came via the extensive air bridge to Mogadishu airfield.[49] During the operation the JTF commander planned to receive 28 aircraft per day to deploy and sustain his force. Because of limited United States' interest, and the threat in Somalia, the operation only received 12 aircraft per day.[50] The MOG restricted the APOD to only narrow-body aircraft. This was quickly enlarged to allow wide-body aircraft into the APOD.[51] Security remained a major concern through out the year as fifteen clans and sub-clans vied for power in multifactional civil war with constantly changing sides.

Clans obstructed the movement of relief supplies as an extension of internal power struggle, and interfered with the relief flights.[52] Food in Somalia was more valuable than money and relief work was hazardous. Assaults on the food supply became

a key military strategy in Africa's civil wars.[53] Therefore, anyone who guarded the food was an enemy to those who were making money from the food shortage. The JTF providing security at Mogadishu airfield was the enemy to these factions.

Security at the APOD was difficult. The nature of the APOD precluded the establishment of a tight perimeter. It was extremely difficult to deny penetration of the base since host nation assets were assisting in the humanitarian relief mission. Completely securing the airfields with the JTF's limited forces was not possible.[54] Just outside the airfield, bands of clan fighters armed with AK-47s and crew-served weapons posed a threat to airlift security. Numerous buildings within 300 meters of the airport offered excellent concealment and cover. These buildings were well within MANPAD SAM range. The terrain surrounding the airport was higher than the airfield, allowing good observation and a clear field of fire for a MANPAD SAM. Armed men infiltrated the airfield perimeter almost every night. The JTF base commander could not even secure the perimeter, let alone an effective patrol outside the APOD.[55]

Security was made more difficult because there was an ineffective chain of command. The base commander had not established a clear, defined chain of command for security in the APOD.[56] Base security was confused because numerous nations and relief agencies shared the airfield. Each organization had its own agenda and national interests. This meant the force protection of the airlift operation was done separately, instead of a combined effort. Unity of effort was never obtained. The JTF followed Joint doctrine and combined its assets to provide this protection.

The JTF recognized the threat to the airlift bridge and used the forces available to

protect it. On the ground, the base commander used patrols as suggested by Joint Pub 3-01.4. These patrols consisted of scouts sent out fifteen minutes before each takeoff and landing of the military strategic airlift aircraft. No patrols went out prior to NGO aircraft flights. Bandits closely observed the force movements to identify any patrol patterns and timing. Nevertheless, the commander did not vary the fifteen minute patrol pattern![57] The base commander disregarded both Joint doctrine for air defense and the requirement to protect civilian aircraft in the AOR. Tactical patrols, as suggested under Security in Joint Pub 3-10.1, are necessary to collect information, confirm or deny accuracy of previous information, and provide security. Patrols can also provide force protection to strategic airlift aircraft by denying terrain to the enemy. This doctrine stresses that patrols should avoid daily routines and times. This is because a set pattern can be detected and defeated.[58] By maintaining a routine patrol the commander made it easier for a MANPAD SAM to attack the airlift bridge. Only by using air patrols in conjunction with JTF ground patrols was the air bridge kept open.

Two methods of airborne force protection were used. First, the military strategic airlift aircraft adhered to their primary defense procedure--threat avoidance. They avoided the land and city approaches as much as possible. The aircraft approached and departed the APOD from over the water. This was possible in Mogadishu because the APOD bordered the ocean. This will not be the case for an inland APOD. Strategic airlift aircraft developed their own predictable patterns that made them very vulnerable. This was similar to the routine patrols established by the base commander. Humanitarian aid received the priority. Therefore, AMC used the steady flow method for the airlift. It

brought the most relief to the region in the shortest amount of time, but made the airlift bridge vulnerable to interdiction.

The second airborne method was defensive air patrol. Attack helicopters patrolled the APOD area fifteen minutes before the strategic airlift aircraft's arrival and departure. Again, this set a routine that was learned and attacked by the enemy. The base commander had to raise the altitude of hovering helicopters to over 1,000 feet to avoid ground fire. The adjustment was needed because the enemy fired RPGs at the helicopters when they patrolled at lower altitudes. The enemy could just as easily have used a MANPAD SAM and made the helicopters targets as well.[59]

The After Action Report (AAR) for Operation RESTORE HOPE cites two lessons learned regarding force protection from this operation. Lesson one, the CINC and transportation planners should consider the safety requirements of large aircraft. They are not capable of effective evasive action, and they are vulnerable to small arms and MANPAD SAMs while taking off and landing. Second lesson they learned it is necessary to provide force protection during a humanitarian assistance mission, though it means using strategic airlift less efficiently and not keeping to a routine.[60] The AAR concluded that US doctrine was not adequate nor were there sufficient forces to defend airlift forces against hostile threats. Military transport aircraft remained vulnerable to attack and civilian, CRAF and NGO, aircraft were not protected by any means. Now, by examining Operation SUPPORT HOPE we can see if these lessons were applied in the next humanitarian relief mission or whether other means for providing protection were found.

Operation SUPPORT HOPE

The crisis in Rwanda was the inevitable result of 50 years of misrule, repression, and violence. On 6 April 1994, a transport plane carrying President Habyarimana of Rwanda and President Ntaryamira of Burundi was shot down. The probable cause was a MANPAD SAM fired from Kigali, the capital city of Rwanda. These deaths resulted in a rampage by the government and militia forces that killed the Tutsi and moderate Hutus castes.

To alleviate the crisis both the United Nations and United States responded. The United Nations deployed 2,500 peacekeepers to Rwanda to stop the most recent genocide. Chapter VI of the UN Charter constrained the forces because it did not authorize the use force during the mission, except in self-defense.[61] After the Tutsi led Rwanda Patriotic Front declared victory and established a new government, over a million Hutus fled to Tanzania and Zaire. Death by cholera, dysentery, and exhaustion came to the refugee camps there. This humanitarian crisis led to the US response.

Shortly after the deaths were reported in the refugee camps, SEC DEF Perry said US forces would go to Rwanda to deliver emergency humanitarian assistance and the forces would leave as soon as the aid was established. The American public was not interested in intervening to stop Rwandan ethnic violence. There was no vital US security interest. The JTF task was directed solely to provide humanitarian assistance. It was not to provide a nation-building or peacekeeping force in the AOR. The JTF's ROE allowed self-defense, defense of other relief agencies, and protection of "mission essential" property. This clearly defined the JTF's responsibilities to provide force

protection for all the aircraft entering the theater, not just the military aircraft.[62]

The sudden humanitarian crisis forced the United States to rush forces to the theater with little time for organizing and planning the coordination with other agencies. The JTF for Operation SUPPORT HOPE was organized on very short notice, in some cases as the elements were deploying. At no time did the JTF exceed 3,000 troops in the theater, too small a force to secure the APODs.[63] There were already over seventy relief groups in the theater before the JTF arrived. Each had its own agenda. Not all agencies were willing to cooperate with the JTF and receive force protection, though the JTF was responsible for this task. Confusion was not limited to the JTF ground forces it also included the airlift forces.

Strategic airlift aircraft carried out two different missions in the AOR. It provided emergency humanitarian supplies for the JTF, and airlift for the UN peacekeeping mission in Rwanda. This contributed to the chaos and confusion as to the United State's role in the AOR. JTF Support Hope was a humanitarian assistance mission, in the CINC's words to "stop the dying." According to the Secretary of the Air Force over 15,000 tons of relief supplies were flown to the Rwandan AOR via the strategic airlift bridge.[64] The JTF was not part of the UN forces in Rwanda, as it had been in Somalia. The JTF could not take sides or cooperate with UNAMIR, the UN military command with a peacekeeping mission, though the US transport aircraft did do this for the United Nations.

The second mission assigned to the strategic airlift force was airlift in support of UN forces. US airlift transported Ethiopian troops to Rwanda and took French forces

from the theater for UNAMIR. The United Nations and relief agencies assumed that the deployment of United State's forces meant security and protection for both the UN forces and the NGOs.[65] Because the United States transported the UN forces, it assumed responsibility for their protection while deploying into the AOR. Force protection for the airlift forces was a constant concern. The AOR was chaotic; local troops were undisciplined; and no Status of Forces Agreement existed with the local government.[66] The JTF had to overcome all these constraints and limitations to provide protection to the airlift bridge. This protection was handled differently in Rwanda than in Somalia.[67]

The threat in the Rwanda AOR was met by sending a Humanitarian Assessment Survey Team (HAST) to the area first. The HAST's mission was to assess the situation in the AOR for the commander's initial estimate of the situation before the JTF commander arrived. According to the AAR for the operation this analysis was not complete before the forces deployed to the theater. The HAST should have looked harder at the political situation. The area was a war zone and the refugee situation deliberately orchestrated and each APOD had its own peculiarities.[68] The dispute between the Tutsi and Hutus clans had been going on for years, and the previous government had not agreed to the cease fire. The HAST assessment was probably effective for the humanitarian mission, but it did not include an assessment related to the protection of the airlift aircraft. The HAST therefore, did not adequately address the protection for all the aircraft operating in the AOR.

The JTF relied exclusively on the strategic airlift aircraft to protect themselves. Other than the HAST examination of the environment there was little else the JTF did to

provide protection for any of the aircraft in the AOR, although the MANPAD SAM threat was there.[69] Also, the United States transported other national forces for the UN peacekeeping mission. Normally, a peacekeeping mission requires all parties to agree to the cease-fire. This was not the case in Rwanda, and should have been considered in terms of providing protection to the airlift aircraft. Only an armistice was in effect. The United States was fortunate no further aircraft were downed by MANPAD SAMs. Consequently, force protection was left to the transport aircraft, or ignored.

Obviously, the lessons learned during Operation RESTORE HOPE were ignored in Operation SUPPORT HOPE. Relying on only the self-defense assets of strategic airlift aircraft is not the correct approach in the humanitarian assistance environment. Most aircraft lacked ADS equipment. These aircraft also cannot use avoidance tactics since they must fly into the APODs to deliver their cargo. Adequate air defense coverage is not currently provided to the strategic airlift aircraft. Doctrine provides guidance to protect the APODs, but with the constraints and limitations imposed on the JTF during humanitarian relief operations, other options must be found for future operations.

V. Future Responses

Joint doctrine provides guidance for force protection in the humanitarian assistance environment. The doctrine is currently inadequate to provide protection for all strategic airlift aircraft operating in the AOR during a humanitarian relief mission. The AAR for Operation RESTORE HOPE made this observation. The lessons of Somalia

were ignored in Operation SUPPORT HOPE. The doctrinal and operational shortfall in airlift protection stems in large part from the assumption of air superiority.

Assuming air superiority is clearly valid, but irrelevant. While there is no air-to-air threat, a significant ground threat exists. The MANPAD SAM denies the freedom of action to all aircraft operating from the APODs. Since Air Force doctrine requires its aircraft to have a self-defense capability, it should equip the strategic airlift aircraft with ADS. This includes the CRAF aircraft. Therefore, force protection capability will not depend on whether SEAD aircraft are available. The ADS equipment will alleviate a large portion of the JTF's concern for force protection in the humanitarian assistance environment.

The self-defense equipment the strategic airlift aircraft require consists of an integrated, automatic ADS. A relatively small amount of EW equipment will produce a proportionally larger effect on the aircraft's survivability, but doubling or trebling the systems will not provide twice or thrice the protection. Therefore, the transport aircraft can use a single automated system for the aircraft's self-defense capability. The three major ADS subsystems are the warning receiver, chaff/flare dispenser, and the jamming system.

The warning receiver subsystem is the first system of the ADS affected by the MANPAD SAM threat. A warning receiver provides information to the ADS that determines the radar type, range and bearing to the radar, and status of the threat, whether the radar is searching, tracking, illuminating or actively guiding a missile.[70] The warning receiver also notifies the aircrew by displaying the threat as a strobe line or a

position of the aircraft's radar scope. When possible, the crew can then avoid flying near the threat. In the event it cannot, the integrated ADS will automatically trigger the chaff/flare dispenser and jamming subsystems.

After the chaff/flare dispenser subsystem receives information on the threat from the warning receiver it discharges either a chaff or flare cartridge. Most dispensers hold thirty chaff or fifteen IR flare cartridges. Normally, chaff drops present spurious targets to the threat that can last from 24 to 48 hours at distances up to hundreds of miles from the original drop site.[71] This is extremely hazardous in an airport area when the ground controller relies on radar to safely guide the aircraft. Therefore, transport aircraft usually do not use chaff, and flare cartridges are loaded in the dispenser.

Flares saturate the missiles' IR sensors with so much energy that the target becomes invisible to the missile and the flare decoys them away from the aircraft. Flares mimic the actual engine IR signature and are effective when fired at the appropriate time and in large amounts.[72] Therefore, this system must be automated to fire the flares at the correct intervals and amounts to defeat the threat. Both flares and chaff are very effective when used with the jammer subsystem.

Jamming systems mimic the missiles' radar and seeker electronic emissions. This induces the missile to track the false targets created by the chaff and flares.[73] Jamming exploits the weakness in the electronic circuitry of the MANPAD SAM. As the aircraft moves the jammer determines the radar emitters which represent the greatest threats to the aircraft. It then assigns priorities to these threats, and selects the optimum jamming techniques and electronic power level needed to counter these threats.[74] The jamming

system with the other systems of the integrated ADS provides airlift aircraft adequate self-defense capability to airlift aircraft.

The Air Force has already developed these integrated aircraft defensive systems for transport aircraft. The Air Force's Advanced Defense Avionics Response Strategy (ADARS) features a data base managed system that has all the SAM threats programmed in the data base. This includes the threats' susceptibilities and vulnerabilities, as well as onboard countermeasures that could be employed automatically. The ADARS onboard processor assigns threat priorities and develops response strategies according to the available countermeasures, based on the aircraft's EW equipment and phase of flight.[75]

An ADS specifically designed for large aircraft is the Advanced Threat Infrared Countermeasure system (ATIRCM). It protects transports from the MANPAD SAM threat and includes a passive missile warning subsystem, a chaff/flare dispenser, and a directable IR jammer. The E-4A Airborne Command Post , E-8 Joint Stars, and VC-25A Air Force One aircraft all have these aircraft defensive systems, and these planes are military versions of commercial aircraft.[76] Therefore, ADS equipment is already available for commercial aircraft and no further development is needed. Only one obstacle remains to prevent the CRAF from receiving ADS equipment.

The principal obstacle to achieving this force protection for the United States' transport aircraft is lack of money for EW in the current military budgets.[77] The Air Forcesees no urgent need to equip the CRAF aircraft with ADS equipment. This is mostly due to the cost of onboard electronic protection equipment when individual systems are installed. The Air Force must complete the installation of ADS on AMC's

aircraft. These include both the military and CRAF aircraft used in the humanitarian assistance mission. It is not feasible to equip all the CRAF aircraft because the composition of this fleet changes monthly. However the long-range, wide-body CRAF aircraft are the first aircraft used in a crisis and therefore, should receive ADS equipment. These aircraft are crucial for crisis response, and they are the most difficult aircraft to replace.

Another reason ADS is neglected is the small amount of money DOD budgets for humanitarian missions and no money is budgeted for force protection. This is because it is not a combat environment. Electronic Warfare weapons are not lethal weapons. The General Accounting Office criticized the DOD in 1992 for not developing an effective EW master plan to achieve the intended commonality of equipment and tactics.[78] SEAD aircraft are retiring because the newest fighter and bomber aircraft come with built-in stealth and EW technology. The newest military airlift aircraft comes equipped with ADS equipment. Consequently, no one foresees the need to apply the SEAD role in the humanitarian relief missions.

As the world's major contributor of strategic airlift the United States must take the leading role in providing force protection for the airlift aircraft. The United States can manage this task by its technical capabilities and current doctrine. The BUR stated that the United States should plan on faster incorporation of technologies into weapons to provide significant advantages to US forces.[79] The technical capabilities related to force protection are EW and Unmanned Aerial Vehicle (UAV) assets are available today. This equipment has not yet been assessed for its ability to contribute to the humanitarian

assistance mission.

To provide force protection to all aircraft operating through the APODs the JTF can employ UAVs with EW pods. These vehicles are replacing the SEAD aircraft on the battlefield in the EW role. They can just as easily do this mission in the humanitarian assistance environment. UAVs require the same airspace requirements as a low performance aircraft. The UAVs do not give off a clear radar signature and are difficult to acquire visually. This both helps and hinders the JTF.

A small radar signature helps the UAVs by making them difficult to acquire and track by the MANPAD SAM. Therefore, UAVs are harder to shoot down. The lack of a radar signature can also adversely affect the air bridge. This is because the UAV could present a potential hazard to high performance aircraft operating near the APODs. The UAVs need to coordinate their flight plans with the approaching transport aircraft. This is not difficult to resolve since the UAV operators will locate at the APODs, collocated with the tower controllers.[80] The UAV can assist the force protection of all aircraft over the APOD, and not disrupt the flow of relief forces into the theater.

UAVs equipped with jamming pods can deceive and degrade the tracking and guidance systems of the MANPAD SAMs. By using several UAVs, in the same APOD area, it is possible to present the MANPAD SAM from locating the aircraft. The technique of employing several jammers in the same area is referred to as the "n squared rule." Two UAVs with jammers presents four possible targets to the threat radar. Three UAVs present nine targets, etc. to the threat radar. This prevents the tracking radar from acquiring the aircraft, and thus the missile cannot fire effectively at the target. Jamming

equipment aboard transport aircraft has only power enough to protect the individual aircraft. Only SEAD aircraft or UAV jamming pods can accomplish this mission.[81] Because SEAD aircraft are not available for this mission the JTF commander must consider how to include UAVs into the Time Phased Force Development Data List (TPFDDL) early in the deployment.

The personnel and equipment necessary to operate the UAVs will not interfere with the requirement to deliver assistance to the AOR. The UAV teams can break down into force packages that allow 24-hour coverage for the APODs in the AOR. The force packages can fit on three to eight C-141s, depending on the number of APODs covered. UAVs can assist the other air and ground assets in providing force protection for the air bridge into the theater. This is especially true for those aircraft without an ADS--the CRAF and NGO commercial aircraft. Current UAV characteristics, sensors, and equipment is listed in Appendix E. Technical equipment is not a panacea for the force protection requirement. It is just one aspect of the joint package needed to defeat the threat. Doctrine also has an important role.

The last part of the force protection package is the tactics and techniques provided in doctrine and learned in the field. The best method of conducting an analysis of the "battlefield" in the relief AOR is by getting ahead of the time limitation. One method to obtain the initial estimate of the AOR is the HAST. This survey team is a good technique that provides the latest update of the threat to the JTF commander as he puts the final touches on the TPFDDL. The analysis provided by the HAST on the intentions of the various factions in the AOR is invaluable to the JTF commander. It

allows the JTF commander to decide the size of combat force needed to reduce the risk to the US forces.

Once in theater the JTF must rely on other tactics to defeat the threat. At the APODs securing an entire MANPAD SAM free zone is not possible with the limit placed on the force size in theater. Therefore, the JTF must rely on correctly executed tactics to provide this protection. These tactics include patrols, both air and ground, to deny the terrain to the enemy, and establishing a base defense operations center as required by Joint doctrine. These tactics had positive effects during Operation RESTORE HOPE. Whenever a threat is found by the patrols, the location and type of threat must be passed to all aircraft flying into the APOD, not just the military aircraft. This warning will allow the aircraft to avoid the threat. It will also allow them to focus their ADS at the critical time and location to safely enter and exit the APODs.

Establishing a base defense operations center allows for unity of effort in securing the APOD. It ensures all agencies, US, UN, host nation, and relief organizations assume responsibility for base security. Together these technical capabilities, tactics, and techniques will meet the force protection requirement in the future.

Conclusion

During a relief mission the greatest threat to transport aircraft is the MANPAD SAM. The characteristics, capabilities, and numbers of MANPAD SAM available make it an ideal weapon to attack the aircraft in their most vulnerable phases--takeoff and landing. Relying on only self-defense tactics of strategic airlift aircraft is not the correct approach in the humanitarian assistance environment. Transport aircraft require air

defense to protect them in this environment.

Current air defense doctrine is adequate to provide force protection when the JTF commander when there are no limits on combat forces. However, during a humanitarian assistance mission, with its force limitations, doctrine only covers military transport aircraft. Doctrine does not extend to the CRAF and commercial aircraft operating in the relief AOR. The Air Force assumes air superiority, therefore, it does not deploy any SEAD aircraft to support the air bridge. Meanwhile, the Army deploys its forces expecting the Air Force to defend the air bridge because the Air Force is the Service most effected by the threat. Hence, there are not enough ground assets available to provide adequate defense against the MANPAD SAM threat during the relief missions. The AAR for Operation RESTORE HOPE made this clear, and the lessons of Somalia were ignored in Operation SUPPORT HOPE. Tactics, techniques, and procedures are necessary to provide force protection to the strategic airlift aircraft in the humanitarian assistance environment.

Force protection is required during humanitarian assistance missions, as well as during war, for the strategic airlift aircraft based on the potential threat. However, doctrine does not yet recognize this air defense requirement for relief operations. This air defense must not only cover the United States' military aircraft, but also the CRAF and civilian aircraft aiding the relief effort. There is not just one solution to protecting the strategic airlift fleet during humanitarian assistance missions. Technology is not the ultimate solution. An integrated EW master plan to include airlift forces, ADS for transport's self-protection, and tactics to provide force protection in the AOR is required.

The direction and guidance provided in Joint doctrine provides adequate air defense measures for the protection of the military transport aircraft. They do not currently protect all the airlift aircraft operating in this environment.

A sense of urgency to equip the CRAF with ADS capability as part of the CEP is needed. At least, as a minimum, the most crucial part of the CRAF, the long-range international aircraft should receive this self-defense capability. These will be the first aircraft used to deploy troops overseas in a crisis. If these aircraft are destroyed, their loss would significantly reduce the cargo capability of the air bridge. The JTF should insist on these aircraft to deploy his initial forces to the crisis area. These initial forces should consist of HASTs and UAVs with EW pods.

Next, the United States should continue the development of UAVs and their payloads. The UAVs can provide continuous force protection, when integrated with the ground forces, for all aircraft flying into the APODs. The number of aircraft used, and personnel deployed with the UAVs, are small. Hence, UAV deployments will not interfere with the mission to provide rapid humanitarian assistance, nor will they threaten to exceed the force limits for the mission. Since the UAVs have interchangeable payloads they can adapt to the changing threat technology. UAVs should deploy early to the AOR to assist in the force protection of all the airlift aircraft in the theater.

Lastly, the JTF commander should follow Joint doctrine in establishing base defense operations centers and patrol standards. Sending in a HAST early to analyze the situation will allow time for the commander to bring the right forces to the theater to provide the APOD security with these operations centers and patrols. Close coordination

between the air and ground patrols will ensure the LOCs are covered during the critical times when aircraft are flying through the APODs. By applying these recommendations, with current doctrine and military capabilities, it will be possible to provide adequate force protection to the strategic airlift aircraft.

GLOSSARY

AD	Air Defense
ADS	Aircraft Defensive System
AMC	Air Mobility Command
AME	Airlift Mobility Element
AOR	Area of Operations
APOD	Aerial Port of Debarkation
ARM	Anti-Radiation Missile
BUR	Bottom Up Review
CEP	CRAF Enhancement Program
CONUS	Continental United States
CRAF	Civil Reserve Air Fleet
DOD	Department of Defense
EW	Electronic Warfare
HAST	Humanitarian Assessment Survey Team
IR	Infrared
JCS	Joint Chiefs of Staff
JRA	Joint Rear Area
JTF	Joint Task Force
LO	Liaison Officer
LOC	Lines of Communication
LOS	Line-of-Sight
MANPAD SAM	Man-Portable Surface-to-Air Missile
MOG	Maximum on the Ground
MRC	Major Regional Conflict
MRS	Mobility Requirements Study
NGO	Non-Governmental Organization
NMS	National Military Strategy
OOTW	Operations Other Than War
RHAW	Radar Homing and Warning
ROE	Rules of Engagement
RPG	Rocked Propelled Grenade
SACLOS	Semi-Automatic Line-of-Sight
SEAD	Suppression of Enemy Air Defenses
SEC DEF	Secretary of Defense
SOFA	Status of Forces Agreement
TPFDDL	Time Phased Force Deployment Data List
UAV	Unmanned Aerial Vehicle
UN	United Nations
USTRANSCOM	United States Transportation Command

Appendix B

MANPAD SAMS[82]

SAMs	SA-14 Strela 2	SA-16A Strela 3	SA-16B Igla	BOFORS RBS70
Code Name	Grail (NATO)	Gremlin (NATO)	Needle (NATO)	Rayrider
Range (meters) minimum	500	600	600	not revealed
Range (meters) maximum	3600	6000	7000	5000
Altitude (meters) minimum	45	10	10	0
Altitude (meters) maximum	4800	5500	6000	3000
Speed, maximum (m/s)	580	600	600	not revealed
MACH	1.7	1.8	1.8	not revealed
Guidance	IR/IFF	IR	IR	Laser
Weight (lbs)	20	21	176	not revealed
Remarks	-battery good for 11 to 60 seconds -limited to pursuit course -defeated by flares in large amounts -missiles cost $45,000 on black market	-good for side and front shots at 4000 m -IR signal processor defeats flares	-good for side and front shots at 4000 m -IR signal processor defeats flares	-30 seconds to erect and fire -requires clear weather

SAMS	BOFORS RBS 90	SHORTS	SHORTS
Code Name	Rayrider 2	Blowpipe	Javelin
Range (meters) minimum	not revealed	300	300
Range (meters) maximum	5000	4025+	5485
Altitude (meters) minimum	0	0	0
Altitude (meters) maximum	3000	2010	1985+
Speed, maximum (m/s)	not revealed	not revealed	not revealed
Guidance	TV/IR/Laser	Radio/IFF	IR/SACLOS
Weight (lbs)	unknown	13	66
Remarks	-can use in any weather -can use remote control		-Thorn EMI ADAD device installed -Shows 4 targets at one time

SAMS	Shorts	GD FIM-43A	GD FIM-92A
Code name	Starstreak	Redeye	Stinger-Post
Range (meters) minimum	300	unknown	unknown
Range (meters) maximum	6995	3700	5030
Altitude (meters) minimum	not revealed	not revealed	unknown
Altitude (meters) maximum	not revealed	not revealed	4800
Speed, maximum (m/s)	not revealed	not revealed	not revealed
MACH	4.0+		
Guidance	IR/SACLOS	IR	IR/IFF
Weight (lbs)	unknown	13	30
Remarks	- Warhead is Kinetic Energy and High Explosive type	- limited to pursuit chase - early model, 1960s	- cannot fire down on target

Appendix C[83]
Strategic Airlift Aircraft

Aircraft	C-5	C-17	C-141	KC-10
Name	Galaxy	Globemaster III	Starlifter	Extender
Range, (NM) maximum unrefueled	2958	2400	2500	4400
Payload, maximum (1,000 lbs)	216	171	94.5	170
ACL[84] (1000 lbs)	150	120	50	100
Cargo Capability[85]	outsize	outsize	oversize	oversize
Pallets[86]	37	18	13	27
Troops, max for overwater flight	73[1]	102	160	69
Air refuelable	yes	yes	yes	yes
Total PAI[87] in 1995	104	199	54	12
ADS (planned or in place)	AN/AAR-47 AN/ALE-40	AN/AAR-47 AN/ALE-40	AN/AAR-47 AN/ALE-40	AN/AAR-47 AN/ALE-40
Unit cost ($ millions)	168 (1992)	534 (1994)	8.1 1992)	86.3 (1992)

[1]Troop seating in the overhead troop compartment in the tail of the aircraft. 267 additional seats can be configured in the cargo compartment. Field Manual 55-9, p. 2-3.

Aircraft	B-747	DC-8	DC-10	B-707
Range, (NM) maximum	3500+	3500+	3500+	3500+
Payload, maximum (1,000 lbs)	250	110	176	90
ACL (1000 lbs)	180	90	150	73
Cargo Capability	oversize	bulk	oversize	oversize
Pallets	42	18	30	13
Troops, maximum for overwater flight	492	235	354	142
Air refuelable	no	no	no	no

Appendix D[88]
Aircraft Defensive Systems

Warning Systems[89]	Characteristics
AN/AAR-44	missile launch warning system
AN/AAR-47	missile warning receiver
AN/ALQ-153	detects missile launch, warns crew, and directs optional flare launch
AN/ALQ-156	detects missile launch, warns crew, and directs optional flare launch
AN/ALR-56M	RHAW
AN/ALR-69	RHAW
AN/AVR-2	laser energy detector, warns crew of beam-riding weapon lock-on

Suppression Systems

Consumables[90] / Decoys (Flares[91] and Chaff[92])

System	Characteristics
AN/ALE-40	decoy dispensor: set of 4 dispensers of 30 RR-170 chaff cartridges or 15 MJU-7 IR flares
AN/ALE-47	replacing the AN/ALE-40
AN/ALQ-131	combines AN/ALQ-153 and decoy dispensers
AGM 136A	ARM
ATIRCM	RHAW, jammer, decoy dispensor, used on large aircraft to protect against MANPAD SAMs, on E-8 J-STARS
V-Chaff	presents temporary numerous false targets[93]

Non-Consumables[94]

System	Characteristics
AN/ALQ-144	continuously generates pulses of IR "noise" to produce erroneous guidance signals
AN/ALQ-157	continuously generates pulses of IR "noise" to produce erroneous guidance signals
AN/ALQ-172	detector and jammer
AN/ALQ-178	jammer
Exhaust Extensions	shields engine emissions
MODIR	IR jammer
AN/ALQ-202	autonomous jammer

Appendix E[95]

UAVs[96]

Type	Tactica	Short	Meduim	High Altitude Long Endurance
Sensor	EW	EW and anti-radar	EW	EW
Radius (KM)	30	150	650	classified
Speed (kts)	not specified	90	550<20,000'	not specified
Phase	Demonstration	Test	Operational	Dormant
Payload (lbs)	<50	200	not stated	not stated

Equipment Baseline[97]

- 8 UAVs
- 1 Launch/Recovery Station
- 1 Payload Transporter
- 4 UAV Transporters
- 14 Personnel

Endnotes

1. Steven Metz, Associate Research Professor of National Security Affairs at the Strategic Studies Institute, specializing in transregional security issues and OOTW, Disaster and Intervention in Sub-Saharan Africa: Learning from Rwanda, (Carlisle Barracks, PA, Strategic Studies Institute, 1994), p. 20.

2. Strategic Airlift is defined as airlift between theaters or CONUS to a theater.

3. During Operation Desert Shield/Storm many CRAF airlines would not fly into fields threatened by chemical warfare attack because they did not have any means to combat this threat. Mark Pires & Darrell K. Williams, "Strategic Lift: Can the United States Conduct Two Nearly-Simultaneous Major Regional Contingencies," (Monograph submitted to the School of Advanced Military Studies, 1995), p. 24.

4. These aircraft: C-5, C-17, C-141, L-100, B 707, MD DC-10, KC-10 are the aircraft examined in this paper and are the primarily strategic aircraft used during humanitarian assistance missions.

5. For example, just recently AMC coordinated three Humanitarian assistance missions to the African nations of Congo, Eritrea, Kenya, Tanzania, Uganda, and Zambia between July to September 1995. These DC-8 aircraft carried 120 tons of medical supplies for Americares Foundation Inc. and Dutch HRA, Schiphol Triport. Both of these are NGOs. Also, AMC contracted Evergreen International Airlines B-747 and Air Transport International DC-8 aircraft to transport cargo and medical supplies to Kigali, Rwanda and Zagreb, Croatia respectively in September 1995. This information was obtained from AMC's Internet Homepage under the following links: AMC/Press/Release # 950706/ 25 Jul 95 and AMC/Press/Release # 950902/ 5 Sep 95/ Scott AFB, Ill, HQ AMC.

6. The CRAF program uses commercial aircraft to rapidly augment organic military airlift during crises. CRAF combines both cargo and passenger airlift capabilities to meet emergency airlift requests. CRAF provides aircraft without the outlay of purchasing aircraft, personnel costs and maintenance costs. In the CRAF Enhancement Program (CEP) DOD pays for the ability to transport bulk and oversize cargo on the commercial aircraft by strengthening the floor, cargo door, and roller and rail system. The actual number of aircraft in the CRAF program changes monthly based on the three-year contract negotiations. As of April 1995, 536 commercial aircraft were committed to CRAF throughout its three stages. The long-range international aircraft, capable of overwater flight, are the most crucial to CRAF. USTRANSCOM wants the equivalent of 136 wide-body B-747 aircraft for passengers and 120 for cargo capability. As of mid-1995 they have committed 133 and 110 respectively. CRAF has the capability of transporting 20 Million Ton Miles/Day.
Stage I Carriers have 24 hours to make aircraft available for missions. With the Secretary of Defense's approval the commander of USTRANSCOM can activate this stage of CRAF, as of

February 1992. Previously, the commander of AMC could activate Stage I without this approval. The minimum numbers of aircraft desired for this stage are 30 cargo and 30 passenger planes. It is possible to only activate some of the aircraft available in each stage. Stage I contibutes 9% of the passenger capacity in the long-range US commercial fleet and 19% of the cargo capacity.
Stage II Carriers have 24 hours to make aircraft available for missions. With the Secretary of Defense's approval the commander of USTRANSCOM can activate this stage of CRAF. An additional 30 cargo and 30 passenger planes are available for Stage II. CRAF's capacity now rises to 28% of the passenger capacity and 47% of the cargo capacity.
Stage III Carriers have 48 hours to make aircraft available for missions. The SEC DEF can activate this stage during military national emergencies declared by the President or by Congress. All remaining aircraft in CRAF are available in Stage III. "Pentagon Pursues Additional Commitments from Airlines to Boost U.S. Airlift Capability," Aviation Week and Space Technology, (30 January 1989), p. 24. Field Manual 55-9, p. 3-1. Military Airlift Changes Underway to Ensure Continued Success of Civil Reserve Air Fleet, pps. 2-19. Peter Grier, "The Comeback of CRAF," Air Force Magazine, (July 1995), p. 13. AFLINK/Fact Sheet/95-07/CRAF (internet). Clifton F. Berry, "The Civil Reserve Air Fleet--National Airlfit Asset," Air Force Magazine. (February 1980), p. 59. Perry, p. 219.

7. A MOG restricts the number of aircraft on the ground at an airfield. Normally, this restriction is due to the size of the airfield and the amount of space available to park the aircraft. A MOG can also be due to the number of: emergency vehicles capable of responding to an accident, refueling trucks available, maintenance personnel and equipment on hand, or material handling equipment (MHE) available to download the aircraft.

8. Joint Pub 4-01.1, Airlift Support to Joint Operations, (Washington, D.C., National Defense University Press, 1991), pps. I-6, IV-17.

9. SEAD is an activity that neutralizes, destroys, or temporarily degrades enemy surface based AD. One category of SEAD is local suppression. This type of SEAD normally operates for a specified time and location in the theater. This is the type of force protection required for strategic airlift in the humanitarian assistance environment. Joint Pub 3-01.4, JTTP for Joint Suppression of Enemy Air Defense (J-SEAD), (Washington, D.C., National Defense University Press, 1993), pps. 1,6. There are only two types of SEAD aircraft on active duty in the US military, the AF's EF-111 and Navy's EA-6B. Only 24 EF-111s are on active duty, most of them are employed in the air operations over Iraq and Bosnia. The EF-111 is retiring based on 1992 recommendation of the Senate Armed Services Committee. All will be retired by 1998. The replacement for the EF-111 is the EA-6B. The EA-6B is also limited in numbers while undergoing refitting to take over the EF-111 role for all the services. The Pentagon was in favor of retiring the EF-111 as a way to save money and increase joint efforts. The Air Force is trying to delay the retirement of the EF-111 until 1998 when enough EA-6Bs will be available. The plan is to retire 12 EF-111s in 1997 and 12 in 1998. Steven Watkins, "EF-111's Future Remains Unclear," Air Force Times, (25 September 1995), p. 41.

10. The Geneva Conventions of 1949 and the two additional Protocols of 1977 set out the rights of victims of armed conflict to receive humanitarian assistance. A symposium organized by the International Institute of Humanitarian Law in 1992 came to the conclusion that authorized organizations must be allowed access to victims and have the right to offer and provide humanitarian assistance. International Committee of the Red Cross Annual Report, (1992), pps. 162, 163.

11. Joint Pub 3-10.1, Joint Tactics, Techniques, and Procedures (JTTP) for Base Defense, (Washington, D.C., National Defense Universtiy Press, 1993), p. I-4.

12. Routine airlift and airlift supporting MRCs and lesser regional conflict were areas reviewed by a 1982 Summer Study for the USAF Scientific Advisory Board done by Hughes Aircraft Company and Tracor Corporation and by the C-17 Defensive Systems Study performed by HQ Military Airlift Command. John A. Skorupa, Self-Protective Measures to Enhance Airlift Operations in Hostile Environments, (Maxwell AFB, Alabama, Air Universtiy Press, 1989), pps. 19, 24, 27.

13. Robert E. Ball, The Fundamentals of Aircraft Combat Survivability Analysis and Design, (New York, New York, American Institute of Aeronautics and Astronautics, Inc., 1985), p. 77.

14. Doug Richardson, "Jam the Geese and Dissolve the Paint," Armada International, (February-March 1995), p. 46.

15. Ball, pps. 103, 104, 255.

16. Expendables are used as a last resort to defeat the tracking and seeker systems of the MANPAD SAM and includes chaff and flares for transport aircraft. Chaff is not widely used for airlift aircraft due to the radar environment the aircraft operate in. Radar controlled airfields require radar contact to maintain the safe and continuous flow of aircraft into the fields. If chaff was used in the APOD area the aircraft would be lost in the clutter and could not be controlled safely. In a mountainous environment the aircraft could fly into the ground because its own radar would also be affected by the chaff. Therefore, flares are used to mimic the aircraft's emission signature.

17. This was in 1986 before Operations JUST CAUSE and DESERT SHIELD/STORM sent more weapons to the Third World. David R. Mets, Land-Based Air Power in Third World Crisis, (Maxwell AFB, Alabama, Air University Press, 1986), pps. 20, 22.

18. Chris Bellamy, The Future of Land Warfare, (New York, New York, St. Martin's Press, 1987), p. 135.

19. Surface-to-Air Missiles are sold via primary sales to the following countries: Afghanistan, Angola, Algeria, Bulgaria, CIS, Cuba, Cyprus, Czechoslovakia, Egypt, Ethiopia, Finland, Guinea, Hungary, India, Iraq, Iran, Jordan, Kuwait, Libya, Mali, Morocco, Mozambique, Nicaragua, Nigeria, Poland, South Yeman, Vietnam, Yugoslavia, and the UK. Secondary sales are to guerrilla groups including the PLO and IRA. The only two continents missing were Australia and Antartica. Report of the Bottom-Up Review,(Washington, D.C., October 1993), p. 36. Christopher Chant, Air Defense Systems and Weapons World AAA and SAM Systems in the 1990s, pps. 25-133. Steven Zaloga, Soviet Air Defense Missiles, (Jane's Information Group Limited, Surrey, UK, 1989) pps. 243, 308.

20. Zaloga, p. 239.

21. Don Herkovitz, "Elements of EW Expendables," Journal of Electronic Defense, (December 1993), p. 42.

22. Zaloga, pps. 240, 241. Herkovitz, p. 42.

23. Metz, p. 7.

24. The Mobility Requirements Study (MRS) stated that there would be a shortfall in strategic airlift mobility capability until after the year 2000. This report also found the assumptions concerning strategica airlift as too optimistic. The MRS assumed that 80 C-17s would be available in 1999. Actually, only 53 might be available according to the Air Force, based on current C-17 production schedules. Details of the MRS and its assumptions are classified and are not included in this paper. U.S. General Accounting Office, DOD's Mobility Requirements Alternative Assumptions Could Affect Recommended Acquistion Plan, (Washington, D.C., 22 April 1992), p. 1.

25. Of the four pillars on which the NMS is built, strategic airlift plays a vital role in three of them--to fight and win two nearly simultaneous Major Regional Conflicts (MRCs), Forward Presence, and Crisis Response. Airlift does not have a role in Strategic Nuclear Deterrence.

26. Joint Chiefs of Staff, Roles, Missions, and Functions of the Armed Forces of the United States, (February 1993), p. III-5.

27. John L. Cirafici, Airhead Operations--Where AMC Delivers The Linchpin of Rapid Force Projection, (Maxwell AFB, Alabama, Air University Press, March 1995), p. 3.

28. Samuel W. Lewis, President of the US Institute of Peace, "Enhancing Stability: Peacemaking and Peecekeeping," Non-Combat Roles for the US Military in the Post-Cold War Era, (Ft. Lesley J. McNair, Washington, D.C., National Defense University Press, 1993), pps. 39-40.

29. William Matthews, "Shali's Warning: Casualties are Inevitable," Air Force Times, (16 October 1995), p. 27.

30. Report of the Bottom-Up Review, (October 1993), p. 2.

31. Ibid., pps. 16, 198.

32. AF Manual 1-1, Volumes I and II, Basic Aerospace Doctine of the United States Air Force, (Washington, D.C., Department of the Air Force, 1992), pps. Vol I 7, 14, 15. Vol II 4.

33. Electronic Warfare consists of three subcomponents: electronic attack (EA), electronic warfare support (ES), and electronic protection (EP). EA was formerly known as electronic countermeasures (ECM). EA involves actions taken to prevent or reduce effective use of the electromagnetic spectrum by the enemy; for example, jamming. ES was fromerly known as electronic support measures (ESM). ES involves actions taken to search for, intercept, locate, and identify sources of enemy electromagnetic emissions for the purpose of immediate threat recognition. EP was formerly known as electronic counter-countermeasures (ECCM). EP involves actions taken to retain effective friendly use of the electromagnetic spectrum. Field Manual 34-8, Combat Commander's Handbook on Intelligence, (Washington, D.C., Department of the Army, 1992), p. Glossary-2. Field Manual 34-130, Intelligence Preparation of the Battlefield, (Washington, D.C., Department of the Army, 1994), p. Glossary-6.

34. Joint Pub 3-01.4, p. I-4.

35. Herkovitz, p. 45.

36. Skorupa, p. 258.

37. The CEP was authorized under Public Law 97-86, 1 December 1981. In 1989 Congress expanded the CEP to allow for incorporation of various defense features with the other structural conversions funded by the CEP. However, no contract has been awarded for this newest CEP addition. U.S. General Accounting Office, Military Airlift Changes Underway to Ensure Continued Success of Civil Reserve Air Fleet, (Washington, D.C., 31 December 1992), p. 19.

38. Colonel Robert B. Killebrew, US Army, special assistant to the Chief of Staff of the Army, "Force Projection in Short Wars," Military Review, (March 1991), p. 28.

39. Patrick Swan, "Army Cites Importance of C-17," Army News Service, (9 August 1995), p. 2.

40. Field Manual 100-5, Operations, (Washington, D.C., Department of theArmy, 1993), p. 2-13.

41. SEAD is any activity that neutralizes, destroys, or temporarily degrades enemy surface based AD. One category of SEAD is local suppression. This type of SEAD normally operates for a specified time and location in the theater. This is the type of force protection required for strategic airlift in the humanitarian assistance environment. Joint Pub 3-01.4, pps. 1, 6.

42. Ibid., p. 7.

43. Joint Pub 4-01.1, p. 3.

44. Joint Pub 3-10.1, p. 10. Security is defined as never permitting hostile factions to acquire and unexpected advantage. It deals primarily with force protection against virtually any person, element, or group hostile to US interests according to Joint Pub 3-0, p. 6.

45. Joint Pub 3-00.1, Joint Doctrine for Contingency Operations (Draft), (Washington, D.C., National University Press, 1991), p. 10.

46. Rear area installations, which includes all bases during a humanitarian assistance mission, may be targets for factions using the full spectrum of unconventional operations ranging from crime, sabotage, and terrorism. Joint Pub 3-10.1, p. 1. Joint Pub 3-10, Doctrine for Joint Rear Area Operations, (Washington, D.C., National Universtiy Press, 1993), pps. 5, 7.

47. Joint Pub 3-10, p. 6. and Joint Pub 3-10.1, pps. 8, 9.

48. Operation Restore Hope Lessons Learned Report, (Fort Leavenworth, Kansas, US Combined Arms Command, 15 November 1993), p. Introduction. Joint Pub 3-0, Doctrine for Joint Operations, (Washington, D.C., 1993), p. V-15.

49. International Committee of the Red Cross Annual Report, (1992), pps. 14, 46.

50. With a limited interest in the AOR the United States did not want to risk losing its valuable strategic airlift aircraft. A C-5 cost $168 million, and a C-141 cost $8.1 million, to replace in 1992 dollars, if their production lines were still open. A C-17 is estimated to cost about $534 million in 1994 dollars. And the replacement costs estimate for the CRAF aircraft used during Operation Desert Shield/Storm is 15 to 50 billion dollars. This is the replacement cost for 31 cargo and 21 passenger aircraft. These costs do not include the crew, cargo, and passengers that would also be lost. AF LINK/Fact Sheet/C-5A/B Number 92-35 and AF LINK/Fact Sheet/C-141/ Number 92-19. U.S. General Accounting Office, Military Airlift C-17 Settlement Is Not a Good Deal, (Washington, D.C., 15 April 1994), p. 3. AF LINK/Fact Sheet/C-17/ Number 95-06. U.S. General Accounting Office, Military Airlift Changes Underway to Ensure Continued Success of Civil Reserve Air Fleet, p. 7. Operation Restore Hope Lessons Learned Report, p. 5.

51. The first task Air Force personnel accomplished in Mogadishu, Somalia was increasing the MOG for the strategic airlift aircraft to increase the cargo throughput. Cirafici, p. 35.

52. Operation Restore Hope Lessons Learned Report, p. 2.

53. David Keen, "In Africa, Planned Suffering," New York Times, (15 August 1994), p. A-15.

54. Joint Pub 3-10.1, p. 13.

55. Center for Army lessons Learned, U.S. Army Operations in Support of UNOSOM II,(Fort Leavenworth, Kansas: U.S. Combined Arms Command, 1994), pps. I-8-15, I-8-16.

56. Operation Restore Hope Lessons Learned Report, p. VII-2.

57. Operation Restore Hope Lessons Learned Report, p. III-6. U.S. Army Operations in Support of UNOSOM II, p. I-8-16.

58. Joint Pub 3-10.1, pps. F-1 to F-3.

59. U.S. Army Operations in Support of UNOSOM II, pps I-8-8, I-8-17.

60. Operation Restore Hope Lessons Learned Report, p. I-5. U.S. Army Operations in Support of UNOSOM II, p. II-11-12.

61. Chapter VI of the UN Charter only allows for peaceful settlement of disputes between parties. This chapter restricts US forces from using any force, except in self-defense. Bringing a large force to the theater would violate the intent of the UN Charter, and thus places a constraint on US forces. The other chapter humanitarian relief missions fall under is Chapter VII. Chapter VII allows the United Nations, or nations assigned to its operations, to "take such action . . . as may be necessary to maintain or restore international peace and security. This removes most restrictions on the use of force. But the United Nations still controls what force is allowed and when it must be reduced. Operating under Chapter VII allows the United States to bring its superior combat forces to the theater to help end the crisis. Leleand M. Goodrich and Edward Hambro, Charter of the United Nations, (Boston, Massachusetts, World Peace Foundation, 1949), pps. 237-259, 276-278.

62. Metz, pps. v, 7, 8, 10. Operation Support Hope Lessons Learned DRAFT Report, (Fort Leavenworth, Kansas, US Combined Arms Command, 1995), pps. 2, 12.

63. Lt. General Daniel Schroeder, USA, Commander JTF Support Hope, "Lessons of Rwanda Joint Warfighting doctrine Works in Operations Other Than War," Armed Forces Journal, (December 1994), p. 33.

64. Perry, p. 293.

65. Ibid., pps. 31, 33.

66. SOFAs establish the legal status of the force. As a minimum SOFAs include: the right to carry arms, freedom of movement in the performance of service, use of the airports, and matters of jurisdiction. SOFAs must have the appearance of total neutrality of the force. Consequently, this neutrality makes the JTF vulnerable to attack from all sides, as were the cases in Somalia and Rwanda. Operational law for Commanders (Study Guide), (Ft. Leavenworth, Kansas, US Army Command and General Staff College, 1995), pps. 295-6.

67. Operation Support Hope Lessons Learned DRAFT Report, pps. 3, 5-7, 13, 19, 46. Perry, p. 293.

68. Goma was on the brink of lawlessness. Random firing after dark was common and crowds milled at all hours, including many armed paramilitary types. Kigali was virtually a ghost town and US forces were restricted to the airport and not allowed to even use patrols like those used in Somalia. The terrain around Bakavu is rolling, steep hills, well compartmented and difficult to patrol and secure. Ibid., pps. 21, 31.

69. Operation Support Hope Lessons Learned DRAFT Report, pps. 3, 6.

70. Ball, p. 273.

71. Herskovitz, p. 43.

72. Skorupa, pps. 81, 116.

73. Ibid., p. 68.

74. Richardson, pps. 48, 52.

75. "Airborne Electronic Warfare Changes Vex Planners, Pilots and Aggressors," pps. 46, 47.

76. "Electronic Combat Simulation Blunts Diverse Threat Growth," p.55. Francillon, p. 360.

77. "Airborne Electronic Warfare Changes Vex Planners, Pilots and Aggressors," p. 46. "Airborne Self-Protection thwarts Infrared Missiles," Signal, (July 1994), p. 56.

78. Richardson, p. 54.

79. Report on the Bottom-Up Review, p. iv.

80. Joint Pub 3-55.1, Joint Tactics, Techniques, and Procedures (JTTP) for Base Defense, (Washington, D.C., National Defense University Press, 1993), pps II-4 to II-6.

81. Richardson, p.48. Skorupa, pps. 70-71.

82. Information obtained from numerous sources: Ball, p. 112. Chant, pps. 25-133. Modern Warfare, (New York, New York, ARCO Publishing, Inc., 1985), pps. 124-126. Skorupa,p. 32. Zaloga, pps. 232-316.

83. The information for these aircraft came from the following sources: Chapman, pps. 23-62. Mary Chenoweth, The Civil Reserve Air Fleet: An Example of the Use of Commercial Assets to Expand Military Capabilities During Contingencies, (Santa Monica, California, RAND Corp., 1990), p. 29. Swan, "Army Cites Importance of C-17." Field Manual 55-9, Unit Air Movement Planning, (Washington, D.C., Headquarters US Army, 5 April 1993), pps. 2-1to 2-38, 3-2-3-13. Military Airlift Changes Underway to Ensure Continued Success of Civil Reserve Air Fleet, pps. 8-10. Carol Reed, Nick Cook, John Boatman, & J.A.C. Lewis, "Market Survey Airlifters," Jane's Defense Weekly, (23 May 1992), p. 901. Perry, pps. 219, D-3. Rene J. Francillon, The Naval Institute Guide to World Military Aviation 1995, (Annapolis, Maryland, Naval Institute Press, 1995), pps. 360, 361, 516-518, 524, 525, 555-557, 565-567. AFLINK/Fact Sheet/92-19/C-141. AFLINK/Fact Sheet/92-35/C-5A/B. AF LINK/Fact Sheet/C-17/ Number 95-06. AF LINK/Fact Sheet/KC-10/ Number 93-14. U.S. General Accounting Office, Military Airlift C-17 Settlement Is Not a Good Deal, p. 3.

84. ACL is the amount of cargo and passengers, determined by weight cubic displacement, and distance to be flown, that may be transported by specified aircraft. Field Manual 55-9, p. Glossary-3.

85. Bulk cargo is cargo that fits the dimensions of a 463L pallet. Oversize cargo is equipment and material too large to fit on a 463L pallet. Outsize cargo is the largest and heaviest equipment such as M1 main battle tanks, Patriot air defense batteries, bridging equipment, self-propelled guns, or equipment in combat-ready configuration and can only be carried on the C-5 or C-17.

86. The 463L pallet is a flat base used for combining cargo, equipment, or a single load item to facilitate the storing, handling, and air transporting of these items with the AF 463L MHE system. Dimensions are 104" x 84" x 96". Field Manual 55-9, p. Glossary-4.

87. PAI is for active and reserve components. The numbers reflect only combat support and industrial funded aaircraft and not development or test aircraft.

88. The information in this appendix came from the following sources: "Airborne Electronic Warfare Changes Vex Planners, Pilots and Aggressors," Signal, (July 1994), pps. 47, 48. Ray Braybrook, "New Wings for Airlift," Armada International, (October-November 1993), p. 10. "Electronic Combat Simulation Blunts Diverse Threat Growth," Signal, (July 1994), pps. 53, 56. Herkovitz, pps. 44, 45. Reed, Cook, Boatman, & Lewis, p. 901. Richardson, p. 56. Francillon,

pps. 518, 524, 525. Skorupa, pps. 137, 140.

89. Passive warning systems notify the crew of: the type of radar; location of the tracking systems, not necessarily the actual firing weapon; and the status of the weapon system--searching, tracking, illuminating or actively guiding a missile. Ball, p. 273.

90. Consumables provide a screen or decoy to the radar operator. These items are designed to be ejected from the aircraft to deny or deceive the threat tracking systems for a limited period of time.

91. Flares emit a large amount of radiation in the sensor bandwith associated with the engine exhaust temperature range (1,300 to 2,000 degrees Kelvin) making it a more attractive target. Some SAMs with dual spectral sensors are able to dectect and discriminate between a flare and the aircraft target. The new "smart" flares depict a more accurate flight trajectory similar to the aircraft to draw the missile away from the target. Herskovitz, p. 43.

92. Chaff is most effective in decoying the SAM in its terminal phase, after it has fired. Chaff causes the missile seeker to lock-on to a false target refelctor. There are 14 chaff disperion variables which include: the radar cross section of the chaff, bloom time, dispensing methods, environmental effects, and fall rate. Chaff may also produce radar reflections over a 48-hour period at distances of hundreds of miles from the original drop site. This may not occur when dropping chaff from lower altitudes, but chaff will inhibit the airport radar from depicting actual aircraft from false targets. A dangerous side effect. Increasing sophistication of moving target indicators processing, i.e. Doppler radar, and other EP meassures are making chaff less effective. Ball, p. 297. Herskovitz, p. 42, 44.

93. The "V" stands for vanishing. This newest chaff has its radar-reflecting properties neutralized within three to five minutes after dispersal and their false targets disappear from radar screens. This type of chaff would be more useful on airlifters operating within the airport traffic area than the older, more persistant chaff. Herskovitz, p. 44.

94. "Noise" jammers are used to deceive radars to prevent tracking or to send out false targets to the radars. It is described as "brute force" jamming to simply outshout or mask the echo from the target aircraft. Continuous noise jamming obscures the target echo by showing the radar operator a large area of clutter. The deception part of noise jamming transmits false signals to confuse the threat radar by appearing as one or more false targets. Ibid. p. 277.

95. Information for this appendix came from the following sources: Stephen M. Hardy, "Finding a Place on Board EW Payloads for UAVs," Journal of Electronic Defense, (February 1992), pps. 30, 31. James C. Massaro, "UAVs and EW: The Perfect Marriage," Journal of Electronic Defense, (December 1993), pps. 34, 35. Michael Taverna & Jean Dupont, "Euro UAVs on the Move," Interavia Business & Technology, (April 1995), pps. 40-42. Joint Pub 3-55.1, pps. I-2, I-3, II-16.

96. UAVs are defined as "powered, aerial vehicle that does not carry a human operator, uses aerodynamic forces t provide vehicle lift, can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or nonlethal payload. Ballistic or semiballistic vehicles, cruise missiles, and artillery projectiles are not considered UAVs. Joint Pub3-55.1, p. Glossary-4.

97. This is the basic equipment payload and takes between 3 to 8 C-141 load equivalents to deploy to the theater depending on equipment taken. For the HA mission not all the UAVs will be needed for 24-hour operation at 2 to 3 airfields in the theater. Ibid., pps. II-18 to II-20.

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