AU/ACSC/40-9232/2005-06

AIR COMMAND AND STAFF COLLEGE

AIR UNIVERSITY

JOINT TRANSFORMATION OF AERIAL INTERDICTION BY ENHANCING KILL BOX OPERATIONS

by

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A Research Report Submitted to the Faculty

In Partial Fulfillment of the Graduation Requirements

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Maxwell AFB, Alabama

April 2006

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
APR 2006		**00-00-2006 to 00-00-2006**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Joint Transformation of Aerial Interdiction by Enhancing Kill Box Operations	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Air University Press (AUL/LP),131 W Shumacher Avenue,Maxwell AFB,AL,36112-6615**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**35**	

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INTRODUCTION

The interaction of air and ground warfare is as old as military aviation itself. As far back as WWI, air interdiction (AI) and close air support (CAS) have been integral missions supporting overall campaign objectives. Originally conceived as a mission to support military ground operations, the purpose of aerial interdiction has gradually changed and widened over time. In World Wars I and II, Korea, Vietnam, and Desert Storm, interdiction campaigns attempted to disrupt and destroy enemy goods and supply routes to such levels that any attempt by the enemy to conduct offensive operations would prove futile. In the Balkan theater, commanders used interdiction campaigns to coerce Serbian leader Slobodan Milosevic to end ethnic cleansing in Kosovo.

The above examples represent both the traditional use of ground attack as well as the more recent focus of coercing an opponent with air power. These historical examples also show how operational planners have adjusted AI campaigns to met campaign objectives. Planners had to develop AI tactics that overcame issues that normally plague AI campaigns. Issues of denying sanctuary to an enemy, ensuring accurate battle damage assessment (BDA) using solely air power, and safely integrating ground forces with in the aerial interdiction construct are just a few of the many concerns that commanders historically face when conducting AI operations. Like in the past, in today's combat environment, planners are facing new operational interdiction challenges.

Complicating the air-to-ground warfare construct is its changing nature. The non-linear battlefields of Afghanistan, the speed of finding and fixing targets as well as the speed of ground offensives in the Iraqi theaters present unique problems for commanders seeking to use air power

against ground targets effectively. To mitigate these issues, commanders have implemented a kill box command and control construct to integrate air power with ground scheme of maneuver. While this fire support coordination measure (FSCM) solved some geographic airspace issues, when used in conjunction with a fire support coordination line (FSCL), the lines of AI and CAS are blurred.

There are several issues with the kill box/FSCL relationship. Kill boxes tactics, techniques and procedures (TTPs) allow air power to have freedom of action in a certain area of the battlespace. Depending where the kill box falls, however, the kill box may exude both procedural characteristics of AI and CAS. For example, if the kill box falls on the friendly side of the FSCL, TTPs recommend procedures similar to those prescribed in Joint Publication 3-09.3 for Type 3 control CAS. If a kill box falls on the enemy side of the FSCL, TTPs recommend procedures similar to traditional AI. While, on the surface, these issues may seem frivolous, because the speed of the ground scheme of maneuver and time ground commanders need to update FSCL placement, ground commanders may need to place FSCLs long of the forward line of troops (FLOT) to reduce the potential for fratricide. Because of the operational detailed integration procedures needed to conduct air strikes inside the FSCL (kill box or CAS), combatant commanders cannot engage the enemy quickly and the enemy has sanctuary between the FLOT and the FSCL. Ultimately, to exploit the full potential of the kill box construct, especially in the non-linear battlespace, the joint community needs to develop a kill box "like" construct that not only replaces the FSCL but expands to become the primary means to define battlespace ownership, target engagement areas and most importantly, the supported and supported relationships within the battlespace.

This paper will examine the evolving nature of air interdiction campaigns and offer some

suggestions to transform the kill box construct in order to keep air-to-ground operations relevant in the changing battlefield environment. First, this paper will look at interdiction campaigns in every major aerial campaign since World War II and analyze the effectiveness of those campaigns. Next, this paper will examine current kill box TTPs defined by the joint community and highlight some short falls in those TTPs. Finally, using these discussions, this paper will outline ways the joint community can transform kill box TTPs that are more relevant and that take advantage of the technological, tactical, operational advantages that US forces have in today's battlespace.

HISTORICAL AI SHORTFALLS: SANCTUARY TO AN ENEMY

OPERATION STRANGLE: ITALY - SPRING 1944

One of the first examples of a dedicated air interdiction campaign in World War II occurred in the Italy during the spring of 1944 called Operation STRANGLE. Operation STRANGLE was "designed to force the withdrawal of the German armies from central Italy by denying them essential supplies."[1] In the words of a Mediterranean Allied Air Forces (MAAF) directive, the objective of the campaign was "to reduce the enemy's flow of supplies to a level which will make it impracticable for him to maintain and operate his forces in Central Italy."[2] The overall purpose of the operation was to destroy German supplies to such a degree to "strangle" the German Army and make a major Allied ground offensive unnecessary.

To achieve this goal, the MAAF first conducted operations against the Italian rail network system attacking "marshalling yard, bridges, tunnels, defiles and even stretches of tracks."[3] (Fig. 1) Interdiction strikes conducted against viaducts and road bridges brought about the best effects in during the campaign, because, given the mountainous terrain in central Italy, German engineers were unable to repair the river and gorge crossings quickly. [4] This reduced German

resupply efforts over time. However, these effects did not lead to success.

Figure 1. Interdiction Zone of Operation Strangle

Ultimately, Operation STRANGLE did not meet its objective to of making a major allied ground offensive unnecessary. During the allied ground offensive to capture Rome, the Allies suffered 42,000 casualties proving that the German army was a viable force and could still inflict heavy damage to Allied ground units.[5] There are several reasons for the shortfalls of Operation STRANGLE. The first is that the interdiction campaign was solely an air campaign. STRANGLE did create supply shortages of various kinds and reduced German ammunition stocks, however, these shortages were not critical until the ground offensive began.[6] Had the allies combined the interdiction campaign with a ground offensive, German soldiers would have had to consume more supplies to hold ground in Italy. Other factors that inhibited the success of the operation were a lack of adequate night bomber capability and bad weather. The inability for the MAAF to attack German supply lines during the night and in bad weather allowed German forces to receive enough supplies to sustain defense operations in Italy.

OPERATION STRANGLE: KOREA - MID 1951 - EARLY 1952

Like World War II, in the Korean theater, US and Allied forces attempted an air interdiction campaign to cut enemy supply lines that would prevent North Korean ground forces

from conducting offensive ground operations. Far East Air Forces (FEAF) and the 5th Air Force stationed in Korea executed Operation STRANGLE, also known as the Rail Interdiction Program from the summer of 1951 to early 1952. The objective of the Korean Operation STRANGLE was to "interfere with and disrupt the enemy's lines of communications to such an extent that he'll will be unable to contain a determined offensive by friendly forces or be unable to mount a sustained major offensive himself."[7]

To accomplish these tasks, the FEAF targeting committee apportioned North Korea into 11 zones (A-K) and identified 172 targets within these zones to destroy.[8] (Fig. 2) B-29's from the FEAF's Bomber Command sequentially attack zones A-C which corresponded to targets in the Northwestern portion of Korea. As interdiction operation continued, the number of B-29's in theater was reduced to from 5 to 3 groups, limiting FEAF's ability to attack all portions of North Korea's rail system. To reinforce interdiction operations, the US Navy attack began engaging targets in the easternmost zones.

Initially, the interdiction campaign saw some successes. In fact, the most successful period for Operation STRANGLE was the first three months of the campaign when the 8th Army was conducting ground operations.[9] During these combined attacks, North Korean forces began to show some wear from the attacks. There were even reports of food shortages in some areas. However, when these combined operations ceased so did the effectiveness of the interdiction effort.

Unfortunately, like the MAAF's Operation STRANGLE, the Korean Operation STRANGLE did not achieve its objectives. First, the FEAF had difficulty cutting enough rail lines to stop the slow the flow of goods to North Korean forces. According to Air Force Historian Robert Futrell, only 12.9% of the ordinance dropped had any effect on the rail

system.[10] Furthermore, the FEAF strikes only decreased enemy rail transportation by 4 or 5% of its prewar levels.[11]

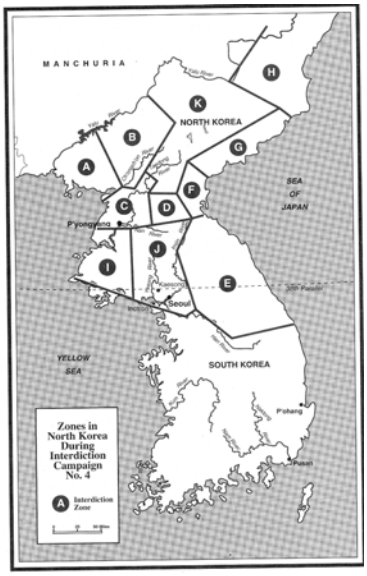

Figure 2. Interdiction Zones in North Korea

In addition, Allied planners underestimated the North Korea's reactions to the interdiction campaign. The FEAF's initial interdiction plan was to attack the interdiction zones sequentially rather than putting constant pressure across all zones. The North Koreans adjusted their supply routes to the east while the western routes were under attack. Moreover, the North Koreans began to move supplies at night and began to cannibalize double-track rail lines that assured at least a single track remained opened which, caused more problems for the FEAF.[12] Not attacking across all zones at once or being able effectively engage forces at night gave North Korean forces needed sanctuary to resupply their forces and maintain pressure on UN Forces in the south.

Both these STRANGLE campaigns show how providing an enemy sanctuary reduces the effectiveness of an interdiction campaign. Whether it be night, or weather or lack of aircraft support, if the enemy has some sanctuary to move supplies to front line troops, the overall

interdiction campaign will suffer. Furthermore, campaign commanders must conduct some sort of ground offensive in concert with the AI campaign to force the enemy to use what little supplies they have. This paper does not insinuate that ground forces will fix every shortfall of every air interdiction campaign, but they do put the enemy in position where they have to "operate on the margin".[13] According to Dr. Eduard Mark of the Center of Air Force History, air interdiction, except in the rarest of circumstances, will only stop a small percentage of the troops and supplies in the interdiction area.[14] Enemy force may have a surplus of equipment and troops, which allows them to continue to operate with a reduced supply line. Given that the very nature of interdiction operations are wars of attrition to degrade the enemy's ground forces ability to sustain combat operations, commanders must apply constant pressure to those forces to speed up the consumption process. Without this pressure, an interdiction campaign that would have taken weeks, may take much longer.

HISTORICAL AI SHORTFALLS: ACCURATE BATTLE DAMAGE ASSESSMENT (BDA)

COMMANDO HUNT VII: VIETNAM - NOVEMBER 1971 - MARCH 1972

In the Vietnam conflict, similar to WWII and Korea, the US conducted many air-only interdiction operations to stop the flow of goods into South Vietnam. One such campaign was called Commando Hunt VII, which targeted the primary supply route for enemy forces in Vietnam, the Ho Chi Minh Trail (Fig. 3). Although there was some ground personnel involved, the primary means of interdiction was via air power. The US forces used AC-130 gunships, AC-119 gunships as well as other fighter and bomber aircraft as the primary means to attack the Ho Chi Minh Trail.[15] The operation consisted of three phases, an entry interdiction phase, a blocking phase and an exit phase. During the entry interdiction phase, ARC LIGHT B-52 strikes

attacked the southern passes of Ban Raving and the western DMZ to force traffic through the northern passes of Mu Gia and Ban Karai.[16] Phase II attempted further block trail routes in the STEEL TIGER region (Fig. 4) of the trail to create traffic jams and backlog supplies. Forward air controllers would locate targets and direct fighter-bomber attacks. During the exit phase, gunships and fighter-bomber would continue strikes on the trail while B-52s would bomb the passes into South Vietnam.

Figure 3. Ho Chi Minh Trail

Figure 4. Steel Tiger Regions

The effectiveness of Commando Hunt VII is difficult to assess. Seventh Air forces hailed the operation a success claiming it destroyed or damaged over 10,000 enemy trucks.[17] However, each aircraft assessed battle damage assessment (BDA) differently. For example, AC-130 and AC-119 crews assessed a truck destroyed if it exploded or suffered a sustained fire, while B-57 crews assessed a truck destroyed if it was no longer visible after a direct hit from a bomb, observed to burn, reduced to wreckage or, "rendered unusable or irreparable after a strike."[18] Intelligence sources obtained little data from actual ground sources or other assets to validate the aircrew information. Furthermore, little is known whether Phase I actual achieved its objective of forcing enemy supplies through the northern parts of the Ho Chi Minh trail. The trigger for starting Phase II was not the blocking of the route but the arrival of vehicles in the STEEL TIGER region of the trail.

To better assess these triggers, US commanders needed better BDA. An aircrew's ability to assess the combat effectiveness of a damaged vehicle from a platform moving at 350+ knots is virtually impossible unless something significant happen to the vehicle. While a B-57 pilot may have been able to confirm the first three assessments of their B-57 vehicle destruction validation matrix, one must question their ability to assess a vehicle as unusable or irreparable, especially if none of the first three triggers had happen. One way US commanders could have gotten valid BDA could have been through ground forces. Ground forces could have not only provided valid BDA of the vehicles destroyed or damaged but also the validity of the success of Phase I. Accurate BDA would have provided a realistic assessment of the effectiveness of the US air strikes and given better data to Vietnam commanders on the status of the interdiction campaign.

TRANSFORMING AI: PART I -
AIR LAND BATTLE (ALB) AND FOLLOW ON FORCES ATTACK DOCTRINE

After the Vietnam War, leaders from both the Army and the US Air Force attempted to write doctrine that made the air and ground relationship more synergistic. In 1983, under the 31 initiatives outlined in the ALB constructed by Army Chief of Staff General Edward Myer and Air Force Chief of Staff Charles Gabriel, the Army and Air Force would better integrate across a broad spectrum of issues to include interdiction.[19] At the same time, General Bernard Rodgers, the Supreme Allied Commander for Europe, and his planning staff at SHAPE were developing a strategy of Follow on Forces Attack (FOFA) "aimed at delaying, disrupting and destroying Warsaw Pact forces from just beyond the so-called close battle to as far into the enemy's rear."[20] From these two discussions, air interdiction and its newest subset, battlefield air interdiction (BAI) received more clarification.

Doctrine would define BAI as "air interdiction attacks against targets which are in a

position to have a near term effect of friendly land forces."[21] AI and BAI would remain under the air commander's control, however, because BAI operations would occur on both sides of the fire support coordination line (FSCL), to deconflict fires and mitigate against potential fratricide situations, air commanders would coordinate with Army's group level. Before this BAI concept, many air and ground commanders saw the FSCL as the separation between land and air battle and the between close air support (CAS) and AI.[22] The ALB and FOFA concept would change that philosophy. According to Lt Col Donald Roberts, author of "An Alternative Look at Air Interdiction," the difference between BAI and CAS was how it affects the ground commander.[23] In other words, CAS influences the ground battle right now where AI influences the future battle. CAS affects battalions and brigades where BAI affects divisions and corps.[24] Some pundits feel that this concept to interdiction was ahead of its time. In spite of this assessment, this BAI/CAS/FSCL relationship would cause some issues during Desert Storm.

THE RELATIONSHIP BETWEEN AI AND THE LONG FSCL

DESERT STORM: IRAQ - JAN 1991

The concept of operations for Desert Storm was different for both the USAF and the Army.[25] As expected, US forces planned normal interdiction (both air and battlefield) and CAS missions. What was different was the implementation of push CAS sorties as well as kill box operations. While kill boxes had been around since Vietnam, in Desert Storm, the gameplan was different. Kill boxes had different rules depending on what side of the FSCL they fell.[26] Commanders outlined the procedures like this:

1) Kill boxes beyond the FSCL were considered AI missions
2) Kill boxes beyond the FSCL remained open until the ground commander closed them
3) A Forward Air Controller (Airborne) (FAC(A)) or Killer Scout will control all kill boxes lying beyond but within 30 nautical miles of the FSCL. These kill boxes would act as a buffer between CAS and AI

4) Kill boxes inside the FSCL remained closed until opened by the ground commander
5) Aircraft must contact AWACS or ABCCC for updates to Kill Boxes and FSCL location
6) Push CAS would flow continuously to support the ground commander. If CAS was not needed, these sorties would flow forward to AI kill boxes for tasking

While these procedures on the surface seem simple, they caused some friction for both aircrews and soldiers during the ground war of Desert Storm. For example, airborne command an control assets re-tasked A-10s slated for CAS and BAI to AI missions. Unfortunately, A-10 pilots trained in BAI and CAS were not trained in the AI mission.[27] Because of the high level of mission planning required for AI and other factors, A-10 pilots could not perform the mission as well as needed. According to Lt Colonel Terrance McCaffrey's book "What happened to BAI? Army and Air Force Battlefield Doctrine Development from Pre-Desert Storm to 2001", "one A-10 unit felt that because of the need for detailed planning for AI missions, they should not have been hastily retasked by the ABCCC."[28] Aircrews missed targets and were unable to drop their ordinance. Another source of friction was the FSCL.

In a static, linear environment, the FSCL/AI relationship functioned well.[29] However when the ground war started, ground forces moved so fast the kill boxes were overrun and increased the potential for fratricide. Moreover, there were problems with forces operating beyond the FSCL. Special Forces units, operating in a non-linear environment, had CAS missions denied because they were operating in the AI region north of the FSCL.[30]

Perhaps the most glaring problem with the FSCL was where ground commanders placed it. By definition, the FSCL is a coordination measure for ground and air commanders can use to deconflict fires. In the case of Desert Storm, Army commanders initially placed the FSCL well north of the Euphrates River with the intent that attack helicopters would engage and destroy

escaping Republican Guard forces.[31] However, according to General Merriel McPeak, former Air Force Chief of Staff, on the third day of the ground war, the XVIII Corps commander placed the FSCL well beyond the US Army's ability to affect the close battle with his own artillery and attack helicopters.[32] Consequently, the JFACC could not interdict supply lines from Baghdad to Kuwait without coordinating the Army. Although the FSCL would move closer during the 100 hour ground air, ultimately some of the Republican Guard escaped.

This FSCL placement issue shows how placing this FSCM too long from the FLOT can give an adversary sanctuary. Effectively, this long FSCL placement provided the Republican Guard sanctuary in Kuwait and gave them opportunity for some to them to escape through Basra. This paper does not imply that US and collation air and ground forces were unable to engage and destroy a good portion of the Iraqi Republican Guard. Historical facts prove quite the opposite. What this situation does highlight is the criticality of FSCL placement and its effects on the battlespace.

AI IN COERISIVE OPERATIONS

OPERATION ALLIED FORCE: KOSOVO - MARCH 1999 – JUNE 1999

Unlike Desert Storm where air and ground forces worked together to achieve national objectives, during Operation Allied Force (OAF), US and NATO forces attempted to conduct an air only coercion campaign to end Serbian ethnic cleansing in Kosovo. Given the quick success the CAS/AI campaign of Operation DELIBERATE FORCE, NATO planners felt that Serbian President Slobodan Milosevic would capitulate after a few days of air strikes.[33] After finding these strikes ineffective, NATO leaders decided to shift from strictly attacking integrated air defense and command and control targets to conducting AI operations to destroy Serb forces in Kosovo and Serbia.

These AI missions ran into a myriad of problems. First, NATO pilots had to overcome a series of rules of engagement (ROE) hurdles that hampered finding, fixing and identifying targets. NATO pilots had to stay above 15,000 feet to stay out of reach of Serbian air defense artillery as well as most man portable (MANPAD) surface to air missiles.[34] While OAF commanders reduced this restriction when a FAC(A) was on station (NATO commander allowed pilots to descend to 5,000 feet above ground level), it was not enough to give pilots the ability to detect targets hiding in small villages, tree lines and the rolling hills of Kosovo. Second, intelligence updates were lacking. Pilots would launch with up to 30 potential target areas in hopes of finding targets, however, these photos and the intelligence associated with them were sometimes 12-24 hours old.[35] By the time pilot arrived at the target area, the target had moved. Lastly, NATO pilots had to ask NATO leadership for permission to drop if they found any potential targets. For example, one US FAC(A) said he saw individuals setting fires in Kosovo villages, but when he asked to investigate, he was told to leave the area.[36] To overcome these shortfalls, NATO Forces clearly needed a ground option.

Once the Kosovar Liberation Army (KLA) entered the fight with a 4,000 guerrilla offensive in late May 1999, the landscape of the war changed. While the Serbian Army was able to destroy the KLA forces, they had to come out from hiding to do so. As a side note, one could also question the effectiveness of the NATO air interdiction campaign, if after 70 days of air strikes, the Serbian Army could still mount a strong counter offensive operation. More importantly, however, was that when Serbian forces came out of hiding, NATO aircraft had an easier time finding and destroying them. Specifically, on 7 June 1999, during a Serbian counteroffensive against KLA forces, two B-52's and two B-1's dropped Mk-82's and cluster bombs on 800-1,200 Serbian forces and fewer than half of survived the attack.[37]

This situation highlights again how when conducted with a ground scheme of maneuver, AI campaigns are more effective. In previous AI campaigns, ground attack sped up the war of attrition by forcing enemy ground troops to consume what little supplies they had. In the case of OAF, ground attacks forced Serbs to move from hiding places. The environmental landscape of Kosovo, coupled with rule of engagement restrictions from OAF commanders made conducting an AI campaign almost impossible. Consequently, like in Korea and other campaigns, Serb Forces had sanctuary in Kosovo. Serb Forces could virtually hold ground indefinitely until something or someone brought them out of hiding. Once the KLA offensive began, Serb Forces could no longer hide behind decoys, mountains and the cover of villages or risk being killed by ground attacks. Once they moved to engage the KLA, NATO pilots could find them and destroy them.

THE EFFECTS OF COMMAND AND CONTROL ON AI

OPERATION ENDURING FREEDOM: AFGANISTAN – OCTOBER 2001 - PRESENT

Following OAF, the next substantial air interdiction operation occurred in Afghanistan. Operation ENDURING FREEDOM (OEF) saw air power used almost exclusively in concert with Special Forces scheme of maneuver. Starting in mid October 2001, the US inserted Special Forces (SOF) and Tactics (STS) teams in Northern Afghanistan to support the North Alliance and other forces against Al Qaeda and the Taliban.[38] The purpose of these teams was "to call in air attacks on Taliban forces in contact with opposition forces."[39] Initially, planners felt that these strikes would be insufficient so US Central Command planned to insert 50,000 additional ground forces if the air strikes needed support.[40] However, the US did not need the extra forces. SOF/STS teams called in air strikes so efficiently that the Northern Alliance was able to capture Mazer-e Sharif by 10 November and Kabul two days later. By 7 December, once Kandahar fell,

the Taliban crumbled so North Alliance forces shifted their focus on rooting out rouge Al Qaeda and Taliban forces left fighting in other parts of Afghanistan.

As effective as these air strikes were (most sorties were flown in CAS and AI roles), there were still some problems in the execution process, specifically with time sensitive targeting (TST). One problem was general lack of understanding of Joint Direct Attack Munition (JDAM) employment and its effect on the ability to prosecute targets quickly. During OEF, there was a general consensus that a JDAM required "mensurated" latitude and longitude coordinates before an aircraft could employ the weapon.[41] Moreover, CENTCOM also required a collateral damage estimate for on all targets before aircraft could employ ordinance and process could take up to two hours.[42] If operational commanders hope to achieve success in dynamic targeting missions especially against fleeing targets, obviously, the process must be faster than two hours.

THE RELATIONSHIP BETWEEN AI AND THE LONG FSCL (TAKE TWO)

OPERATION IRAQI FREEDOM: IRAQ – MARCH 2003 - PRESENT

While US and collation forces fought in OEF, combat operations began in Iraq. Like the first Gulf War, the air campaign during Operation IRAQI FREEDOM (OIF) had many of the same elements; strategic strikes on downtown Baghdad, kill box operations, and a relatively fast moving ground offensive. What was different was how collation forces executed combat operations. Instead of an air war to prepare and shape the battlespace for a ground offensive, US and collation ground forces first started a massive ground offensive pushing from Kuwait. With Army V Corps units in the west, USMC I MEF in the east and British forces securing Basra and points southeast, collation forces were extremely effective. Ground forces were able to move on average 75 miles per day to and secure Baghdad in three weeks. The air war was also different.

OIF commanders used air power almost solely in kill box interdiction and CAS mission, which made up almost 80% of OIF missions flown in these operations.[43]

As previously stated, from a campaign perspective, OIF was a tremendous success, however, some of the same FSCL issues that occurred in Desert Storm resurfaced in OIF. In the case of OIF, at times, V Corps placed the FSCL 140km or 84 miles from the forward line of troops (FLOT). [44] Short of this line, all kill boxes were closed and were difficult to open for attacks because of some shortfalls at the ASOC's equipment.[45] Unhappy with the 140km FSCL, the 1st MEF implemented a new concept call a battlefield coordination line (BCL) that served the same functions as the FSCL however, was much closer to the FLOT. This BCL gave more freedom of action to aircraft interdicting in kill boxes beyond the BCL, however, it also caused problems.[46] According to one USMC reconnaissance battalion commander, he was unable to use certain terrain for his ground scheme of maneuver because of an overlapping kill box.[47] While this may have been an isolated problem, it does highlight potential coordination issues and management of kill boxes. The kill box construct used in OIF allowed for a tremendous freedom of action for the air units inside the kill box but based on this example, this freedom has the potential to restrict ground units from maneuver. The joint community needed to refine kill box TTPs further.

TRANSFORMING AI: PART II - ESTABLISHING KILL BOX TTPS

Even though military campaigns have used kill boxes since Vietnam, the joint community had not formalized any TTPs until June 2005 with Air Land Sea Application release of the "Multiservice Manual for Kill Box Employment". The manual attempts to update procedures for kill boxes operations using the construct as kill boxes as FSCMs.[48] It specifically

states that kill boxes are NOT a reference system although they are usually associated with an area reference system (i.e. a Common Grid Reference System or Global Area Reference System (GARS)).[49] Kill boxes can be open or closed and when opened, fall in to two categories; blue and purple. Blue kill boxes allow air to surface fires without coordination or deconfliction. Purple kill boxes allow for both air-to-surface fires as well as indirect surface-to-surface fires. Fires in purple kill boxes are deconflicted by time or space, laterally or vertically. Essentially, according to this publication, kill boxes are similar to existing FSCM like free fire areas (blue kill boxes), no fire areas (closed kill boxes), and airspace coordination areas (purple kill boxes).[50]

There are several issues with this publication. The term kill box has a stigma that implies a designated area where a unit (ground or air) can enter and kill everything in that area. The joint definition supports that mindset. Joint Publication 1-02 defines a kill box as "a three-dimensional area reference that enables timely, effective coordination and control and facilitates rapid attacks."[51] Building from this definition the Joint TTP for Kill Box operations uses this construct as a FSCM to develop procedures to deconflict and integrate fires. These TTPs, however, have an "air-centric" foundation. For example, when a component commander opens a kill box, joint fires can occur within that box (air or ground). However, when describing what type of fires occur in the kill box, the TTP identifies fires using air power as its foundation (only purple kill boxes have procedures for other fires besides air strikes). Having a system based on air to surface fires may seem restrictive to ground maneuver units. Besides open kill boxes, there is no color-coded classification that describes other battlespace movements and fires (i.e. surface-to-surface fires). Furthermore, when the TTP allows for simultaneous fires (i.e. a purple kill box), it stops short of outlining any TTPs that describe the command and control issues between air-to-surface and surface-to-surface fires procedures for integrating those fires.

Another issue with current kill box TTPs is its similarity to existing FSCMs. For example, the TTP still allows for a FSCL. Procedures for kill boxes inside the FSCL but outside a joint terminal attack controller's (JTAC) ability to see the attacking aircraft or the target are very similar to Type 3 CAS procedures listed in Joint Publication 3-09.3. Under Type 3 control CAS procedures, the JTAC passes targeting information via a nine line, gives restrictions and attack instructions to include what to attack, how long Type 3 procedures are in effect, gives final clearance and what to do when "attack complete".[52] The only differences between the procedures for Type 3 control CAS and kill boxes inside the FSCL are who gives the attacking aircraft targeting information (the kill box authorizing agency versus the JTAC), the format of that information (a four line brief versus a nine line brief) and who gives final clearance (the kill box authorizing agency versus the JTAC). In essence, current kill box TTPs are using the existing Type 3 control, free fire area or restricted fire area concepts of operation and calling it kill box operations.

TRANSFORMING AI: PART III - MOVING BEYOND KILL BOXES FROM A FSCM TO A JOINT FIRES AREA

From previous historical examples, kill box TTPs have improved drastically over time. Even with this improvement, there are some shortfalls in current TTPs for kill boxes operations. With current technological advances, the ability for surveillance sources to find and fix targets, and a shift from a linear battlespace concept to a non-linear battlespace, the joint community must move toward battlespace command and control measures that not just deconflict air and ground combat operations but integrate them as well. In order for kill box interdiction operations to achieve greater effects, the joint community must update current TTPs to allow a more robust and reactive construct that does the following:

a) Doesn't provide sanctuary in any area of the battlespace

b) Is reactive to quickly exploit missions with minimal command and control friction

c) Quickly integrates air and ground forces and fires safely and efficiently

d) Ensures that all aircrew and ground maneuver units perform in a joint manner

To take advantage of the kill box framework, joint TTPs should expand the concept of kill boxes beyond the FSCM paradigm to more of a joint reference system for combined operations. Using the term put forth by the Joint Fires Coordination Measures group at Nellis AFB, NV, the joint community should call them Joint Fires Areas.[53] Using the GARS reference system, the JFC would overlay joint fire areas that his or her component commanders could use to integrate and synergize joint forces. These areas would define supported and supporting relationships within these joint fires areas. Furthermore, using GARS, all forces, both air and ground, can use the same reference format to define joint fires areas and move closer to building a common operating picture.

Armed with this joint fires concept, the next step in enhancing these procedures is to remove the concept of the FSCL and replace it with the joint fires area concept throughout the battlespace. When setting a FSCL, the ground commander considers a variety of factors. One of these is scheme of maneuver. If the ground commander anticipates moving a great distance over a linear battlefield, he may set the FSCL far from the FLOT knowing that it takes some time to reset a FSCL (as long as 12 hours). As previously stated, in OIF, ground commanders set the FSCL at 140 kilometers or 84 miles from the FLOT. Although the Army has some organic assets that can reach out to targets that far away from the FLOT (i.e. ATACMS), for the most part, most organic fires for the Army can only affect targets at a range of 32 km or about 20 miles.[54] From 20 miles to the 84 mile FSCL is essentially sanctuary for the enemy. Denying

use of those sixty miles for the entire 12 hours is inefficient. If the Federal Aviation Administration (FAA) controlled aircraft this way, when a flight left Dulles International Airport, near Washington, D.C. left for its 1+ hour flight to John F. Kennedy Airport (JFK) in New York, New York, no other aircraft could use the airspace between Dulles and JFK until that flight arrived at JFK. While this example is not a direct parallel (the FAA used positive control via radar and radio interrogators while the Army uses procedural control via radios and maps), the Army does have some situational awareness on their forward troops that the JFC could use to deconflict and integrate other forces.

Another issue with having a separate FSCL/BCL with a kill box system is that the two may not overlap. Typically, well-defined terrain features such as a river or a mountain range identify FSCLs and BCLs where joint fires areas are defined by the GARS construct which uses lines of latitude and longitude to define areas.[55] The problem with using the FSCL or BCL is that references used by ground forces may be difficult for aircrew to see. By using joint fires areas as a reference system, all players in the battlespace can talk using the same data. Furthermore, most ground units have GPS that would allow them to identify where joint fires areas end or begin. Even if GPS systems fail, ground commanders, referring to established joint fires areas drawn on maps, can still operate under the reference system.

By using the joint fires area construct instead of FSCLs or other FSCM as the reference system for the entire battlespace, when ground commanders communicate with aircrew they will speak the same language. For example, under the current structure, if an aircrew is looking for the forward line of friendly troops for ground unit X, he or she may hear this: "Ground Unit X is two kilometers short of phase line Patriots moving east bound, ACA White is established, contact Blackthorn 41 for tasking." If the aircrew does not know, the current planned ground

scheme of maneuver (i.e. the location of Phase line Patriots) or what ACAs the ground commander has established, that situation report means nothing. A better update would sound like this: "Ground Unit X is established in keypad 006AF69 moving east…joint fires area 006AF and 007AF are currently is purple with artillery firing up 6,000 feet MSL…Stay above 7,000 and contact Blackthorn 41 for tasking." Because all players are working from the same reference system, data means something to the aircrew. While this example is very air centric, it helps ground commanders as well. If the ground commander foresees that he will cross into a joint fires area that he does not own, instead of requesting permission to move into to an area defined by references that he can only see, he can speak off a common reference that everyone understand, thereby slowing the lag time inherent when operating two separate air and ground reference systems.

To implement this joint fires area concept, combatant commanders must develop TTPs on how to manage the battlespace, define C2 relationships, and operational integrate fires and combat units. If joint fires areas are to become the primary reference system for all air and ground units, joint doctrine must identify a command and control structure that can assimilate data on all forces in the battlespace, process that data, and execute joint fires area management over the whole battlespace. This paper does not advocate that this command and control hierarchy function as the decision maker for what fires occur in what joint fires area or what unit or what function occur in a particular joint fires area. This command and control structure merely acts as overseer for the owner of a particular joint fire area and on behalf of the JFC directs, integrates and deconflicts assets as necessary to achieve JFC goals.

Using current doctrine as a framework, perhaps the best command and control structure to perform this duty exists at the joint air operations center (JAOC). According to Joint

Publication 3-30, one of the JFACC's taskings to oversee the command and control of airspace to enhance the effectiveness of accomplishing the JFC's objectives.[56] This includes both positive and procedural control methods to insure air and ground assets are deconflicted. To accomplish this tasking, the JFACC has a robust staff with liaisons from each service and other non-military players (i.e. non-governmental organizations) that give him or her data to execute the air mission. These liaisons, using the theater air ground system (TAGS) TTPs and other methods, disseminate data back and forth to the JFACC to deconflict services operating in the same AOR, deconflict air assets from fires occurring in the AOR, as well as fulfill requests for air power in support of the ground scheme of maneuver (i.e. CAS or AI).[57]

Another asset at the JFACC disposal is the Theater Battlefield Management Core System (TBMCS). According to the Joint Interoperability Test Command, "TBMCS provides the air commander with the means to plan, direct, and control all theater air operations in support of command objectives and to coordinate with ground and maritime elements engaged in the same operation."[58] According to a US Marine Corps concept brief, TBMCS will provide better interface with air and ground components during combat operations.[59] For example, ground commanders can input requests for CAS directly to the JAOC. In addition, there is also a near real time blue force tracking (BFT) capability and some capability for real time chat with users of the system as well as other enhancements of the current TAGS TTPs.

While these liaisons and TBMCS provide vital information, their role in the JAOC, except for CAS, is based on deconfliction, not integration. For example, the role of the Army's liaison element, the battlefield coordination detachment, is to provide the JFACC situational awareness on Army operations as they affect the air operations. However, under current TTPs, beyond CAS, the detachment does not integrate Army ground scheme of maneuver with air

scheme of maneuver, nor does it have the situational awareness to do so.[60] Consequently, aircrew has very little situational awareness on the ground scheme of maneuver except the location of FSCMs like the FSCL or other planned ACA's. Moreover, ground maneuver elements have very little situational awareness on air assets except pre-planned CAS sorties. As for TBMCS, while it does have some BFT capability, not all ground units are on the BFT net so it cannot be a sole sort for friendly ground maneuver units.

To manage joint fires areas properly, the liaisons and TBMCS needs to be more robust to work with the JFACC in managing and allocating airspace for weapons employment. Given the speed of ground maneuver units and the finite amount of time required to execute TST missions, these elements need to have the highest situational awareness possible. The liaisons need real time updates from their supporting tactical operations centers for locations of front line friendly forces (similar to ones used by fire support coordinating cells). Overlapping this data with other systems like TBMCS would give a more synthesized picture of what happening in the battlespace. Using this situational awareness, the JFACC (or his or her designated team) can manage airspace to turn on or off joint fires areas as needed to execute JFC objectives.

Beyond operational command and control of joint fires area operations, component commanders will need tactical situational awareness to ensure that once the JFC turns a joint fires area on, operations in that joint fires area occur without increasing risk. The JFACC needs to have communication capabilities to pass joint fires area information to all players in the AOR as well as receive requests for activation of joint fires areas from units operating in the AOR. To do this, the JFACC will need an airborne platform with the C4ISR capabilities not only pass joint fires area requests and status to and from the JAOC, but also to have the same battlefield picture as the JAOC to aid in managing joint fires area operations. The platform needs to have long on-

station time to monitor air and ground operations without losing information once a controller hands off to another controller. The ideal platform for this mission is an UAV, like the Global Hawk.

The Global Hawk UAV provides near real-time, high-resolution, intelligence, surveillance and reconnaissance imagery and can survey large geographic areas with pinpoint accuracy, to give military decision-makers the most current information about enemy location, resources and personnel.[61] The Global Hawk, flying at high altitudes, would have communication capabilities with units throughout the AOR. Using its targeting data, Global Hawk crews could update air and ground commanders on potential joint fires areas. Using JAOC information, once the JAOC turns on the joint fires area and a kill box coordinator arrives on station, the Global Hawk could pass joint fires area status, targets, area updates, aircraft inbound to the joint fires area and any other pertinent information.

The last enhancement to joint fires area operations is the kill box coordinator concept outlined in kill box TTPs. Under kill box TTPs, a kill box coordinator is required when multiple flights are operating in the same kill box.[62] The coordinator manages the kill box to ensure that aircraft are deconflicted from each other as well as from any other fires occurring in that kill boxes. The coordinator also may be call upon to locate, identify, mark, make collateral damage assessments and provide terminal guidance for air to ground fires. Furthermore, this coordinator may need to provide BDA or BHA (as necessary) to the JAOC. While these tasks are very similar to those of a FAC(A), the TTPs are very specific that the two missions are not confused. They state, "The functions associated with kill box coordination should not be confused with those of the FAC(A). FAC(A)s are a direct extension of a tactical air control party (TACP) or joint terminal attack controllers (JTAC) and specifically facilitate the conduct of CAS. Flights

providing kill box coordination will not normally provide terminal attack control within a kill box."[63] Using this philosophy, the TTPs state that a flight lead can act as kill box coordinator.

While the kill box coordinator is not an extension of the JTAC, he or she needs more training that the typical flight lead to ensure that operations are conducted safely. As previously stated, under the proposed construct, the JAOC would have situational awareness of all friendly personnel in the battlespace. However, no matter how much positive control a system has, tracking systems fail and command and control systems lose track of units. A typical flight lead does not have the training to identify friendly units from hostile units. A typical flight lead does not have training in tactical air coordinator procedures required to deconflict aircraft in a kill box. Furthermore, a typical flight lead does not have knowledge of dissimilar aircraft's capabilities or weapons employment tactics or the training to integrate air-to-surface fires with surface-to-surface fires for maximum effect (i.e. a purple kill box). These and other skill sets will be required for a kill box coordinator to execute safely. While doctrinally saying that kill box coordinators are not FAC(A)s may be a true statement, it ignores the fact that there is an air strike control (ASC) skill set needed to execute interdiction sorties safely and properly. Ultimately, a kill box coordinator needs more ASC training that what a typical flight lead receives.

When looking at USAF fighter flight lead upgrade programs, except for the A-10 program which as an ASC evaluation, other upgrade programs are lacking. According to 11-2FXX series publications, F-16 and F-15E flight lead upgrade programs do not have a CAS or ASC evaluation.[64] There are not ASC-like sorties until a flight lead enters a combat search and rescue upgrade (F-16 or F-15E), FAC(A) upgrade (F-16), or Killer Scout upgrade (F-16). Of these upgrades, the one that most resembles the skill sets outlined in kill box TTPs is the F-16

FAC(A) upgrade program. Like other service's FAC(A) upgrades, an F-16 FAC(A) must meet the requirements outlined by joint standards to receive certification. With this certification, a commander knows that when an aircrew has a FAC(A) qualification, that aircrew as met a joint standard and perform tasks in accordance with joint mission requirements. While this paper does not advocate that a kill box coordinator must be a FAC(A), the joint community should consider some joint standard for kill box coordinators to ensure that they conduct operations safely and correctly.

Along with joint kill box coordinator standardization, the most important aspect to ensure proper execution of kill box interdiction operations is joint training. Currently, there are joint training venues at the Joint National Training Center at Fort Irwin, CA and the Joint Readiness Training Center at Fort Polk, LA. These training centers conduct exercises called Air Warrior I and II that allow an air unit to work with ground maneuver units in a realistic training environment. While this training is very realistic and dynamic, participating units may only have an opportunity to attend one of these exercises once every two years. Given the turnover in most fighter squadrons, the first time a pilot see joint air ground maneuver operations may be in theater. Both ground maneuver units and CAS/AI platforms must train more together so that both sides understand how joint combat operations will work as well as to solidify relationships with air and ground units. These relationships equate to building trust and understanding of each other's abilities and limitations.

Interdiction operations must evolve to meet the changing nature of the battlespace. Because of the rapid pace of ground maneuver units, the ability for assets to find and fix targets, and the non-linear battlespace, the joint community must expand AI procedures. To remain effective, the kill box concept needs refinement. That refinement must include a shift in

philosophy of what a kill box is, how it is controlled, and the supported and supporting relationships within those areas. Furthermore, to execute within joint fire areas, aircrew must conduct frequent joint training. Air Warrior I and II are excellent training arenas; however, they do not occur often enough for aircrew to gain proficiency in the joint maneuver battlespace. If the joint community moves to the joint fires area concept of managing the battlespace, the JFC will gain more flexibility and versatility to use his or her forces as needed to met national objectives.

End Notes

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[35] Lt Colonel Patrick McKenzie, 310th FS Commander, Luke AFB, AZ, interviewed by author, 1 March 2006.
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[60] TAGS, II-11-II-13
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