NEW CLOSE AIR SUPPORT DOCTRINE: GETTING CONTROL OF EMERGING TECHNOLOGY AND ADVANCED CONCEPTS

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ABSTRACT

NEW CLOSE AIR SUPPORT DOCTRINE: GETTING CONTROL OF EMERGING TECHNOLOGY AND ADVANCED CONCEPTS, by Major Todd J. Serres, 139 pages.

The joint close air support (JCAS) community is struggling to determine future close air support (CAS) employment tactics, techniques, and procedures (TTPs). Since 1996, the JCAS community, lead by an Office of the Secretary of Defense JCAS Joint Test Force, has tried to improve JCAS by proposing changes in training, doctrine, equipment and organization. Differing service perspectives and the advent of new technologies make agreement on necessary doctrinal changes tenuous. The primary question set out in this thesis asks, Are the changes in terminal attack control framework proposed in the draft JP 3-09.3 necessary and sufficient for current and near future operations? The paper examines contentious issues such as battlefield air interdiction (BAI), the fire support coordination line (FSCL), CAS definitions, and the purpose of maintaining separate categories of control. It then structures a qualitative comparative analysis of the current and proposed terminal attack control procedural frameworks based upon the criteria of simplicity, completeness, and utility. The evidence of this study suggests that proposed doctrinal changes are necessary, but the overall "utility" of the draft terminal attack control framework is not sufficient. This study makes five recommendations for improvements in JCAS doctrine.

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ACRONYMS

ABCCC	airborne battlefield command and control center
ACASS	Advanced Close Air Support System
AFDD	Air Force Doctrine Document
ALSA	Air land sea applications
AO	Area of operations
AOC	Air operations center
ASOC	Air support operations center
ATO	Air-tasking order
BAI	Battlefield air interdiction
BOC	Bomb on coordinates
C2	Command and control
CALL	Center for Army Lessons Learned
CAS	Close air support
CID	Combat identification
CFL	Coordinated fire line
CGSC	Command and General Staff College
DMPI	Desired mean point of impact
EPLRS	Enhanced position location reporting system
ETAC	Enlisted terminal attack controller
FAC	Forward air controller
FAC(A)	Airborne forward air controller
FSCL	Fire support coordination line

FM	Field manual
GCC	Ground component commander
GPS	Global-positioning system
IR	Infrared
ISR	Intelligence, surveillance, and reconnaissance
JAAT	Joint air attack team
JCAS	Joint close air support
JT&E	Joint test and evaluation
JDAM	Joint direct attack munition
JFACC	Joint forces air component commander
JFLCC	Joint forces land component commander
JFC	Joint forces commander
JSOW	Joint standoff weapon
JSTARS	Joint surveillance target attack radar system
JTTP	Joint tactics, techniques, and procedures
LGB	Laser-guided bomb
LTC	Lieutenant Colonel
LTD	Laser target designator
MAGTF	Marine air-ground task force
NTC	National Training Center (Fort Irwin, California)
OSD	Office of the Secretary of Defense
PI	Probability of Incapacitation
SA	Situational awareness

SADL	Situational awareness data link
SOTAC	Special operations terminal attack controller
TAC	Terminal attack controller
TACP	Tactical air control party
TACCS/AAGS	Tactical air command and control system/Airy air-ground system
TAGS	Theater air-ground system
TGO	Terminal guidance operations
TIC	Troops in contact
TTP	Tactics, techniques, and procedures
UAV	Uninhabited aerospace vehicle
USA	United States Army
USAF	United States Air Force
USMC	United States Maine Corps
USN	United States Navy
WCMD	Wind corrected munitions dispenser

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CHAPTER 1

INTRODUCTION

Control Excerpt from National Training Center

[Controller]:	"Speedy, Misty 71."
[Pilot]:	"Go!"
[Controller]:	"Good hits, you have flight lead discretion on those targets and the targets just to the north of that [dirt mound]. I'd like you to, uh, hit that until you are Winchester. How copy?"
[Pilot]:	"Understand I got flight lead discretion . . . what does that mean? I can just, uh, wail on them at free will?"
[Controller]:	"That is affirmative . . . you have flight lead discretion . . . wail on them at free will. Keep all fires on the road or on the movers just to the north of that [dirt mound]." (OSD 2000)

The above transcript of a close air support (CAS) control at the National Training Center (NTC) may or may not have been effective in accomplishing the objectives of the commander for his exercise. The pilot is given "flight lead control" by the terminal attack controller. He has apparently transferred clearance authority to drop ordnance to the pilot provided the pilot adheres to the procedural control measures stipulated. At least that is one way of looking at it. The truth be known, anyone would be making an assumption if he told you who was actually in control of the weapons release from this point on. That is because "flight lead control" is not defined in the joint doctrine. The consequences of this control--or lack of control--method are fairly benign at NTC during this stage of the exercise. The aircraft was not delivering actual ordnance, and there were no live surface-to-surface fires commensurate with this attack, so the likelihood of fratricide was nearly zero.

But what if this had been an actual combat air control with actual weapons employment against an actual enemy--precisely the purpose for the training at NTC? In that case the risk taken by that controller would have been much greater. He has, in essence, approved the use of unobserved fires in the ground commander's area of operations (AOs). Or has he? Is the pilot not capable of observing his own fires? The risk of fratricide might have been negligible if the controller had absolute knowledge that there were no friendly forces in the area, verified through electronic data link with both the friendly units inside the AO and with the flight of aircraft. Perhaps also, for the commander with responsibility of this AO to position this controller or another observer closer to the targeted area would have been too risky or taken too much time. This ad hoc control method may have been precisely what was needed at the time to be most effective against this enemy force.

This flight lead control is not specified in doctrine or tactics, techniques, and procedures (TTPs), and that alone makes it a point of confusion. Uncertainty is apparent in the voice transmission of the pilot in the above example. Confusion increases friction and increases the potential for accidents and incidents on the battlefield. Whether this and other nondoctrinal control methods should be incorporated into CAS doctrine is what this paper will explore. Specifically, this author will attempt to determine whether the terminal control framework established in our current doctrine is sufficient or if proposed changes should be incorporated to make the doctrine more applicable to current and near-term future methods of warfare.

Close Air Support Doctrine

United States Air Force (USAF) fixed-wing aircraft and Tactical Air Control Party (TACP) personnel provide a majority of the CAS used by the United States Army (USA). The very nature of this relationship makes CAS a joint service issue that must be adequately addressed in joint doctrine. The doctrine for CAS is delineated in JP 3-09.3, *Joint Tactics, Techniques and Procedures for Close Air Support*, and is currently in the first draft stage of an updated publication. This doctrine that is under scrutiny is actually a joint TTP (JTTP). It differs from most doctrine in that it specifically addresses the details of mission accomplishment. Tactics refer to the "employment of units in combat" (JP 1-02 1998, 445). Techniques are accepted methods of accomplishing tasks. Procedures direct the orderly accomplishment of critical tasks (JP 1-02 1998, 357).

Like all joint doctrine, this JTTP is authoritative. It will be followed in all cases "except when, in the judgment of the commander, exceptional circumstances dictate otherwise" (JP 3-09.3 1995, i). This doctrine guides the application of CAS for all war fighters from combatant commanders through the members of the individual service components. It is certainly not meant to inhibit the joint force commander (JFC) from employing his forces in the most-effective manner; however, adherence to the doctrine ensures that armed forces execute operations using the methods with which they are most familiar--to fight the way they have trained (JP 3-09.3 1995, i).

JP 3-09.3 is a comprehensive publication; it describes the organization and fundamentals, the command and control, the request and tasking processes, planning methods and considerations, and finally the execution of CAS. This paper will refer to all of these elements of CAS, but its focus will be on the last topic--CAS execution. Very specifically, it will focus on a very small, but important element of the execution--terminal attack control methods.

A discussion of fratricide occurs very early in Chapter I of the JTTP. It states that, although fratricide occasionally occurs because of weapons malfunctions, it is more typically the result of confusion on the battlefield. It then identifies some of the causes of confusion, such as "misidentification of targets, target location errors, target locations incorrectly transmitted or received, and loss of situational awareness by terminal controllers, CAS aircrews, or requestors" (JP 3-09.3 1995, I-2). Terminal attack control procedures are discussed in Chapter V of the doctrine as part of the execution of CAS. They are employed in order to mitigate the risk of fratricide and to ensure meeting the commander's intent. JP 3-09.3 discusses specific information that must be relayed within each terminal attack control procedure in order to properly conduct a weapons release. This information is situationally dependent but may be categorized under three essential elements of control: targeting direction, fratricide prevention, and weapons release clearance. All of the aforementioned causes of fratricide have links to these essential control elements. If employed correctly, terminal attack control procedures should reduce or eliminate the likelihood of fratricide. Because a safe and effective weapons release is the paramount concern for the supported maneuver commander, terminal control procedures are the sine qua non of CAS.

The Broad Doctrinal Issues

Historical writings about CAS reveal many contentious issues that surfaced as a result of the perceived quality of support. More recently, the adequacy of the doctrine itself has been called into question as the joint community explores the lack of flexibility in the methods of controlling aircraft that perform attacks in close proximity to ground forces. Mixed in the discussion of CAS control measures are several significant peripheral issues. These include the following: incongruent service perspectives, new and emerging air-to-ground munitions and weapon delivery methods, emerging target tracking methods, improved methods of friendly force identification, recognized deficiencies in CAS training and education, and the vague and confusing nature of the definition of CAS.

This paper will delineate the current CAS control methods as outlined by doctrine. It will make observations on how distinct service perspectives, technological advances, and doctrinal definitions may affect the control methodology established in JP 3-09.3. It will detail some of the proposed recommendations for change, primarily focusing on the framework proposed in the initial draft of the revised JP 3-09.3. A content analysis will be made on the necessity of the proposed changes. This study will conclude with its own doctrinal recommendations that follow from the evaluation of the proposed doctrinal solutions. This will be done within the context of currently fielded and soon to be fielded technologies.

Proposed Research Question

Primary Research Question: Are the changes in the terminal attack control framework proposed in the draft JP 3-09.3 necessary and sufficient for current and near future operations?

Based on the thesis' opening example, one might find the first part of this question somewhat rhetorical--obviously there is a problem with the control framework. However, several other options may be just as adequate. First, simply because an aircraft is tasked to perform a CAS mission does not mean that it will be employed in the CAS role. That aircraft, if performing an attack against military potential not currently engaged with friendly forces, may have been performing air interdiction (AI), particularly if there was no need for detailed integration with the fire and movement of the ground forces. In this case, to determine whether a new terminal attack control structure needs to be established is a moot point. Perhaps a review of established methods of interdiction control should be directed instead.

Second, as asked within the opening paragraphs, if the pilot on board the aircraft can observe his own fires and maintain radio contact at all times with the terminal attack controller, could the opening example simply be illustrating a form of indirect positive control, a control method already established within the existing framework? In other words, is "flight lead control" only a misnomer? The control of weapons release never transfers to the flight lead if the forward air controller maintains positive control by remaining in constant radio contact and monitors the potential for fratricide throughout the attack, regardless of the number of passes and weapons releases conducted during the attack. In this case there are probably changes necessary to be made to the doctrine, but not necessarily to the framework of positive control that currently exists in the doctrine (JP 3-09.3 1995, V-9-11).

Finally, is there a procedural control measure that needs to be defined that is neither AI nor CAS? In other words, is the CAS doctrine adequate for what the armed forces currently define as CAS, while the categorization of air support functions is lacking? This third option is potentially the most troublesome. Despite the USAF efforts to educate the USA through its doctrinal changes in Air Force Doctrine Document 2-1.3, *Counterland*, on how they intend to support requests for immediate interdiction through a flexible targeting process (AFDD 2-1.3 1999, 64-5), many USA officers still believe that the quickest and most reliable way of engaging interdiction targets short of the fire support coordination line (FSCL) is to use CAS-allocated resources. They are still looking for the responsiveness of dedicated interdiction assets that existed under the concept of battlefield air interdiction (BAI). A question that rises out of this is whether the USAF should accept the fact that CAS allocated sorties will be used in shallow interdiction roles and provide an appropriate control mechanism under the umbrella of CAS to aid in targeting direction and fratricide prevention.

Background

Technological Innovation

Leveraging technology has always been a pillar of the American way of war, particularly with the USAF. In almost every application of airpower currently employed by the USAF, the TTP and doctrine have evolved to take advantage of technological advances. Informal changes in TTP evolve continuously and in pace with the technological advances. However, changes in doctrine and formalized TTP lag behind the technological advances while airmen evaluate what is necessary to fully exploit the advantages of the new technology. Joint doctrine is even slower to evolve, as the reconciliation of parallel service perspectives with the parent doctrine takes time, effort, and diplomacy (Edmondson 1995, 109). Formal training also is inclined to adapt more slowly, since much of this training has as its basis the doctrine that governs the type of warfare that is being contemplated.

War fighters now find themselves again at a crossroads of doctrine and technology, where advances in communications, command and control (C2), weapons, and weapon delivery systems have outpaced the foresight of joint doctrine. Although debatable, evidence indicates that the current doctrine may be less than optimal, or even totally irrelevant for current operations, and it may also inhibit the optimal performance of desired activity (OSD 2000). This, however, is only part of the problem with regard to the doctrinal deficiencies in CAS.

Even without the complexities of technological innovation, there is ample evidence that the doctrine is less than adequate in addressing the reality of close air support. It can be argued the current Joint Publication 3-09.3, *Joint Tactics, Techniques, and Procedures for Close Air Support*, tends to emphasize safety concerns and risk avoidance over mission accomplishment or operational necessity. In doing so it may lack the ability to adequately prescribe methods of employment that can be adhered to in combat, given the dynamic situations encountered on the battlefield. Emerging technologies simply exacerbate this problem because the propensity to use them exists, yet the terminal attack control framework within the doctrine does not.

Service Perspective Differences

JP 3-09.3 has been in various stages of revision for the past three years in an effort to close the doctrine-technology gap. However, the revision process of JP 3-09.3 has not been without its own doctrinal trappings. This refers to a common problem encountered within the process of writing joint doctrine wherein the joint effort is often plagued by a parochial slant of the author--the lead agent--that may not be tenable to all services affected by the publication (Edmondson 1995, 109). Divergent perspectives exist among the US Marine Corps (USMC), USAF, and the US Army (USA) with respect to not only the terminal attack control procedures, but also the scope of the CAS mission. One reason for difficulty in the rewrite of JP 3-09.3 is that the doctrine must be broad enough to encompass all service perspectives, yet narrow enough to prevent confusion on the battlefield. This is imperative when these aircraft are tasked to provide supporting fires to units outside of "typical" support arrangements.

Current joint doctrine on CAS is largely satisfactory to the lead service agent--the USMC. However, it is inadequate in addressing methods of support that are currently or soon to be available and more likely to be utilized by the USAF in providing CAS to Army units. To fully appreciate the differences of opinion that exist between the USAF and USMC with regard to current doctrine, one must understand the differences in service doctrine and typical support relationships that exist for performing CAS. Marine Corps aviation is typically tied to the Marine air-ground task force (MAGTF). It is considered an integral portion of the task force and is not likely to be separated to perform attacks in support of other services. For this reason the support relationship with the "typical" supported command is integral with the already established command relationship. Whether a sortie is executed as CAS or deep air support is not of much consequence to the MAGTF commander, provided the supporting aircrew and maneuver echelon commander have accomplished appropriate coordination for the type of air support being performed.

On the other hand, CAS sorties are allocated by the joint force air component commander (JFACC) according to the apportionment decision of the JFC. Those sorties have been specifically set aside to perform the USAF counterland function of CAS. The other function that exists under counterland is AI. Army AI targeting is handled in one of two ways. Targets are nominated for attack by the senior echelon of the Army and eventually end up at a joint targeting committee to be sorted and prioritized with all other preplanned targets, or they exist in a mobile target database and are prioritized "real time" as they are selected for attack. Either way, if they do not fall within the priorities of the JFC, they are not likely to be attacked using joint assets. Perhaps a target exists that is critical for this maneuver commander, but falls short of the JFC priorities. The most effective method of attack in this case may be air power. This is a gray area that may leave the maneuver commander little choice but to utilize a portion of his CAS allocation for the attack of that target. The problem is that current terminal attack control procedures may not support that attack. Searching for terminal attack control methods that allow the USAF to support the USA in these gray areas contributes to the debate over the appropriate control framework for the doctrine. The USAF tends to be very specific in functionally separating CAS and AI because of the operational apportionment implications and their impact on theater-wide operations. The USMC, however, even under current control methodology, has the liberty of allowing those gray areas to be defined by common-sense decisions made at the user level. Erosion in these differences is emerging, as the USMC requires terminal attack control methods to support urban CAS operations that mimic some of the control procedures required by the USAF in these gray areas between CAS and AI.

How CAS Is Defined

The current use of the term "CAS" is a contributing factor in the problem of defining methods of terminal attack control--in fact it may be the leading factor in the current doctrinal deficiency. This is due to several factors. Arguably, the term CAS is defined using vague terms. The current definition used by all services is:

> Air action by fixed- and rotary-wing aircraft against hostile targets which are in close proximity to friendly forces and which require detailed integration of each

> air mission with the fire and movement of those forces. Also called CAS. (JP 1-02 1998, 80)

Although on the surface this definition may seem quite appropriate, the term “close proximity” is not defined. One can assume that this proximity is defined by distance as opposed to a temporal proximity, but that is not clear. Furthermore, distance may not be as appropriate as a temporal proximity measurement, given the Army’s needs, the current use of the term as an operational apportionment identifier, and the tasks given to those aircraft allocated to provide CAS. (Jones 1990) This leads to the second point of confusion with the term CAS. Confusion exists within the joint force community over the air sorties allocated to perform CAS and the mission that many of these aircraft are ultimately tasked to perform. If aircraft allocated to perform CAS are consistently utilized in other than the doctrinal methods prescribed to perform that mission, does that change the definition of the term? The third problem with this term is that the definition does not describe a relationship; it simply describes an action. It does attempt to tell where this action will take place and even describes some of the elements that are necessary to accomplish it--detailed integration with fire and movement--but it does not explain the relationship between the supported and supporting forces.

Current Joint Doctrine and Control Methodology

All this is not to say that current doctrine is without merit. The focus of the doctrine, as written, appears to be on risk mitigation and fratricide prevention. The avoidance of unnecessary risk is essential to both the supported and supporting combatants in this relationship, although the total emphasis in this doctrine tends to be on avoiding fratricide on ground troops from the air. The doctrine allows for two levels of weapons release authority. The first is maintained at the joint and component service level--called reasonable assurance. The other level of release authority--positive control--remains with the commander who is being directly supported by the attacking aircraft. Reasonable assurance applies to only the most desperate circumstances when the risks associated with not accomplishing the mission outweigh the risks associated with operating in a nonstandard way. Positive control is preferred and is further broken down into direct and indirect control, the former being the doctrinally preferred method of control based on the least risk of fratricide to the ground forces from the attacking aircraft (JP 3-09.3 1995, V-9).

Unfortunately, although direct control is advocated as the preferred method because it is perceived to involve the least inherent risk of fratricide, it is not necessarily the most likely to be employed, nor is it necessarily the most effective method of air attack within the battlefield scope as it is currently practiced. Because positive direct control is the doctrinally preferred method of executing a CAS sortie, it is also the preferred method to use during the limited training opportunities for USA-USAF joint fires training. This apparent incongruity between doctrine and reality, and, therefore, the prescribed training and reality, poses a risk to armed forces in future combat operations.

However, the incongruity does not stop there. This overemphasis on an unlikely CAS scenario actually leaves the development of other techniques and procedures wanting. Indirect positive control methods are not formally categorized, documented, or trained. Hence, the gap between doctrine and technological capability leaves two basic alternatives: squander combat opportunity or improvise in combat. What is critical for both the USAF and the USA is that they attempt to find solutions to the control methods of CAS that allow all services to take full advantage of advanced technologies, while at the same time preserving the inherent benefits of the current doctrine.

Before progressing much further into this discussion, there are some key elements that must be set forth. The following paragraphs detail some of the definitions used in this thesis, some assumptions the author has made, and some limitations set by the author or imposed on the study due to other circumstances. Some of the definitions utilized are defined in doctrine; others are from historical doctrine or doctrinal derivatives. Some of the doctrinally defined terms will be called into question, as the inadequacy of the definition may contribute to the doctrinal deficiencies. Regardless, they are provided here for reference. Also provided are some nondoctrinal definitions found useful in describing applications or events that may or may not be defined elsewhere in literature. Any difference or similarity of these definitions to those of another author is purely coincidental.

Definitions

Air Interdiction (AI). Air operations conducted to destroy, neutralize, or delay the enemy's military potential before it can be brought to bear effectively against friendly forces at such distance from friendly forces that detailed integration of each air mission with the fire and movement of friendly forces is not required (JP 1-02 1998, 18).

Allocation. "The translation of the air apportionment decision into total numbers of sorties by aircraft type available for each operation or task" (JP 1-02 1998, 26). A certain number of aircraft will be allocated to perform CAS for an air-tasking order (ATO) period.

Apportionment. "The determination and assignment of the total expected effort by percentage and/or priority that should be devoted to the various air operations and/or geographic areas for a given period of time" (JP 1-02 1998, 26).

Battlefield Air Interdiction (BAI). Air action against hostile surface targets which are in a position to directly affect friendly forces and which requires joint planning and coordination. While battlefield air interdiction missions require coordination in joint planning, they may not require continuous coordination during the execution stage (Cardwell 1992, 190).

Direct Control. A method of accomplishing positive control wherein "the terminal controller is able to observe and control the attack." JP 3-09.3 stipulates that "direct control will be used whenever possible" (JP 3-09.3 1995, V-9).

Direct Support. "A mission requiring a force to support another specific force and authorizing it to answer directly the supported force's request for assistance" (JP 1-02 1998, 139).

Forward Air Controller (FAC). "An officer (aviator/pilot) member of the tactical air control party who, from a forward ground or airborne position, controls aircraft in close air support of ground troops" (JP 3-09.3 1995, GL-9).

General Support. "That support which is given to the supported force as a whole and not to any particular subdivision thereof" (JP 1-02 1998, 189).

Indirect Control. A method of accomplishing positive control "**when the terminal controller cannot observe the attack, but is in contact with someone who can.** The terminal controller can issue clearance or abort the attack based on information from the observer. This form of control must be authorized by the maneuver force commander." JP 3-09.3 states that this is "**not the preferred method** of positive control" (JP 3-09.3 1995, V-10).

Positive Control. (1) A method of aircraft control associated with CAS where "the terminal controller or an observer in contact with the terminal controller must be in a position to see the attacking aircraft and target, and receive verbal confirmation that the objective/mark [sic] is in sight from the attacking pilot/aircrew [sic] prior to commanding 'cleared hot.' **Aircrews must receive positive clearance from the terminal controller ('cleared hot') before releasing any ordnance"** (JP 3-09.3 1995, V-9).

Positive Control. (2) A method of airspace control that relies on positive identification, tracking, and direction of aircraft within an airspace, conducted with electronic means by an agency having the authority and responsibility therein. (JP 1-02 1998, 348)

Terminal Attack Controller (TAC). The individual who has been delegated weapons release clearance authority by the supported commander and who provides terminal attack guidance and clearance to an aircrew executing an attack against a surface target. Current TACs include but are not limited to FACs, airborne FACs (FAC(A)), enlisted terminal attack controllers, air liaison officers (ALO), and special operations terminal attack controllers (SOTAC).

Terminal Guidance Operations (TGOs). TGOs are electronic, mechanical, visual, or other assistance given by ground elements to missiles, ships, and artillery elements to facilitate target destruction. It constitutes a complementary action between SOF ground operation and joint air interdiction. It does not include authority to clear aircraft to release ordnance and should not be confused with terminal control (JP 3-09.3 draft 2001, II-21).

Assumptions

The primary assumption in exploring this topic is that most of the perceived problems associated with the control methodology have indeed been written or spoken about or that, as a minimum, certain members within the joint community are familiar with the problems. The current doctrine has been in effect since December 1995 and has been part of an ongoing debate within the joint close air support (JCAS) community. Key members of the JCAS community have been gathering annually for the past three years to discuss issues in training, equipment, and doctrine in an effort to improve the ability of US forces to conduct this difficult and essential task. However, due to lack of attendance at these forums by USA service members, it is quite possible that not all of the concerns that the USA has with the doctrine have been highlighted to the JCAS community.

The USA has expressed concern over the CAS doctrine via proxy to their associated TACP personnel, who have attended the forums in large numbers. There is ample evidence that they have also expressed their views in professional journals, publications, and theses; though most of these do not deal specifically with the subject matter of CAS control, they do lend quite a bit to the peripheral issues that will be addressed. Finally, through the author's experience teaching CAS doctrine at the USA Command and General Staff College (CGSC), a sufficient amount of student writing and direct interaction affords a fairly accurate assessment of at least the midlevel Army officer concerns with the current CAS control methods. Further exploration of the

Army's own doctrine and possible interviews with Army officers may fill any information voids.

Limitations

A portion of this research will include a review of the statistical analysis of CAS control that has recently been accomplished by the JCAS JTF through an Office of the Secretary of Defense (OSD) chartered Joint Test and Evaluation (JT&E). The specific data that was collected over an eighteen-month period at the NTC involved 22 battles, 200 CAS sorties, and over 400 weapons delivery attempts. A large database that resulted from their study includes approximately 40,000 data points is not currently available to the general public or even in any published format. Although these data may be available, this author is inadequately prepared to conduct an independent analysis of the data. Therefore, this study will rely on the statistical analysis of the JCAS JTF members, which is published in the electronic *Joint Close Air Support Interim Report* dated October 2000.

A second limitation exists in the amount of effort contributed by the Army in evaluating JCAS doctrine. Although the Army's writings on CAS in general are prolific, they are not directly related to the ongoing dialogue that has occurred over the past few years with regard to terminal attack control methods. This is partially due to the fact that they have been numerically underrepresented in the JCAS symposium forums, where many of these issues are being discussed. Therefore, some of their concerns appear to be based primarily on historical failings of the CAS system, a topic that relates indirectly to terminal attack control methods for CAS employment.

Delimitations

The author has limited the scope of the research in the following manner.

Army-AF Centric. JP 3-09.3, *Joint Tactics, Techniques, and Procedures for Close Air Support*, is written to cover all services that participate in joint CAS. For example it covers MAGTF integrated close air support, USAF support to the MAGTF, and USMC or US Navy aircraft supporting USA operations. Because this thesis' focus is how this doctrine impacts USAF support to the USA, the scope may be limited at times to encompass the concerns most applicable to those two services.

This delimitation will not impact the primary question concerning the weapons release control framework, but may be apparent in some of the important peripheral discussions involving the C2 structure and the scope of CAS. It will also not prevent this study from using USMC air support as a comparative tool of analysis when discussing these tangential issues; it will simply limit the doctrinal research to include those publications that pertain to Army and Air Force operations and the theater air control system/Army air to ground system (TACS/AAGS) portions of the Theater Air-Ground System (TAGS). Due to the interservice nature of the TACS/AAGS system there exist some unique challenges not inherent in the single-service support structure of the MAGTF. Limiting the focus to the USA-USAF relationship will enable this thesis to cover this topic using consistent terminology without continual reference to the amphibious tactical air control elements of the TAGS.

Second, it must be clear that this analysis is not going to cover specific details of every procedure that exists for terminal control of every weapon type employed. For instance, laser-guided munitions have specific procedures outlined in the JCAS publications that detail specific parameters that must be met, specific codes that must be passed, and specific timing for a successful attack using those munitions. It is not in the scope of this paper to determine whether these procedures are adequate. That task would be incredibly daunting and would require the equivalent of a thesis to cover each one thoroughly. This analysis will focus on the necessity and completeness of the framework used to define the weapons release control categories.

Finally, this study will confine any CAS control mechanisms to the doctrinal elements of the TAGS delineated within the multiservice TAGS manual. The purpose of this study is not to suggest new TAGS elements, but simply to evaluate the mechanics suggested in the current and revised editions of joint doctrine for the application of airpower. This does not mean that specific references to emerging control measures using nondoctrinal roles for elements of the current TAGS will be ignored, just that new elements of the TAGS will not be suggested by the author.

Significance of the Research

This research is significant for the sole reason that it is timely. CAS doctrine has been attempting to evolve for several years, as doctrinal authors strive to make sense of the impact of technology on this very difficult combat task. The current operating environment is vastly different from the environment existing when the current weapons release framework was established. Advances in technology have enabled new techniques in war fighting. Theoretical questions over the quality and completeness of air support remain within the Army since the disappearance of BAI from the doctrinal lexicon. This paper will directly or indirectly address each of these issues. However, the primary significance of this research is its thorough analysis of suggested changes to terminal attack control procedures outlined in JCAS doctrine. Because this doctrine is currently being debated by the joint services in an effort to renew the doctrine, this study may have some ability to affect the proposed future changes. Regardless of its ability to directly influence the proposed changes to the doctrine, it is timely and applicable to the education of officers in both the USAF and USA both before and after those changes occur.

CHAPTER 2

LITERATURE REVIEW

Introduction

In the past eleven years, since the end of the Persian Gulf War, much has been written on CAS, as well as other related aspects of USA-USAF integration. A majority of the research resources is from this time period. While a relatively small number of authors discuss specific recommendations for changes to terminal control procedures in CAS, a much larger bulk of literature is dedicated to indirect discussions of this subject matter. The primary resources used in this research are the current and draft publications of JP 3-09.3. Additional sourcing of joint and service doctrine will be necessary, especially as this author attempts to define the battlefield realm that will encompass the CAS mission. The best of these primary doctrinal sources is the AFDD 2-1.3, *Counterland.* Released in 1999, this doctrine by far makes the best attempt to thoroughly define the CAS mission as it applies to the USAF counterland function.

Additional primary sources will include those few authors who have expressly addressed CAS control methods and CAS doctrinal problems. As indicated, some of these sources discuss control methods specifically, such as Major Thomas Deale's "Background Paper on Modifying JCAS Terminal Control Procedures." Others address the general doctrinal issue of identifying why, how, and where CAS occurs on the battlefield. This last category of primary sources is essential because it is necessary to determine the scope of CAS activity in order to establish and evaluate the doctrinal methods necessary to accomplish it.

Although the author has described the general nature of this paper's primary sources, this chapter will not be organized along primary and secondary source materials. Instead, the sources will be introduced as they contribute to a subject matter template. The thesis research will begin with the central question subject matter--the categories of terminal attack control procedures--and then progress to the secondary issues of CAS terminology and battlefield framework. This chapter will conclude with a brief description of some sources that do not fit precisely into the subject matter categories, but will be helpful in conducting the analysis and conclusions in chapter 4 or 5 respectively.

Categorizing CAS Control Methods

When CAS control methods are mentioned in this paper, the heart of the matter is the weapon release portion accomplished through terminal attack control. Although planning, C2, and synchronization of fires are important and indirectly affect the methods available for weapons release, it is the final attack guidance and communications, to include weapons release authorization, that is the chief focus of this paper. Current JCAS doctrine positions its discussion of this topic in the "Execution" chapter in the paragraph titled "Clearance to Drop/Fire" (JP 3-09.3 1995, V-9). This paper applies the content of this chapter to diagram the current control procedures. Table 1 depicts the current doctrinal classification of terminal attack control procedures. All information in Table 1 is derived from the 1995 JP 3-09.3, *Joint Tactics, Techniques, and Procedures for Close Air Support*.

Table 1. Current Terminal Attack Control Procedures

Release Authority	POSITIVE CONTROL		REASONABLE ASSURANCE
Description	**"Used to the maximum extent possible"** -Terminal Controller, or Observer in contact w/Terminal Controller a) In position to see the attacking aircraft and the target b) Receives verbal confirmation that objective/mark is in sight from the attacking pilot - Aircrew Must receive "cleared hot" call from Terminal Controller before releasing any ordnance		**- Not a Routine Procedure** a) Used when POSITIVE CONTROL "cleared hot" can not be received by pilot b) Allows Aircrews to attack - Joint Force Commander a) Conducts Risk Assessment b) Established Guidelines c) Places Guidelines in Effect - Aircrew a) Has already received initial targeting information b) Is confident the attack will achieve objectives w/o harming friendlies - Terminal Controller a) Is confident the attack will achieve objectives w/o harming friendlies - Maneuver Force Commander a) Is confident the attack will achieve objectives w/o harming friendlies
	Direct Control **-"Used whenever possible"** -Terminal Controller a) Visually confirms aircraft attacking correct target **Or** b) Confirms with other means that aircraft is attacking correct target and has friendly positions in sight **Then** c) Transmits "cleared hot" -Aircrew a) Acquires and acknowledge target and friendly positions (as required)	**Indirect Control** **-"Not the preferred method"** - Observer a) Visually confirms aircraft attacking correct target b) Maintains contact with the Terminal Controller - Terminal Controller a) Issues clearance or aborts the attack based on information from the observer - Maneuver Force Commander a) Authorizes this form of control	

Source: JP 3-09.3 1995, V-9-11.

It appears through its use of dogmatic phraseology, such as "used whenever possible" associated with direct control, and "not the preferred method" to describe indirect control, that current doctrine heavily favors the positive direct control method. When operating under positive direct control, the maneuver commander's general approval for release may be assumed. However, in all other weapons release situations, the maneuver commander must specifically authorize the release. Many see this as a suggestion of inherent risk differences between the various control types. The greater the risk, the higher the authority required for weapons release approval. When using positive direct control, the fire support coordinator and air liaison officer, if not the actual terminal attack controller, will likely clear the weapons to be released. However, if using positive indirect control procedures, the maneuver commander must specifically authorize the weapons release. Finally, when operating under reasonable assurance, the guidance from the JFC must be applied (assuming it is in effect) and the maneuver force commander must concur with the safety measures employed--in other words he must specifically authorize the release of ordnance.

Major Thomas Deale was a doctrine author at the Air Force Doctrine Center and primarily responsible for the Air Force's 1999 counterland doctrine. In his "Background Paper on Modifying JCAS Terminal Control Procedures," prepared following the annual JCAS Symposium in 1999, he made the following observation:

> Direct control minimizes the potential for fratricide during close-contact operations. However, by being the most restrictive form of control and requiring visual contact with the aircraft, direct control procedures introduce the most friction to operations and may put the aircraft at greater risk to enemy surface-to-air threats. (1999, 2)

Major Deale's background paper makes some other excellent observations regarding the way the current joint doctrine is structured. He describes the USMC and USAF doctrinal divergence with regard to the battlefield depth of CAS. Figure 1 is essentially a reproduction of a similar chart in Major Deale's paper. He states that in so strongly favoring positive control at the expense of indirect control methods, the doctrine has the effect of "minimalizing the integration of advanced sensors or weapons systems" (1999, 2).

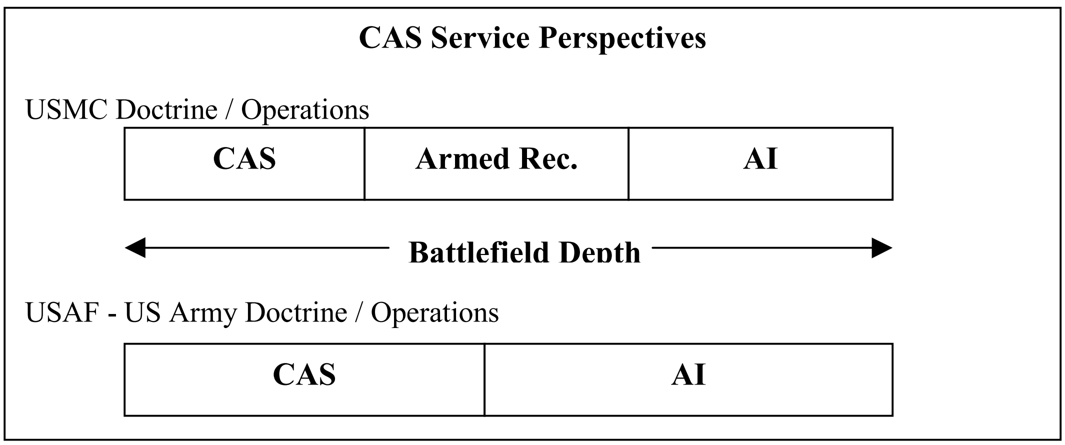

Figure 1. *Source*: Deale 1999, Figure 1.

Major Deale's major thrust is that USMC can prescribe procedures for conducting armed reconnaissance separate from JCAS procedures, but that the Air Force must employ its CAS assets at those ranges and, therefore, employ JCAS procedures. In fact, it is at ranges outside the visual observation of ground forces that the USA-USAF team is very likely to employ CAS. The MAGTF does not bring nearly the amount of surface firepower to the battlefield that a similar-sized Army unit brings. The MAGTF relies heavily on its CAS as fires. The USA, however, is better equipped to fight at the shorter ranges using its ground-based fires. Therefore, they are far more likely to use more of their CAS at ranges outside the line of fire of their tube artillery and even guns, where it is easier to deconflict and less restricted by the cumbersome coordination procedures required to separate ground-based fires and aircraft. Fratricide risk is also lower the deeper the aircraft are employed. He claims the doctrine does not support CAS employment at these ranges (1999, 2).

Major Deale makes several recommendations based upon the discussions held at the 1999 symposium. First, he recommends that preferences for control procedures be eliminated from the joint doctrine, allowing flexibility to rest with the "on-scene" maneuver commander. Second, reasonable assurance is removed as a type of control and instead becomes a "set of criteria enabling CAS during periods of extreme operational friction." Third, and most significantly, he recommends adding a third control type called "Flight Lead Control." The terminal controller following his initial guidance would issue this control after ensuring the aircrew is familiar with both the friendly positions and the target area. (Deale 1999, 3) As the reader may have already deduced, following this clearance the aircrew may "wail on the enemy at free will" without any more guidance from the controller.

It is also interesting to note that in the USAF's *Counterland* doctrine, there is a section that discusses the use of CAS in "beyond-visual-range" situations. This section is primarily aimed at allowing this same "flight lead control" under the auspices of indirect positive control, where the pilot in the attacking aircraft is also the observer. This doctrine caveats this method, stating that the maneuver commander's approval is required, yet one would think this to be unnecessary since that is already required of any indirect positive control (AFDD 2-1.3 1999, 57). The question that follows is: Given that flight lead control is permissible under the current doctrine as a form of indirect control, why would it be necessary to add a third control measure? One possible answer may be linked to the notion that the purpose of maintaining separate control procedures is based on the inherent risks associated with each procedure. If flight lead control poses additional risks in fratricide or mission accomplishment, separating it from other procedures would give more control over risk to the maneuver commander.

Complex CAS Situations

Two recently prepared papers that contribute directly to terminal control methods cover the utilization of precision-guided munitions in CAS and shortcomings of current doctrine in addressing CAS control in the urban environment. The first of these is Major Kenneth T. Stefanek's thesis "The Utilization of Inertially Guided Weapons in Performing Close Air Support." The thesis was written in 1998 in partial fulfillment of the requirements for the degree of Master of Military Art and Science at CGSC. The second is Lieutenant Colonel (LTC) Glenn M. Hoppe's "Current Close Air Support Doctrine: Out of Step With New Technology and Urban Combat Requirements." This paper was submitted to the Faculty of the Naval War College in partial satisfaction of the requirement of the Department of Joint Military Operations in 2001.

Inertially Guided Weapons

Major Stefanek's thesis is attempts to answer the question of whether or not inertially guided munitions should be used to perform CAS. Although not directly apparent in his primary question, but explicitly framed in a secondary question is whether aircrews need to see and visually identify CAS targets before releasing inertially guided precision ordnance (Stefanek 1998, 10). He carefully explains the differences between precision-guided munitions currently in USAF inventory. Laser-guided bombs (LGB) and guided missiles both require some human interface to observe the target. Typically a ground or airborne observer marks the target for the LGB, while the pilot or weapons officer releases the weapon within parameters or guides missiles to impact. An inertially guided munition guides itself to a set of coordinates rather than to a marked target location. Target coordinates could be passed to the aircrew based on real-time intelligence from a variety of sensors, and the aircraft release this ordnance according to the coordinates input by the crew. This methods primary benefit is the ability to achieve high accuracy while operating in or through weather conditions that preclude the use of LGBs. His position is that, as these all-weather munitions proliferate in US armed forces' inventory at the expense more restrictive visual and infrared weapons, to not capitalize on the inherent all-weather attack capability would be a waste of the resource. This opens up the debate of whether or not CAS teams should be able to utilize these highly accurate global positioning system (GPS) guided munitions in the conduct of their mission (Stefanek 1998, 49-56).

The thrust of his analysis is based upon the risk of fratricide to ground forces from the aircraft releasing the ordnance. He brings up several considerations for the use of GPS munitions. First, he outlines two targeting methods used with the weapon--bomb on coordinates (BOC) and relative targeting. BOC occurs when target location coordinates are passed to the aircraft from some outside source. Relative targeting is when the aircraft determines the target location using the same techniques available for dropping unguided munitions, and the weapon uses information sent from the on-board inertial navigation system to update the target location just prior to release. Due to several aircraft induced errors when accomplishing relative targeting, BOC is by far the more accurate method of target attack (Stefanek 1998, 54-5). Second, he discusses the use of aircraft-based situational awareness feeds, in particular the enhanced position location reporting system (EPLRS), which has the potential of providing friendly troop locations to the cockpit. It can also serve as a digital link for transmitting information (coordinates, nine line briefing) directly to the cockpit (Stefanek 1998, 65-7). The third factor he brings up is the accuracy of the coordinates. For simplicity sake, he divides accuracy into either high or low, attributing high accuracy for target locations obtained from GPS coordinates with a reported accuracy of thirty meters or less. All lower accuracy GPS coordinates and coordinates obtained from maps would be given a low-accuracy rating (Stefanek 1998, 75). His final consideration for the use of GPS munitions is whether or not there are troops in contact (TIC) with the target. TIC specifically refers to targets located within 1,000 meters of friendly locations (JP 3-09.3 1995, V-4).

Figure 2 was directly duplicated from Major Stefanek's thesis recommendation. He recommends it to be used as a decision matrix for terminal controllers, aircrews, and maneuver commanders to determine whether or not to allow inertially guided munitions to be released. The matrix is clear and simple to follow, allowing responsible individuals a very quick decision guide for allowing or rejecting the use of GPS weapons when no visual target acquisition can be obtained. An important note is that he suggests specific ground commander involvement in the decision only when in a TIC situation when coordinate confidence is high but no separate source of situational awareness (like

EPLRS) is available. He is suggesting that technological advances, such as GPS and EPLRS, should allow the release of ordnance in situations technically outside the limits even imposed by indirect control (aircraft not in sight, and no one is observing the attack), using the less-stringent general weapons release authority afforded by the direct control method.

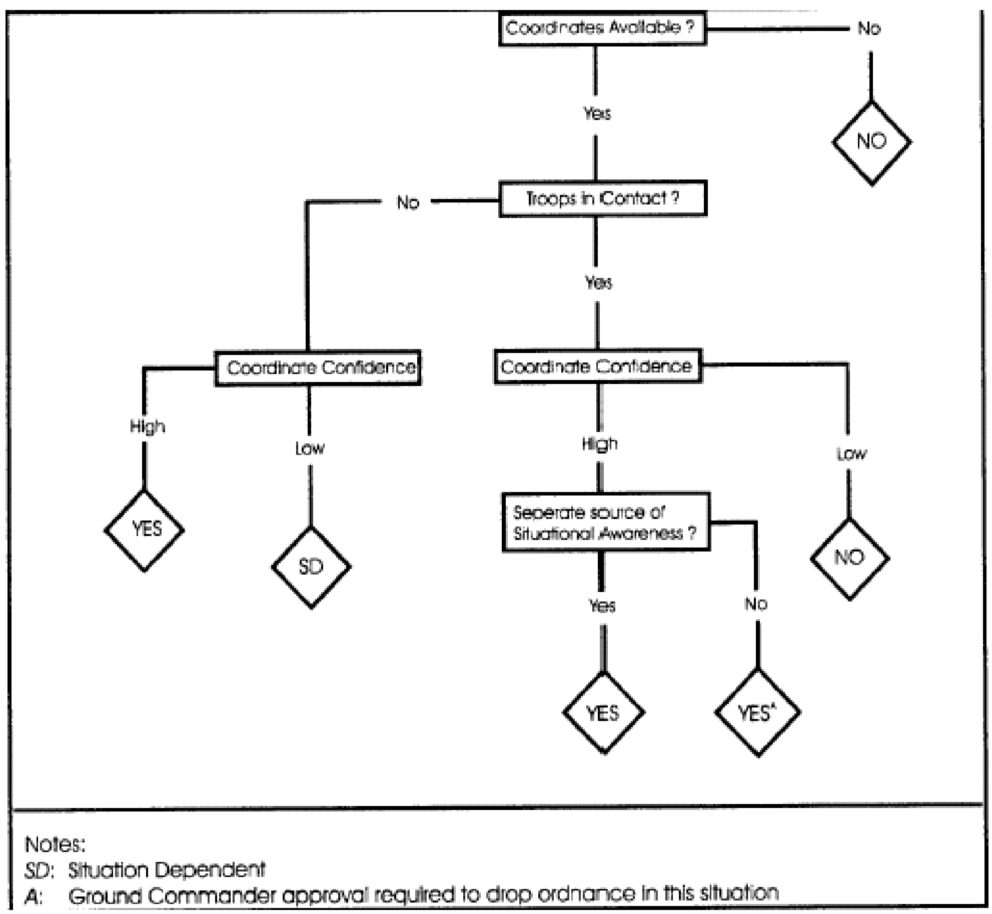

Figure 2. GPS Weapons CAS Decision Matrix. *Source*: Stefanek 1998, Figure 2.

Urban CAS

LTC Hoppe's thesis is similar to Major Stefanek's in that it is focused on how current doctrinal methodology for CAS control may obviate the use of modern technology on the battlefield. He is also concerned about the ability of the terminal controller to operate using currently defined positive control procedures. However, LTC Hoppe centers his discussion on what he sees as a very likely near-future battlefield setting--the urban environment. This urban environment creates situations where the terminal controller may have problems seeing both the aircraft and the target, marking the target, and maintaining positive communications throughout the attack due to man-made obstacles, such as tall buildings. In order for a controller to observe a target area in the urban environment, he states that the controller needs to be within 50 to 100 meters of the target area (Hoppe 2001, 9-13). This is well within what would be described as TIC and well within the danger close parameters for most munitions (JP 3-09.3 1995, G-2-4).

LTC Hoppe relies on recent USMC war-fighting lab experiments for much of his information for general findings on the difficulty of conducting CAS in the urban environment, as well as to demonstrate some of the successful uses of technology to overcome the difficulties. Again, a combination of GPS weapons, GPS equipped aircraft, and situational awareness in-cockpit displays--in this case the advanced close air support system (ACASS) as opposed to EPLRS--enabled target acquisition for either the pilot or the weapon in a very high (95) percentage of the attacks (Hoppe 2001, 16-18). It is important to remember that he is not specifically discussing the possibility of the aircraft releasing on the coordinates without the target in sight, just confirming the ability to control and monitor the aircraft using digital transfer of information.

Again, the pertinent question LTC Hoppe posed is, Which type of control method is it? His concern is how the attack is being observed, as opposed to Stefanek's debate over whether the attacking aircraft needs visually acquisition of the target. LTC Hoppe asserts that in order to prevent being killed by maintaining extremely close proximity to the target being attacked, the controller in the urban environment will want to remain hidden at a distance from the target area that will preclude visual acquisition of either the aircraft or the target area. Using the digital transfer of information through ACASS, however, he could still positively identify that the aircraft is indeed setting up to attack the correct target. This digital link could, as he says, "embody the 'other means' phrase of direct positive control" (Hoppe 2001, 18). What he claims cannot be ascertained digitally is whether or not the aircraft has identified the friendlies--a required element of direct control when the TAC cannot see the aircraft. Because the TAC is not using another observer (for the same reasons he himself would not want to observe the attack), it does not fit neatly into indirect control. Finally, assuming verbal communications are maintained, it would not fit the reasonable assurance category of weapons release authority (Hoppe 2001, 18).

His final recommendation asserts a need for CAS doctrinal revisions to adapt to modern digitization and precision guidance capabilities. These revisions would allow combatants to take advantage of CAS in the urban environment without placing either aircrews or controllers in a position of undue risk. He describes this control methodology as a combination of the direct and indirect control methods, which he calls "virtual control" or "virtual assurance" (Hoppe 2001, 19-20).

Future CAS

The above research constitutes everything currently available to this author specifically concerning the need for changing the current control methodology. Other papers have been written that discuss future CAS concepts without going specifically into doctrinal changes to control procedures. A collection of USAF, USMC and US Navy officers wrote a noteworthy paper at the Air University in the 1995 to 1996 academic year to be submitted to the Chief of Staff of the Air Force in support of future concepts development. This paper, "Close Air Support (CAS) in 2025: 'Computer, Lead's in Hot'," discusses the need to take full advantage of advancing technologies for the benefit of future CAS. Its entering argument is that two central issues of CAS will not change in the future. There will still be the need to operate in close proximity to friendly forces, and there will still be the need to rapidly respond in that proximity with air-delivered munitions (Unterreiner et al. 1996, 8).

Of direct impact on this particular study is the fact that many of the key issues discussed in this paper echo the sentiments of the previous two authors. First, the emergence of sensor-to-shooter targeting mechanisms will replace outdated voice talk-on targeting by terminal attack controllers. Second, combat identification of friendly forces using highly accurate and automated computer-based systems will emerge to ease fratricide prevention problems. Third, GPS munitions will continually improve and continue to be an important component of future weaponry used in CAS operations.

Emerging JCAS Doctrine

Given the above recommendations, the terminal attack control procedures proposed in the draft JCAS doctrine should not come as a surprise. Both the USAF and USMC have identified the need to incorporate new techniques and technology into the new doctrine, albeit for different reasons. The proposed changes are incorporated into table 2. While the draft publication of JCAS doctrine is currently dated 7 September 2001, this figure is not based specifically on the terminal attack control procedures delineated in that draft publication. Several changes have now been made to that draft publication. The author retained a copy of the latest revision from the doctrinal authors during the 2002 JCAS Symposium at Fort Sill, Oklahoma, held 23 through 25 January 2002. Because these latest changes are indeed likely to be released prior to publication of this thesis, this thesis will refer to these as the current draft JCAS TAC procedures. Other sections of the draft doctrine were not obtained, so when referencing other sections of the draft publication, the 7 September 2001 document will be used. When using one or the other specifically, the reference for the actual draft publication or current changes will be apparent. This specific revised section of the draft JP 3-09.3 is included in appendix A to this thesis.

Three key changes are readily observed and will be highlighted within this section, while a more thorough analysis is contained in chapter 4. First, "reasonable assurance" is neither described as a control method, nor is it even defined within the confines of the current draft of this publication. This change was intentional, not an oversight. Much has been spoken about the term reasonable assurance in the JCAS community, and the consensus is that it is not, nor ever was, intended to be construed as a type of control at all. It was simply placed in the control method section of the 1995 JP 3-09.3 because it generally applied to control procedures. Because of much confusion over its application on the battlefield, it has been eliminated in the draft publication.

Table 2. Proposed Terminal Attack Control Procedures

Type 1	Type 2	Type 3
Considerations for use: - Language barriers exist between coalition forces - Lack of confidence in a particular platform - Lack of confidence in aircrew capability - Troops in Contact situations	- TAC unable to see aircraft at release - Attack aircraft unable to acquire mark or target prior to release **- Considerations for use**: -- timeliness and accuracy of targeting data -- weapon time of flight (TOF) -- detailed planning and prep for standoff weapons -- flight profile and aircraft/weapon/terrain deconfliction -- digital or datalink providing SA to TAC/aircrew	- Tactical Risk Assessment $ indicates a low risk of fratricide - TACs provide specific parameters/restrictions to attack aircraft along with "blanket" clearance to attack TAC coordinated/controlled targets - Attack Aircraft Flight Leaders may then initiate attacks within parameters imposed by the TAC - Used when observer or CAS aircraft acquires a target - Observer may deliver CAS briefing/terminal guidance to attack aircraft - TAC monitors transmissions to maintain control of attack
TAC will a) Visually acquire target b) Delivers CAS Brief** to attack aircraft c) Mark/designate target (as practicable) **Attack Aircraft will** a) Provide verbal/digital "IN" call @ **TAC will** d) Visually acquire aircraft* e) Ensures friendlies safety by visual analysis of attack geometry/nose position* f) Provides "cleared hot" or "abort" based on compliance with above criteria being met verbally or digitally	**TAC or Observer <u>will</u> "see" the target** (an observer may be a scout, COLT, FIST, UAV, SOF, or other C4ISR asset with real time targeting info) **TAC <u>will</u>** a) Deliver CAS Brief** to attack aircraft **Attack Aircraft <u>will</u>** (verbally/digitally) a) Confirm target elevation and location b) Verify target location correlate w/expected target area (using all available means) c) Provides verbal/digital "in" call @ **TAC <u>will</u>** a) Provide verbal/digital "cleared hot"	**TAC or Observer <u>will</u> "see" the target** **TAC <u>will</u>** a) Deliver CAS Brief** to attack aircraft. Briefing will include area for attacks, restrictions and/or limitations, and attack time window b) Provides verbal/digital "cleared to engage" to attack aircraft c) Monitors engagement **Attack Aircraft will** a) provide "attack complete" to the terminal controller

* If visual acquisition/analysis cannot be completed, attack aircraft will be forced to modify attack profile to aid in these two tasks.
** 9-line or Theater Standard may be delivered verbally or digitally
@ Indicates the aircraft is maneuvering for a targeting or weapon firing solution
$ Tactical Risk Assessment made by maneuver force commander and staff includes: Confidence and training of unit and staff, Timeliness of information, Absence of information, information flow and communications, Confidence in battle tracking (friendly force, non-combatant, and enemy locations), Confidence in targeting information (who/what provides it, stationary or mobile, ability to mark), Ordnance available for attack (capabilities, limitations, restrictions, proximity of friendlies/non-combatants, "Risk Estimate Distances")

Source: Current draft JP 3-09.3 2002.

However, nothing in the proposed doctrine interferes with the ability of the JFC to provide rules of engagement (ROE) for specific circumstances if warranted.

Second, the term positive control is no longer used to describe the types of control, preferred or otherwise, for CAS aircraft. That does not remove positive control from the lexicon or even as a description of the type of control afforded by the TACS/AAGS system, necessarily. In the definitions presented in chapter 1 there were two definitions given for positive control. The first referred to the definition given in the 1995 (current) version of JP 3-09.3, to define how it applied to CAS. The second definition given is the definition as it applies to aviation in general and as it is written in the Joint Terminology Master Database. It is clear that at times, given the proper equipment, a terminal attack controller could maintain positive control. Perhaps in the future that will become the standard; however, it is not suggested or required by the draft publication in question. It is somewhat refreshing that this confusing double meaning has been rectified in the current publication, regardless of its direct applicability to this study.

Third, and most significant, the concept of a preferred method of control has been eliminated in the draft doctrine. While the draft JP 3-09.3 contains reference to a default authorization for Type 2 control (JP 3-09.3 draft 2001, V-18), the revised draft negates even the "default" terminology (Revised draft 2002). The type of control applied within an AO will be at the maneuver commander's discretion. As stated in the draft publication, "the intent is to offer the lowest level on-scene tactical commander the latitude to determine which type of terminal control best accomplishes the mission. The commander considers the situation and issues guidance to the terminal controller based on recommendations from his staff, and associated risks identified in the tactical risk assessment" (JP 3-09.3 draft 2001, V-18-19). This exact wording is also expressed in the latest revision. Also noteworthy is the consideration that more than one type of control may be simultaneously employed in a single commander's AO. This aspect will be addressed more thoroughly in chapter 4.

Important Aspects of the Subject

This concludes what is presented in the overall area of terminal attack control framework. The next section will look at some of the material that will aid in the analysis of possible types of terminal attack control. There are really three questions that impact what terminal control methods are available. The first is, Who are the TACs? The second is, What are the CAS communications methods? The final is, Where will CAS occur on the battlefield?

Who are the TACs?

The first of the three questions seeks to determine *who* can perform terminal attack control. This section emphasizes the USAF support to the USA and current doctrine. Authorized terminal attack controllers include the ALO, the FAC, and the enlisted terminal attack controller (ETAC), who are typically assigned to the TACP. Additionally, the FAC(A) and specially trained and certified USAF combat controllers may perform terminal attack control. Finally, qualified attack helicopter commanders "may direct the terminal control of CAS in coordination with the TACP" (JP 3-09.3 1995, II-8, 9). The attack helicopter commander will usually perform this terminal control as part of a joint air attack team (JAAT) operation. Important for this study is that terminal attack controllers may be officers or enlisted, on the ground or airborne. They are specifically identified and trained to perform the requirements of this mission.

Because of the unique nature of JAAT compared to typical CAS operations, further explanation is necessary as to its relevance to this study. Multiservice doctrine for JAAT operations currently exists in FM 90-21, *Multiservice Procedures for Joint Air Attack Team Operations*. A JAAT is "a coordinated attack by rotary- and fixed-wing aircraft, normally supported by artillery or naval surface fire support" (JAAT 1998, vi). The doctrine describes all the planning and execution procedures for JAAT operations. Because it is covered in its own doctrinal publication, it is not typically held to the attack control framework established by JP 3-09.3. What is critical to this study is that when planned inside the timeline for fixed-wing requests and approved by the appropriate USA chain of command, on-call fixed-wing assets--CAS--will support the request and the TACP will coordinate the activity (JAAT 1998, II-7). This places it in the consideration for inclusion in whatever terminal attack control framework is adopted.

Two other primary doctrinal references for evaluating the roles of the terminal attack controllers and procedures used for fires deconfliction are FM 100-103-2, *Multiservice Procedures for the Theater Air Ground System (TAGS)*, and FM 3-100.2, *Multiservice Procedures for Integrated Combat Airspace Command and Control (ICAC2)*. In addition to describing the subsystems and individual components of the TAGS, the *TAGS* manual defines the TTP used in coordinating and integrating theater-wide applications of air power. This includes the "detailed integration" between Army and Air Force elements required for planning and execution of CAS sorties. Appendix A of *TAGS* highlights the procedural control measures often employed in the execution of CAS. *ICAC2* is an expanded reference of the procedural control measures and fire support control measures discussed in TAGS.

What Are the CAS Communication Methods?

The second of the three questions involves determining the communications methods available to terminal attack controllers--or the how? Since communication methods are varied in both their form and efficacy, they may be a factor in this analysis. As explained in chapter 1, the three key elements of CAS control are targeting direction, fratricide prevention, and weapons release clearance. This typically requires two-way communications between the controller and aircrew in order to verify that each understand the other's intent. This paper will categorize all communications procedures as one of the following three: voice, digital, and signal. Separate communications may be used for different elements of a particular control method. For example, in defining the target or target area, the controller may use a laser target designator (LTD), which falls under the signal category, while using voice communications to transmit the positions of friendly forces. Not all communications of a particular category are equal. For example, beacon referencing is a less precise measure of directing the pilot's weapons release to a target than utilizing a LTD with a laser-guided munition. Therefore, one should not attempt to make any generalizations on the risk involved in a control based solely on these categories; the exact communication method being used is necessary to assess risk.

The JCAS community, particularly regarding new digital technologies, is currently conducting an in-depth analysis of various methods of communication. Which communications are available to any given controller is highly dependent on the efforts of the USAF TACP modernization program. Similarly, the aircrews situational awareness (SA) regarding friendly force locations is partially dependent on the operational fielding of various combat identification (CID) initiatives (Joint Chiefs of Staff 2001, 21-26). This study will rely on presentations from the 2002 JCAS Symposium when discussing these emerging capabilities.

Where Will CAS Occur on the Battlefield?

The third of the three questions seeks to determine *where* terminal attack control will occur and is the most difficult and contentious of the issues. However, it is also the most essential. Changes in the other two may occur as the proper definition of the battlefield scope of CAS is realized. As indicated by Major Deale's background paper, the battlefield scope of CAS is also largely responsible for the debate about the inclusion of new methods. There is not one single doctrinal reference that defines the location of CAS, so a distillation of other writings will be used to help define this aspect. For this reason it will be given ample attention in this chapter, preventing a complete rehash of the topic in the design of the methodology and conduct of the analysis. This discussion will begin by looking at what has been written on the definition of CAS.

Defining CAS

As identified in chapter 1, the brief definition of CAS given in JP 1-02, *DoD Dictionary of Military and Associated Terms*, has a few problems. The first problem with the definition is that it lacks a statement of purpose. Where virtually all other aerospace power functions--air interdiction, counterair, strategic air warfare--form their definitions around their purpose in warfare (JP 1-02 1998, 18, 110, 428), the CAS definition is centered around a rather vague description of the activity itself. That leads to the second definitional fault, its use of vague terms, such as close proximity and detailed integration. While integration techniques are discussed throughout JCAS doctrine, close proximity is only hinted at. The third problem further contributes to the confusion created by a weak definition, and that is the double meaning of the term. CAS, although not defined as such, is also used to describe the general category of aircraft made available to the ground component by the JFC and JFACC through the apportionment and allocation of air resources (that is, CAS apportionment) (JP 3-56.1 1994, IV-6). The next few paragraphs will attempt to identify where terminal attack occurs through observation of the current and historical purpose of CAS.

Purpose of CAS

Before determining how to accomplish a particular task, one should determine the purpose for its accomplishment. In most circumstances this is essential if the intent of the given task is to be performed adequately. The importance of identifying a purpose is evident in the USA FM 3-0, *Operations*, when it discusses the concept of the mission analysis. It states that the "results of the analysis yield the essential tasks that, together with the purpose of the operation, clearly indicate the action required. The mission includes what tasks must be accomplished; who is to do them; and when, where, and why the tasks are to be done" (FM 3-0 2001, 5-4).

The purpose of CAS is not readily evident within the definition alone. Nor does the current JP 3-09.3 specifically identify the purpose of CAS within the outlined text. This may not seem to be a problem, as one can be quite certain that when an aircraft is tasked to perform an attack, there will be a purpose stated explicitly or implicitly. But this leaves war fighters at a disadvantage in the training stage. For comparison sake, the quoted definition of every other form of aerial warfare defined in JP 1-02 contained a purpose for the activity. Air interdiction is "conducted to destroy, neutralize, or delay the enemy's military potential" (JP 1-02 1998, 18); strategic air warfare is "designed to effect . . . the progressive destruction and disintegration of the enemy's war-making capacity"(JP 1-02 1998, 428); and counterair is "conducted to attain and maintain a desired degree of air superiority" (JP 1-02 1998, 110). Further examination of JP 3-09.3 will reveal a purpose for just about every fire support control measure and control net--even the purpose of Army attack aviation. FM 3-0 gives a purpose for every type of maneuver warfare, attack type, and defense type it categorizes.

The "Executive Summary" of JP 3-09.3 is one place where the purpose of CAS is given in some form. It states that CAS "**provides firepower in offensive and defensive operations** to destroy, disrupt, suppress, fix, or delay enemy forces in close proximity to friendly forces" (JP 3-09.3 1995, ix). It continues, stating that CAS support is either general or direct. However, *Air Force Basic Doctrine* states that CAS "*provides direct support to help friendly surface forces carry out their assigned tasks*" (AFDD 1 1997, 50). Whether CAS is executed as direct support or general support depends on ones perspective. Each of these has a distinct meaning. From one perspective, the CAS allocation is provided from the JFACC in direct support to the Joint Forces Land Component Commander (JFLCC) or the Army component. Yet, the JFLCC will "distribute" these sorties to subordinate units based upon need or weight of effort, much like general support artillery. The JP 3-09.3 "Executive Summary" lends further credibility to the notion that the "purpose of CAS" encompasses all attacks accomplished by the CAS allocated aircraft, regardless of whether they meet the technical definition of CAS or instead perform a battlefield purpose that resembles AI. This brings up the concept of direct support aircraft performing air interdiction for a supported commander.

While this remains a fairly heated topic of debate between USAF and USA commanders, it is necessary in the explication of the battlefield scope of CAS.

What Really Happened to Battlefield Air Interdiction?

Determining the purpose of CAS requires the study of both functions that historically brought air support directly to the maneuver commander. In "Battlefield Air Support: A Retrospective Assessment," Dr. Richard P. Hallion makes several critical observations about the direct support roles of airpower on the battlefield. His thesis was written at a period of time when the term battlefield air interdiction (BAI) was only recently introduced into the lexicon as a separate mission and conducted in an effort to determine and suggest the operational priority that should be assigned to specific air missions by the air force. His ultimate suggestion, based upon careful historical analysis, is that the priorities should evolve to air superiority first, followed by BAI, deep strike, and CAS (Hallion 1990, 25). He bases this on historical evidence that BAI had been conducted from as early as 1917, and that historical analysis reveals that BAI has always been of far-greater value to the ground component than CAS (Hallion 1990, 9-12).

Dr. Hallion describes BAI as "air interdiction used to support close-in battle" defined as "air interdiction attacks against land force targets which have near-term effect on the operations or scheme of maneuver of friendly forces, but are not in close proximity to friendly forces" (1990, 9). This differs from the definition provided in chapter 1 of this paper in that this one focuses on the proximity in distinguishing it from CAS, while the former definition focuses on the level of coordination required in separating the two missions. Deep strike, as Dr. Hallion uses in his prioritization of missions, is not currently defined by joint doctrine, but is a common reference to air attack missions in the extended battlefield typically carried out by AI and strategic air warfare (Cardwell 1992, 101). BAI has now been included under the auspices of AI as well, yet it is unclear whether that is a proper placement of this important aspect of direct air support. In his book *Airland Combat*, Colonel Thomas A. Cardwell, USAF, former commander of the Air Force Studies and Analysis Agency, conducts an in-depth analysis of the TAGS (referred to as the air ground operations system at the time). Within his book Colonel Cardwell suggests that the purpose of BAI cannot be separated from that of close air support, while "interdiction against deeper targets indirectly supports the airland battle" (1992, 122).

Major Robert D. Evans, USAF, wrote a research paper on the concept of flexible air interdiction while a student at the Command and General Staff College. This paper, "Flexible Air Interdiction," makes enormous strides in explaining the demise of BAI in the time period immediately prior to Desert Storm. He echoes many of the doctrinal philosophies of the Air Force's new counterland doctrine and states that "counterland doctrine credits air interdiction with the flexibility to operate either in support of surface operations or as the main effort against enemy ground forces." In essence his argument, and that of the counterland doctrine, is that the JFACC can be both the supporting and supported commander for interdiction, depending on how those assets are tactically tasked, and that "since all interdiction remains under the control of the air component commander, separate terms are not warranted" (Evans 2000, 4-49). He continues, within his paper, to acknowledge that the timing and tempo of the effects desired will dictate separate control measures to ensure the successful prosecution of these distinctive forms of interdiction. His conclusions indicate a belief that the JFACC's C2 system is flexible enough to execute interdiction at all levels, whether as the supported or supporting element. While few will argue about the capability of the JFACC's C2 structure to enable such flexible attacks in the shallow interdiction realm, the pressing question for the supported commander is not if it *can*, but if it *will*.

For example, Colonel J. L. Whitlow, USMC, suggests in his 1994 article "JFACC: Who's in Charge" in *Joint Force Quarterly* that the loss of BAI has made ground operations more difficult by removing the ability of the ground commander to direct the forces that directly support him. He does not believe that the JFACC can properly prioritize targets in a subordinate commander's AO, and states "if [a centralized target prioritization process for interdiction targeting] implies that BAI targets must always compete with theater targets for attention, BAI will usually come up short. This will likely remain true until such time as the ground war goes to hell in a handbasket, or the importance of mission success in that AO takes on theater-level significance" (Whitlow 1994, 68). His point is that if all interdiction targeting is left to the JFACC, the ground component effectively loses the ability to shape his own battlespace, and, thereby, the ability to set conditions for success in his AO.

All this leads back to the question, What has happened to BAI? To answer this, the author will refer briefly to Dr. Hallion's retrospective analysis of air missions. Long before the advent of the term BAI, which, as Major Evans states quite correctly in his paper, was never a formal part of joint doctrine and only briefly introduced into USAF doctrine, aircraft flew shallow interdiction missions in direct support of ground forces. Even in Vietnam only a small percentage of missions--3 percent--were actually devoted to CAS missions. Many others fell into a "gray area" that was neither CAS nor AI. The “gray area” was termed *direct support*, a BAI euphemism dating to British experience in World War II (Hallion 1990, 15). In other words, nothing has really happened to BAI, it has always been there. Call it flexible interdiction, call it CAS, call it direct support, it remains as a vital portion of the ground commander’s shaping operations. Regardless of the effort to completely separate CAS and AI, the desired effects accomplished formerly by BAI are now achieved by both interdiction and CAS sorties because they are so critical to the ground commander’s operations.

Close Proximity

Another indication of where terminal attack should occur is contained within the definition of CAS, which states that it is conducted against targets in “close proximity” to friendly forces. Joint doctrine does not make any attempt to quantify this term, instead stating that “close does not imply a specific distance; rather, it is situational” (JP 3-09.3 1995, I-2). The USMC doctrine echoes this exactly and adds that “the requirement for detailed integration based on proximity, fires, or movement is the determining factor” (MCWP 3-23.1, 1-1). Air Force doctrine does attempt to identify at least what is intended by close proximity when it states that it is “the distance within which some form of terminal attack control is required for targeting direction and fratricide prevention” (AFDD 2-1.3 1999, 4). The bottom line is that no service has related a distance to the scope of CAS.

LTC Brian W. Jones’ paper “Close Air Support: A Doctrinal Disconnect” mimics the Air Force’s current perspective on the proximity issue, or indeed may have influenced it, since he wrote it approximately nine years before the counterland doctrine emerged. He stated that the term proximity as part of the description or definition of CAS is misleading and that "it is important to avoid the type of confusion that has long existed with regard to the term *proximity*. . . . Battle relevance rather than battlefield proximity is the useful criterion" (Jones 1990). He suggested the following definition as an alternative to the current one:

> Close air support missions integrate aerospace assets into the fire and maneuver plan of surface force commanders at all levels; toward that end, the joint force commander procedurally authorizes temporary tactical control of CAS assets to surface force commanders for specified mission execution. (1990)

While the suggestion of sacrificing tactical control of his air assets to a commander with dubious knowledge of aerospace tactics may be abhorrent to most air component commanders, it is probably not necessary to meet the intent of LTC Jones' argument. The modern TACS/AAGS system with its airborne elements included is robust enough to allow the decentralized execution of tactical air missions flown in direct support of a maneuver element, while still operating under tactical control of the JFACC established by the air tasking order (ATO). His main argument is that CAS is not proximity based, but based upon its ability to be directly responsible to the tasking of the supported maneuver force commander.

<u>The Issue of the Fire Support Coordination Line</u>

Another often-used mechanism for determining where CAS and, therefore, where terminal attack control should occur is the fire support coordination line (FSCL). Much has been written on the issue of the FSCL. To list all the references which this author has relied upon to generate an understanding and form an opinion about its influence on the use of CAS would take more time than believed necessary to make the applicable points regarding its use. Its definition follows:

> A fire support coordinating measure that is established and adjusted by appropriate land or amphibious force commanders within their boundaries in consultation with superior, subordinate, supporting, and affected commanders. Fire support coordination lines (FSCLs) facilitate the expeditious attack of surface targets of opportunity beyond the coordinating measure. An FSCL does not divide an area of operations by defining a boundary between close and deep operations or a zone for close air support. The FSCL applies to all fires of air, land, and sea-based weapon systems using any type of ammunition. Forces attacking targets beyond an FSCL must inform all affected commanders in sufficient time to allow necessary reaction to avoid fratricide. Supporting elements attacking targets beyond the FSCL must ensure that the attack will not produce adverse attacks on, or to the rear of, the line. Short of an FSCL, all air-to-ground and surface-to-surface attack operations are controlled by the appropriate land or amphibious force commander. The FSCL should follow well-defined terrain features. Coordination of attacks beyond the FSCL is especially critical to commanders of air, land, and special operations forces. In exceptional circumstances, the inability to conduct this coordination will not preclude the attack of targets beyond the FSCL. However, failure to do so may increase the risk of fratricide and could waste limited resources. (JP 1-02 1998, 173)

One of the best references found for delineation of the FSCL and its use during Desert Storm is Major John P. Horner's thesis to the School of Advanced Airpower Studies entitled "Fire Support Coordination Measures by the Numbers." Desert Storm was, as he states, "the first major war with the FSCL effectively applied as a 'restrictive' coordination measure to land component fires." He also states that "CENTCOM directed that the FSCL also be used as the routine means to delineate close air support (CAS) missions, as those flown short of the line, and air interdiction (AI) missions, as those flown long of the [*sic*] it." Desert Storm is very likely the basis for what this author notes as the general perception of most young Army officers, that the FSCL does indeed form the boundary between CAS and AI.

Within the context of the author's instruction at CGSC he has found the subject of the FSCL as being the one issue to spark the most intense debates among students. The lesson author for an Air Force block of instruction in the Fire Support for the Nonartilleryman elective taught at CGSC posed a series of questions concerning USAF-USA integration. The student composition in this course, hence of those responding to the questions, was almost entirely USA combat arms officers. Of the sixteen questions given to each of the instructed sections, five or six have some direct impact on the topic of research. A list of the questions asked is included as appendix B to this study. The question that had the most divided response was, "Should the FSCL define the line between CAS and AI? Explain." Of the ten students assigned to answer this question, five responded in the affirmative, and two of those maintained that it should continue to define the missions performed on either side. While statistically irrelevant, similar disparity over the use of the FSCL has been noted throughout other classes taught at CGSC. Explicit in the definition provided in joint doctrine is that the FSCL does not divide mission types, but what is most telling from the student papers is their explanations. Those that responded in the affirmative normally cited the difficulty in coordinating AI short of the FSCL as their concern. In effect, they tend to continue to think of the FSCL in terms of its early predecessor, the bomb line.

Some additional insight on the CAS and FSCL relationship is contained within LTC R. Kent Laughbaum's research report, "Synchronizing Airpower and Firepower in the Deep Battle." This work, written in 1999, contains an extremely informative discussion of the history of fires coordination efforts between air and ground components. It explains the evolution of the FSCL from the bomb line, and describes its use and misuse during Desert Storm. LTC Laughbaum's overall focus is developing a concept for the best method to prevent fratricide and improve coordination of fires between the two services. His five recommendations are worth noting and are: (1)

Assign the JFC the responsibility for establishing and positioning the FSCL. (2) Redefine the FSCL as a restrictive fire support coordination measure. (3) Include all planned airpower, firepower, and maneuver operations beyond the FSCL on the ATO. (4) Position the FSCL relatively close to the forward line of own troops, typically no farther than tube artillery's maximum range. (5) Restrict planned AI missions to targets beyond the FSCL. (Laughbaum 1999, 68-71) His recommendations are noteworthy for this study in that they make an honest attempt to define the scope of CAS. This is evidently the case when considering that one of the most important elements of the CAS definition is its focus on fratricide prevention, which is exactly what the FSCL was designed to mitigate. These recommendations attempt to assign specific, easily definable geographic boundaries for fratricide prevention responsibility. One concern is that the recommendations do not completely account for the maneuver commander's need to direct responsive airpower and fires toward a variety of locations and toward objectives that may not be a high priority for the JFACC. The resulting possibility is that there will be unobtainable, yet necessary, objectives concerning the Army component commander bound to this definition. Flexibility must exist on both sides of the line. Also, his considerations for placement of the FSCL appear to be too simplistic. They do not specifically account for the mission, enemy, terrain, or the ability to survey and target the enemy in a timely manner. All of these must be considered in placement of the FSCL.

Consensus on the Location of Terminal Attack Control

That concludes a topical review of some of the literature that directly pertains to this subject; however, it is no way a comprehensive or exhaustive list. Nor is it even a fraction of the material that has influenced the author on this subject. It is simply a fairly representative example of some of the key references that pertain to this subject matter.

Throughout the author's tenure as an instructor at CGSC, he has had the distinct opportunity to spend a great amount of time in detailed discussions with the Army's future leadership at the Army's "premier tactical war-fighting school." Air Force instructors stationed at Fort Leavenworth are often brought into discussions concerning the methods, tactics, purpose, and scope of CAS. For this reason, the author felt it necessary to learn as much as possible about the integration of Army and air-delivered fires on the battlefield; while he does not consider himself to be a complete expert in the subject, he feels he has developed sufficient competency to comment with some authority in the subject of USA-USAF integration. With that said, some general comments from the author will be offered here, as it is often difficult to separate specific references from generally formed opinions, even in the context of pure research.

During the past forty years USA direct and indirect fires systems have increased in range, lethality, and accuracy. This marked change in ground delivered firepower has essentially changed the distances from which the USA is able to accurately and effectively employ both direct and indirect fires. This shift in the Army's capability has two key influences on the terminal attack control measures and CAS in general. First, the USA is very well equipped to support itself with fires in some of the closer ranges that in the past were often the realm of air support. Second, the shear numbers and lethality of the Army's direct and indirect fire systems makes integration of CAS within the ranges and line-of-fire of those systems much more complex. While systems like the army field artillery tactical display system could make artillery fires and aircraft integration easier, shortfalls in integration and training between TACP and the fires support element mark one of the biggest concerns of the JCAS JT&E (OSD 2000). For these reasons, the Army is far more likely to employ CAS at ranges, or from altitudes that have the least hindrances on their ability to employ organic systems.

One might logically conclude that, because of this increased capability, the need for direct support from the air has decreased. Quite possibly it has; however, it is important to note that during that same time period potential adversaries have had similar evolutions in direct and indirect fire systems from maneuver units. Those longer-range direct and indirect fire systems continue to plague maneuver commanders in the short-term temporal battlefield. The proximate distances that currently concern the maneuver commander within the same temporal proximity of years past have expanded. Dr. I. B. Holley Jr. alludes to these changes in a comparison of the missions of interdiction and CAS contained in his "Restrospect" chapter of Benjamin Cooling's *Case Studies in the Development of Close Air Support*, when he states the following:

> Close air support, on the other hand, involves direct intervention at the forward edge of battle. In World War I, this could mean strafing a line of trenches with machinegun fire. In World War II, it might mean bombing an enemy gun position on a reverse slope masked from friendly artillery; while in Vietnam it could mean flying cover for a column of trucks to be instantly ready with counterfire against an enemy ambush. (1990, 536)

Now, the task is to determine the logical extension of this analogy on the modern battlefield, given modern equipment and war-fighting techniques. The fact that USA ground-based fires have improved does not change the fact that responsive and dependable air delivered fires and maneuver afford the ground commander additional flexibility, accuracy, and lethality in the current environment. Air-delivered weapons have also improved dramatically in their accuracy and capability to survive in a hostile environment.

Methods of terminal attack control have changed very little since the Vietnam War. During this same era, however, the capability of the air-ground operations system, now the TAGS, has increased dramatically due to improved communications, observation, and identification techniques and capability. The battlefield environment is shifting as well from a previous focus on contiguous linear tactics to a framework that may be comprised of both noncontiguous AOs and nonlinear forces (FM 3-0 2001,6-16). The needs of the ground commander for responsive air-delivered fires, and the air component's ability to employ them have both evolved. The single, key item in this element of war fighting that has remained constant is the terminal attack control procedures utilized to facilitate these fires. Terminal control procedures have not evolved to match the current needs and capabilities required to be truly effective on the battlefield.

Using the above references, this study will narrow the area of CAS and, therefore, the application of terminal attack control methods to support it to the following. The purpose of CAS is to provide direct support to the ground commander using air assets apportioned by the JFC and allocated by the JFACC. Terminal attack control measures for CAS should, therefore, be designed to facilitate coordination of fires for fratricide prevention and targeting direction in the areas where the supported commander is responsible for that coordination. Typically, that area of coordination is either short of the FSCL or within a designated area for special operations, nonlinear operations, and noncontiguous AOs. Therefore, terminal attack control procedures for CAS should be broad enough to enable attacks within those areas.

Analysis Tools

Additional sources of information will be used to analyze terminal attack control methods that do not fall neatly into the above framework. Two of these are part of a broad research effort by the joint community. The third has to do with risk management.

The Joint Close Air Support Joint Test and Evaluation

A portion the research included a review of the statistical analysis of CAS control that has recently been accomplished by the JCAS JTF through an OSD chartered JT&E. Two separate documents will be referenced. The first is the *JCAS Day CAS Mini-Test Results*, a DoD distributed report concluded in February 1999. The second is the *JCAS Interim Report*, published in electronic format in October 2000. This thesis will rely heavily on the statistical analysis of the JCAS JTF members presented in these published formats.

The minitest was small in its scope. It measures the ability of terminal attack controllers and ground observers to see attacking CAS aircraft while executing medium altitude tactics, and to visually determine which target group the attack aircraft was targeting. The test conducted used A-10 aircraft attacking from a medium altitude--10,000 feet above ground level. Although the true purpose of the test was intended to create a controlled baseline for tests conducted later during force-on-force scenarios, the results do offer this study some additional information regarding the difficulty of controlling medium-altitude air support using positive direct control (OSD 1999, vii).

The specific data that were collected over an eighteen-month period at the National Training Center involved 22 battles, 200 CAS sorties, and over 400 weapons delivery attempts. A large database that resulted from their study includes approximately 40,000 data points is not currently available to the general public or even in any specifically published format. The results are broken down into three primary areas: TTP, equipment, and training. From their results, they make several recommendations for each of the following three areas: doctrine/TTP, joint training, and teamwork. The JCAS JT&E test results and recommendations that this author will base his own recommendations upon come mainly from the TTP and doctrine sections and will be covered as applicable in future chapters.

Risk Management

The determination of categories for terminal attack control is a part of battlefield risk management. While risk management occurs at all levels of war fighting, TTPs are where procedures are delineated to allow safe and efficient operations on the battlefield. The JCAS TTP is part of the risk management for CAS, containing controls to be implemented in CAS operations (FM 3-100.12 2001, I-5). Although much is published on operational risk management, a majority of it is directed at mitigating financial or environmental risks for businesses. Therefore, for the purposes of this study, an appropriate reference for risk management is the multiservice TTP published by the Air Land Sea Application Center's (ALSA), FM 3-100.12, *Risk Management*, which is specifically designed to be applied to the military decision making process.

Fratricide

Another location of sources for studying the utility of the framework of terminal attack control as a commander's risk management tool is the abundant material produced regarding fratricide. While virtually every recent tactical unit field manual has a section or paragraph on mitigation of fratricide, the most concise tool, and one of the most recent is contained in Appendix D, "Fratricide Prevention," in FM 71-1, *Tank and Mechanized Infantry Company Team*. This is also very similar to the fratricide reduction section of FM 17-18, *Light Armor Operations*. Both of these publications break out the categories of concern along the same lines, using slightly different adjectives for a qualitative assessment of the criteria. A summary of each of these criteria, balanced along a three point rating system, will ultimately give a quantitative indication of the risk of fratricide for a given operation. A more robust discussion of operational risk management and fratricide, as well as more complex rating system, is contained in the Center for Army Lessons Learned (CALL) Newsletter 92-4. Finally, USN Lieutenant Commander William H. Ayers' paper "Fratricide: Can It Be Stopped?" provides a general analysis of the common causes of fratricide and some of the technological efforts to prevent it in the future.

CHAPTER 3

METHODOLOGY

Introduction

So far this study has looked at the nature of the problem and noted some of the sources that will be utilized in the analysis of this topic. It is now imperative to outline the methodology that will be used in the analysis. Again, the effort is to determine if the changes in terminal attack control framework proposed in the draft JP 3-09.3 are necessary and sufficient for current and near future operations? This study will primarily employ a qualitative content analysis based upon three criteria and a comparison of the control methods currently employed and those proposed for the revised JP 3-09.3. To help qualify this analysis, some time will be devoted here to identify those specific aspects that will be analyzed within chapter 4.

Purpose for Categorizing TAC Procedures

As stated in chapter 1, terminal attack control procedures contain three essential elements. The first, and primary, is that they provide instructions to aircrews that enable air delivered maneuver and fires to meet the intent of the supported maneuver commander. This will be referred to as targeting direction. The second, inherent in this targeting direction and that which completes the targeting process, is that they allow the commander to exercise weapons release authority through the terminal attack controller. The third element, which is derived from the first two out of necessity, is the element of fratricide prevention. Terminal attack control procedures establish responsibility for particular actions or communications that apply to the aircrew or the TAC during the control. A standardized procedure prevents confusion on the battlefield and expedites the attack, essentially mitigating some of the risk of fratricide. Because there are differences in methods of attack, there are different procedures and communications necessary depending on the circumstances. Yet that does not appear to be the only reason the doctrinal authors established the frameworks in question. The following paragraphs will help identify the particular purpose of maintaining separate categories of control.

Current doctrine is fairly clear on the purpose of the separate categories of terminal attack control, even if it is not explicit. When stating "direct control will be used whenever possible," it seems clear this is the acceptable method of control in any circumstance. It continues further to state that "indirect control is not the preferred method" and that it must be "authorized by the maneuver force commander" (JP 3-09.3 1995, V-9, 10). While it does not specifically state that the reason for preferring one method to another is based on disparity in probability of fratricide between the two, it is implied. The only other possible purpose would have to be based upon the other primary purpose of terminal attack control--targeting direction--or ensuring target destruction. While this indeed is possible, it is also unlikely. The focus of current JCAS doctrine is apparent from the first chapter in its attention to the issue of fratricide. The purpose of CAS--"to destroy, disrupt, suppress, fix, or delay enemy forces" (JP 3-09.3 1995, I-2)--is almost a sidebar in the doctrine. Additional evidence of the current doctrine's use of terminal attack control categories as a risk management tool is contained in the section on weapons release clearance, which states that reasonable assurance "is a risk assessment," and not one that can be made by the maneuver commander; it specifies that the risk assessment be made "by the JFC" (JP 3-09.3 1995, V-10).

The draft publication is more explicit in its assignment of risk mitigation to the separate categories, but less clear in how a maneuver commander may use this as a tool of risk mitigation. The revised draft edition describes the tactical risk assessment process in detail and states that this process uses "available information to ascertain a level of acceptable risk to friendly forces or non-combatants." The commander will then "weigh the benefits and liabilities of authorizing a particular type of terminal attack control" (Revised draft 2002). While this paragraph on risk assessment does not specifically declare that each terminal attack control type has a varying level of inherent risk, other areas within the control section promote that concept. The section describing the types of terminal control states that each type "follows a set of procedures with associated risk." Later this section states that Type 1 control may be assessed to be the preferred method when there are "language barriers when controlling coalition aircraft, lack of confidence in a particular platform, aircrew capability, or troops in contact (TIC) situations" (Revised draft 2002). In other words, when a commander wants to be absolutely sure of mission accomplishment when presented with difficult circumstances, Type 1 control is probably the best option. Further in the paragraph it states, "Type 3 control may be used when the tactical risk assessment indicates that CAS attacks impose low risk of fratricide" (Revised draft 2002).

While neither the current doctrine nor the latest draft is explicit on the purpose of the categorization, both clearly indicate its intent as a risk mitigation tool. The purpose appears to be to allow a maneuver force commander at some level to evaluate political, operational, and tactical level factors and, consequently, determine the appropriate terminal attack control type warranted for the current battlefield situation. That would become the guidance by which TACs could plan and execute attacks within the area of operations (AO). The TACs would subsequently evaluate mission specific risk factors and use their expertise to mitigate risk within the control type or types allowed by the commander. For instance, a commander may determine, given the disposition of enemy forces, the array of friendly forces, and the nature of the battle at hand, that Type 1 through 3 controls are authorized. Yet, as the battle transpires, the TAC is unconvinced that a particular aircrew is capable of locating the specific targets necessary to meet the commander's intent. The TAC may determine Type 1 or 2 as a more prudent method of meeting the intent. The TAC could then apply the control procedures associated with that type of control. On the other hand, if the commander only authorized Type 2 control but the TAC determined Type 3 to be necessary based on specific target locations outside the "eyes" of observers, the TAC would need specific authorization to employ that control type. The commander would gather specific information and make an informed decision based on the expert advice of his TAC and staff.

Without the ability to use the control types as a tool of risk mitigation by the commander, the doctrinal writers are asking for the commander's direct involvement in each and every aircraft attack within their AO. The categorization of controls then becomes an unnecessary additional complication to specific procedures required for various weapons employment. The revised terminal attack control framework does not account for every weapon that may be released within each category. For instance, it does not take into account specific additional communication requirements for LGBs, which in the current publication could be employed using direct or indirect positive control, and in the draft would be necessitated by attacks conducted under Type 2 control exclusively. Because of this, one may rule out communication requirement similarities within each category as the sole reason for categorizing the weapons control procedures in either framework. Instead, similarities of risk factors associated with the weapons employment methods within each category of terminal attack control appears to be the most likely reason for establishing the separate control categories. The categories of control in each framework simply detail the general communications requirements required by that category in order to mitigate risk. The weapons employment methods allowed within each control category ultimately lead to specific communication requirements for the release of the respective weapon.

Terminal Attack Control Framework Analysis

Having revealed the purpose for the terminal attack control procedure framework, this study will establish a method to conduct the analysis. This analysis will attempt to determine how each of these two methodologies meets the purpose. The specific purpose is: the framework provides a method for the commander to transfer weapons release authority, giving the greatest flexibility to the terminal attack controller commensurate with the risk acceptable to the commander. In other words, the more freedom given to the terminal attack controller in choosing targeting options, the more effective he can be in accomplishing the goal of providing targeting direction. The commander must, however, maintain a certain level of control as acceptable risk levels change; therefore, the freedom of attack will need to be limited in some circumstances. The framework established should allow for this flexibility. Essentially, to provide the required utility to the maneuver commander, the framework must have the following characteristics:

simplicity, completeness, and utility. The results of the analysis will aid in answering whether or not the revised terminal attack control procedures are necessary or sufficient.

Simplicity

The first criterion that will be applied to evaluate the control methodology in the current and proposed doctrinal publications is its simplicity. According to AFDD 1, *Air Force Basic Doctrine*, simplicity is one of the nine accepted principals of war that:

> calls for **avoiding unnecessary complexity in organizing, preparing, planning, and conducting military operations**. . . . *Simple guidance allows subordinate commanders the freedom to creatively operate within their battlespace*. Military operations, especially joint operations, are often complex. Common equipment, a common understanding of Service and joint doctrine, and familiarity with procedures . . . can help overcome complexity . . . unambiguous organizational and command relationships are central to reducing it. (1997, 21)

This definition is good for helping understand what the doctrine needs to provide for the warrior who is attempting to employ fires to aid in CAS--one of war fighting's most-complex and difficult tasks. Simple guidance that relieves the commander of direct involvement--except when necessary--is recommended by this definition. The guidance in CAS control methodology must be able to be rapidly applied on a dynamic battlefield. A maneuver commander who is ultimately responsible for the fires employed in the AO is not always going to know in advance exactly what weapon types and control methods will be available. The commander may also be unable to determine exact target area distances--proximity--from their forces. Therefore, he must have the means to allow his staff to make a determination of risk when appropriate, and to seek his guidance when necessary.

The definition of simplicity is also explicit about the desire for unambiguous command relationships. This reading of simplicity may be applied to the control methods by insisting that they establish unambiguous responsibility levels for each type of control and establish responsibilities for tasks within the procedures. The doctrine should be clear enough to be able to be carried out without ambiguous interpretation of who is responsible for what aspect of the risk mitigation. Two separate forces are working together in a dynamic situation where the delay of execution could mean the difference between life and death for either of the contributing parties. In the midst of a battle while an aircraft is holding over the battlefield is not the time to debate or question the authority to execute an attack. Well before the engagement, the pilot, the controller, and the maneuver commander clearly understand who bears the responsibility for each aspect of the attack. This is the framework upon which trust relationships are built--through absolute knowledge of the responsibilities of those parties involved.

Completeness

The second criterion this study will apply in its analysis of control methodologies is completeness. Do the established methodologies allow for terminal control in all anticipated CAS situations? This aspect of analysis looks at the ability of the terminal control procedures to allow for all weapons and all situations likely to require CAS. In order to evaluate this aspect of the control methodology, one must first have a clearly formulated idea of the definition of CAS. This definition should yield an idea of its purpose, as well as some limits of its applicability--the scope of CAS on the battlefield. As stated previously, the current definition is too vague and lacks the ability to adequately accomplish these two goals without further analysis. Therefore, a derived definition is necessary to conduct the analysis.

In analyzing the scope, the author is more concerned with the inclusiveness of the methodology for all anticipated situations within the identified scope of the CAS battlefield. Within chapter 2, this study highlighted some of the current literature that pertains to the purpose and scope of CAS. Based upon this previous discussion, this study will use the following concepts to examine the completeness of current and future terminal attack control procedures.

CAS Purpose Statement

CAS is aerial maneuver and fires provided in direct support to the ground component commander in order to destroy, disrupt, suppress, fix, or delay enemy forces. CAS-allocated resources are tasked directly by the ground component commander through an air liaison element and may support the targeting requirements of the component commander or his subordinate commanders through liaison elements at each associated echelon. Operational and tactical control of CAS is retained by the air component commander providing the support and is coordinated and exercised through appropriate agencies of the TAGS.

This delineation provides the purpose of CAS in terms that are well understood by all joint forces and defined in joint publications. It is doctrinal in nature, as it combines the phrasing suggested by the "Executive Summary" contained in the current edition of the JP 3-09.3 with the C2 relationships established in the theater air-ground system TTP. The exact scope of CAS will encompass any range currently allowed by the fires procedures of the ground unit supported. For reasons that one may derive from the above stipulation, it is unlikely, except in rare circumstances, that the CAS assets would be employed beyond the FSCL; however, for the purposes of this analysis this will not be ruled out. Although terminal attack control is inherent in the CAS relationship for purposes of targeting direction and fratricide prevention, it is not identifiable only in CAS. Terminal attack control procedures may also be necessary to effectively conduct certain attacks within the scope of air interdiction or counterair missions, even though the only place in joint doctrine where they exist is in the context of JCAS TTP.

Completeness does not only incorporate the areas where CAS attacks may occur, but the tools with which these attacks will be conducted. The entire range of guided and unguided conventional munitions must be included, even if not every weapon is likely to be suitable in all CAS scenarios. Of particular concern here will be the ability of the control methods to allow for attacks with GPS munitions, such as the joint direct attack munition (JDAM), joint stand-off weapon (JSOW), and the wind-corrected munitions dispenser (WCMD).

Utility

Utility to the commander will be the final criterion this study will include in its analysis of the existing and proposed frameworks of terminal attack control procedures. This portion of the analysis is intended to determine whether or not the categories established offer the commander an adequate measure of fratricide risk management while permitting terminal attack controllers the necessary flexibility to conduct attacks achieving desirable effects. Because this last category of analysis is quite complex, this study will focus on determining how each framework separates categories of control in order to facilitate this risk management. A comparative analysis of the two frameworks in question will enable a determination of the relative utility of each.

Fratricide Prevention

Warfare involves risks and associated threats. Various aspects of the battlefield threaten the lives of soldiers engaged in mortal combat. Weapons employment in particular presents a threat to the lives of combatants. This includes those employed by the opposition, as well as those employed by friendly forces. It is the latter which is the focus of fratricide prevention. CAS, particularly with the USAF and USA, increases this inherent threat due to the various types of friction created within the process. Soldiers from two distinct services, each with their own doctrine and war-fighting techniques, employ two very distinct methods of combat in the same relative time and space on the battlefield. Lethal fires from each of these two services can easily cause mortal injury to soldiers from the complementary arm or lethal damage to their equipment. The following section will assess some factors that contribute to the fratricide threat in the CAS environment.

This focus on fratricide prevention is not intended to detract from the primary element of terminal attack control--to provide targeting direction. It will simply aid in an analysis of the risk mitigation tool the commander uses to provide the proper amount of flexibility to the air-ground attack team without imposing unwanted risk on organic maneuver forces. It is anticipated that different missions, political constraints, locations, weather, training opportunities, priorities, weapons, intelligence level, and many other factors will weigh heavily on the commander's determination of acceptable risk. It is doubtful that any *simple* risk mitigation tool can adequately account for all the factors of fratricide. So, in the preservation of simplicity, the experts involved in the process will usually consider many of these factors collectively for each mission. However, there are a few factors that stand out because of their great influence on either the severity or probability of fratricide. While not all of these factors will be considered in the specific analysis, they are mentioned here to demonstrate the complexity of risk mitigation for CAS and also to show when they are considered in the terminal attack control process. The following paragraphs highlight some of those areas.

Proximity

From the shear effects of the nondiscriminatory aspect of lethal fires being employed by each of these arms, logic dictates that proximity and fratricide have an inverse relationship. As fires from one complementary arm approach the areas where its sister service soldiers operate, the probability and severity of fratricide increase. It also seems to follow that the greater distance separating these two arms, the less probable and less severe is harm to friendly forces. At some point, both become negligible. This relationship will hold true as long as the weapon type, methods of employment, and level of coordination remain constant. Each of these must also be taken into account when evaluating the risk of fratricide. At various proximities from friendly forces, fire control measures or procedures are employed. Some of these measures include the coordinated fire line, the FSCL, and the area regarded as TIC. TIC will be discussed in subsequent paragraphs.

Weapon Classification

The type of weapon being employed has a significant impact on the threat of fratricide from CAS. Three distinct weapons characteristics can influence the severity or probability of fratricide, given a constant distance between the friendly forces and the desired target impact area. The first is the size of the warhead or blast, or the weapon weight. A 500-pound munition designed to extol a particular effect will impose greater severity of fratricide than a 1,000- or 2,000-pound weapon with the same characteristics. The second is the designed desired effect of the weapon being employed, commonly referred to as the damage mechanism. Designed into various weapons types are specific effects, each with a lethal range that differs from another even if only slightly. These include blast, fragmentation, incendiary, penetration, and cratering. For example, general-purpose munitions incorporate blast and fragmentation effects that are designed to spread the effects from the desired mean point of impact (DMPI) to a desired or optimum dispersion range. On the other hand, the dispersion of effects of a 30-millimeter projectile is minimal because it is designed to penetrate armor; the effects are more localized to the DMPI, thereby reducing threat to the friendly forces within the same proximity as the general purpose munitions. The third characteristic of the weapon is the guidance mechanism. This characteristic primarily influences the probability of fratricide and will be covered further in the section on weapon employment methods (Air Ground Operations School 2001, 62).

It would be very difficult to specifically detail the probability and severity of all of the various weapon types due to the immense number of systems in existence. Fortunately, this has already been accomplished for this very purpose and is contained within JP 3-09.3, Appendix G, of the current publication (1995, G-3, 4). The table sets a particular “acceptable” level of risk. It is not this author’s intent to question either the quality of data within the data, the appropriateness of the risk assumed, or the assumptions made in its creation. It serves the scope of this paper to note that this is accounted for somewhere within the doctrine and is provided in an adequate format to allow a risk assessment by responsible persons.

Weapon Employment Method

The third weapon characteristic, guidance mechanism, is directly related to the weapon employment method. This study will refer to the guidance mechanism in one of two ways: unguided and guided. Just because a guided weapon is utilized does not mean it has a smaller probability of fratricide. It may still be released unguided, leaving it with similar ballistics to an unguided munition of the same category. Likewise, as Major Stefanek has stated in his thesis, the near precision JDAM guided munition released using BOC is typically more accurate than one released using relative targeting. Therefore the probability of fratricide can change based solely on the weapon employment procedures used. For doctrinal authors attempting to form categories from which commanders, terminal controllers, and aircrew members can make risk assessments, this is one of most difficult characteristics of the attack procedure for which to account. Aircraft capabilities, target identification capabilities, and specific weapon capabilities all vary. A table reference for making quick determinations of the probability or severity of injury or death is not easily deducible from these data, nor would the application of such a table be easily used on a dynamic battlefield.

Consideration for creating such a tool was mentioned during doctrinal discussions at the 2002 JCAS Symposium. It was decided, following a terse discussion, that such a tool would be marginally useful in battlefield application because it would need to account for a myriad of weapons and weapons system malfunctions--each with its own unique probabilities and resulting weapons impact areas. Even if developed, a table of this sort could only contain a small segment of the relevant information. As an example, for each weapon and weapons system combination, there may be various malfunctions that would result in some likely impact area for the weapon. In application, each of these would need to be adjusted for the exact parameters of the specific situation at hand, such as altitude, aircraft direction and speed, wind direction and speed, location and disposition of friendly forces, as well as a host of other environmental factors. To be absolutely certain of complete risk mitigation, one would need to take all of this into account for each weapon type available against an almost limitless number of weapons delivery parameters. One could compare this to "measuring with a micrometer and cutting with an axe." A marginal gain in safety would require a dramatic increase in the complexity and friction of the decision-making process. Overall, the experience of the ALO, TAC, commander, and aircrew provides the greatest reference for generally determining and accounting for the risks associated with different weapons guidance systems.

This is not to suggest that the guidance mechanisms available should not be accounted for within the context of a framework of terminal attack control procedures. There is critical disparity in the accuracy of unguided and guided munitions, and there may be some utility in categorizing procedures differently based on these general categories of guidance. This study will observe how this subject is approached within the context of the terminal attack control procedures.

<u>Coordination</u>

Clear coordination between the maneuver commander responsible for fires and the pilot executing the attack is essential. The coordination is typically exercised through the terminal attack controller; however, it may also include the coordinated effort of other elements of the TAGS, such as a forward observer, a FAC(A), an airborne battlefield command and control center (ABCCC), or airborne intelligence, surveillance, and reconnaissance (ISR) assets, such as uninhabited aerospace vehicles (UAV) or the Joint Surveillance Target Attack Radar System (JSTARS). How coordination is addressed in the context of the control procedures is important in establishing the critical link of responsibility for each aspect of weapons delivery. Specific communication procedures prevent confusion in a critical phase of the weapons delivery.

The author acknowledges that there are many aspects of coordination for CAS that go well beyond the scope of terminal attack control procedures. These aspects are critical to the success of any weapons delivery. Coordination for the suppression of enemy air defenses, airspace coordination for protected airspace, and friendly air defense controls are all critical, but outside the scope of this analysis. Terminal attack coordination, as it pertains to either weapons delivery or authorization to fire, will be emphasized in the analysis.

Competency

The competency of the pilot and the competency of the controller have a great impact on the inherent risk associated with a control. A maneuver commander may know the competency level of his controllers (based on working relationship, past history, and others) but is unlikely to know more than the unit and airframe type of the aircrew executing the attack. Likewise, the pilot may have a working relationship with a particular controller or unit, but is unlikely to know the specific competency level of each person who controls him. Therefore, it does not make sense for any control methodology to specifically take individual competency into account, although it may indeed be accounted for in the personal decisions made by individuals when assessing the risk of fratricide for a particular weapons release. The frameworks must assume that TACs and aircrews will be able to accomplish their particular job in a professional manner. The subject of the competency of observers poses a different problem. This study will assume that a certain level of competency exists for those considered observers, but that the level of competency does not provide the measure of risk mitigation equal to that of the TAC. If their capability were equal in this area, the observers would be qualified as TACs.

While the assumption of equal qualification is necessary, there are claims that some disparity exists between the various people qualified as TACs. Different schools that provide training for TACs employ unique syllabus requirements, and continuation training for TACs between services varies. The JCAS JTF in its *Joint Close Air Support Interim Report* highlighted this problem. Subsequently, a great effort has been made by participants from all services to determine joint training requirements for initial and continuation training. Progress on this issue is difficult, as training requirements often result in budget manipulations, and the subject matter experts who debate the requirements do not control service budgets. The JCAS executive steering committee should be able to make progress in facilitating "buy in" from their various services, thus solving some of the budgetary issues. The ultimate goal is to improve efficiency on the battlefield through standardization of training. Perhaps, in a few years the various schools will be producing joint TACs.

Analysis Application

The application of the analysis criteria of simplicity, completeness, and utility will be done in a qualitative manner. In chapter 4, the study will compare the two frameworks of terminal attack control with regard to each criterion in order to determine the necessity and sufficiency of the revised draft changes. Specific conclusions and recommendations will be provided in chapter 5.

CHAPTER 4

ANALYSIS

Introduction

The previous chapter established the criteria through which a qualitative comparative analysis of the current and proposed terminal attack control procedures will be conducted. The specific criteria are simplicity, completeness, and utility. The portion of the analysis focused on simplicity will account for the conciseness, the clarity of the procedures, and the ease of understanding when the specific procedures apply. The analysis of the completeness of these frameworks will compare how they account for the scope of CAS operations to include applicable munitions and battlefield situations. Finally, the utility of the two frameworks will be compared based upon their ability to serve as a risk management tool for the maneuver force commander. In the analysis of utility the overarching concern will be focused on how the framework of controls aids in managing the risk of fratricide. This is not to suggest that fratricide mitigation is the overarching element of terminal attack control, but that the framework itself allows a commander to determine the proper weapons release authorization commensurate with the risk he or she is willing to assume. The analysis of utility will give ample consideration toward the primary objective of terminal attack control--targeting direction.

Simplicity

The principle of simplicity in the guidance provided to troops on the battlefield is extremely important when attempting to exploit the enemy in complex scenarios. CAS is an extremely complex method of engaging enemy forces. Joint forces employ two quite different combat methods operating from separate battlefield dimensions into essentially the same relative space on the battlefield. The complexity of separate services and command chains--as in the USA-USAF relationship--adds another level to that complexity. As stated, "simple guidance allows subordinate commanders," or in this case supporting elements, "the freedom to creatively operate within their battlespace" (AFDD 1 1997, 21). It is this effect that doctrinal authors should attempt to achieve with the guidance in joint doctrine--simple guidance that allows this battlefield element to operate in the most effective manner possible.

Current Doctrine

General Structure

The structure of terminal attack control procedures that exists in current joint doctrine allows for two methods of control to be exercised by the TAC--direct and indirect. These two methods aid in maintaining positive control of the release of weapons within a maneuver commander's AO. Additionally, when authorized by the JFC, an additional measure of flexibility is allowed in the weapons release authorization--reasonable assurance. When exercising that option, the aircrew, TAC, and maneuver commander may complete the attack without positive control if they are reasonably sure that the mission will be effective and that no friendlies will be harmed. Application of the concept of reasonable assurance is probably the most misunderstood part of the JCAS doctrine.

Ambiguity of Reasonable Assurance

A large part of the confusion over reasonable assurance is the ambiguous nature of the doctrine overall, but particularly in this section. Early in this section it states that JFCs "**establish guidelines that allow CAS aircrew to continue attacks on targets**" when operating in "**battlefield conditions such as communications jamming or low altitude flight**" when they may be unable to receive "**positive clearance to complete the attack**" (JP 3-09.3 1995, V-10). This suggests that reasonable assurance applies to times when communications between the aircrew and controller are unable to be maintained throughout the attack. But later it states that it "is **not** a 'comm out' rule of engagement" [emphasis mine] (JP 3-09.3 1995, V-10). The question that follows is, When does it apply if not in a "comm out" condition? By reading between the lines, one may assume that it applies to temporary situations of communications loss that prohibit only the ability of the TAC to clear the aircraft "hot" and *not* to the targeting direction and fratricide prevention measures, which occur before this interference during the transfer of a nine-line briefing.

This assumption is partially based on a subsequent paragraph that stipulates the conditions that must be present for attacks to continue while operating under reasonable assurance. It states, "**attacks can continue** if the maneuver force commander, terminal controller, and aircrew are **confident the attack will achieve objectives without harming friendly forces**. This only applies if the CAS aircrew has already received initial targeting information" (JP 3-09.3 1995, V-10). In trying to put together a likely scenario that meets all of these criteria, one could assume that a flight of aircraft has received the nine-line information and has attempted to attack a designated target, but unable to receive the "cleared hot" due to terrain or communications jamming interfering with the transmission receipt, aborted the attack and returned to a designated hold point. The TAC would then need to request and be granted authorization from the commander to allow the aircraft to continue under reasonable assurance.

That is this study's interpretation of this rule, but the 2002 JCAS Symposium revealed other explanations of this policy. One postulated that an attack may continue on the first pass when reasonable assurance is in effect as long as the aircrew is confident the attack will be successful and they have positive identification of friendly forces. However, this would require that the TAC had anticipated the inability to maintain positive control and prebriefed the aircrew; otherwise, the aircrew could not know the commander's confidence. It also necessitates that an alternate abort signal had been planned and briefed, as is depicted in the "**Examples of reasonable assurance scenarios**" (JP 3-09.3 1995, V-11).

But even the JP 3-09.3 example of reasonable assurance adds to the confusion, as it states, "An abort can be accomplished via radio, a prebriefed code change, or shutdown of the radar beacon or laser designator." It continues, "A radio transmission is the most desirable method" (1995, V-11). This seems counterintuitive when one considers that the whole reason for applying this technique assumes the absence of positive radio communications when the aircraft is in the final attack. This misleading example could be the reason that some interpret reasonable assurance to allow *any attack that does not fit into positive direct or indirect control*, instead of what reasonable assurance was designed to allow--additional flexibility when encountering communications difficulties during attacks attempting to be executed under positive control. Contrary to the specific text, some construe this policy as allowing aircrews to attack targets outside the visual range of an observer or TAC, based on indications from the attack aircrew or from other sensors. As a result, reasonable assurance has become a caveat that allows attacks to occur in all situations when positive control cannot be maintained. While a complete read of this doctrinal segment does not reveal such leniency in its interpretation, it is conceivable that such an elucidation has some merits when the attacks are based on mission necessity and commander's intent.

Complexity in Weapons Employment

A similarly liberal construal of the CAS doctrine is also necessary within the positive control measures. This is because the doctrine does not explicitly, or even implicitly, allow for many of the latest evolutionary technological adaptations. For instance, positive control explicitly asserts that the TAC receives verbal confirmation from the aircrew that the target or mark is in sight. A "mark"' is described earlier in Section V of JP 3-09.3 to include laser designation, infrared pointers, and artillery, tank, gun, or mortar round marks. The mark may be delivered by either airborne or ground based systems. This method gives no consideration for the release of inertial guided munitions, like the JDAM, which require only precise coordinates to successfully deliver the ordnance. Target visibility and mark visibility may aid in pilot SA, but they are not required for release. While it does allow for "voice-only" marking of the target area, it is clear from this caveat that voice-only marking--or a talk-on--will be used in a "medium- or low-threat environment" that its primary goal is to orient the pilot's eyes to the target, not to simply pass coordinates for the aircraft to attack (JP 3-09.3 1995, V-5 - 7). Aircraft had been capable of bombing on coordinates long before this version of the JCAS doctrine was established. Though the accuracy of bombing coordinates has improved since the advent of GPS, the accuracy of many aircraft inertial navigation systems, coupled with a well-trained aircrew and competent TAC, could have provided an adequate margin of safety to conduct weapons releases--at least when bombing outside the TIC range. If bombing coordinates were acceptable it would certainly have been mentioned within the doctrine. Additionally, this doctrine does not allow aircrews to release weapons through any kind of cloud cover obscuring the terrain, regardless of the capability to employ inertial guided munitions accurately through such obscuration (Stefanek 1998, 10). Another example of the need to interpret the rules has occurred in Operation Enduring Freedom, where US forces are using the Predator UAV as a forward air control element (Butler 2002, 1). Again, there is no provision in the current doctrine for specifically interpreting a UAV as an observer or even an extension of the TAC's "eyes."

Summary of Current Doctrine Simplicity

In summary, the established control structure is simple; there are two types of control--direct and indirect. There is also one major exception to the rule--reasonable assurance. However, such a simple tool can be quite complex when it does not afford the war fighter enough flexibility to conduct operations in the most efficient manner or with all the tools available. While the necessity for this interpretation of the TTP may not inhibit the soldier from taking advantage of new methodology in combat, it has its dangers. It is certain that both JDAM and UAVs are being employed in some semblance of weapons release authority from terminal attack controllers in current operations in Afghanistan (Butler 2002, 1). However, the ongoing practices in this conflict do not equate to guidance for peacetime training requirements. Training uses established TTP as its guide, and without an explicit interpretation of the doctrine it is unlikely that TAC and aircrew training will adapt sufficiently. So the hazard is that forces will be sent into combat to conduct complex CAS operations without the procedural training necessary to prevent inadvertent loss of life. In fact, it is for this very reason that the members of the 2002 JCAS Symposium felt compelled to draft guidance for the use of JDAM weapons in CAS operations. The draft guidance was proposed to the JCAS executive steering committee and closely resembles Type 2 control guidance in the revised draft terminal attack control procedures (Draft message 2002). This guidance, if adopted by the service chiefs, could be used to modify initial and continuation training.

This shows that changes to the current doctrine are necessary. The analysis will now apply this same criterion of simplicity to the revised draft publication of JP 3-09.3 to determine whether the drafted changes are sufficient.

Revised Doctrine

General Structure

The most recent draft of JP 3-09.3 (appendix A) contains three primary categorizations of terminal attack control procedures, as opposed to the two in current doctrine. According to this draft, the commander conveys weapons release authority to the TAC by stipulating which control measures are in effect. The commander's decision is based upon a risk estimate of the situation, for which some risk estimate factors are provided. Two of the control types are very distinct and allow room for almost no interpretation of the conditions present when operations are conducted within them, leaving all other methods of control under the general Type 2 control. The concept of reasonable assurance has essentially been eliminated as a term, although some of the previously mentioned interpretations of that concept are included within Type 2 or Type 3 control situations. The incorporation of the concept is discussed in the utility analysis section.

Type 1 control requires the pilot to visually acquire both the target and the aircraft and to ensure the attack will not impact friendly forces through visual analysis of the attack aircraft's geometry or nose position. Type 3 control *requires* no visual observation of the target area and *allows* for a blanket target engagement clearance to be given to an aircraft or flight. While other requirements exist within both these control types, those are the elements that set them apart from the other, Type 2 control. Type 2 control would be utilized when a TAC or an observer maintains visual acquisition of the target, and allows these targets to be attacked by aircraft not within visual acquisition of the controller or observer, but does not allow for a blanket weapons release clearance. Again, there are other specific requirements associated with Type 2 control, but those are what distinguish this method of control from the other two types.

Specificity and Flexibility

A well-designed aspect of the new procedures is that, while they allow virtually no interpretation, they allow for a great amount of flexibility. The procedures are very clear about which element of the attack team is responsible for what element of the targeting control. The term "will" is used within virtually every line of the new procedures, as in "TAC will visually acquire the target" (Revised draft JP 3-09.3 2002). Yet sufficient elasticity for alternative methods of accomplishment exists within each step. For example, while all three types of control require a CAS briefing, it may be either the nine-line standard or an established theater standard briefing. Additionally, it may be delivered verbally (over a radio) or digitally (using data link technology). Type 3 control even allows an observer to deliver the CAS briefing.

No Preferred Control Method

One aspect of the proposed control procedures adds complexity to the use of this new framework. Since the doctrine does not specify a preferred method of control, commanders will need to be very specific about changes to the weapons release authorization given to each controller. This will possibly require additional coordination and monitoring of CAS engagements in order to allow appropriate control measures for the risk assessed by the commander. Additionally, the revised draft states, "senior commanders may provide restrictions that will prevent subordinate commanders from choosing certain terminal control types" (revised draft JP 3-09.3 2002, 3). While the intent is for the on-scene commander to make the decision, if higher commanders decide to exercise this option the coordination for additional flexibility will be more difficult.

Comparison

This analysis indicates that the latest draft of the terminal attack control procedures corrects all of the interpretation deficiencies of the current publication. To this end, all changes were both necessary and sufficient. It removes the hazy reasonable assurance term and incorporates procedures that allow for employment of the JDAM type munitions. Its limited number of procedures makes it fairly simple to understand which procedure applies to a given situation. There is still one focal point for clearing the release of ordnance--the TAC. The procedures the TAC must use to authorize a weapons release come directly from the CAS supported commander. However, the current procedures have been under the scrutiny of operators for a number of years, and problems in employment surfaced as a result of trial and error in training and application. While it is true that some units have been using some of the proposed procedures as well, such as flight lead control (essentially Type 3 control), the entire framework has yet to meet an operational test. Allowing digital information flow between the cockpit and the TAC may cause overdependence on those data--resulting in problems when, in the infancy of this technological capability, it is suddenly not available to the aircrew or TAC. Or, it may cause confusion initially as aircrews and TACs adapt to using both digital and voice communications simultaneously. There are other significant changes in this new structure, and the adaptation to these changes may reveal additional complexities not evident in the literature.

Completeness

The second analysis criterion this analysis will use to compare the old and new terminal attack control procedures is completeness. A complete framework of terminal attack control methods will allow for methods of employing both unguided and guided munitions anywhere that a commander needs the influence of supporting airpower. Therefore, if some weapons or areas of desired influence are not allowed by the current terminal attack control procedures, changes will be necessary. If the new control procedures do not allow the use of some desirable weapons or do not allow CAS employment in areas of desired influence, then they are not sufficient. However, sufficiency in the completeness of terminal attack control procedures may go beyond CAS operations. Some might argue that terminal attack control procedures should cover all situations requiring an on-scene agent (other than the aircrew conducting the attack) for targeting direction or fratricide prevention during an attack. This places terminal attack control procedures outside the scope of strictly CAS operations, even using this study’s more liberal definition of CAS contained in chapters 2 and 3. However, it could be argued that CAS and terminal attack control procedures should not necessarily be tied together exclusively. Other operations may require terminal attack control procedures. Before beginning the analysis of the two frameworks, this study will briefly examine this concept, as it has direct applicability to a complete framework of terminal attack control.

Terminal Control of Air Interdiction Attacks

Effects-based operations, the buzzword of current airpower philosophy, rely heavily on precision engagement and accurate intelligence within their concept. In his article, "Transforming Warfare with Effects Based Joint Operations," LTC Price T. Bingham describes future effects-based operations in the following way:

> Ideally, the JFC's campaign guidance to the joint force land component commander (JFLCC) would be to support the JFACC's precision engagement with maneuver while also maneuvering to avoid close combat as much as possible. Under this guidance, the JFLCC would orchestrate maneuver to present such a threat or opportunity that creates the "effect" of causing enemy forces to attempt rapid and massive vehicular movement. Closely coordinated with the JFACC, such an effect would greatly increase enemy vulnerability to air attack. The resulting destruction of enemy forces attempting to move would, in turn, complement friendly land maneuver by quickly causing more long-lasting and widespread enemy vehicular paralysis and dispersal. (2001, 62)

In operations like those described by Bingham, a TAC may be employed to aid in targeting direction or fratricide prevention, but would this be CAS? The supported commander in this case is the JFACC. The target priorities would be the JFACC's, not the JFLCC's, and the aircraft would respond to the targeting priorities of the JFACC. That does not fit the definition of CAS this study provides, even though it might still be "in close proximity" and require "detailed integration," as the current definition of CAS states.

A similar situation presented itself in Afghanistan during Operation Enduring Freedom. While Northern Alliance forces were certainly engaging the Taliban and Al

Qaeda forces, it appears that a search-and-destroy effort between the Special Forces and air forces, aided by a robust ISR network, led to the destruction of the enemy. As General Gregory S. Martin, commander of US Air Forces in Europe stated, "The people who were with them were identifying targets of value. We were striking targets of significant value and they were being cut off from the world" (Tirpak 2002, 39). This sounds more like an AI or even strategic attack than CAS. Attendees at the 2002 JCAS Symposium were equally torn about what exactly to call an interdiction effort that employed CAS terminal attack control procedures. Ground-directed interdiction, CAS-AI, and ground-aided air attack operations were all mentioned (JCAS Symposium 2002). While these semantic permutations of the terms describing methods of accomplishing the destruction of enemy forces do not directly interfere with the ability to carry out that destruction, they do interfere with the ability to relate war-fighting practices to future leaders and current soldiers.

Weapons Comparison

Guided Munitions

This study has already described the inability of the current doctrine to allow certain weapons employment procedures to occur in the scope of CAS. The release of weapons on coordinates when the aircraft is not in sight of a TAC or an observer and when the attack aircraft does not have visual acquisition of the friendly forces is not allowed. This essentially prohibits JDAM, WCMD, and JSOW munitions employment from optimal ranges and altitudes. The fact that they are indeed being employed in Afghanistan may indicate to some that they are obviously allowed. Additionally, a loose application of the reasonable assurance or positive control measures can lead some to believe that GPS munitions are not completely prohibited by the current doctrine. However, the difficulty of fighting a war in Afghanistan more likely presents a sufficiently appropriate set of unusual conditions that the following statement, which allows divergence from prescribed TTP, applies: "This doctrine (or JTTP) will be followed except when, in the judgment of the commander, exceptional circumstances dictate otherwise" (JP 3-09.3 1995, i). Also, if this loose interpretation of current procedures was acceptable for training purpose, it is doubtful that a large group of subject matter experts gathered at the 2002 JCAS Symposium would have felt it necessary to craft an entire set of guidelines to allow the use of JDAM in CAS operations (draft message 2002, 1).

Another situation that is prohibited by current doctrine for the essentially same reason as the GPS weapons prohibition is the release of LGBs from a TAC-undetected aircraft whose aircrew does not have friendly positions in sight. In this case, the aircrew may be able to meet the requirement for "confirmation that the objective/mark is in sight," but would not be able to confirm they have "friendly positions in sight" (JP 3-09.3 1995, V-9). While it is certainly important for the pilot to be reasonably certain the weapons will not affect friendly forces, the visual acquisition of friendly forces by the pilot seems an unnecessary safety measure in the targeting process, particularly for employment of guided munitions.

Visual With Friendly Forces Requirement

A TAC is a weapons expert who understands the capabilities and limitations of air delivered munitions. Guided munitions, by their design, will impact within a few meters of the designated position, unless a weapon malfunction occurs. The TAC is required to obtain explicit commander authorization if a weapon impact on the designated target has a probability of affecting friendly forces. The requirement for informing the commander is when friendly troops are in contact with the targeted force or when the DMPI is within 1,000 meters of friendly forces. Specific authorization to conduct an attack must be obtained from the commander if the target falls within the 0.1 percent probability of incapacitation (PI) range. This 0.1 percent PI means that one in 1,000 soldiers within the designated range of the specific weapon employed will be unable to function for five minutes during an assault. It assumes a soldier in prone position with winter gear and helmet (JP 3-09.3 1995, G-1, 2). Given these considerations, it is the commander and TAC who bear primary responsibility for ensuring the protection of friendly forces from weapons impact. For guided munitions, the aircrew's focus should instead be on finding the correct target designation. Efforts to locate friendly positions result in additional communications requirements (beyond the nine-line briefing), divert the aircrew's attention from the task at hand, and may result in confusion over target area and friendly location. Certainly, if there is a possibility of impacting friendly forces if the aircrew does not see them, then the additional coordination is warranted. However, if the effort is expended only to meet a guideline that exists for the employment of an unguided weapon, applying it to guided weapons release procedures is far more likely to add to friction and confusion, increasing the possibility of fratricide. An example of this may have occurred recently in Afghanistan. Reporters from the *Wall Street Journal*, speculating on the cause of a near fratricide involving five US soldiers during Operation Enduring Freedom, relate the following:

> The commandos were hunkered down a few hundred yards from one of the bloodiest fights of the war. Using state-of-the-art laser range finders and powerful binoculars, the men radioed to a Marine Corps pilot above the detailed locations of some 600 non-Afghan fighters staging a suicidal prison revolt inside a mud-walled fortress a few hundred yards away. When the Marine pilot plugged the coordinates into his computer, the location appeared awfully close to the commando position. So the pilot double-checked the data with the men on the ground. To clear up the confusion, a commando gave the pilot his own coordinates. Amid the explosions and confusion, the pilot misheard him and sent a 2,000-pound precision Joint Direct Attack Munition (JDAM) right at his fellow Americans, said a senior Defense official involved in the campaign. (Jaffe, Cummins, and Squeo 2001, A22)

While it is certain that there are plenty of causal factors in this incident, had precise friendly coordinates not been passed the chance of their input into the bomb's guidance system are very slim. While the specifics of these mishaps remain privileged information, a recent interview with Major Jim Quinn from the JCAS JT&E reveals that passing friendly coordinates may have been causal in some recent fratricide incidents. For this reason, during the 2002 JCAS Symposium much discussion arose over the passing of friendly coordinates to aircraft. It was emphasized that while general locations of friendly forces help develop an aircrew's overall SA, the positions should be passed in relation to the target and not as a specific set of coordinates (JCAS Symposium 2002).

The revised doctrine removes all requirements for aircraft to verbalize their visual acquisition of friendly forces. While it still acknowledges the importance of building the aircrew's SA with regard to friendly force positions, the focus throughout the new doctrine seems to focus the attention of the aircrew on proper employment of the weapons. Certain medium- to low-altitude attack profiles are far more conducive to aircrew observation of friendly positions. Equipment, such as the Situational Awareness Data Link (SADL), EPLRS, and ACASS, can also provide the aircrew with information aiding in the detection of friendly force positions. These certainly reduce the "fog" associated with incomplete knowledge of the battlefield environment. Use of these tools for unguided munitions delivery, and "talk-on" control of aircraft will be beneficial to utilize in certain situations involving forces in TIC situations and when visual acquisition of the target is utilized. However, their use in this draft publication is at the discretion of the TAC. This tends to put more emphasis on the TAC for fratricide prevention, which some may see as reduction in fratricide mitigation. The TAC would become the "hub" of fratricide prevention during CAS, but may utilize all available resources, including the aircrew, to aid in that effort. Overall, this contributes to the simplicity of the procedures themselves, but it also allows for weapons releases from altitudes and in weather conditions that preclude visual detection of friendly forces. This alone simplifies the requirements for the release of LGBs from medium to high altitudes, and combined with removing requirements for the aircrew to see the "target-mark," directly allows for the optimal employment of GPS munitions (JP 3-09.9 1995, V-0).

This analysis shows that the changes in terminal attack control procedures are both necessary and sufficient with regard to weapons employment. The next section will apply the criterion of completeness to the scope of CAS terminal attack control procedures.

Scope Comparison

The scope of CAS will encompass any proximate range currently allowed by the fires procedures of the ground unit supported. This should allow for CAS to occur where the supported commander is responsible for fires coordination. Typically, that area of coordination is either short of the FSCL or within a designated area or engagement zone for special operations, noncontiguous AOs, or nonlinear operations. This is fairly wide-open territory, and it would be difficult to pin this to a distance. This study removes all pretense of using proximity requirements to define where it should or will occur.

Current Doctrinal Constraint on Flexibility

Air power has always held as one of its tenets its flexibility. Flexibility, according to AFDD 1 allows air to "*exploit mass and maneuver simultaneously*. . . . At the operational level, flexibility allows air operations to shift from one campaign objective to another, quickly and decisively" (1997, 23). At the tactical-level application of CAS, it would allow shifting from one decisive point to another, quickly and decisively. But restricting its employment to only the locations where a TAC, FAC(A), or observer is prepared to provide terminal attack control may be unnecessarily limiting. Yet, this is exactly what combat forces confront in the employment of CAS under current terminal attack control procedures. At first glance, these restrictions may not seem too constraining, since a FAC(A) can provide control realistically anywhere on the battlefield that a CAS aircraft can fly. However, the number of FAC(A) aircraft available will probably not support all the targeting requests of the corps. For every FAC(A) that flies during a given period of time, there is one less munitions-carrying attack aircraft available. These limited resources are typically in short supply. Additionally, JP 3-09, *Doctrine for Joint Fire Support* allows, "air strikes short of the FSCL (both CAS and air interdiction [AI]) must be under positive **or procedural** control to ensure proper clearance of fires" [emphasis mine] (JP 3-09 1998, A-3). Yet, the current terminal attack control procedures restrict CAS to positive control employment.

Army fire control procedures allow unobserved fires at certain times and places on the battlefield. This allows targets detected by ISR sensing systems to be engaged by artillery and mortars, regardless of direct observation. While this may pose additional risk of fratricide, that risk may be mitigated through the use of "multiple sensor acquisition and procedural control measures" (JP 3-09 1998, IV-13). However, these same considerations are not allowed for aircraft delivered weapons, which could incorporate both additional sensors--the systems on-board the aircraft--and procedural control measures issued by the TAC. With the large array of ISR platforms and sensing systems available to support the ground commander's AO, it seems terribly restrictive and ineffective to limit the employment of air delivered weapons to what a terminal attack controller or forward observer can see, or to the availability of FAC(A) aircraft.

This ineffectiveness is particularly evident at a time when greater capability exists for collection of timely information from remote sensors, like JSTARS and UAVs. These systems can be employed to focus in key areas for high-payoff targets, based upon the commander's intelligence preparation of the battlefield. Information detected by these systems can be linked directly into the air support operations center, which is where all CAS missions are processed and coordinated. The air support operations center can track this information to form a good sensor-based picture of probable high-payoff targets (Koven 2000, 24). The commander and TAC can develop preplanned engagement zones or informal airspace coordination areas over the projected target locations to sanitize airspace for air-to-ground engagements. SADL, EPLRS, or ACASS can further reduce fratricide potential in these engagement areas by providing real time friendly force locations to the cockpit and the TAC. However, engagement zones sufficiently and discernibly separated from friendly forces can even alleviate necessity for these friendly force identification data links.

A demonstration of the inability of current terminal attack control procedures to meet battlefield employment needs is contained in the OSD JCAS JT&E *Joint Close Air Support Interim Report*. Data collected from over 200 CAS sorties attempting more than 400 weapons deliveries during USA-USAF CAS engagements at the NTC reveal some severe problems with the terminal attack control procedures currently in effect. While 50 percent of the target engagements were conducted using positive direct control, 47 percent were conducted using nondoctrinal methods. No attacks were accomplished using positive indirect control (OSD 2000). While this is revealing of the utility of the current system, other data indicate the area where the Army is attempting to employ CAS is usually outside of the range of ground observers and TACs, or outside the typical area influenced by positive control measures allowed in current doctrine. One *Joint Close Air Support Interim Report* fact observed the employment of FAC(A) aircraft to provide a majority of the direct controls (OSD 2000). Another fact noted a high number of weapons delivery clearances given by TACs who were "not in position to observe the attack" (OSD 2000). The extensive use of FAC(A) control indicates the Army's desire to target deeper and to use the more-flexible measures of control available with airborne controllers. And while the TACs not being in position to observe attacks could indicate poor planning and ineffective use of the TACs, it also indicates the preferred method of employment when FAC(A) aircraft are not available. As stated in the *Joint Close Air Support Interim Report*:

> CAS aircraft were often sent forward to find targets. In these instances, the aircraft passed a spot report to the terminal controller, who in turn notified the ground element. If the ground element nominated the target for attack, release authority was passed to the fighters and the target was engaged. . . . Terminal

> controllers routinely confirmed friendly locations during target designations. (OSD 2000)

These are the situations that resulted in the issuance of "flight lead control," as was used in the opening example of this study. One last indication of the desire to use CAS in the "deeper" areas of the battlefield rests in the data from this report that showed of the controls provided by TACs, 73 percent were conducted by the brigade while only 27 percent were passed to the battalion for targeting employment (OSD 2000). The brigade, fighting a deeper battle than the battalion, was employing almost three-fourths of the CAS.

Revised Doctrine Flexibility

The revised doctrine, within Type 3 control, specifically allows for the use of the terminal attack control procedure in question. Type 3 control allows a controller or an observer to pass the CAS briefing to the aircraft. This briefing includes the area for the attacks, any restrictions or limitations, and the time period for the attacks. There is no requirement for any controller or observer to visually monitor the attacks. After providing a "cleared to engage" call to the attack aircraft, the TAC will monitor the engagement using radios or other methods. Also allowed within the terminal attack control procedures is the incorporation of those additional observers mentioned on page 87. Observers used in both Type 2 and Type 3 controls may include a UAV or "other C4ISR [command, control, communications, computers, intelligence, surveillance, and reconnaissance] asset with real time targeting information" (revised draft JP 3-09.3 2002). This last category could include the JSTARS, if available.

This demonstrates the proposed changes to terminal attack control procedures are necessary and sufficient in that they allow for CAS to be applied outside the visual acquisition range of TACs and observers when a FAC(A) is not available. However, as mentioned earlier, terminal attack control procedures may not only apply to CAS. The next section examines a terminal attack control concept that may not be applicable to CAS but may be applicable to other forms of air-to-ground attack.

Beyond the Scope

The revised doctrine does a thorough job of covering the scope of CAS with terminal attack control procedures. However, as alluded to in the previous chapters, terminal attack control procedures are not only used in CAS. The purposes of AI, offensive counterair, and even strategic air attack can all be accomplished using terminal attack control procedures. However, war fighters are often at a loss for what to term such attacks. For example, if a SOTAC provides target observation of a JFACC nominated hardened bunker facility on an airfield in order to determine the type of aircraft contained within and subsequently passes coordinates to an aircraft carrying a penetrating weapon, is the attack being conducted CAS? Many will say, “yes” because of the procedure involved, even though the effect being produced and the purpose of the strike clearly are more in line with the counterair function. This problem is due to the only location of the terminal control procedures within joint doctrine--in JCAS procedures. Again, it does not affect the outcome of the mission to call it by a nondescript term; however, it matters a great deal to those people involved in educating future leaders in sister services. Common, adequate, and descriptive language enables communication of intent and purpose. When soldiers lose the ability to adequately describe what they are doing, it becomes difficult to lead others to accomplish the desired tasks and even harder to communicate an intent.

If doctrinal authors determine that terminal attack control procedures should be removed from residing solely in the JCAS TTP, another method of control may be appropriate to include in the revised procedures. Currently, all of the control methods in the revised doctrine rely on voice or digital communication for a weapons release clearance. However, special operators may desire to facilitate the attack of a target deep in enemy territory and may require total radio silence for covert security purposes. While frequency hopping radios, digital communications, and secure voice radio may be able to prevent an enemy signal reconnaissance element from accessing the content of a transmission, they will not prevent that same element from determining the source of the transmission. In these cases, a weapons release clearance and target mark may be provided using signals in a different spectrum--visual, infrared, or radar beacon. Used in conjunction with preplanned parameters, the presence or absence of these various signals employed independently or in combinations could provide sufficient targeting direction and weapons release clearance to constitute a control method.

Signal-Only Control

The draft JCAS doctrine discusses a similar collaboration between special operations forces (SOF) and strike aircraft in the paragraph called "Terminal Guidance Operations." It describes terminal guidance operations (TGO) as making "joint air interdiction and SOF ground operations complementary." However, it actually precludes it from consideration as a terminal attack control procedure when it states that TGO "does not include authority to clear aircraft to release ordnance and should not be confused with terminal control which does include the authority to clear aircraft to release ordnance" (JP 3-09.3 2001, II-21). But even in TGO procedures, someone must clear the aircraft to release the ordnance, probably the JFC through the JFACC's ATO process. However, if the terminal guidance were not present, would the aircraft still release ordnance? It probably would not. Therefore, the absence of the signal would essentially constitute an abort call; while, conversely, the presence would indicate clearance for the aircrew to release ordnance. This procedure actually functions very similarly to reasonable assurance. The authorization for weapons release comes from the JFC based upon criteria established by the JFC and agreed upon by the two functional component commanders involved--JFACC and Joint Special Operations Component Commander. The mission details are sufficiently planned to allow the weapon release without a verbal clearance, similar to reasonable assurance. Because of its complexity, this type of procedure is not one that should be practiced or executed by *all* TACs.

So, if the scope of terminal attack control reaches beyond simply CAS operations, an additional procedure may be necessary that incorporates signal-only terminal attack control. Neither the current nor draft procedures account for signal-only control, which due to its increased difficulty and uncertainty, would probably necessitate an additional procedural category. The following sections examine the utility of the two frameworks of terminal attack control procedures in order to determine if the changes are both necessary and sufficient.

Utility

Utility is the final criterion this study will apply in the analysis of the two frameworks of terminal attack control procedures. In chapter 3, this study determined that the purpose of these frameworks was their ability to aid in risk mitigation of fratricide on the battlefield. Individual terminal attack control procedures enable the primary element of the control--targeting direction, but the separation of categories within a framework allows a ground commander to manage risk. This section will examine the changes made to determine if they are both necessary and sufficient in maintaining the utility of risk management, focusing on fratricide prevention.

Since this is a comparative analysis and not an analysis to determine an optimized method of separation of control procedures, it will emphasize differences in the two methodologies. Many of the differences between the methodologies have already been covered in detail within the previous criteria analyses. Those will be reiterated briefly in this section while highlighting how those differences impact the utility of the respective framework.

Risk Management Analysis

The utilization of the terminal control framework is simply the implementation of a risk management tool. The multiservice TTP entitled *Risk Management* specifically mentions three separate elements of this process: (1) make implementation clear, (2) establish accountability, and (3) provide support (FM 3-100.12 2001, II-5). All three of these issues have been addressed to some degree in the analyses of the criteria of simplicity and completeness.

The current doctrinal framework has been shown to lack clarity with respect to both guided munitions and the concept of reasonable assurance. This lack of clarity in the framework also reduces its capability to function effectively as a risk management tool. The revised doctrine at least appears to be clear in its separation of categories. While this finding may seem inherently obvious, it highlights the progress being made in the design of this new doctrine and current emphasis on battlefield risk management.

In establishing accountability, the revised draft is very plain. It states very clearly, “the authority and responsibility for the expenditure of any ordnance on the battlefield rests with the supported commander” who will “delegate weapons release clearance authority to his Terminal Attack Controller” (revised draft 2002). Additionally, each step within the control types holds the TAC, observer, or aircrew accountable for completion by using the indicator “will” to enforce each predicate. The current doctrine is far less precise in both its language and overall assignment of responsibility. For example, within direct control the TAC is responsible for seeing the aircraft and target. However, if the TAC cannot obtain the aircraft visually, then the aircrew is responsible for visually finding the friendly forces. Even though this is properly stipulated in the context of preventing fratricide incidents, the changing levels of responsibility on the battlefield for different events can become a nuisance to the person attempting to apply the procedures. Reasonable assurance, which requires that the TAC, aircrew, and commander are “confident the attack will achieve objectives without harming friendly forces” turns into an accountability nightmare (JP 3-09.3 1995, V-10).

Providing support refers to “providing the personnel and resources necessary to implement the control measures” (FM 3-100.12 2001, II-6). While the risk management publication actually refers to providing this support during the active implementation of the controls, this subcriterion is still worthy of a discussion regarding the tools allowed by the control procedures. The tools being developed currently for combat identification are what are intended with regard to “providing support,” and neither publication prohibits the use of those tools. However, the revised draft publication specifically mentions some tools available for targeting and observation that may contribute to the overall effectiveness of CAS and may ultimately aid in reducing fratricide. Incorporating UAV and JSTARS into the observer category adds a dimension of targeting fidelity not specifically mentioned in current doctrine. More importantly though, allowing the use of digital transmissions of critical attack information may actually aid in expounding the mission intent and in creating an unambiguous "picture" of friendly force locations and targeting direction. This picture may eventually reduce communications necessity, freeing radio transmission for vital data only.

Direct and Indirect Control

If reasonable assurance and Type 3 control were stripped away and the clarity and GPS weapons employment issues were rectified between these two frameworks, two very similar structures would remain. The two types of control remaining would function very similarly. Type 1 control would look very similar to direct control, and Type 2 control would look very similar to indirect control. However, Type 1 control is more constraining and, therefore, narrower in application than direct control. As a result, Type 2 control is broader in application than indirect control. The revised doctrine creates a shift in the dividing line between the categories of control. The following section explains that shift and explores its effect on the utility of the framework.

Shifting the Dividing Line

Type 1 control requires the TAC to see both the target and aircraft. It also requires the TAC to determine from the visual acquisition and analysis of the aircraft geometry and nose position the weapon impact point. Direct control acts very similarly in that it requires the TAC to have visual acquisition of the target area and visual acquisition of the aircraft. However, in cases where the TAC cannot see the attacking aircraft, the direct control allows a weapons release clearance "if the terminal controller can use other means to confirm that the aircraft is attacking the correct target and has friendly positions in sight" (JP 3-09.3 1995, V-9). Type 1 control makes no such concession. So, essentially, Type 1 control has narrowed the band of (currently) direct control to an all-visual control procedure for the TAC. As previously observed in chapter 3, it also recommends this type of control for difficult situations, such as when there may be language barriers between TAC and aircrew, uncertainty in aircrew or aircraft capability, or in a TIC situation.

This narrowing of the band of Type 1 control has some utility. In some situations, a commander may only feel secure in allowing weapons delivery if the TAC sees both the aircraft and target and confirms *visually* that friendlies will not be impacted. Essentially, this has the potential for serving a wary commander as a measure of control of the air to ground battle within the AO. However, this may also lure a commander into a false sense of security about both the effectiveness and the fratricide mitigation offered by such a control type. Data gathered from the JCAS JT&E demonstrate the possible ineffectiveness of relying on this type of control.

Implications of JCAS JT&E Minitest

The JCAS JTF conducted a minitest at the NTC from 9 through 13 November 1998. This minitest was designed specifically to determine the ability of a ground controller to visually acquire an attacking aircraft and correctly assess the target being attacked. The test evaluated 666 determination possibilities. The targets were arrayed in a diamond pattern, separated by between 1.4 and 2 kilometers. The observer-target separation ranged from 1 to 3.2 kilometers, depending on both target and observer locations (OSD 1999, 2-3). The subjects--controllers--were all qualified TACs or qualified forward observers. The goals of the controller were to visually acquire the aircraft and then determine which of the four targets were being attacked before it reached release altitude. The test was conducted with large A-10 attack aircraft flying at a relatively slow 375 knots and using a 45-degree dive angle with a 10,000-foot release altitude. The tests were conducted in low humidity during the day (OSD 1999, 3-7). Essentially, the controllers had optimal conditions for observation.

The results of the test were significant. While detection of the aircraft occurred during 91 percent of the attacks, correct determination of the target under attack occurred only 45 percent of the time (OSD 1999, ix). Differences between the TACs and forward observers were significant as well. TACs made correct determinations of the attacked target 50 percent of the time, while forward observers were correct on only 36 percent of the attacks (OSD 1999, 4-5). Keeping in mind that these observations were occurring in optimal conditions with no other requirements for the TAC or forward observer, a successful determination in less than one-half the attacks is reason to be skeptical of the ability to successfully employ Type 1 control. One should also reflect on the fact that the distance between the targets in this test was 1.4 to 2 kilometers and the distance that determines TIC is only one kilometer. The use of this control type in TIC situations during hectic battlefield conditions with haze from smoke and additional controller verbalization requirements would probably only decrease the dependability of the TAC to perform this type of control. Given the accuracy of precision-guided munitions in comparison, the lure of the safety of Type 1 control could reduce the effectiveness of CAS at an increased risk. Given these statistics, one may suggest that the lure to use

Type 1 would not be that great. The question then becomes, What might dissuade a commander from implementing Type 2 control? That will be the focus of the following paragraphs.

<u>The Catch-All Category</u>

The narrowing of the band of weapons employment procedures under Type 1 control has the resulting effect of grouping more weapons employment procedures under Type 2. As a quick illustration of the wide range of risk associated with weapons employment procedures under Type 2 control, this study will briefly look at the two ends of the spectrum. Within Type 2 control two different categories of individuals could be providing target observation--the TAC or the observer. On one hand is the qualified TAC--well versed in aircraft weapons employment procedures, aircraft capabilities, air-delivered weapons effects, and communications--who is required to perform a certain number of aircraft controls at a specified frequency and to a specified proficiency level. On the other hand is the observer, who may have been introduced to aircraft weapons employment procedures and weapons effects during initial training but who has no requirements for maintaining any currency or proficiency in terminal control methods. Weapons employment procedures within Type 2 also vary greatly, from the difficult use of a combination of visual acquisition of aircraft and subsequent talk on to target to LGBs and GPS weapons involving their own unique requirements. Therefore, on one end of the spectrum a qualified TAC is passing target coordinates to a high-altitude bomber releasing near-precision munitions with accuracies as good as ten feet from the DMPI (Tirpak 2002, 32). And on the other hand, an observer, marginally qualified in air weapons employment, is analyzing the battlefield to aid in the determination of air weapons employment of possibly unguided and less-accurate weapons. This information is then passed to the TAC to try to develop some sort of SA of the battlefield based on possibly incorrect data or incorrect assumptions made by the observer. In this latter case, the TAC will ultimately need to make the decision whether to abort or continue the attack, so the final assessment is still coming from a qualified controller. However, the assessment may be based on incomplete or incorrect information.

Risk of Second-Hand Information

The additional risk associated with observer oriented terminal attack control is evident when the situation is put against a typical USA risk mitigation framework. One such framework is included in appendix C. The one depicted is from FM 71-1, *Tank and Mechanized Infantry Company Team*, and breaks the impacting factors into the following categories: (1) understanding the plan, (2) environmental factors, (3) control measures, (4) equipment, (5) training, and (6) planning time (FM 71-1 1998, Figure D-1). Given that the TAC will be making the decision to attack or not to attack, a quick sketch of comparative risk between a TAC-only control and observer-assisted control would increase the risk in the following risk-factor categories: complexity, enemy situation, friendly situation, command relationship, audio communications, standard operating procedures, liaison personnel, individual proficiency, unit proficiency, rehearsals, and habitual relationships. These ten categories alone could move the risk scale to the right by between ten and twenty points, since each category moves from a low-risk value of one point to a high-risk value of three points. This disparity would move the overall risk assessment of a control from low to medium or medium to high, and if combined with other elements could easily shift the risk involved with a control performed under Type 2 from low to high risk. While this is a simple subjective sketch of the risk incurred when moving from TAC only control to observer-assisted terminal attack control, further evidence reveals objective evidence of a hesitancy to use observer aided control.

Current Propensity to Avoid Observer Aided CAS

During the full test conducted at NTC during the exercises, positive indirect control--essentially the same as described in the example--was available for 18 percent of the missions flown, yet it was never used (OSD 2000). Several reasons could account for this. The current doctrine's prescriptive emphasis on positive direct control may be one. However, that does not account for the reason that 47 percent of attacks did not use any doctrinal method of control. This strongly suggests that, even with observers available, the TACs felt more comfortable relying solely on the pilot's observation and the utilization of nondoctrinal methods to facilitate the attacks (OSD 2000). In other words, TACs preferred to use an unauthorized variant of Type 3 control than a method allowed under Type 2 control. Since the revised draft states that Type 3 control would be used in a situation where the risk of fratricide was determined to be low (revised draft 2002, 5), how low does the fratricide risk have to be before these difficult observer aided methods of Type 2 control will be employed?

The variance in the control measures allowed within Type 2 control appears to undermine its ability to function as an adequate risk mitigation tool for the commander. An adequate risk mitigation tool will allow the commander to authorize one or more of the control measures based on the battlefield conditions. The commander should not have to resort to conducting a risk assessment for each individual air mission. Yet in lieu of doing that, it is doubtful that Type 2 control will be implemented until the risk of not doing so becomes too great. More likely, it will be implemented in part, rather than as a whole.

In retrospect, the draft procedures enhance risk management utility with respect to clarity, assignment of responsibility, and providing (or allowing the use of) tools essential to mission effectiveness. Therefore, the sufficiency of these changes must be viewed with respect to overall utility. The utility gained by the clarity of these new procedures may be offset by the inability of the framework to act as a tool to allow control procedures, due to the wide range of controls allowed in Type 2 control. In chapter 5, this study will propose an alternative to the current division of terminal attack control types. Because there may be a more appropriate method of dividing control procedures, this study finds that the revised draft procedures are insufficient in the area of utility.

Conclusion

The analysis in this chapter presented a qualitative comparative analysis of two frameworks of terminal attack control procedures. The frameworks analyzed were the current framework that exists in the 1995 JP 3-09.3 and a 23 January 2002 revised draft of the procedures contained in the initial draft of JP 3-09.3, dated 7 September 2001. The analysis compared the two frameworks against the criteria of simplicity, completeness, and utility in order to determine the necessity and sufficiency of changes. The final chapter of this study will summarize the conclusions from each section of this analysis and make several recommendations for joint doctrine.

CHAPTER 5

CONCLUSION

Introduction

This study was conducted to determine if proposed changes in JCAS doctrine and TTP, specifically those in the draft and revised draft terminal attack control procedures, are necessary and sufficient. The study applied a qualitative comparative analysis of the 1995 JP 3-09.3, *Joint Tactics, Techniques and Procedures for Close Air Support* (current) and the 7 September 2001 draft JP 3-09.3, supplemented with a 23 January 2002 draft revision of the terminal attack control procedures obtained from the doctrine's authors. Specifically, the applied analysis compared the simplicity, completeness, and utility of the two doctrinal methodologies.

Background

The JCAS community has been in a struggle to determine future CAS employment TTP. In 1996, the Office of the Secretary of Defense created the JCAS JTF to conduct a night CAS feasibility study through a joint test and evaluation process. That JTF charter was expanded to encapsulate a study of the entire JCAS system, including training, doctrine, equipment, and organization for both day and night CAS. Beginning in 1998, a number of CAS subject matter experts from all services have gathered annually for a JCAS Symposium. The symposiums' focus is in line with the JCAS JTF charter to study the necessary changes in training, doctrine, equipment, and organization. Concurrent with these two efforts has been a third effort to revise and rewrite JCAS doctrine. The differing service perspectives and advent of new technologies have made agreement on necessary doctrinal changes very tenuous.

This author is a USAF officer who is personally involved in the education of sister service officers (primarily USA) in Air Force and joint doctrine. The Command and General Staff College (CGSC) is advertised as the premier tactical war-fighting school of the Army, and because of this school's focus there are many deliberations within classes on the USA-USAF war-fighting relationship, particularly on tactical air support and CAS doctrine. As it commonly occurs after in-depth analysis, the students and faculty of CGSC have noticed many incongruities in the doctrinal terminology, definitions, and ability to meet the ground commander's battlefield needs. As a result, this author determined that further study was needed into both the current and evolving JCAS doctrine--this study is the result of a 2 ½-year assignment on the faculty of the USAF Element at CGSC.

Thesis, Limitations, and Study

Thesis

The primary question set out in this thesis asks, Are the changes in terminal attack control framework proposed in the draft JP 3-09.3 necessary and sufficient for current and near future operations?

Limitations

This study was purposely delimited in some ways. While JCAS involves all services, this study focused primarily on the USA-USAF relationship. That focus allowed singularity of terminology and enabled the study to spotlight the separate service support relationship that is not necessarily a unique issue in the MAGTF structure. This study does not attempt to determine new doctrine, only to comment on the necessity and sufficiency of changes proposed. The white paper *CAS in 2025* attempts to reach beyond the foreseeable scope of CAS doctrine to determine war-fighting efforts in the future and is a worthy read for those interested in exploring future CAS considerations. While terminal control procedures are the focus of the research, the study did not attempt to categorize specific weapons release procedures. Instead, it focused on the overall framework as a tool for the ground commander to specify weapons release authority in the AO.

Also, a few unpreventable limitations exist within the scope of analysis. The amount of literature available from USA authors on the applicability of the terminal attack control procedures is very limited. While an immense amount of commentary exists on the ability of CAS to meet the ground commander's needs, it primarily focuses on the C2 relationships and the amount of CAS available. While these are worthy topics of discussion, they do not apply to the JCAS doctrine as much as they do to deliberations on unity of command. It is also the opinion of this author that these control issues may be resolved when CAS doctrine, TTP, training, and equipment improve the way the USAF provides support.

Study

One of the most difficult and debatable issues within this study involved an attempt to determine the scope of CAS operations. Any attempt to determine the appropriate concept of a framework of terminal attack control for CAS involves a determination of where it applies or to what it applies. While a purpose for CAS can be located in current doctrine, there are many issues that confuse any student of that doctrine. How does CAS differ from other missions? Where does CAS occur? What is close proximity and detailed integration? Does the FSCL divide CAS and AI? What happened to BAI? Within the literature review, this study attempted to answer these questions in an effort to determine the scope of CAS.

Another critical issue addressed by this study in an effort to determine the analysis criteria was the determination of a purpose for a framework of terminal attack control procedures. All indications lead one to believe that the separate categories of control provide the commander a tool to balance the risk of fratricide with the necessity of mission accomplishment in the application of air-delivered fires and maneuver on the battlefield. The commander manages risk by giving the TAC weapon release authority according to the procedures allowed within a particular control type. Based on this, the criteria of simplicity, completeness, and utility were applied in the analysis.

Findings

This section presents two different types of conclusions, and then specifically answers the thesis question. First, it offers general conclusions arrived at during the process of defining either the scope or specific criteria within the analysis. These conclusions apply to CAS in general and to the purpose of terminal attack control procedures and the proper placement of procedures within joint doctrine. Second, it delineates conclusions arrived at during the analysis of each individual criterion studied in chapter 4. Finally, it answers the thesis question with regard to the necessity and sufficiency of the doctrinal changes. Recommendations follow each of the applicable conclusions.

General Conclusions

The definition of CAS lacks clarity. It uses vague terms to describe where and when the activity will occur, rather than clearly describing the purpose for this aerospace power function. This is further complicated by the association of CAS as not only a tactical function, but also as an allocation of resources. There is enough disparity to indicate that these two are not the same. Realistically, they ought to be the same. Therefore, the definition, even the name, of the term should focus on the purpose of allocating the resources. New terminal attack control procedures being proposed actually enforce this line of reasoning. While proximate distances and the level of integration involved in the activity may be important, they do not give a purpose for either the allocation of resources, or the battlefield application of those resources. Doctrine should discuss how soldiers fight or desire to fight in clear, unambiguous terms. Within joint doctrine, terminology used should also be common to all services involved in the activity in order to avoid confusion and unnecessary cross-referencing. For this reason, not only should the definition of CAS be changed, but also the term itself should be adapted to a more descriptive and exact one. Two recommendations follow:

Recommendation 1. Change the name of air support provided to the Army component commander from close air support (CAS) to direct air support (DAS). This will alleviate existing confusion about CAS allocation and the associated application of airpower. The term "close" carries connotations of specific distance, but all references to the activity--CAS-- state that no specific distance is intended. The title of any activity should not infer something that must be immediately corrected when describing the activity--particularly when there is a more specific term that can be applied. DAS does a much better job of accurately describing the relationship that exists between the air component and ground component in accomplishing this function on the battlefield. If this terminology is changed in conjunction with other recommendations listed below, it will help alleviate confusion about what is actually occurring on the battlefield when terminal attack control procedures are employed during other aerospace power attack functions--offensive counterair, AI, and strategic air warfare.

Recommendation 2. Define DAS as follows:

DAS is aerial maneuver and fires provided in direct support to the ground component commander (GCC) in order to destroy, disrupt, suppress, fix, or delay enemy forces. DAS allocated missions are tasked directly by the GCC through an air liaison element and may support the targeting requirements of the component commander or his subordinate commanders through liaison elements at each associated echelon. Operational and tactical control of DAS are retained by the air component commander providing the support and are coordinated and exercised through appropriate agencies of the TAGS.

This definition, like all other definitions of aerospace functions, defines the activity by describing its purpose and its effect on the battlefield. CAS is currently defined by a vague description of where and how the activity occurs without clarity of purpose. The proposed definition defines the purpose--to support the ground commander--and its battlefield effect--to destroy, disrupt, suppress, fix, or delay enemy forces. It then describes how the support relationship is executed. Additionally, it specifies the command relationships in order to avoid any misunderstanding of responsibilities and duties of the personnel tasked to provide the support. The combination of these two recommendations marries the activity performed to the allocation of resources to perform the activity--thus eliminating any confusion about the operational decisions and tactical application of DAS.

This study attempts neither to define exactly how that DAS will be apportioned and allocated, nor to define the boundary of DAS operations, nor to redefine how the FSCL will be used. That is outside the scope of this research. There may be other deliberations necessary on these issues before these recommendations can be effectively put into place. It is not this study's intent to recommend a heavier or lighter allocation of resources to the DAS role, just to clarify the relationship and definition so that joint forces can communicate with joint terminology instead of vague phrases.

Simplicity

The proposed changes are determined to be both necessary and sufficient in the area of simplicity. The terminal attack control procedure framework contained in the revised draft of JP 3-09.3 was assessed to be a much simpler tool for all applicable combatants. The current doctrine requires a great amount of interpretation, particularly in the area of reasonable assurance. Additionally, as new systems are being employed, the lack of specificity in current doctrine leaves the use of those systems open for interpretation. On the other hand, the types of weapons releases authorized by the new control types are readily apparent within the constraints of the procedures. The uncertain concept of reasonable assurance is removed. The revised procedures also clearly assign responsibility to specific individuals involved in the procedure by using the indicator "will" in the description of each activity. Overall, the draft doctrine appears to focus the pilot's attention almost entirely toward weapons delivery, while responsibility for fratricide prevention rests with the commander and TAC. Also, the simplicity of the revised doctrine does not compromise the flexibility of CAS in execution. Verbal and digital communications are addressed, as are alternatives to the standard nine-line briefing.

Completeness

Changes to current terminal attack control procedures are necessary to accommodate all available weapons types. One of the largest criticisms of current control procedures has been their inability to accommodate GPS munitions. Additionally, sensors like UAV and JSTARS are not linked to the terminal control procedures at all. However, these weapons and observation platforms are included directly and indirectly in the revised draft procedures. In fact, the procedures call for inclusion of other "C4ISR platforms" that may not even yet be developed. Type 2 and Type 3 control both make allowances for this advanced technology; but Type 1 control, by virtue of being a visual procedure, excludes any utility these systems offer--at least in the terminal control phase of execution. The proposed changes are sufficient enough to accommodate all available weapons.

The current terminal attack control procedures do not allow attacks in all areas required by a ground commander--at least not without a FAC(A). Some may suggest that the simple solution to this problem is to provide more or continuous FAC(A) coverage to the ground commander. However, given the fact that airpower is often a constrained resource on the battlefield and that simple, safe alternatives exist, the revised doctrine appears to negate this additional burden for the JFACC through Type 3 control. The new framework, by allowing Type 3 control, allows greater battlefield coverage by DAS assets while still meeting joint fires doctrinal provisions stipulating positive or procedural control short of the FSCL. So the proposed changes are both necessary and sufficient to provide terminal attack control, positive or procedural, in all areas anticipated for using DAS. However, if terminal attack control procedures are applicable to strategic air warfare, offensive counterair, and AI in support of the JFC or JFACC, consideration for incorporating another procedure should be given. The following paragraph provides reasons for considering signal only control measures.

It appears there is confusion in the joint community about what to call a mission that employs terminal attack control procedures in the attack of JFC or JFACC objectives. Procedures do not typically define the mission. Objectives define the mission. Strategic air attack, offensive counterair, and AI all may include surface target attacks. They all may also all include terminal attack control for targeting direction and fratricide prevention. In situations when "the CNN effect" or other political and operational requirements force detailed intelligence only achievable through ground based human intelligence coupled with accurate targeting direction, the use of special operations terminal attack controllers may become more prevalent when attacking important high-visibility targets. This may be especially true in conflicts where the US interests appear to be less than vital. Terminal attack control employed in such a manner does not, however, mean that these are air support missions. The placement of terminal attack control procedures in JCAS doctrine is confusing and frustrating to combatants involved in the processes of surface attack and is confusing to future leaders attempting to grasp the concepts of war fighting. For these reasons, the following is recommended:

Recommendation 3. Remove the terminal attack control procedures section from JCAS TTP and position it in a separate multiservice TTP called Tactical Air-Ground Integrated Targeting**.** While this specific title is only an example of possible titles for the

TTP, the concept is important. Separating these procedures from doctrine accomplishes two very important goals. First, it allows the TTP to be updated more frequently, essentially allowing training procedures to be developed commensurate with updates to the multiservice TTP instead of being driven by the much slower approval processes for joint doctrine. This is particularly true since the new procedures are significantly different from the current ones in effect and have not met an operational test of their ability to function in the desired manner for the ground commander, pilots, and TACs. Second, it allows these procedures to apply to all forms of land attack and removes the confusing nature of calling missions by two names, as in CAS-AI or CAS-Strategic Attack.

Recommendation 4. Add an additional type of control that pertains specifically to those TACs qualified in TGO. This control procedure would give considerations for use of signal only control measures. This procedure would be specifically authorized by the JFC and agreed upon by the supported and supporting commanders. Only specifically current and qualified TACs would be allowed to utilize this control procedure as it includes considerations for use beyond the necessity of most TACs. The fact that it indirectly accommodates the weapons release authorization concept provides adequate reason for its inclusion in any framework of controls, even though its use would be highly selective and apply only to AI, strategic air warfare, and offensive counterair missions.

Utility

The current doctrinal framework has marginal utility as a risk management tool because of its lack of clarity and confusion in assignment of responsibility. Nor does it address the weapons, communication tools, and observation platforms currently available to the commander for conducting attacks. This does not negate the genius of its basic concept for categorizing the control measures. The basis of its framework is built upon the observation of the fires applied. The expert--TAC--observation of the fires equated to one level of risk. Any other observation of the target area equated to a higher level of risk associated with the conduct of that mission. What it really boiled down to was direct expert observation and analysis versus indirect observation and analysis of the targeted area. All Army risk analysis tools show that a higher level of risk is associated with missions where uncertainty is higher and where expertise is lower. Therefore, the logic of a direct and indirect control methodology is in line with other risk mitigation processes.

The revised draft framework makes a division between target-observed control types based on whether the TAC is visual with both the aircraft and the target. In doing so it places a wide variety of weapons release procedures in the Type 2 control that include both direct observation by a TAC and indirect observation through an outside observer. This tends to water down the utility of the framework due to the wide variety of risk associated with different controls under Type 2. This will have the adverse effect of either making Type 2 control unusable as a blanket weapons release authorization, or forcing a commander to specifically authorize control procedures for each air mission flown in the AO. Either of these negates its utility as a risk management tool.

Another adverse effect of this framework is that, in negating the usefulness of Type 2 control, the possibility exists that commanders will rely more on Type 1, simply because its associated risk is probably less than the most risky control measures allowed under Type 2. However, some control types authorized under Type 2 may actually be much safer--impose less of a fratricide risk--than afforded by Type 1 control. This seems particularly true, given the results of the JCAS JT&E minitest. However, a lure exists that may entice commanders to resort to Type 1 authorization as a fail-safe measure of fratricide prevention. While there is no absolute way to achieve homogeneity of risk within any single category, the proposed framework seems a less optimal method than the current in attempting to do this, particularly in Type 2 control. As a result, one of the following three recommendations is appropriate, listed in order of preference.

Recommendation 5a. Recategorize the control methods and include all controls for which the TAC is the sole responsible agent for risk determination of the air-delivered weapon release into Type 1 control. This category will include controls that involve the use of an UAV as an extension of the TAC's eyes, provided the TAC is solely responsible for mitigating fratricide and ensuring targeting direction. Type 2 control would then include all weapons releases for which a TAC relies on observer interpretation of the target area for fratricide prevention and target destruction. Type 3 remains the same. Procedures for Type 1 control and Type 2 control would need to be carefully drafted in order to preserve the simplicity of the proposed framework.

Table 3 provides an example of the recommended recategorization. Essentially, this would have the dual effect of increasing the methods of terminal attack control under Type 1 control while reducing the methods of terminal attack control procedures under Type 2. The reasoning is based on the general concept that a qualified TAC with visual

Table 3. Recommended Terminal Attack Control Procedures.

Recommended changes from proposed procedures highlighted in ***bold italics***

Type 1	Type 2	Type 3
Considerations for use: ***- TAC is able to visually acquire target area and determine appropriate measures*** ***- This does not include the use of remote visual acquisition from UAV or other remote sensor***	- TAC unable to ***visually aquire target area*** - Attack aircraft ***may be*** unable to acquire mark or target prior to release **- Considerations for use**: -- timeliness and accuracy of targeting data -- weapon time of flight (TOF) -- detailed planning and prep for standoff weapons -- flight profile and aircraft/weapon/terrain deconfliction ***-- remote sensor, observer, UAV,*** digital or datalink providing SA to TAC/aircrew	- Tactical Risk Assessment $ indicates a low risk of fratricide - TACs provide specific parameters/restrictions to attack aircraft along with "blanket" clearance to attack TAC coordinated/controlled targets - Attack Aircraft Flight Leaders may then initiate attacks within parameters imposed by the TAC - Used when observer or CAS aircraft acquires a target - Observer may deliver CAS briefing/terminal guidance to attack aircraft - TAC monitors transmissions to maintain control of attack
TAC will a) Visually acquire target b) Delivers CAS Brief** to attack aircraft c) Mark/designate target (as practicable) **Attack Aircraft will** a) Provide verbal/digital "IN" call @ **TAC will** d) ~~Visually acquire aircraft*~~ e) Ensures friendlies safety by visual analysis of attack geometry/nose position ***or verbal/digital confirmation of aircrew's SA*** f) Provides "cleared hot" or "abort" based on compliance with above criteria being met verbally or digitally	**TAC or Observer will "see" the target** (an observer may be a scout, COLT, FIST, UAV, SOF, or other C4ISR asset with real time targeting info) **TAC will** a) Deliver CAS Brief** to attack aircraft **Attack Aircraft will** (verbally/digitally) a) Confirm target elevation and location b) Verify target location correlate w/expected target area (using all available means) c) Provides verbal/digital "in" call @ **TAC will** a) Provide verbal/digital "cleared hot"	**TAC or Observer will "see" the target** **TAC will** a) Deliver CAS Brief** to attack aircraft. Briefing will include area for attacks, restrictions and/or limitations, and attack time window b) Provides verbal/digital "cleared to engage" to attack aircraft c) Monitors engagement **Attack Aircraft will** a) provide "attack complete" to the terminal controller

~~* If visual acquisition/analysis cannot be completed, attack aircraft will be forced to modify attack profile to aid in these two tasks.~~

** 9-line or Theater Standard may be delivered verbally or digitally

@ Indicates the aircraft is maneuvering for a targeting or weapon firing solution

$ Tactical Risk Assessment made by maneuver force commander and staff includes: Confidence and training of unit and staff, Timeliness of information, Absence of information, information flow and communications, Confidence in battle tracking (friendly force, non-combatant, and enemy locations), Confidence in targeting information (who/what provides it, stationary or mobile, ability to mark), Ordnance available for attack (capabilities, limitations, restrictions, proximity of friendlies/non-combatants, "Risk Estimate Distances") acquisition ("eyes on") of the intended target poses less risk to friendlies and noncombatants than does terminal attack control procedures relying on a less qualified observer's inputs or direction. The format of this recommendation is presented using the same table outlined in chapter 2 depicting the "Proposed Terminal Attack Control Procedures" (table2), but includes the recommended changes. The changes are not intended to be all encompassing; instead, they are intended to be a guide for doctrine authors who will need to expand with appropriate textual clarification.

Recommendation 5b. If the current control methods are not intended to be used as a risk management tool for the commander, this should be explicitly stated in the text of the section on categories of control. All references to the use of a risk assessment by the commander to determine which category of controls to use should be removed. The reason for categorizing control methods should be explicitly stated in order to alleviate any misinterpretation of the framework as a risk management tool. Since this has been viewed as a risk management tool in the past, it is very likely that it will continue to be viewed in that light.

Recommendation 5c. If left as is, one way of giving the commander more ability to utilize this as a risk management tool is to specifically state that a commander may specify that only a portion of the total weapons delivery procedures allowed by Type 2 control will be allowed within the AO as appropriate. For instance, if a commander did not feel that observer-aided controls were adequate for his risk assessment, he could specifically prohibit those weapons release procedures while authorizing all other procedures allowed by Type 2 control. This final recommendation may be utilized despite any changes to the text in the draft publication, but clarifying it may bring credibility back to the structure and alleviate the pressure some commanders may feel to resort to Type 1 control during training exercises.

Final Response to Thesis Question

The changes to terminal attack control procedures offered in the revised draft publication of JP 3-09.3 are necessary. The current control procedures are open to interpretation in both applicability and responsibility for the controls. They do not adequately allow for the use of advanced weapons, communications, or ISR platform integration. Additionally, they do not address the entire scope of CAS or DAS operations. Finally, they cannot function effectively as a risk management tool for the commander because they are incomplete and unclear. The revised draft procedures adequately address all of these concerns. However, this study finds that the new procedures are not sufficient in two areas. First, they do not account for signal only terminal attack control procedures that may be necessary outside the scope of CAS or DAS. Second, the framework does not lend itself to be a useful risk management tool without severe manipulation. In fact, it may result in creating overreliance on the use of Type 1 control by commanders, imposing a higher state of risk and lower effectiveness of airpower.

APPENDIX A

DRAFT TERMINAL ATTACK CONTROL PROCEDURES FOR
JP 3-09.3 AS OF 23 JANUARY, 2002

f. Weapons Release Authority. The authority and responsibility for the expenditure of any ordnance on the battlefield rests with the supported commander. The supported commander will delegate weapons release clearance authority to his Terminal Attack Controller's (TAC) to facilitate CAS attacks. Weapons release authority grants TAC's the authority to provide the following to attacking aircraft:

- **"Cleared Hot"-** Term used by a qualified Terminal Attack Controller (TAC) granting weapons release clearance to an aircraft attacking a specific target.
- **"Cleared To Engage"-** Term used by a qualified Terminal Attack Controller (TAC) granting a "blanket" weapons release clearance to an aircraft or flight attacking a target or targets which meet the prescribed restrictions set by the TAC.

g. Tactical Risk Assessment. As the battlefield situation changes, the maneuver force commander and staff make continuous tactical risk assessments. Risk assessments involve the processing of available information to ascertain a level of acceptable risk to friendly forces or non-combatants. Based on the current risk assessment, the commander will weigh the benefits and liabilities of authorizing a particular type of terminal attack control. Information to consider when assessing risk includes:

- Confidence and training of the unit and staff
- Timeliness of information
- Absence of information
- Information flow and communications
- Confidence in Battle Tracking
  - •• Friendly force locations
  - •• Non-combatant locations
  - •• Enemy locations
- Confidence in targeting information
  - •• Who or what provides targeting information
  - •• Stationary or moving
  - •• Ability to mark the target
- Ordnance available for attack
  - •• Capabilities
  - •• Limitations
  - •• Restrictions
  - •• Proximity of friendlies/non-combatants

h. Types of CAS Terminal Control.

There are three types of terminal control. Each type follows a set of procedures with associated risk. The intent is to offer the lowest level on-scene tactical commander the latitude to determine which type of terminal control best accomplishes the mission. The commander considers the situation and issues guidance to the terminal controller based on recommendations from his staff and associated risks identified in the tactical risk assessment.

When using Type 1 control, TACs must be in position to visually acquire the attacking aircraft and the target under attack. It may have been determined, during the tactical risk assessment process, that analysis of attacking aircraft nose position and geometry is the best method of ensuring first pass success and fratricide mitigation under the current conditions. Language barriers when controlling coalition aircraft, lack of confidence in a particular platform, aircrew capability, or troops in contact (TIC) situations are examples where visual acquisition and control of attacking aircraft may be assesed to be the control method of choice.

There is no requirement for the TAC to visually acquire the target under attack in Type 2 or 3 control. Targeting information may come from someone or something in a position to observe a nominated target. An observer can can include a scout, COLT, FIST, UAV, SOF or other C4ISR asset. **The TAC must consider the timeliness and accuracy of targeting information when relying on any form of remote targeting.**

Type 2 control will be used when the TAC assesses he will be unable to see the aircraft at weapons release (night, adverse weather, tactics, standoff weapons employment) or when attacking aircraft are not in a position to acquire the mark/target prior to weapons release/launch. Successful CAS attacks under these conditions are dependent on timely and accurate targeting data. Weapon time of flight (TOF) will be a factor relative to movement of enemy targets and friendly forces when employing standoff weapons incapable of receiving targeting updates throughout the duration of flight. Such munitions may be maximized against "dug-in," less mobile targets or choke points where movement is more restrictive. Detailed planning and preparation by both the TAC and the aircrew are required to identify the situations and locations conducive to standoff weapons attacks, and to address flight profile and deconfliction (aircraft/weaponry/terrain) considerations. Digital or data link systems capable of displaying aircraft track, sensor point of interest, etc., may provide the required information and situational awareness that better enables the TAC to authorize weapons release when the TAC is unable to visually acquire the attacking aircraft.

Type 3 control may be used when the tactical risk assessment indicates that CAS attacks impose low risk of fratricide. When commanders authorize type 3 controls, TACs grant a "blanket" weapons release clearance to an aircraft or flight attacking a target or targets which meet the prescribed restrictions set by the TAC. Attack Aircraft Flight Leaders may then initiate attacks within the parameters imposed by the TAC. Observers may be equipped and in a position to provide terminal guidance to attack aircraft. The TAC will monitor radio transmissions and other available digital information to maintain control of the attacks. The TAC maintains abort authority throughout the attack.

TACs will broadcast the type of control in use upon aircraft check-in. It is not unusual to have two types of control in effect at one time. For example, a TAC may control helicopters working type 2 control from an attack position outside the TAC's field of view while simultaneously controlling medium or low altitude fixed wing attacks under type 1 or 3 control. The terminal controller maintains the flexibility to change the type of terminal control at any time within guidelines establish by the ground commander. Due to battlefield dynamics, friendly positions and targeting are subject to accuracy and latency. Senior commanders may provide restrictions that will prevent subordinate commanders from choosing certain terminal control types based on the risk assessment. However, the intent is for senior commanders to provide guidance that **allows the on-scene tactical commander to make the decision based on the situation. The following procedures will be used when executing Type 1, 2 or 3 terminal control.**

- Type 1

  •• **TAC will visually acquire the target**
  •• **TAC will send a CAS Briefing (9-line or Theater Standard) to Attack Aircraft** (verbally or digitally)

  •• **TAC will Mark/designate target (as practicable)**

  •• **Attack Aircraft will provide "IN" call indicating maneuvering for weapons firing solution** (verbally or digitally)

  •• **TAC will visually acquire the Attacking aircraft** (verbally or digitally)

  •• **TAC will ensure attack will not affect friendlies by visual acquisition and analysis of Attack Aircraft geometry/nose position to determine weapon impact point**

  •• **TAC will provide a "cleared hot" or "abort" based on the above procedures being met Verbally or Digitally**
  Note: In the case where aircraft acquisition/analysis by the TAC is difficult or not possible, attack aircraft may be forced to modify their attack profile to aid in acquisition.

- Type 2:

  ••**TAC or an Observer will "see" the target** (an observer may be a scout, COLT, FIST, UAV, SOF, or other C4ISR asset with real time targeting information`)

  •• **TAC will send a CAS Briefing** (9-line or Theater Standard) **to Attack Aircraft** (verbally or digitally)

  •• **Attack Aircraft will confirm Line 4** (elevation) **and Line 6** (target location) **of the CAS briefing** (verbally or digitally)

  •• **Attack Aircraft will verify target coordinates correlate with expected target area** (verbally or digitally)
  Note: Attack aircraft verifies target location by using all available means: map plot, target designation displayed on digital map set, Heads-up display (HUD) symbology, Forward looking infra-red (FLIR), RADAR, etc.

•• **Attack Aircraft <u>will</u> provide the TAC with an "in" call indicating maneuvering for a targeting solution** (verbally or digitally)

•• **TAC will provide a "cleared hot" clearance to drop/fire** (verbally or digitally)

The following scenario provides a step-by-step example of how Type 2 control would be used for standoff weapons employment.

-TAC acquires target, verifies target location and assesses the targeting data to be of sufficient accuracy for JDAM employment.

-Attack aircraft checks in as fragged and is provided the CAS briefing.

TAC : "Skull 21, this is Mighty, Type 2 control"

1. MAZDA
2. 360 Right
3. 9.9
4. 450
5. T-80 dug in
6. N 343605.01 W0772329.01
7. NONE
8. South 1000, Troops In Contact
9. Egress east to to CHEVY

Attack Aircraft : "Line 4 : 450, Line 6 : N 343605.01 W0772329.01"

TAC : "Readback Correct. Final Attack Cone 300-345, TOT 45"

Attack Aircraft : "Roger, TOT 45"

-Attack aircraft validates target location by plotting coordinates on a 1 : 50,000 map, and cross checks that his desigantion is coincident with the expected target area.

-Prior to weapon release attack aircraft provides TAC with an IN call.

Attack Aircraft : "Skull 21's IN"

TAC : "Cleared Hot"

- **Type 3:**

•• **TAC or an Observer will send a CAS Briefing** (9-line or Theater Standard) **to Attack Aircraft** (Briefing includes area for attacks, restrictions/limitations, and attack time window) Verbally or Digitally

••**TAC will provide Attack Aircraft "cleared to engage"** (verbally or digitally)

••**TAC will continue to monitor the engagement**

•• **Attack platform will provide "attack complete" to the terminal controller** (verbally or digitally)

Note: The TAC maintains abort authority in all cases.

The following scenario provides a step-by-step example of how Type 3 control would be used in a situation where the tactical risk assessment revealed a low risk of fratricide.

-The supported commander has just been informed that a reconnaissance team has spotted a company of mechanized infantry approaching 15 KM to the north. A very discernible ridgeline conveniently separates friendly forces from the enemy.

The commander and staff are confident in friendly force disposition and the common operating picture provided through sound battle tracking. A division of AV-8s is currently in the stack and has sensors in the target area verifying the recon teams sighting. The decision is made to authorize type 3 control and attack the mechanized company before they close and become decisively engaged. The following 9-Line is provided :

TAC : "Latch 21, this is McFly, Type 3 control"

1. MAZDA
2. 360 Right
3. 9.0
4. 450
5. Mechanized Company in the open
6. N 343605.01 W0772329.01
7. NONE
8. SE 3000
9. Egress S to Mazda. TOT 45-55.

Attack Aircraft : "Roger 45-55"

TAC : "Remarks to follow. Latch 21 you are cleared to engage from time 45-55. Stay North of the saddleback ridgeline. Cobra recon team is currently 3000 S in position to lase. Contact him this TAD. Report attack complete."

Attack Aircraft : "Roger. Copy All."

While recent technological advances in weaponry and digital/data link systems have provided significant enhancements to the CAS mission, it is imperative that commanders and operators fully understand the capabilities and limitations of the systems being brought to the fight. Descriptive dialog between the TAC and aircraft will often provide the best means of mitigating risk and producing the desired effect on target.

APPENDIX B

RESEARCH TOPICS

1. What is the definition of "close proximity," and who or what on the battlefield determines the "proximate" distance?
2. What is meant by "detailed integration" with regard to CAS?
3. In what ways have technological advances made CAS easier or more difficult?
4. What is "reasonable assurance," and how does it apply to CAS?
5. What are the advantages and disadvantages of sending terminal attack controllers beyond the forward line of own troops (FLOT)?
6. Is the Air Force prepared to meet the ground force commander's immediate interdiction needs? Qualify your answer.
7. What is meant by "danger close" with regard to CAS and troops in contact (TIC)?
8. Should the FSCL define the line between CAS and AI? Explain.
9. What are some of the complexities of performing CAS in a military operation in urban terrain (MOUT) environment?
10. What is the best way to affect the brigade's deep battle, with CAS or AI? Which is more effective? Which is more responsive?
11. Do Army commanders today understand flexible AI?
12. What is the best use of a brigade's CAS assets, given that they have subdistributed sorties available?
13. What is better for the ground force commanders, a "push" or "pull" CAS system?
14. Given that army attack aviation performs the same Counterland functions of CAS and AI as the Air Force, should attack helicopters from the army be placed on the ATO and allocated according to the JFACC's master air attack plan (MAAP)?
15. If enlisted terminal attack controllers (ETACs) are placed at battalion level as the only TACP personnel (no ALO), will they have sufficient influence on decisionmaking of the S3 to ensure that air assets are properly tasked?
16. What are some of the problems with having TAC-trained army personnel controlling CAS sorties? Can the problems be overcome?
17. As a battalion commander, what are your concerns for effectively integrating CAS into your scheme of maneuver?
18. As a battalion commander, how will you integrate your ALOs and ETACs into your training plan? Can this program work at brigade and division levels?

APPENDIX C

FM 71-1, FRATRICIDE RISK FACTOR TABLE

Table C1. Fratricide Risk Factors

	Potential risk categories (with variable conditions and point values)		
Factors affecting fratricide	**Low risk (1 point)**	**Medium risk (2 points)**	**High risk (3 points)**
UNDERSTANDING OF THE PLAN			
Commander's intent **Complexity** **Enemy situation** **Friendly situation** **ROE/ROI**	Clear Simple Known Clear Clear	___________	Vague Complex Unknown Unclear Unclear
ENVIRONMENTAL FACTORS			
Intervisibility **Obscuration** **Battle tempo** **Positive target identification**	Favorable Clear Slow 100 %	___________	Unfavorable Obscured Fast None (0 %)
CONTROL MEASURES			
Command relationships **Audio communications** **Visual communications** **Graphics** **SOPs** **Liaison personnel** **Location/navigation**	Organic Loud / clear Easily seen Standard Standard Proficient Sure	___________	Joint/combined Jammed Obscured Not understood Not used Untrained Unsure
EQUIPMENT (compared to US equipment)			
Friendly **Enemy**	Similar Different	___________	Different Similar
TRAINING			
Individual proficiency **Unit proficiency** **Rehearsals** **Habitual relationships** **Endurance**	MOS-qualified Trained Realistic Yes Alert	___________	Untrained Untrained None No Fatigued
PLANNING TIME (based on 1/3 - 2/3 rule)			
Higher headquarters **Own unit** **Subordinate elements**	Adequate Adequate Adequate	___________	Inadequate Inadequate Inadequate
Overall risk assessment (by total point value)	**Low risk 26 - 46 points**	**Medium risk 42 - 62 points**	**High risk 58 - 78 points**
NOTE: Point values alone may not accurately reflect fratricide risk. The commander must tailor his assessment to the unit's requirements.			

Source: FM 71-1 1998, Figure D-1.

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