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RESEARCH REPORT

COMBAT AIRLIFT: CAN IT SURVIVE THE MODERN-DAY BATTLEFIELD?

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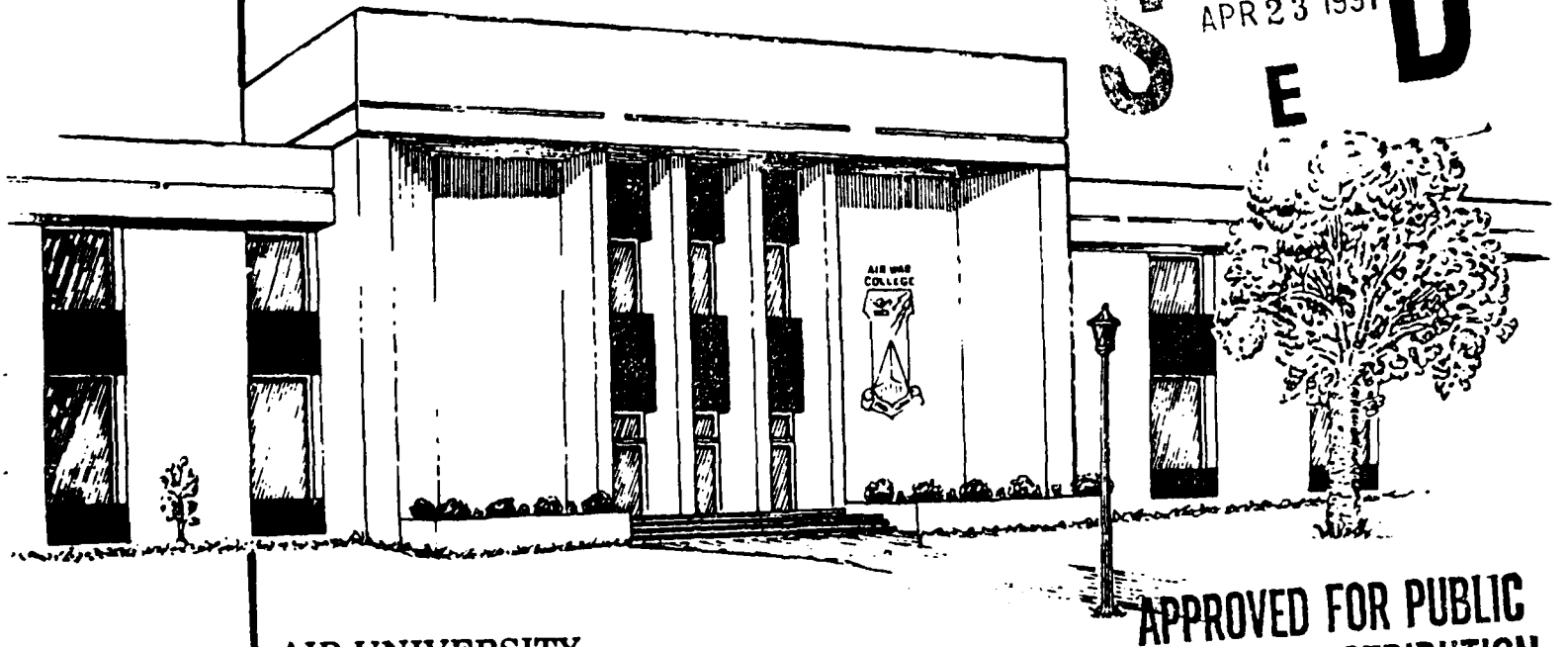

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COMBAT AIRLIFT: CAN IT SURVIVE THE MODERN-DAY BATTLEFIELD?

by

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A DEFENSE ANALYTICAL STUDY SUBMITTED TO THE FACULTY

IN

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Advisor: Lieutenant Colonel Peyton P. Lumpkin

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EXECUTIVE SUMMARY

TITLE: Combat Airlift: Can it Survive the Modern-Day Battlefield?

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Strategic force projection and tactical force employment performed by Military Airlift Command (MAC) aircraft remain vital portions of our national military strategy. Survivability of airlift aircraft as they sustain ground forces therefore becomes a critical component of U.S military capability. Future Army victory could depend upon support received from the air, and airlift must be survivable to perform the mission--dead men can't fight and destroyed aircraft can't fly.

Combat airlift aircraft will encounter significant hostile threats in future war scenarios. Even if MAC aircraft could avoid all enemy threats, a problem arises even in overflying friendly air defense forces--avoiding fratricide. Using the central European battlefield as its focus, this paper suggests that it is unlikely enough MAC aircraft could penetrate the airspace over central Europe without loss to enemy or friendly fire to effectively resupply the Army.

The paper proposes solutions to this problem including defensive avionics suites, improved aircrew knowledge of procedural and electronic methods of identification of friend or foe when over friendly forces, and tactics/methods to reduce the threat potential. Additionally, the paper reviews existing Air Force doctrine and suggests that updated doctrinal guidance is essential to clarify under what conditions and how combat airlift aircraft are to operate.

BIOGRAPHICAL SKETCH

Lieutenant Colonel Larry M. Chadwick (M.B.A., Webster University), has been interested in combat operations planning and applications to the NATO theater of operations for several years. He served as a Combat Plans and Exercises Officer and participated in numerous C-130 rotational tours of duty in Europe while assigned to the 314th Tactical Airlift Wing from 1974 to 1979. During a joint exercise simulating a NATO/Warsaw Pact battle, Lieutenant Colonel Chadwick performed as a scheduler and planner on the battle staff responsible for directing the allied air effort in central Europe. In the early stages of the exercise, he observed the simulated destruction of friendly air assets by friendly air defense forces--prompting him to select this topic for further study. Lieutenant Colonel Chadwick is a graduate of Squadron Officer School, Airlift Operations School, the Armed Forces Staff College, and the Air War College class of 1990.

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SECTION I

INTRODUCTION

When one thinks of airlift operations in support of the Army's AirLand Battle doctrine and imagines the intense level of activity of the offensive on both sides, two important issues come to mind: airlift aircraft survivability and tactics/methods to best provide support for the Army. Current Air Force and Army doctrine along with the increased lethality of today's high technology weapons make it increasingly likely that Military Airlift Command (MAC) aircraft will be employed in scenarios for which they are poorly equipped to survive. Gone are the days of Vietnam when our Air Force enjoyed air superiority over the areas in which airlift aircraft operated. The Army will need even greater than Vietnam levels of resupply on the battlefield envisioned in an AirLand Battle of the future, placing a premium on airlift aircraft survivability.

Despite lessening of tensions in the European theater recently, perhaps the most threatening situation for MAC aircraft would still be a potential conflict on the central European battlefield. This paper will look at airlift missions in support of such a scenario as its focus and point out the threats airlifters would face in accomplishing such missions. Besides the obvious threat of enemy weaponry, the hazards of operating over friendly forces in congested and hostile airspace will also be analyzed. Tactics/methods will be discussed which improve the chances of airlift aircraft completing their missions. Additionally, ways to reduce the risk of fratricide will be reviewed.

Before getting into the specific threat scenarios, however, the paper begins with a review of doctrinal issues to see how the airlift mission is described in basic, operational, and tactical doctrine. This review suggests that the airlift mission would be dependent upon support from fighter and attack aircraft in order to conduct operations in heavy combat. However, other new and evolving doctrines suggest that airlift aircraft need to have self-defense capabilities. It proves to be an interesting controversy.

The paper concludes by acknowledging that despite our airlift doctrinal shortfalls, evolving electronic combat and Army and Joint doctrines along with the concept of direct delivery associated with the C-17 have brought to the forefront the need for defensive systems on airlifters. Funding has been provided for a first step in completing this very critically needed defensive suite, but the suite itself addresses only part of the threat. Other recommendations and conclusions are made regarding current efforts in the areas of doctrine and training associated with the combat airlift mission.

SECTION II

DOCTRINE

Doctrine is critical to understanding why a force is equipped and employed in particular ways. A search of Air Force, Army, and Joint doctrine yields interesting results when one views it from the mind of an airlifter who is trying to understand why his aircraft is void of self-defense features yet is committed to the "you call, we haul" motto through which all airlifters so proudly voice their support for the Army. Today's high-technology battlefield represents significant threats to any unarmed aircraft, yet the Air Force has only recently begun to directly assess and correct the lack of adequate operational doctrine for employment of airlift forces and to specifically address the need for defensive systems on-board.

A review of Air Force, AirLand Battle, and Joint Doctrines follows and is revealing with the above comments in mind.

Air Force Doctrine

Current Air Force basic doctrine hinges largely on the belief that without air superiority, all other mission capabilities become suspect. This point of view is clear in the following quote:

> Sustained aerospace and surface operations are predicated on control of the aerospace environment. As a primary consideration, aerospace forces must neutralize opposing aerospace forces, including both aerospace and surface threats; otherwise, they cannot fully exploit their striking power to assist friendly surface forces. Aerospace superiority, therefore, is prerequisite to the success of land and naval forces in battle. (6:2-12)

Problems arise when one views this belief in light of the recent test of

current air capabilities against simple air defense capability--witness the Soviet experience in Afghanistan. Stinger missiles in the hands of the Afghani insurgents denied the Soviets air superiority over the battlefield. Some have questioned then what makes the Air Force think it can ever achieve air superiority against a force such as the Warsaw Pact. (24:4)

Under the specific roles and missions explained in AFM 1-1, our doctrine continues this preoccupation with similar comments about the counterair mission, suppression of enemy air defenses (SEAD), and about defensive counterair (DCA). SEAD's goal ". . . is to provide the favorable situation which allows friendly aerospace forces to perform their other missions effectively without interference from enemy air defenses." (6:3-3) DCA's mission is ". . . to detect, identify, intercept, and destroy enemy aerospace forces that are attempting to attack friendly forces or penetrate friendly airspace." (6:3-3)

Under the mission of airlift, AFM 1-1 states that,

> Airlift objectives are to deploy, employ, and sustain military forces . . . under varying conditions, ranging from peace to war. As a combat mission, airlift projects power through airdrop, extraction, and airlanding of ground forces and supplies into combat. (6:3-5)

One must assume from the above that airlift operations in a high-threat environment will receive SEAD and DCA assistance when complete air superiority is not attained--there is no other specific mention of how to defend airlift forces. However, again questions in competent studies are worth review. Who protects airlift aircraft from an insurgent's SA-7 missile, or from bypassed enemy air defense elements on the fluid battlefield of AirLand Battle? (24:5)

Such questions are not expected to be answered in basic doctrine; however, the Air Force's basic doctrine regarding conduct of airlift operations seems entirely too presumptive and idealistic regarding the support that airlift aircraft can expect from already highly tasked SEAD and DCA assets. If the Army corps commander's need is of sufficient priority, then the assets will probably be made available, but certainly not routinely. If basic doctrine cannot address reality of the modern battlefield, then perhaps a review of doctrine at the operational level can.

Unfortunately, a review of "current" Air Force 2-series manuals which are supposed ". . . to provide detailed mission descriptions and methods for preparing and employing aerospace forces" (6:vi) is disappointing. AFM 2-1, Tactical Air Operations: Counter Air, Close Air Support, and Air Interdiction, 2 May 1969; AFM 2-4, Tactical Air Force Operations: Tactical Airlift, 10 August 1966; and AFM 2-21, United States Air Force Strategic Airlift, 13 July 1972, predate AirLand Battle doctrine which came into being around 1982. (24:5) They appear to assume that transport aircraft will operate in low-threat environments only. (24:6) It is obviously past time that these manuals were updated! The Military Airlift Command is working on this lack of operational doctrine and has a draft manual United States Air Force Operational Doctrine: Airlift in coordination. (18:415) The new draft is significant in that it does address airlift survivability and specifically mentions the need for on-board defensive systems. (24:6)

Remarkably, the first mention of airlift defensive systems came out in AFM 2-8, Electronic Combat (EC) Operations, 30 June 1987, and

clearly addresses the problems airlift aircraft will encounter on today's battlefield:

> Enemy threat systems most likely to impact airlift operations outside of the forward areas are enemy naval SAMs, mobile SAMs, and hostile electronic warfare against communications, navigation, and IFF (identification, friend or foe) systems. In addition to these threats, airlift forces operating in the forward combat area are susceptible to early warning and acquisition radars, antiaircraft gunlaying systems, selected SAMs, and fighter interceptor aircraft. While most airlift operations are normally conducted in relatively permissive environments, threat warnings, countermeasures, and expendables are required to protect the force from these threats. (7:30-31)

AirLand Battle/Follow-On Forces Attack Doctrine

AirLand Battle doctrine provides the foundation for how the United States Army will conduct combat operations. The Army's current warfighting doctrine is based on securing and retaining the initiative and aggressively defeating the enemy. Victory on the battlefield requires fighting in accordance with the four basic tenets of AirLand Battle: initiative, agility, depth, and synchronization. (10:15)

These tenets will be accomplished simultaneously in close, deep, and rear operations. Close operations are those one usually associates with a battle--units engaged near the forward line of troops (FLOT). Deep operations are directed against enemy forces not in contact and are designed to influence the conduct of, or even avoidance of, future close operations by defeating/disrupting enemy rear operations and follow-on forces. Rear operations are designed to assure freedom of maneuver and continuity of operations, including sustainment and command and control. Forces will be intermixed in depth and will use maneuver to conduct attacks and counterattacks. These forces maneuver constantly in the

attack/counterattack mode and will expend large quantities of supplies and ammunition.

Current NATO ground battle doctrine, Follow-On Forces Attack (FOFA), derives its name from the implied deep attack operations envisioned in AirLand Battle. NATO's concept is essentially similar to AirLand Battle with the political exceptions of no preemptive use of force and limits to depth of operations by insisting on inviolate NATO borders with the Warsaw Pact.

No matter what the Army concept for battle may be called, AirLand Battle or FOFA, combat airlift forces are committed to supporting the Army at any level of conflict.

Joint Doctrine

The Army-Air Force Airlift Concepts and Requirements Agency (ACRA) at Scott AFB IL has published a draft document, MACP 55-XX/TRADOC PAM 525-XX, Airlift for Combat Operations (ALCO), which recommends threat avoidance as the primary means of defense for transport aircraft, but also expresses the need for Joint Suppression of Enemy Air Defense (J-SEAD), armed escorts, and on-board defensive systems. (1:299,301)

This publication also addresses the potential for aircraft loss during ground operations. With the future direct delivery concept of the C-17, the Army has found itself short in ground support personnel for aircraft handling in the forward areas and realizes that it will likely perform many duties routinely done by Airlift Control Element (ALCE) and aerial port personnel from the Air Force in lower-threat areas. (1:306,320) The corps commander who is more interested in killing the enemy than providing air traffic control and ground support

to arriving airlifters may not always be able to provide enough support to minimize ground time. Therefore, all aircrews and aircraft operating into forward areas need to be combat-offload qualified (capable of rolling the cargo onto the ground via a lowered ramp while the aircraft is moving).

Conclusion

Strategic force projection and tactical force employment performed by MAC aircraft are vital portions of our military strategy. Therefore, survivability of our airlift forces is a critical component of U.S military capability. MAC must remain capable of supporting the ground battle under any threat conditions. The Army's survival could depend upon the support they receive from the air, and airlift must be survivable to perform the mission--dead men can't fight and destroyed aircraft can't fly. This dichotomy is not adequately addressed in current doctrine although efforts are underway to correct this shortcoming.

SECTION III

THE ENEMY THREAT AND TACTICS FOR AIRLIFTERS

The Threat

The Soviets have appreciatively modernized and upgraded the Warsaw Pact (WP) air defense capability in the last two decades. (29:50) They have deployed a new self-propelled anti-aircraft system, the 2S6, which is a 30mm weapon superior in capability to their ZSU 23-4 system which was already arguably the best in the world. Also, they are fielding similar improved capabilities in their basic army-level surface-to-air missiles (SAMs). (29:64) These surface threats are complemented by an aggressive upgrade in their interceptor aircraft capabilities. In the past year alone, the Soviets have increased their fourth-generation aircraft numbers by 40 percent, and by 1994 it is predicted that over half of their approximately 2000 interceptors will be fully look-down, shoot-down systems such as the MIG-31 and Su-27. By 1999, all of their interceptors are expected to be fourth-generation or better. (29:51)

Obviously an unarmed transport aircraft which carries no defensive equipment is extremely vulnerable to threats such as those above, to similar SAM and airborne interceptors (AIs) from ships in the sea, and to newer threats such as directed energy weapons being developed for the future battle. Although each of these threats are formidable, they also have weaknesses which can be exploited. The remaining portion of this section will look at the threat from a mission perspective, looking at strategic and tactical airlift roles in support of a major war in

Europe. A discussion of these threats and examination of the tactics/methods a transport aircraft might use to improve survivability will follow the mission scenarios.

Airlift Missions

Using a European war scenario as the basis, this paper will look at the tasks airlift aircraft will perform in the areas of deployment and employment. Deployment as used here is the movement of personnel, supplies, and equipment from the United States (U.S.) to the European theater and is therefore also referred to as inter-theater or strategic airlift. Once the personnel, supplies, and equipment are in the theater, they must be employed using airland, airdrop, or extraction operations associated with intra-theater or tactical airlift aircraft.

Deployment. The deployment mission will usually be conducted by C-5, C-141, KC-10, or Civil Reserve Air Fleet (CRAF) aircraft. The C-17 will also be used primarily in this role when it is procured. As these large aircraft depart the U.S. they will usually not anticipate attack until over the ocean. Threats from enemy naval forces could include airborne interceptors (AIs) or naval surface-to-air missiles (SAMs). The next threat opportunity occurs as the aircraft prepare for landing at one of the European main operating bases (MOBs). The most likely threat in this environment will be the shoulder-fired, heat-seeking missile such as the SA-7 in the hands of insurgents. These aircraft will offload their cargo and then onload non-combatants, wounded, and reparable assets for return to the U.S. and a second exposure to the SA-7 and naval threats. Once these aircraft have delivered their cargo to the theater, tactical airlift's employment mission begins.

Employment. The employment mission is usually conducted by C-130 aircraft; however, the C-23 will play a minor distribution role. The C-17 will have the capability to deliver its cargo direct to forward locations in theater, thus combining the deployment and employment missions into one movement. Also, C-141 aircraft may be pulled from the strategic airlift flow to augment tactical airlift operations. In the employment role, these aircraft will be subjected to threats immediately upon takeoff from the theater location--the SA-7 threat as mentioned above. Even over friendly rear areas, they could be exposed to mobile anti-aircraft artillery (AAA) weapons of probing enemy units. As they near the objective area, the tactical airlift aircraft can expect to be attacked by enemy aircraft, SAMs, AAA, and small arms fire. In such a high-threat environment, the airlift aircraft will be extremely vulnerable at any altitude, but the lower the altitude, the more likely they are to survive. This then leads to tactics/methods that airlift aircraft might use to limit their exposure and thus vulnerability in these deployment and employment missions.

Tactics/Methods to Reduce Threat

Deployment Phase. In the deployment phase, the naval AI and SAM threat would be a remote possibility if our airlift aircraft were equipped with on-board electronic support measures (ESM) which would warn of radar tracking in time to allow diversion around the threat. This of course presumes the enemy would not be under emission control (EMCON) conditions, since they would likely be interested in their own air defense.

As the deployment aircraft operate around theater airfields they

will be prime targets for SA-7-type missiles. They may reduce the threat by remaining high until over the airfield and spiraling down in close proximity as we did in Southeast Asia. Back then, the C-130s placed crewmembers armed with flare pistols in the paratroop doors for infrared (IR) missile protection. Today, a defensive suite with missile warning receivers mated with flare ejection systems would automate this old tactic. Other more sophisticated systems using an IR jammer are presently being tested and offer improved survivability for airlifters. (19:53) This is particularly significant since recently updated studies indicate that 90 percent of combat losses worldwide since 1975 can be attributed to IR missiles. (19:50)

Employment Phase. The employment phase presents the greatest threat and therefore the greatest opportunity to develop tactics/methods to deal with the threat--the primary means for airlifters still being avoidance if possible. If our doctrine is valid, airlifters will also have help from SEAD and DCA aircraft to counter threats en route to and near forward objective airfields. As mentioned before, this is unlikely unless there is an extremely high priority established for the ground operation these airlift missions are supporting. Therefore, the tactical airlifters will need to improvise or have defensive systems on-board to counter the threat.

Besides avoidance, tactical airlifters must use low-level flight and night/adverse weather operations to increase their survivability. These tactics when used in conjunction with night-vision goggles (NVGs) will provide some protection against optically guided and radar threats, but a towed decoy system has been demonstrated as being the best

existing countermeasure. These towed decoy systems echo received signals with amplification and present the enemy radar with a false target 250-500 feet behind the towing aircraft. (14:87) This system and a covert terrain following/navigation system could be tied into a mission computer which would receive threat signals and automatically recompute the ground track to avoid threats detected en route. Such a system is desirable, and current tests indicate that it could be fielded in the near future. (16:50-51)

To counter the SA-7 type threat and enemy interceptors, tactical airlifters could use similar devices and techniques described above for the deployment phase aircraft. Additionally, when they are required to fly multi-ship formation missions, airlifters can use modified formations which enhance bogey detection by the formation and make the group of aircraft less predictable and more difficult to locate compared to routine peacetime formations. Experience at Red Flag has proven that a group of C-130s or C-141s using modified-V or fluid-trail formations can significantly improve their survivability through mutual support. These formations are now a part of current MACR 55-130 and MACR 55-141, the general operations regulations for the C-130 and C-141, respectively. Single-ship operations, however, have proven to be the most effective in exercises. Individual flight paths to a common initial point for a mass airdrop may be flown or individual routes continued all the way to the drop as long as time and/or altitude separation are maintained over the drop zone.

Despite the advances in tactics our airlifters have developed, it should be obvious that survival in a high-threat environment such as the

central European battlefield will require more than just low-level flying and alternate formation tactics. A recent study indicated that a transport aircraft at 500 feet approaching a forward airfield 20 kilometers from the FLOT in a central European war would be painted by more than 50 radars and tracked by at least 15 of them. (24:42)

Airlifter susceptibility to the threat clearly demonstrates the need for on-board defensive systems for our tactical airlifters. Such a system is the Survivability Augmentation for Transport Installation--Now (SATIN) kit which was recommended by the USAF Scientific Advisory Board Summer Study of 1982: The Enhancement of Airlift in Force Projection and has been installed on a C-130 aircraft and tested at the USAF Airlift Center. The beauty of this system is that it can be installed on a C-130 in less than eight hours and requires no permanent modification to the aircraft. (22:1) This would allow purchase of a limited number of the kits and installation before missions into a high-threat area. Additionally, the SATIN kit offers protection while it avoids political and peacetime overflight considerations presented if we were to permanently install expendable munitions such as flares and chaff on airlift aircraft.

Chance encounters with Warsaw Pact helicopters would remain as one of the most threatening events not yet accounted for in this paper. These helicopters can remain hidden and "pop up" for a kill when spotting transiting airlift aircraft. Tactical exercises employing helicopters as aggressors have demonstrated that airlift aircraft could not spot them until engagement, at which time it was too late for the airlifter to evade. (28:288) The Warsaw Pact helicopters will remain a

serious threat because of their large numbers. Airlifters must hope that Army helicopters take a heavy toll on this threat near any potential air corridors or objective areas.

Continuity Training

All of these tactics/methods are of little use if they are not practiced and passed down in proper training situations. This realization has resulted in the establishment of the Combat Aircrew Training School (CATS) at Nellis AFB Nevada and the Advanced Airlift Tactics Training Center (AATTC) at Saint Joseph Missouri. Additionally, MAC has begun Combat Aircrew Training (CAT) at the local level to insure crews get the opportunity at least semi-annually to practice a full combat-type mission planning scenario and fly that mission with random approaches to local drop zones.

On the downside, not all airlift crews get training in low-level flying. Airdrop crews in the C-130 and about 140 of the 870 C-141 crews routinely fly low-level missions as part of their recurring training. (17:12) The remaining C-141 crews only maintain airland currency and do not get the benefit of low-level flying and navigation. Since even airland missions to forward airfields will be under heavy threat conditions, all crews should at least be low-level navigation qualified if not fully airdrop qualified. There also is the question of how will crew qualification be handled as the C-141 crews accept the C-17. Will they all be airdrop qualified as in the C-130? It seems that they should since the C-17 is advertised as being fully capable of both the strategic and tactical airlift missions.

Special Capabilities

It is also worth noting the tremendous capabilities that C-130 and C-141 airdrop crews qualified in Special Operations Low Level (SOLL) possess. The SOLL qualification is further broken down into SOLL I and SOLL II capability to designate how low an individual crew is qualified to fly. These crews use night-vision goggles (NVGs) and are capable of blacked-out landings and routinely practice alternate tactics flight and drops to blacked-out drop zones on land and practice with Navy special forces in boat extraction over the ocean. These crews possess skills that are desirable for all airlifters, training dollars permitting. The C-141 with its air-refueling capability employed in this type of role represents a sharp point on the spear of U.S. force projection capability. MAC aircrews in the C-17 should perform as well or better.

SECTION IV

THE FRIENDLY THREAT--AVOIDING FRATRICIDE

Although the enemy threat discussed in the previous section represents a formidable problem for transport aircraft, so can operations over friendly air defense forces within a saturated and likely very confused air environment.

Our national leaders have realized the significance of building a strong air defense force capable of taking on a numerically superior Warsaw Pact (WP) air force. In his 1984 report to the Congress, former Secretary of Defense Caspar W. Weinberger states that "Air defense is central to the defense of Europe." (23:179) The Joint Chiefs of Staff point out that "It is clear that control of the airspace in the battle area will be critical, . . . to prevent the Warsaw Pact from effectively employing its attack helicopters or other attack aircraft against NATO ground forces." (21:23)

Having built such a formidable air defense of our own, a seemingly ridiculous problem arises--how to avoid fratricide. A similar problem became a tragic reality for Egyptian aircrews in the 1973 Mideast War, when they destroyed an estimated 69 of their own aircraft in the process of killing 89 Israeli aircraft. (2:351) How then can we reduce the likelihood of such a tragedy in our own forces?

There are two universally accepted methods for identifying aircraft as friend or foe--electronic aids and procedural methods. Each of these will be discussed to explain their inherent problems.

Electronic Aids to Identification

The most common electronic aid to aircraft identification is the Identification Friend or Foe/Selective Identification Feature (IFF/SIF). These IFF/SIF systems, which are carried on all NATO aircraft, operate by transmitting a specific code or signal in response to an interrogating signal from a ground-based or airborne radar. Common shortcomings of this simple system are that it can be jammed easily, interferes with nearby signals or it may simply fail inflight. (3:16) Another shortcoming is aircrew reluctance to turn the system on since signals emit involuntarily and may provide the enemy our aircraft's position. These systems may also be "spoofed" by an enemy reproducing the correct identification signal and identifying himself as friendly to air defense radars. To counter "spoofing" aircraft, air defense radars must also monitor the behavior of an aircraft in terms of position, course, and altitude. (2:352) Therefore, procedural maneuvering will almost always be considered in the final determination of a target as friend or foe.

Having recognized these drawbacks of current IFF/SIF systems, the NATO community is presently acquiring a NATO Identification System (NIS) which will provide better identification of not only aircraft, but also ground vehicles and naval vessels. (26:177) Senior NATO leaders almost unanimously rate the acquisition of the NIS as top priority for the NATO air defense community. (11:20-43) The new system will have a spread spectrum mode capable of defeating jamming and deception by an enemy. (15:26) Unfortunately, the new system will not be available until 1994, and maybe not then unless it survives upcoming defense cuts across

NATO in the next few years. When the system is fielded, it must be installed on all airlift aircraft, with those operating routinely into Europe receiving it first.

Another related electronic aid for identification is the NATO Airborne Early Warning (NAEW) aircraft. These aircraft take the radar high over the battlefield and are capable of tracking low-flying aircraft more than 200 miles away--well beyond the range of any ground-based radar. These aircraft can download target information via data link with air defense and tactical aircraft giving them advance warning and identification information. (12:65) When used in conjunction with the proposed NIS, these NAEW aircraft will certainly increase the survivability of transport aircraft transiting the battle area. Ideally, airlift aircraft could be linked into this system to receive the warning data directly instead of depending on ground relay.

As technology advances there may be electronic aids in the future capable of identifying friend from foe without requiring equipment on board the aircraft to respond to interrogation. These types of systems will be non-cooperative and will greatly reduce the chance of mistaken identity and practically eliminate the chance of fratricide when added to existing capabilities.

As mentioned above, electronic aids are almost always backed up by some procedural method which allows friendly aircraft to identify themselves by adhering to specific flight parameters. These procedural identification methods will be discussed next.

Procedural Methods of Identification

Procedural identification methods involve restricting friendly

aircraft to prearranged flight characteristics. These characteristics may include altitude, speed, location, and direction of flight. For example, a set procedure might require friendly aircraft flying westbound over our forward-deployed belt of air defense to maintain an altitude between 1,000 and 2,000 feet and an airspeed below 300 knots while adhering to a specific ground track with several turning points known only to friendly forces. These flight parameters would help differentiate friendly aircraft from an enemy who most likely would attempt transit at extremely low altitude and high speed along a straight ground track. Of course, a combination of these procedural methods and a functioning, properly-coded IFF/SIF system is the optimal method of assuring safe transit. To this end, classified procedures using schemes such as discussed above are in effect for the central European area and are contained in NATO classified airspace control plans. (4)

To allow maximum flexibility in use of airspace over the area of operations and to provide minimum risk to friendly air traffic, airspace control plans must also cover the entire spectrum of air traffic control methods--from full positive control by radar and IFF/SIF procedures to full procedural control. Positive control will always be the preferred method of airspace control if it is available. As radar and communications facilities become saturated or degraded in effectiveness by enemy action, procedural controls must be implemented on an incremental basis (20:2-2).

Whatever procedural controls are used, they must necessarily be simple and consistent with offensive and defensive standard operating

procedures and/or rules of engagement (SOP/ROE) to insure "timely engagement of enemy aircraft, conservation of air defense resources, and reduction in risk to friendly forces" (8:3-1). The most common procedural methods used will be low-level transit routes (LLTRs), time slot, traverse level, and airspeed control (9:2-3). A brief discussion of each of these procedural methods follows.

LLTRs are identified in the overall airspace control plan and disseminated to appropriate units. Use of these routes allows friendly forces to transit air defense or other restricted use airspace with or without positive control. Although LLTRs are published, they are activated only as directed in air operations orders which identify which aircraft will use which routes at what times. By limiting track usage to particular aircraft at particular times and by constantly changing routing on a timetable basis, enemy compromise of our LLTR procedures is unlikely.

If friendly aircraft are unable to use established LLTRs for whatever reason, they may be required to use lesser procedures of time slot, traverse level, or airspeed control. Time slot airspace management allows specific friendly users (not just aircraft) full use of specifically identified airspace within identified time parameters. Traverse level airspace management grants aircraft safe passage through specific airspace when operating within identified altitude parameters. Airspeed control airspace management allows friendly aircraft safe passage if adhering to specific airspeed parameters when entering airspace over the area of operations. As mentioned earlier, these procedures may be used singularly, but most likely will be used in

conjunction with one another to further enhance identification during periods when radar identification is unavailable due to saturation or enemy action.

Unfortunately, few U.S. Air Force aircrew members have routine access to NATO classified documents and are therefore unaware of the specific details of these plans. U.S. Army air defense forces are well informed about these procedures since they rotate between CONUS and Europe on a regular basis and when in Europe are under NATO operational control at all times. They will expect airlift aircraft to be in compliance or risk being shot down. Therefore, it is critical that these classified procedures be provided to planners and all air defense forces prior to operation in the NATO theater. Although MAC is now on distribution for the NATO classified airspace control plan, discussions with C-130 aircrews recently deploying for rotational duty to Europe indicate that these procedures are not being briefed. A similar condition exists among our strategic airlift crews who routinely transit Europe--most have never heard of such airspace control plans. One must wonder how informed our Civil Reserve Air Fleet (CRAF) crews must be! A related problem is the classified authenticators used in NATO are different from what our crews use everyday, and the crews are likewise untrained in their use. MAC must insure that our transport crews are as knowledgeable as are the allied tactical air forces (ATAFs) and Army air defense forces who will share the sky with them.

SECTION V

FUTURE PROSPECTS TO CONSIDER

Future Air Defense Environment

As mentioned before, the days of Vietnam where air superiority and a low-intensity ground threat environment allowed airlift aircraft to operate relatively free of instant destruction are gone. Today's mobile systems deployed by the Soviets and fielded in many third world nations have changed the nature of the threat to airlifters forever. The spread of SA-7s and similar weapons to countries such as Nicarauga makes our airlifters vulnerable even in what we would consider routine operations.

Certainly, the future air defense environment will become even more threatening unless a technological breakthrough in self-defense for aircraft is made, such as an SDI for aircraft. Technology-wise, it would appear to be an even race with neither side of the air-ground equation possessing a clear edge. Lasers and directed energy weapons will work their way into the air defense role. To be sure, there will be advances in offensive and defensive capabilities, so whatever systems are procured for aircraft defense should be modular and capable of easy upgrade as the threat requires and funds permit. (30:2-42)

Program for Defensive Suite for Airlifters

Following the events in Just Cause last December, the Air Force has finally approved funding for a program placing defensive equipment on MAC's primary airlift aircraft. Apparently, the battle damage that the C-130s and C-141s received from small arms fire in what was to be a low-threat airdrop got the attention of planners and caused them to

wonder what might have happened if this operation had taken place in a more modern air defense environment. Had it not been for the F-117 and AC-130 attacks on the AAA sites at Rio Hato, there would likely have been disastrous results. (13:14) This leads one to realize that no matter how good a defensive suite may be acquired for our airlifters, their operations can always be made more effective and safe when escorted by fighters/attack aircraft or perhaps AC-130 gunships.

The number one rule for airlifters however will remain--avoid the threat if at all possible. However, MAC's new program will be a first step in providing other measures for improved survivability of our airlifters if avoidance is impractical. The program will provide 106 sets of missile warning receivers and flare dispensers for use MAC-wide. There will be 256 aircraft wired to receive this equipment as mission needs dictate. The breakout in numbers for each system includes 106 C-17s, 86 C-130s, 49 C-141s, and 15 C-5s. The program is to be completed by 1997 if funding remains as projected presently. (27) No mention was made of cooperative agreements to place similar types of systems on selected CRAF aircraft or KC-10s which MAC will also use in any major airlift effort.

Prospects for Funding

Hopefully, MAC's program will receive continued funding, but as the situation in Europe improves and calls for cuts in defense spending continue to occur at an increasing pitch and fever, it appears unlikely any such program will survive. This will be indeed unfortunate since MAC's program is only the beginning of what is needed to fully support the Army doctrine of AirLand Battle.

C-17 Direct Delivery Concept

Critics of the C-17 argue that its high price tag and contribution to the strategic airlift capabilities of our country will keep it from being deployed in a high-threat environment. Even former Secretary of the Air Force Verne Orr has been quoted as saying, "My worry . . . is that with a limited number of very large, expensive planes like the C-17, the forward commander may not want to order them up to the edge of the battle area." (28:293) Others argue that all of Europe will probably be a high-threat environment in a NATO war and that all airlift aircraft will therefore be exposed to significant risk. (25:21)

The question becomes one of risk management for airlift managers. How far forward to send C-17s, if at all, must be weighed against their survivability and the priority of the mission. In any case, all agree that if the C-17 is to be fully effective in its direct delivery role, it must have defensive systems. Indeed, it is probably the inquiries into the entire concept of direct delivery which brought the concept of defensive systems to the forefront. Unfortunately, this capability is apparently not going to be designed-in, and will only be implemented on the production line around production model number P-105. (5:48) The MAC program mentioned above will apparently wire the earlier versions.

Assuming the C-17 will be procured, what remains is to work the direct delivery concept into Air Force and Army doctrine.

SECTION VI

CONCLUSIONS/RECOMMENDATIONS

Doctrine

Air defense will play a critical role in any central European air battle and directly impact the effectiveness of support MAC can provide in support of the Army's ground effort in that war. Although the Army's AirLand Battle doctrine clearly requires mobile, survivable airlift assistance to allow sustainment of intense activity, Air Force doctrine is less clear in what roles airlift aircraft are to be committed. Air Force basic doctrine is too "fighter mindset" ordered and appears to relegate airlift in a high-threat environment as something that would only be accomplished if support is available from tactical air forces. While this may be feasible in an ideal situation, we simply do not have enough SEAD and fighter assets to expect their commitment to every resupply effort airlift might be required to fly in support of intensive ground battles. Air Force basic doctrine needs to be reassessed and the doctrine for airlift brought more into line with Army AirLand Battle and C-17 direct delivery concepts. Airlift aircraft are combat aircraft and it is past time this be recognized in Air Force basic doctrine.

At the operational doctrine level, Air Force doctrine dealing specifically with airlift is outdated. A new draft combining strategic and tactical airlift doctrine has been in the works for over two years. Emphasis needs to be placed on resolving whatever difficulties are delaying the coordination process so that MAC will have validated basic and operational doctrine with which to improve the likelihood of funding

for defensive suites for airlifters. Although a limited program is currently underway, its continued funding will be in jeopardy without doctrinal support. Other operational doctrine not specifically dealing with airlift (electronic combat), already requires defensive suite equipment for airlifter survival. It's time to bring airlift operational doctrine into the 1990's.

At the tactical doctrine level, the innovative efforts of many proud airlifters have developed tactics and procedures now included in the C-130 and C-141 operations manuals. These tactics and procedures can enhance survivability of airlift aircraft. Experience gained at Red Flag and similar exercises, the training provided by schools such as CATS and AATTC, and our unit-level CAT training have filled the void of doctrine which has existed for combat airlifters. They are the ones who have kept MAC's airlift forces as capable as possible to support the requirements of the AirLand Battle.

The Air Force solution to this doctrinal dilemma is already coming clear with approval to begin a meager program of IR defensive systems for a limited number of airlift aircraft. There is no other logical solution. Buying more aircraft to allow for attrition is unaffordable. Changing national strategy to eliminate the need for a force projection capability is unacceptable to a country which is so far from many of its vital interests. The only logical solution is to place defensive suites on our airlift aircraft which can provide short-notice force projection anywhere in the world.

Defensive Suites

There are some who would carry the self-defense requirement for

airlifters all the way to including an offensive missile capability. (24:112-115) While this concept is supportable in the case argued, it would appear to take away from the primary role of what airlifters are supposed to be accomplishing. It would seem much more effective to provide a fully-automated defensive suite which would allow the crew to concentrate on their primary mission and not be distracted with trying to launch missiles at enemy fighters, helicopters, or radars.

The Air Force must make its airlift aircraft more survivable. Efforts already begun must continue, but include more than just IR defense. Towed decoy systems such as those being tested by Boeing can defeat radar-guided threats and will have the capability in the future of being tied into a mission computer which can recompute routes of flight as threats are discovered en route to the objective area. Funding must be made available for limited quantities of these automated systems as they are produced. Planning for the advanced tactical airlift aircraft should also include such a system in its avionics.

Regarding the other part of the MAC airlift force which is not included in current defensive suite planning, the CRAF and KC-10 (and other tankers as well) need similar support. Strategic Air Command will have to advocate their portion of this force, but MAC should work a program of cost-sharing which will place IR defensive capabilities as a minimum on our CRAF fleet. As terrorists around the world gain weaponry such as the SA-7/Stinger missile, the loss of an American air carrier to terrorism becomes more and more likely. In any case, the CRAF will need some sort of protective capability as it departs and arrives at main operating bases associated with a European war.

Avoiding Fratricide

Since the enemy threat is significant enough in its own right, every effort must be made to eliminate the possibility of fratricide as airlifters overfly friendly troops. The electronic aids to positive identification are significant and can reduce the risk of fratricide, aid in command and control of our forces, and give greater tactical freedom of operations with less reliance on procedural methods of identification. If fully integrated, they could also allow our air and ground-based weapon systems to use their beyond-visual-range (BVR) capabilities. In the meantime, every effort must be made to continue development of non-cooperative means of identification which would be impossible to defeat. Until such a development, our procedural means of identification increase in significance, particularly since our IFF/SIF electronic aid is likely to be reduced in effectiveness due to jamming and other countermeasures, be turned off to reduce emissions, or simply fail in flight.

Procedural means of identification in the central European area of operations are clearly elaborated in classified NATO documents. These documents are finally being distributed to airlifters (they were not as late as 1979), but the information contained is not widespread among airlifters. MAC should make COMAAFCE SUPPLAN 35001M, the airspace control plan for central Europe, an annual briefing requirement for pilots and navigators. Additionally, MAC should ensure that proper input from 322 Airlift Division is made to the Allied Air Forces Central Europe (AAFCE) staff so that future revisions of this plan are more airlift-oriented. Specifically, current plans give little leeway in

corridors for evading threats (the airlifters number one rule in combat) and also there is little opportunity for an airlifter to move directly between the central region and adjacent areas. A related issue involves the NATO authenticators which are used when encoding in-the-clear transmissions or validating changes to mission orders or updated threat information received en route to an objective. MAC must ensure these NATO authenticators are available at each airlift wing and that pilots and navigators are trained on how to use them. MAC must also work to make this same information available to its CRAF fleet since they are not on distribution for the airspace control plan or NATO authenticators.

The Imperative

What if the Panamanian troops at Rio Hato had emerged from their barracks with SA-7 or Stinger missiles? How has a country so dependent upon force projection, left a major part of its projection capability undefended? As we become more and more dependent upon airlift to meet our national military strategy objectives, so will it become more of a potential target.

We cannot afford invulnerability of our aircraft, nor do we need to make them lethal adversaries in their own right. We expect to take some losses in combat--that's what being part of a combat crew is all about. All that's expected is assistance in avoiding the cheap kill. The technology is there--it's time to recognize that airlift aircraft are combat aircraft and deserve higher priority in the procurement of future defensive systems so that they may become more survivable in the role which our national strategy places them.

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